Program Schedule

104th Annual International Conference of the American Society for Horticultural Science

Westin Kierland Resort and Spa, Scottsdale, Arizona

Sunday, July 15

7:00–6:00 pm

Sedona & Montezuma Castle National Monument Tour

Travel back in time to Montezuma Castle National Monument. The short path to this prehistoric Sinagua Indian cliff dwelling along the banks of beautiful Beaver Creek. The next stop on the tour takes you to the amazing red rocks of Sedona, where you can find yourself surrounded by such famous rock formations as Bell Rock and Cathedral Rock, and you will experience the serene beauty of Oak Creek Canyon. *Bring your camera!*

8:00–3:00 pm

Boyce Thompson Arboretum Tour

Boyce Thompson Arboretum, established in 1927, is located 55 miles east of Phoenix and 75 miles south of Tucson near Superior, Arizona. Covering some 330 acres of unspoiled Sonoran Upland desert and willow-cottonwood riparian plant communities, it is Arizona's oldest, largest, and most spectacularly situated botanical institution.

9:00–5:00 pm **Noble Boardroom**

ASHS Board of Directors Meeting

Presiding: Paul Read

Monday, July 16

7:00–11:00 am

Sonoran Half-Day Hummer Adventure!

Take off for this adventure at the crack of dawn and experience the desert for 4 full hours. Explore the Sonoran Desert with expert guides in the most powerful 4×4 on Earth.

7:30–6:00 pm **Culturekeepers Hall West**

Registration Desk Open

8:00–9:00 am **Powell A/B**

Moderators Training Session

Presiding: Carl Sams & Dennis Ray

8:00–9:00 am **Lowell A/B**

Current Status of the ASHS-Certified Horticultural Advisor Program (ASHS-CHA)

Presenters: Fred Davies, Mary Lamberts, Terry Ferriss

George Fitzpatrick, Susan Steinberg, Karen Panter, Janet Cole

The changing dynamics of the land-grant system, the consolidation of Horticulture Departments into general Plant Science programs, and the decreasing population of graduate students and faculty who identify as being Horticulturists are having immediate and long term affects on the Profession of Horticulture, and on ASHS. Concurrently, the margins of the Horticulture industry have been reduced with increased competition, consolidation and globalization. ASHS must reposition and readapt itself to this changing environment. The ASHS Certified Horticultural Advisor Program (ASHS-CHA) is an opportunity to professionalize and enhance the relevancy of both traditional and emerging areas of Horticulture, encourage and attract young people seeking careers in the field, and to better serve the industry.

The ASHS-CHA is a national program to define and validate the horticultural competency of working horticultural practitioners in the horticulture industry and/or profession who may or may not have a 4-year college degree (in Horticulture or a closely related field). The program will provide the horticulture industry, government agencies, and the general public, a means in which to document and validate the professional credibility of personnel providing horticultural products and services. ASHS Certified Horticultural Advisors are awarded certification based upon a national horticulture competency exam, professional work experience, and professional references. Certified Horticultural Advisors will retain certification by completing 20 Continuing Education Units (CEUs) in specific subject matter areas within a 2-year period, and by adhering to the ASHS Professional Code of Conduct. This presentation will briefly review the ASHS-CHA Program, its benefits to ASHS and the Horticulture Industry, relation to other ASHS Certification programs, current progress and future development challenges.

8:00–10:00 am **Kirkland**

Crucifer Crop Germplasm Committee Meeting

8:00–10:00 am **Merriam A**

Prunus Crop Germplasm Committee Meeting

Presiding: Mark Farnham

9:00–10:00 am **Noble Boardroom**

Collegiate Activities Committee Meeting

Presiding: Richard Harkess

9:00–10:00 am **Powell A/B**

Working Group Chairs/Chairs-Elect Meeting

Presiding: Randy Woodson

9:00–10:00 am **Rainmakers Ballroom A**

Cucurbit Genetics Cooperative Meeting

Presiding: Todd Wehner

10:00–12:00 pm **Herberger Ballroom 1/2**

Opening Plenary Session and William A. "Tex" Frazier Lecturer

20th William A. "Tex" Frazier Lecture

Speaker: Bruce A. Kimball

(see description on page 787)

ASHS 2007 Awards Ceremony

Presiding: Randy Woodson, ASHS President

Presentation of the 2007 Awards including:
- Hall of Fame Inductees
- 2007 Class of Fellows
- Outstanding Extension Educator Award
- Outstanding Graduate Educator Award
- Outstanding Undergraduate Educator Award
- Outstanding Industry Scientist Award
- Outstanding International Horticulturist Award
- Outstanding Researcher Award
- Cross-Commodity Publication Award
- Extension Publication Award
- Education Publication Award
- Ornamental Publication Award
- Vegetable Publication Award

12:00–1:00 pm **Tribal Room A/B**

Award Recipient Reception *(by invitation only)*

12:00–1:00 pm **Kierland Grand Ballroom**

Graduate Student Poster Competition (Group 1)

Presiding: Barbara Liedl

Please note, competition presentation time is *in addition to* scheduled assignment times within the ASHS Technical Program.

12:00–12:45 pm **Kierland Grand Ballroom**

Poster Session 1: Crop Physiology 1

(164) Formation of Fluid Phase Endocytic Vesicles at the Plasmalemma and Fusion with the Vacuole during Sucrose Uptake in Heterotrophic Cells
Ed Etxeberria*, Pedro Gonzalez, Javier Pozueta, Diann Achor

(165) Potato Multicystatin may Facilitate Protein Accumulation by Regulating Protease Activity in Developing Potato Tubers
Sarah M. Weeda*, G.N.M. Kumar, N. Richard Knowles

(166) In Vitro Carbon Dioxide and Ethylene Evolvement of *Cymbidium sinense* Rhizomes Cultured in Both Rhizome Propagation and Shoot Differentiation Media
Jhen-Ying Pan, Nean Lee, Yao-Chien Alex Chang*

(167) Relationship between Low Night Temperature-induced Ovary Deformation and Source Supply in Sweet Pepper
Nicacio Cruz-Huerta*, Rebecca L. Darnell, Jeffrey G. Williamson

(168) Root Carbohydrates and Cane Yield in an Annual Off-season Raspberry Production System
Horacio E. Alvarado-Raya*, Rebecca L. Darnell, Jeffery G. Williamson

(169) Alternate Bearing of the 'Hass' Avocado: Identification of the Mechanism by Which Crop Load Influences Return Bloom
Alfredo López Jiménez, Carol J. Lovatt*

12:00–12:45 pm **Kierland Grand Ballroom**

Poster Session 2: Weed Control and Pest Management

(151) Beach Vitex (*Vitex rotundifolia* Lf.) Seed Characteristics, Germination, and Soil Seed Bank Studies
Ted Whitwell*, Matthew Cousins, Jeanne Briggs, Charles Gresham

(152) The Spread of Invasive Swallow-wort Species Across New York State: Biology, Ecology and Implications for Control and Management
Cameron Douglass, Leslie Weston*

(154) Impact of Low Densities of *Bemisia tabaci* biotype B on Fruit Quality of Zucchini Squash
Elizabeth J. Thomas*, Daniel J. Cantliffe, Philip A. Stansly

(155) Influence of DNA Herbicides on Cold Hardiness During Nursery Field Over Wintering
Upender Somireddy*, Hannah Mathers, Luke Case

(156) Impact of Biofumigation with Seed Meal on Weed Control in Plasticulture Strawberry Production
Carl Sams*, Steven Vaughn, Dennis Deyton, John Cummins

(157) The Effect of the Sequence and Time-lapse between Infection of the Causal Agents of Sweetpotato Virus Disease (SPVD) on Symptom Development and Individual Virus Titers
Cecilia McGregor*, Douglas Miano, Mary Hoy, Chris Clark, Don LaBonte

12:00–12:45 pm **Kierland Grand Ballroom**

Poster Session 3: Growth Chambers and Controlled Environments

(104) Are Greenhouse Tomato Growers Overdosing Their Plants with CO_2?
Diane Edwards*, Peter Jolliffe, David Ehret

(105) Application of Response Surface Methodology to Determine the Influence of Irradiance and CO_2 Concentration on Yield of Carrot Grown Hydroponically
Desmond G. Mortley*, Lashelle McCoy, Darwin Poritz, Jill Hill, Conrad Bonsi, Walter Hill

(107) Hypoxia Effects on Phytochemical Compounds and Antioxidant Capacity in Lettuce
Nihal Rajapakse*, Fred Davies, Chuanjiu He, Luis Cisneros-Zevallos

(108) Changes in Concentrations of Lycopene and Total Soluble Solids of Hydroponic Tomato Fruit as Affected by Greenhouse Environmental Conditions
Mark Kroggel*, Katherine Dietrich, Chieri Kubota, Cynthia Thomson

(109) Research on the Farm Adaptability of Energy-saving Techniques in a Greenhouse
Hark-Joo Kim*, Si Young Lee, Hee Chun, Sung Hyun Yum, Jae Wook Lee

(110) An Evaluation of Fulvic Acid for Hydroponic Lettuce Production
Ronald Muse, Barbara Muse*

(111) Galia Muskmelon Production in High Tunnels
Lewis Jett*

(112) Productivity and Fruit Quality in Beef Tomatoes Varieties Under Greenhouse Conditions in the Northwest of Mexico
Raul Leonel Grijalva-Contreras*, Rubén Macías-Duarte, Fidel Núñez-Ramírez, Fabián Robles-Contreras, Manuel de Jesús Valenzuela-Ruiz

20th William A. "Tex" Frazier Lecture

Sponsored by Seminis Vegetable Seeds

Monday, July 16, 2007
10:00 am–12:00 pm

Bruce A. Kimball
Soil Scientist
Arid-Land Agricultural Research Center, Maricopa, Ariz.

Bruce Kimball's topic will relate to his work on climate change on agriculture, particularly related to carbon dioxide levels.

About Bruce A. Kimball

Throughout his professional career, Bruce Kimball has studied the movement of soil heat and soil gases and has developed several new analysis and measurement methods. He has focused primarily on the study of the effect of CO_2 on plant growth and water relations and, for the last two decades, has determined the effects of the increasing atmospheric CO_2 concentration and climate change on yield and water use of outdoor field crops.

Kimball received his PhD in Soil Physics from Cornell University (1970), MS in Soil Physics from Iowa State University (1965), and his BS in Soil Physics from the University of Minnesota (1963).

Recent publications include:

Kimball, B.A., K. Kobayashi, and M. Bindi. 2002. Responses of agricultural crops to free-air CO_2 enrichment. Advances in Agronomy 77:293–368.

Kimball, B.A. 2005. Theory and performance of an infrared heater for ecosystem warming. Global Change Biology 11:2041–2056.

About the Tex Frazier Lecture Series

The Tex Frazier Lecture series was named in honor of William A. "Tex" Frazier, an eminent member of the faculty at Oregon State University. The intent of the lecture series is: "to foster and promote reciprocal liaisons between ASHS and other professional groups; to recognize distinguished scholars and to bring their point of view to ASHS members; and to encourage the development of a holistic philosophy within the horticultural science profession so that ASHS members and students can enjoy the benefits of a broader perspective provided by an understanding of the interrelationship of seemingly diverse disciplines."

(113) Seasonal Northern Snap Bean Production Using High Tunnels
Meriam Karlsson*, Heidi Rader, Jeffrey Werner

(114) Cherry Tomatoes Characteristics Developed Under Greenhouse Conditions in the Northwest of Mexico
Fidel Núñez-Ramirez, Raul Leonel Grijalva-Contreras*

(115) A Parthenocarpic Cucumber (*Cucumis sativus* L.) Cultivar Assay Under Greenhouse Conditions in La Costa de Hermosillo, Mexico
Everardo Zamora*, Cosme Guerrero, Santiago Ayala, Jose Juvera

12:00–12:45 pm **Kierland Grand Ballroom**

Poster Session 4: Floriculture 1

(339) Plant Growth Regulation of *Bracteantha bracteata*
Brian Trader*, Mengmeng Gu, Mingshu Zhang

(340) Effects of Plant Growth Regulators on Postharvest Characteristics of Geranium and Impatiens
H. Brent Pemberton*, William R. Roberson

(341) Comparison of Three Plant Growth Regulators on Branching of *Clerodendrum thomsoniae*
Karen Davis*, Carl Niedziela, Brian Whipker

(342) Growing Sonora Red Poinsettia with Various Growth Retardants
Youping Sun*, Donglin Zhang, Lois Berg Stack, Bixia Xie

(343) Effect of ProGib, NovaGib and Cyclanilide on Growth of *Bracteantha bracteata* (Vent.) A.A. Ander.
Mengmeng Gu, Brian Trader, Mingshu Zhang*

(344) Effects of GA_{4+7} plus BA on Postharvest Quality of Cut Tulips
Hye-Ji Kim*, William Miller

(345) Effects of Cyclanilide on Lateral Branching of Poinsettia (*Euphorbia pulcherrima*) 'Prestige Red' and 'Visions of Grandeur'
Kelly Allsup*, Dave Williams, Daniel Warnock, Gary Kling

12:00–12:45 pm **Kierland Grand Ballroom**

Poster Session 5: Postharvest 1

(236) Prediction of Ascorbic Acid Content in Broccoli Using Respiration Model
Chairat Techavuthipron*, Kohei Nakano, Shigenori Maezawa

(237) Cell Wall Modification and Polygalacturonase Activity during Ripening of Melon Fruit
Hyunju Lee*

(238) Organic Methods for Potato Sprout Suppression in Storage
Mary Jo Frazier*, Nora Olsen

(239) Nitric Oxide Treatment Reduced Chlorophyll Degradation of Broccoli Florets During Senescence
Hyang Lan Eum, Seung Koo Lee*

(240) Determination of Proper CO_2-shock Condition to Inhibit the Ripening of Tomatoes

Jeonghee Choi*, Byeongsam Kim, Seong Koo Lee

(241) Ripening Events in Seeded Watermelons

Penelope Perkins-Veazie*, Angela Davis

(242) Hyperoxia Accelerates Ethylene-induced Responses, Including Watersoaking Symptoms, in Cucumber Fruit

Eunkyung Lee, Donald Huber*

(243) Sensory Characteristics of Pigeon Pea Pods and Seeds Following Storage in Modified Atmosphere Packaging

Karla Deza Durand, Carol Harper, Annette Wszelaki*

(244) Quality Characteristics of Datil Hot Pepper Harvested at Different Stages of Maturation

Elena Lon Kan, Steven Sargent*, Amarat Simonne, Daniel Cantliffe, Nicole Shaw

12:00–6:00 pm **Kierland Grand Ballroom**

Exhibit Area and Poster Hall Open to Attendees

12:00–6:00 pm **Cushing A/B**

Employment/Internship Services (Placement) Open

1:00–5:00 pm

Taliesin West Tour

International headquarters of the Frank Lloyd Wright Foundation and the winter campus for the Wright School of Architecture. Take the tour here of the buildings and grounds. Built in 1937, Taliesin is an ongoing project. View Wright's continuing contribution to it through his theories of organic design. 1:15–2:00 pm

1:00–2:00 pm **Kierland Grand Ballroom**

Graduate Student Poster Competition (Group 2)

Presiding: Barbara Liedl

Please note, competition presentation time is *in addition to* scheduled assignment times within the ASHS Technical Program.

1:15–2:00 pm **Kierland Grand Ballroom**

Poster Session 6: Propagation 1

(081) Effect of Plant Growth Regulators in Inducing Microrhizome in Rhubarb (*Rheum rhabarbarum* L.) In Vitro

Usha P. Rayirath*, Rajasekaran R. Lada, Claude D. Caldwell, Samuel K. Asiedu, Kevin Sibley

(082) Tissue Culture of Rare and Endangered Plants in China

Xiaoling Jin*, Donglin Zhang, Anxiang Wu

(083) Effects of Fractional Disinfestation, Cytokinin Type and Concentration, Apical Dome Culturing, and Thermotherapy on Establishment, Multiplication, and Potyvirus Elimination for In-Vitro *Canna* × *generalis* Cultivars

Catherine Prestowitz*, Sherry Kitto, James Harbage, Robert Lyons

(084) Galax Seed Germination under Different In Vitro Conditions

Guochen Yang*, Zhongge (Cindy) Lu, Carl E. Niedziela Jr.

(085) Molecular Identification and Control of Endogenous Bacterial Contaminants of In Vitro-grown *Hydrangea macrophylla* (Thunb.) Ser. Cultures

Erik Fargo, Jeffrey Adkins*

(086) Enhancing Germination of *Carex pensylvanica* Seed

Esther E. McGinnis*, Mary Hockenberry Meyer

(087) Seed Germination in Horned Poppies, *Glaucium* spp.

Karen Elsner*, Harrison Hughes

(088) Effects of Stratification, Germination Temperature, and Pretreatment with Gibberellic Acid and Hydrogen Peroxide on Germination of 'Fry' Muscadine (*Vitis rotundifolia*) Seed

Patrick Conner*

(089) Effect of IBA on Rooting *Rhododendron carolinianum* Rehd. Cuttings

Fang Geng, Donglin Zhang*, Jianmin Fu, Xun Chen, Lanying Du

(090) Cutting Propagation of *Melastoma dodecandrum* Lour

Ling Zhu, Donglin Zhang*, Xiaoling Jin, Bin Zhang, Zhonghua Peng

(091) K-IBA Improves Rooting of *Viburnum rufidulum*

Jason Griffin*

(092) Evaluation of Genotypes of Watermelon (*Citrullus lanatus* Shard.) Grafted on Native Rootstock: An Alternative to Reduce Environmental Chemical Contamination

Radillo-Juarez Francisco, Juan Manuel González-González, Jamie Molina-Ochoa*, Mireya Rivera-Montelón

(093) White Sage Cuttings Treated with IBA Root Fastest in Silica Sand with Subirrigation

Angela R. Beaman*, Richard J. Gladon

1:15–2:00 pm **Kierland Grand Ballroom**

Poster Session 7: Vegetable Crops Management 1

(266) Evaluation of Non-harvested Watermelon Pollenizers for Flowering Characteristics and *Fusarium oxysporum* fsp. *niveum* Susceptibility

Christopher Gunter*, Daniel Egel, Frankie Lam, Sara Hoke

(267) Effect of Late-season Glyphosate Drift to Seed Potato

Harlene M. Hatterman-Valenti*, Collin P. Auwarter, Paul G. Mayland

(268) Evaluation of Fungicides for Control of Collard Downy Mildew

Jan Mickler*, Craig Keathley

(269) Impacts of Media and Chlorination on the Growth of Bell Pepper (*Capsicum annuum* L.) Inoculated with *Pythium aphanidermatum*

Shubin Saha*, Dan Cantliffe

(270) Endophytic *Beauveria bassiana* in Tomatoes Yields Mycosis in Tomato Fruitworm Larvae

W.A. Powell, W.E. Klingeman*, B.H. Ownley, K.D. Gwinn, M. Dee, P.C. Flanagan

(271) Effect of Different Seeding Rates of Rye Cover Crop on Weed Control and Yield of Pumpkins

Maurice Ogutu*

(272) Effective Management of Septoria Late Blight (*Septoria apiicola* Speg.) of Celery with Disease Forecasting using Reduced Risk Fungicides

Cheryl Trueman, Mary Ruth McDonald*, Bruce Gossen, Alan McKeown*

1:15–2:00 pm **Kierland Grand Ballroom**

Poster Session 8: Plant Nutrient Management

(135) Effects of Foliar Potassium Source on Muskmelon Fruit Quality and Phytonutrient Content

John Jifon*, Gene Lester

(136) Spinach Shoot Tissue Nutrient Concentrations Respond to Foliar Applications of Chelated Titanium

Dean Kopsell*, Scott McElroy, Carl Sams

(137) Enhancement of Tomato Fruit Lycopene by Potassium is Cultivar-dependent

Henry Taber*, Penelope Perkins-Veazie, Wendy White, Steven Rodermel

(138) Comparison of Phosphoric Acid and Phosphite Foliar Sprays for Lowbush Blueberry

John M. Smagula*, Loretta Kreider

(139) Bud Scales in Flower Samples Can Significantly Alter Nutrient Analysis Results

Franz Niederholzer*

(140) Laboratory Studies Characterize Phosphate Sorption of Calcined Clays Used as Soilless Root Medium Amendments

Rose Ogutu*, Kimberly Williams, Gary Pierzynski

(141) Effect of Potassium on the Growth and Development of the Pitahaya (*Hylocereus undatus* Britt et Rose) in Greenhouse

Arnoldo Michel-Rosales*, Javier Farias-Larios, Francisco Radillo-Juárez, Juan Alberto Osuna-Castro, Elpidio Peña-Beltrán, Celso Reyes-Martínez

(142) Effect of Several Phosphorus Levels on Growth the Pitahaya (*Hylocereus undatus* Britt & Rose) under Greenhouse Conditions

Arnoldo Michel-Rosales*, Javier Farias-Larios, Juan Alberto Osuna-Castro, Elpidio Peña-Beltrán, Marcelino Bazan-Tene, Ernesto Arturo Domínguez-Camarena

(143) Nutrient Extraction in 'Dominico' Banana (*Musa* spp.)

Ana Maria Castillo*, Jose Alfredo Hernandez-Maruri, Edilberto Avitia-Garcia, Joel Pineda-Pineda, Luis-Alonso Valdez-Aguilar

(144) Nitrogen Dynamics in Decomposing Cranberry Leaf Litter

Sarah Stackpoole, Beth Ann Workmaster, Kevin Kosola*

(145) NUTRILYCHEE—A New Approach to Refine Lychee Crop Fertilizer Recommendation Based on Foliar Nutritional Diagnosis

Roberto de Aquino Leite, Victor Hugo Alvarez, Julio Cesar Lima Neves, Gerival Vieira, Vicente W.D. Casali*

(146) Influence of Mineral Nutrient Source on the Yield of Arugula, Basil, and Beetroot in NFT Mixed Cropping System

Jonathan N. Egilla*, Isabelle Nyirakabibi

(147) Nutrient Concentrations of Leachates For Outdoor-grown, Containerized *Ligustrum texanum* When Using Four Different Types of Controlled-release Fertilizers

Donald Merhaut*, Eugene Blythe, Joseph Albano

(148) Leachate Nutrient Concentrations For Greenhouse-grown, Containerized Azaleas When Using Four Different Types of Controlled-release Fertilizers

Eugene Blythe, Donald Merhaut*, Joseph Albano

(149) Light Intensity, Soil Type, Greens Type, and Lithium Addition Affect Greens Leaf Constituents

Donald Makus*, Larry Zibilske, Gene Lester

(150) Evaluation of Nitrogen and Phosphorous on the Production of Tomatillo (*Physalis ixocarpa* Brot.) in the Mexican Dry Tropics

Marcelino Bazan-Tene*, Arnoldo Michel-Rosales, Javier Farias-Larios, Gerardo López-Aguirre, Juan Alberto Osuna Castro

1:15–2:00 pm **Kierland Grand Ballroom**

Poster Session 9: Herbs, Spices, and Medicinal Plants 1

(017) Response of Basil Accessions to Different Mulch Treatments

Cedric Sims*, S.R. Mentreddy

(018) Growth of Ginger (*Zingiber officinale*) as Influenced by Poultry Compost Applications

Lurline Marsh*, Intsar Eljak, Fawzy Hashem, Corrie Cotton, Elizabeth Philip

(019) Influence of Poultry Compost Mixes and Mychorrhizae on Growth and Development

Leonard Kibet*, Lurline Marsh, Fawzy Hashem, Corrie Cotton, Elizabeth Philip

(020) Quality Assessment and Yield of Baikal Skullcap (*Scutellaria baicalensis*) Grown at Multiple Locations Across Mississippi

Valtcho Zheljazkov*, Charles L. Cantrell, M. Wayne Ebelhar, Christine Coker, William B. Evans

(021) Influence of Conventional and Organic Nitrogen Fertilizer on Herbage Yield, Essential Oil Yield, and Composition of Rose-scented Geranium (*Pelargonium* sp.)

Hintsa Araya*, Puffy Soundy, J. Martin Steyn

(022) Assessment of Annonaceous Acetogenin Activity in Pawpaw (*Asimina triloba*) Fruit

Kirk Pomper*, Jeremiah Lowe, Sheri Crabtree, William Keller

1:15–2:00 pm **Kierland Grand Ballroom**

Poster Session 10: Nursery Crops 1

(386) Autumn Application of Foliar Urea Alters Winter Storage, and Nitrogen Uptake and Growth of Container-grown Rhododendron and Azalea the Following Spring

Guihong Bi*, Carolyn Scagel, Leslie Fuchigami, Richard Regan

(387) Effects of Plant Growth Regulators on Branching and Growth of Azalea and Rose

H. Brent Pemberton*, William R. Roberson

(388) Photosynthetic Characterization and Water-use Efficiency of *Hibiscus rosa–sinensis*

Amy Fulcher*, Robert Geneve, Joey Norikane

(389) Salinity Tolerance of Cacti and Succulents

Ursula K. Schuch*, Jack J. Kelly

(390) Irrigation Application According to Plant Demand for Container Nurseries

Aaron Warsaw*, Tom Fernandez, Bert Cregg, Jeff Andresen

(391) Univ. of California Program to Protect Water Quality in Greenhouses and Nurseries

Julie Newman, Donald Merhaut*, Salvatore Mangiafico, Amy Ellis, Dale Zurawski, Kristine Gilbert, Jay Gan, Laosheng Wu, Richard Evans, Ben Faber

1:15–2:00 pm **Kierland Grand Ballroom**

Poster Session 11: Plant Biotechnology—Tissue Culture 1

(203) Plant Regeneration of *Viburnum dentatum* From In Vitro Leaf Tissues

Wenhao Dai*, Cielo Castillo

(205) High Efficiency Somatic Embryogenesis and Plant Regeneration in Suspension Cultures of an Ornamental Ginger Hybrid (*Hedychium muluense* × cv. 'Starburst')

Hamidou F. Sakhanokho*, Rowena Y. Kelley, Kanniah Rajasekaran

(206) Using Amino-purine Cytokinins to Optimize Microshoot Production of Bigtooth Maples

Clare Bowen-O'Connor*, Cynthia Killough, Dawn VanLeeuwen, Rolston St. Hilaire

(207) Acclimation and Development of Bigtooth Maple Microshoots Rooted Ex Vitro

Clare Bowen-O'Connor*, Cynthia Killough, Dawn VanLeeuwen, Rolston St. Hilaire

(208) Tissue Culture and Rapid Propagation of Some Hanging Plants

Chunling Chen*, Ling Guo

(209) Effect of Plant Growth Regulators and Osmotica on Shoot Multiplication and Vitrification Suppression in Meristem Cultures of *Allium wakegi*

Byung Joon Ahn*, Hee Young Noh, Seon Ki Kim

2:00–3:00 pm **Noble Boardroom**

Continuing Strategic Planning Committee Meeting

Presiding: Desmond Layne

2:00–3:00 pm **Merriam A**

History of Horticultural Science (HIST) Working Group Business Meeting

Chair: Irwin Goldman

2:00–3:30 pm **Lowell A/B**

Oral Session 1: Crop Physiology 1

Moderator: Jim Syvertsen, JmSn@ufl.edu

2:00–2:15 pm

Water Relations and Net Gas Exchange of Salinized Carrizo Citrange Seedlings during Drought Stress and Recovery

Jim Syvertsen*, J.G. Perez-Perez, P. Botia, Paco Garcia-Sanchez

2:15–2:30 pm

Physiological Responses of Tomato to Different Rates of Drought Stress

Krishna Nemali, Marc van Iersel*

2:30–2:45 pm

Predicting Genotype-specific Carbon Sequestration in Response to Water Availability

William Bauerle*, Robert Reynolds, Ying Wang, Joseph Bowden

2:45–3:00 pm

The Influence of Spatial Physiological Activity Gradients on Whole-tree Carbon Uptake: The Temperature Acclimation Factor

William Bauerle*, Joseph Bowden

3:00–3:15 pm¡

Derivatives Rather than Ratios Should be Evaluated in Biological Research

Timothy Righetti*, David Sandrock, John Lambrinos, Bernadine Strik

3:15–3:30 pm

Yield Components of Olive Trees with Different Water Status

Riccardo Gucci*, Hava F. Rapoport

2:00–3:45 pm **Rainmakers Ballroom B**

Oral Session 2: Vegetable Crops Management 1

Moderator: Mathieu Ngouajio, ngouajio@msu.edu

2:00–2:15 pm

Rowcover Reduces Insect Infestation and Increases Growth and Yield of Cucumber in the U.S. Virgin Islands¡

Ramon Arancibia*

2:30–2:45 pm

Greenhouse-grown Transplants as Alternative Planting Material for Management of Soil-borne Diseases in Asparagus

Mathieu Ngouajio*, Mary K. Hausbeck, James W. Counts

2:45–3:00 pm

Photoselective Netting Improves Productivity of Bell Peppers

Yosepha Shahak*, Hanna Yehezkel, Eli Matan, Itzhak Posalski, Kira Ratner, Yossi Offir, Elazar Gal, David Ben-Yakir

3:00–3:15 pm

Grafting Tomato Improves Yield Potential but Presents Challenges in Rootstock–Scion Compatibility and Retention of Desirable Scion Traits

David Francis*, Alba Clivati-McIntyre, Matthew Kleinhenz

3:15–330 pm

Early Infestation of Broad Mite [*Polyphagotarsonemus latus* (Banks)] in Greenhouse Bell Pepper (*Capsicum annuum* L.) can be Managed with *Neoseiulus californicus* McGregor

Elio Jovicich*, Daniel J. Cantliffe, Lance Osborne, Peter Stoffella

3:30–3:45 pm

A New Greenhouse Crop: History and Production of Datil Pepper

Nicole Shaw*, Dan Cantliffe, Chad Hutchinson

3:45–4:00 pm

Growth Response of Onion Varieties to Varying Photoperiod and Temperature Regimes

Oli Bachie, Milton McGiffen

2:00–3:45 pm **Rainmakers Ballroom C**

Oral Session 3: Human Issues in Horticulture 1

Moderator: Edward Moydell, emoydell@longwoodgardens.org

2:00–2:15 pm

An Examination of the Mutual Awareness Between Public Horticulture and the National FFA Organization

Casey Sharber*, Robert Lyons

2:15–2:30 pm

Developing a Center in Public Horticulture at the Univ. of Delaware

Edward Moydell*, Robert Lyons, Robin Morgan

2:30–2:45 pm

The Role of Healing Gardens at Assisted Living Residences

Claudia Collins*, Angela O'Callaghan

2:45–3:00 pm

Evaluation of Learning and Behavior Change of Master Gardener Trainees in Oregon

Janice Cowan*, Linda McMahan, Steve Renquist, Amy Jo Detweiler, Joy Jones

3:00–3:15 pm

North Desert Village: The Effect of Landscape Manipulation on Microclimate and Its Relation to Human Landscape Preference

Chris Martin*, Kendra Busse, Scott Yabiku

3:15–3:30 pm

Farm Workers Provide Insight For Improving Field Labor Retention in Arizona

Jorge Fonseca*, Kurt Nolte

3:30–3:45 pm

Multistate Survey of Nursery Laborer-level Employees: Ohio, Michigan, Delaware, Tennessee, Florida, Indiana, Kentucky, Arizona, and Rhode Island

Alejandra Acuna*, Hannah Mathers

2:00–4:00 pm **Powell A/B**

B.Y. Morrison Lecture

Speaker: Bryson James, Consulting Horticulturalist and Director of Horticultural Research, Southern Nursery Association

Industry and Research Need Each Other

Bryson James will discuss how and why the Southern Nursery Association (SNA) started the Annual SNA Research Conference almost 52 years ago. Having learned from his involvement in the past 49 Conferences, he will relate many experiences, hopefully to excite, encourage and offer guidance for others who may wish to start something similar, or, to participate in the SNA conference

(see insert on page 793)

2:00–4:00 pm **Mapmakers A/B**

Tips for Submitting a Paper to ASHS Journals

Join ASHS staff members Kathy Lewis and Ruth Gaumond as they guide you through the mechanics of how to submit your paper through the online peer review system. They will demonstrate how to set up an account online; proper format for text, tables, and graphics; and how to upload your files. Common submission errors, and how to avoid them, will also be covered. Handouts with helpful tips will be available.

2:00–4:00 pm **Rainmakers Ballroom A**

Workshop 1: Survivor ASHS: Attending a Professional Conference!

Sponsor(s): Collegiate Activities (CAC) Committee and Graduate Student Activities (GAC) Committee

Presiding: Richard Harkess
Mississippi State Univ.

Student attending a professional conference are often overwhelmed by all the activity. Many questions arise concerning what is taking place at the conference. Students often ask questions like: Where do I go? Who are all these people? What sessions can I attend? Do I have to sit through all of the talks? How do I meet other colleagues? Can I attend the receptions, workshops, and oral presentations? How can I give a presentation or poster? What do I get for my registration? Why am I here? To help students receive the most benefit from attending the conference, it is necessary to prepare the students prior to the conference. However, most students are left to their own devices to find the answers to their questions and find their way around the conference. This workshop will provide students some of the answers to their questions and provide them with the basic information and tools to reap the most benefit from their conference experience. A panel discussion will follow to answer student questions about the conference and career options in horticulture.

Objective:

To provide undergraduate and graduate students basic information about the ASHS conference, inform them of the many opportunities a conference offers, and to provide suggestions on how to attend a professional conference to reap the most benefits.

What is ASHS? Who Is Behind It, How to Get Involved, and Why You Are Here

John Clark*; Univ. of Arkansas, Fayetteville, AR

What Can I Get From the Conference?

Janet Cole*; Oklahoma State Univ., Stillwater

Networking and Professionalism: How to Make New Contacts

Barbara Liedl*; West Virginia State Univ., Institute

Presentations and Posters: What Are They and Who Can Attend?

Patrick Williams*; Murray State Univ., School of Agriculture, Murray, KY

Making a Game Plan for the Conference

Michael Arnold*; Texas A&M Univ., Dept. of Hort Sciences, College Station

Q&A panel discussion on the conference and career options in horticulture.

2:00–4:00 pm **Greenway A/B**

Workshop 2: Biotechnology Strategies for Improving Horticultural Crops for Human Health

Sponsor: Plant Biotechnology (BTCH) Working Group

Presiding: Alan Smith
Univ. of Minnesota, St. Paul,

Plants are essential sources of nutrients and beneficial compounds for humans. However, many people do not consume a diet with adequate quality, quantity or balance of these compounds. Plant breeding and biotechnology have been tremendously successful in modifying the lifecycle, tolerance to biotic and abiotic stresses, yield, quality and aesthetics in diverse plants. Biotechnology has great potential for improving health aspects of plants over traditional breeding because of the long generation time, high genetic heterogeneity, and complex biosynthetic pathways of compounds in horticultural crops. This workshop will cover some of the advances and potential in improving the quality of functional foods through altered production of phytochemicals, phytonutrients, and nutraceuticals; the elimination of allergens; and the production of vaccines and other pharmaceuticals in plants. The workshop will also address some of the challenges in applying biotechnology to improvement of horticultural crops for human health.

Objective:

The objectives for this workshop are: (1) to introduce researchers to current methods and objectives of biotechnology for improving crops for human health; (2) review issues and challenges of applying biotechnology for crop improvement; and (3) discuss future use and applications of biotechnology for improving horticultural crops.

Genetic Engineering Horticultural Food Crops with Ferritin Genes for Potential Treatment of Human Iron Deficiency

(Max) Zong-Ming Cheng*[1], Xia Ye[1], Zhen Zhang[2]

[1]Univ. of Tennessee, Knoxville, TN; [2]Nanjing Agricultural Univ., Nanjing, China

Iron is an essential element for human health and the iron deficiency is one of the most prevalent nutrient deficiencies affecting about 30% of the world population, mostly in developing countries. One of the sustainable solutions to treat human iron deficiency is to provide dietary iron through normal food source with enriched, bio-available iron. Ferritin is the global iron storage protein in animals, plants and bacteria. In plants, ferritin is a major form of endogenous iron in legume food. Ferritin genes have been cloned from various plant species, and overexpression of the ferritin gene has been explored

as a means of enriching the bio-available iron in various plant parts, such as seeds, and fruits. This presentation will focus on progress and updates on cloning ferritin genes, overexpression of ferritin gene in various horticultural food plants, and their potential and limitations for treating human iron deficiency.

Manipulation of Phytonutrient Synthesis for Improving Nutritional Quality and Health-Promoting Properties of Food Crops

Li Li*; US Plant, Soil and Nutrition Laboratory, Ithaca, NY

Phytonutrients such as carotenoids and anthocyanins are highly beneficial for humans because they provide important nutrients and antioxidants in our diets. To reveal new strategies for high-level increase of these phytonutrient content in food crops, we have been using unique orange and purple cauliflower mutants as models for gene discovery and for further understanding the mechanisms underlying the synthesis of these compounds in plants. The orange and purple mutants accumulate large amounts of ß-carotene and cyanidin, respectively, in the edible cauliflower curds. We have isolated the Orange gene responsible for the orange mutant phenotype. We found that instead of directly regulating carotenoid biosynthesis, the Orange gene appears to mediate the formation of chromoplasts, which provide a deposition sink for carotenoid accumulation. To test its effect as a novel molecular tool for improving carotenoid content in other crops, the gene was transformed into potato. Tuber-specific expression of the Orange gene resulted in the production of orange-yellow-fleshed tubers with over 6-fold accumulation of total carotenoids including ß-carotene. The trait in the transgenic tubers was stably inherited in a subsequent generation. While carotenoids in wild type potato tubers accumulate in amyloplasts, the Orange gene induced carotenoid accumulation in the transgenic tubers were found in chromoplasts. These results provide evidence that manipulation of a sink capacity offers a very useful strategy of enhancing the nutritional content of food crops.

Increased Calcium Bioavailability in Genetically Modified Foods: Analysis Using Mice and Human Feeding Regimes

Kendal Hirschi*; Associate Director of Research, Vegetables and Fruit Improvement Center, Texas A&M Univ., Baylor College of Medicine, Houston, TX

Our long range goal is to make vegetables a better source of dietary calcium. We have utilized genetics to discern the impact of calcium partitioning on the nutritional content of these foods. In previous reports, different plants were compared to discern the role of calcium oxalate crystals on bioavailability. Obviously, these studies were hindered because they could never demonstrate the element regulating bioavailability. Here, using a genetic model system, we definitively establish that a single gene regulating calcium oxalate crystal formation impacts calcium bioavailability. Previously, we have also modified carrots to express a plant Ca_2^+/H^+ transporter (termed sCAX1) which leads to approximately two-fold higher calcium content in the edible portions of the sCAX1-expressing carrots. Here we will elaborate how this single modification alters nutrient content in mice and human feeding regimes.

The Role of Horticultural Crops in Developing Vaccines for Protecting Human Health

Schuyler S. Korban*; Univ. of Illinois, Urbana, IL

The important features of any effective vaccine include those of safety, protective immunity that is sustained for long periods of time (preferably for a lifetime), stability, ease of administration, low cost, and with few side effects. In recent years, plants have emerged as alternative production systems for subunit vaccines as they are likely to address all critical features of effective vaccines. Plants that have been engineered with genes coding for antigenic proteins, proteins that elicit the production of antibodies in mammalian hosts of various pathogenic viral and bacterial organisms, and have been shown to correctly express these antigenic proteins in various plant tissues. Plants can readily and properly handle the downstream processing of foreign proteins, including expression, folding, assembly, and glycosylation, all contributing to the fidelity of antigenic proteins. There are numerous advantages of producing subunit vaccines in plants, particularly in horticultural crops, however, there are various issues that ought to be considered before these plant-based vaccines can make a significant impact and become widely available in the human health industry.

Biotechnology in the Courts: Recent Judicial Decisions Affecting Genetically Modified Crops

Gary E. Marchant*; Executive Director, Center for Law, Science & Technology, Arizona State Univ., Tempe, AZ

This presentation will review recent court cases involving biotechnology, including three recent federal court decisions in the past year rejecting USDA authorizations to grow GM crops. It will also discuss recent court cases involving biotechnology products that address liability for contamination, patent issues, antitrust concerns, and international trade issues.

2:00–4:00 pm **Kirkland**

Workshop 3: Controlled-release Fertilizer Technology for Vegetable Production

Sponsor: Vegetable Crops Management (VCM) Working Group

Presiding: Kelly Morgan
Univ. of Florida, Immokalee, FL

Vegetable production in the United States is often located "upstream" and adjacent to large tracks of land set aside for water management, ecosystem restoration, or urban development. These lands are often located near densely populated urban areas with citizens highly engaged in water and nutrient management issues. Because vegetable growers are being asked to implement BMPs, there is need to better manage fertilizer inputs. Despite their present cost, slow-release and controlled-release fertilizers (CRFs) have the potential to increase fertilizer efficiency and reduce nitrogen loss to the environment. There are several manufacturers of CRFs and each manufacturer has one or more formulations. Some CRF products have already been thoroughly tested, and targeted products developed, for use in high-value perennial plantings such as citrus. CRF technology is currently being widely investigated in vegetable crops, but it remains to be seen whether this technology is appropriate for short duration crops with lower per-unit value than citrus, landscape plants, or greenhouse-grown products. Speakers will discuss CRF products, release mechanisms, and current research results with potato, tomato, and other vegetables grown in a wide range of environments across the United States.

Objective:

The objective of this workshop is to teach basic information about controlled-release fertilizers and present current research results about CRF technology for vegetable crops.

Slow and Controlled Release Fertilizer Release and Strategies for Their Use in Vegetable Production

Kelly T. Morgan*; Univ. of Florida, Department of Soil and Water Science, Immokalee, FL

Fertilizer material costs, particularly N, have increased substantially over the past five years. Increased costs along with increased awareness of the impact of fertilizer leaching on the environment in humid regions have increased interest in use of slow or controlled release fertilizer materials. The goals of slow/controlled released

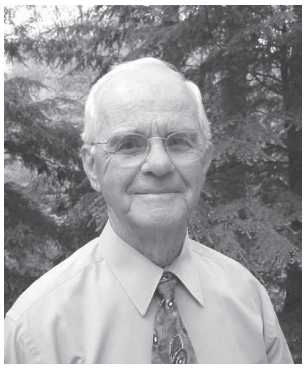
2007 B.Y. Morrison Lecture

Topic:

Industry and Research Need Each Other

Monday, 16 July, 2:00–4:00 pm

Moderator: Kim Kaplan, USDA–ARS, Beltsville, MD



Bryson L. James
Consulting Horticulturist and Director of
Horticultural Research, Southern Nursery Association

Bryson James will discuss how and why the Southern Nursery Association (SNA) started the Annual SNA Research Conference almost 52 years ago. Having learned from his involvement in the past 49 Conferences, he will relate many experiences, hopefully to excite, encourage and offer guidance for others who may wish to start something similar, or, to participate in the SNA conference.

About Bryson James

Throughout his long career (48 years), Dr. James has had both research and extension responsibilities in nursery, turf, and floral crops. He is now both a grower and a consultant. Although Dr. James, like many other scientists, has strongly affected the ornamental horticulture community through his research and extension activities, he is truly unique in the depth and breadth of his efforts to encourage and inspire ornamental horticultural students and young scientists.

He has played a pivotal role in the Southern Nursery Association Researcher's Conference since 1965. This is the main gathering of horticultural researchers, students, growers, and allied trades for 16 southeastern states. Dr. James single-handedly has coordinated these annual meetings, and has tirelessly raised funds from industry donors to support the travel costs of students to attend. It is of critical importance that the horticultural research community "grow" a new crop of young scientists to follow in the footsteps of those who will be retiring.

Dr. James' sustained efforts to foster a passion and commitment to horticultural research has had great impact on both the ornamental horticultural industry and the research community (USDA/ARS and university) as demonstrated not only by his own accomplishments, but also those of all of the students that he encouraged for more than forty years.

About the B.Y. Morrison Lecture

The B.Y. Morrison Lecture was established in 1968 by the Agricultural Research Service (ARS) of the U.S. Dept. of Agriculture (USDA), to honor the memory of Benjamin Y. Morrison (1891–1966) and to recognize scientists who have made outstanding contributions to ornamental horticulture and other environmental sciences, to encourage the wide application of these sciences, and to stress the urgency of preserving and enhancing natural beauty. B.Y. Morrison was the first director of the USDA's National Arboretum in Washington, D.C., and a pioneer in ornamental horticulture. A scientist, landscape architect, plant explorer, author, and lecturer, Morrison advanced the science of botany in the United States. His legacy to the American public includes dozens of new ornamental plants, including the Glenn Dale azaleas.

The Morrison Lecture is on a scientific or policy topic of the lecturer's choice.

The B.Y. Morrison Lecture is sponsored by the Agricultural Research Service (ARS), USDA's principal in-house scientific agency, and by the American Society for Horticultural Science.

fertilizer use are that no nutrient should be limiting for crop uptake, improved nutrient uptake efficiency, and reduced nutrient leaching potential. These considerations are particularly important for crops grown on sandy soils with relatively low nutrient and water holding capacities. Release rates of biodegradable, or slow release materials, such urea formaldehyde (UF), isobutylidene diurea (IBDU), and methylene urea (MU) are soil temperature dependent. These materials are N sources and depend on soil biological activity, thus, soil temperature during specific crop growth penology must be considered and release may be delayed by soil fumigation. Whereas controlled release materials depend on diffusion through coatings and are both soil moisture and temperature dependent. Examples of coated materials are sulfur coated urea (SCU), polymer coated urea (PCU), and polymer/sulfur coated urea (PSCU). The advantage of these materials is that leachable fertilizer elements other than nitrogen can be incorporated within the coating. However, this comes at an increased cost. The use of any single or combination of these materials is dependent on time of year, length of crop cycle and crop nutrient demand patterns, and the use of soil fumigants. Strategies for material use will be discussed.

Estimation of Release Properties of Slow-Release Fertilizer Materials

L. Carolina Medina*, Jerry B. Sartain, Thomas Obreza; Univ. of Florida, Gainesville, FL

Slow-release fertilizers marketed to the public usually include a claim that nutrient release will last for a specific time period, e.g., 6, 9, or 12 months. However, no official laboratory method exists that can verify these claims. A long-term (182-d) incubation method has been developed that produces constants for an exponential model that characterizes nutrient release as a function of time. In addition,

a relatively short-term (74 hr) extraction method has been developed to assess nutrient release under accelerated laboratory conditions. Through a regression technique, release constants established for individual slow-release nutrient sources by the incubation method are used in conjunction with the laboratory extraction data to verify the release claims of slow-release fertilizers. We have been able to predict the nutrient release curve of selected single materials with greater than 90% accuracy. Nutrient release from mixtures of slow-release products have proven more difficult to predict. It is typical for water-soluble and slow-release fertilizers to be mixed in commercial products. Successes and failures in predicting nutrient release from mixtures of soluble and slow-release nutrient sources will be discussed in detail. Ultimately, it is intended that these methodologies will be accepted as an official method to verify nutrient release claims placed on slow-release fertilizers.

Controlled Release Fertilizer Use in Vegetable Production

Elizabeth Guertal*; Auburn Univ., Auburn, AL

Controlled release N materials are used to reduce N leaching losses from sandy soils, and extend N availability over a growing season. Controlled release materials may include sulfur-coat urea (SCU), isobutylidene diurea (IBDU), methylene urea (MU), and the newer technology of resin-coat urea (PCU). The objective of this research was to examine the effectiveness of preplant SCU and PCU N fertilizers, comparing fruit yield and quality as compared to split application of soluble N fertilizer. In Alabama, experiments were conducted to examine the effectiveness of preplant sulfur-coated urea (SCU) and resin-coated urea (PCU) N fertilizers in green bell pepper (*Capsicum annuum* L.) and strawberry (*Fragaria ×ananassa* Duch.) production systems. Preplant controlled release fertilizers were compared to soluble N sources applied through drop irrigation, over a range of N rates. All experiments were conducted on 15-cm plastic-covered raised beds, with experiments conducted for 3 years. Collected data included fruit yield and quality, plant height or width, leaf N (pepper), and petiole N content (strawberry). For green peppers, N source rarely affected the partitioning of harvested pepper into graded quality groups. There were few consistent differences in pepper quality or yield due to N source. From this study, controlled release fertilizers may be a viable option for small-scale growers not using drip application systems.

Controlled Release Fertilizer Programs for Potato (*Solanum tuberosum* L.) Production

Chad M. Hutchinson*[1], Carl J. Rosen[2]; [1]Univ. of Florida, Gainesville, FL; [2]Univ of Minnesota, St Paul, MN

High nitrogen fertilizer and irrigation amounts applied to potato (*Solanum tuberosum* L.) on coarse-textured soils often result in nitrate leaching and low recovery of applied fertilizer nitrogen. Best Management Practices (BMPs) have been developed in many vegetable production areas to reduce nitrate leaching to groundwater or movement into surrounding watersheds. Polymer coated ureas (PCUs) have been tested extensively in Minnesota and Florida to determine their influence on potato production and nitrate leaching over the past 10 years. At both locations, a similar protocol for evaluation of PCUs was conducted which included in situ field incubation of coated prills to characterize nitrogen release and availability, an estimation of nitrate leaching below the crop root zone, a determination of crop production and quality, and a calculation of nitrogen recovery efficiency. At both locations and depending on the product used, PCUs fit a release profile of approximately 70–90 days, which is suitable for potato production. PCUs reduced nitrate leaching below the potato root zone compared with standard fertilizer programs by as much as 40% and 88% in Minnesota and Florida under heavy leaching pressure, respectively. In general, tuber production and quality have been equal to or better than standard fertilizer programs when nutrient release matched nutrient demand, with a general improvement in nitrogen recovery efficiency. With the reduction in off-site nitrate movement as well as tuber yield and quality benefits associated with application of PCUs, their use should be considered a viable alternative to soluble nitrogen sources in potato production.

Use of Controlled Release Fertilizer for Vegetable Production: The California Experience

Timothy K. Hartz*, Richard F. Smith; Univ. of California, Department of Plant Science, Davis, CA

Research on the use of controlled release fertilizer (CRF) in vegetable production has been conducted in California for more than two decades, and commercial CRF products have been aggressively marketed throughout that time. In spite of this attention, CRFs remain niche products used on only a small percentage of vegetable fields. CRF performs to best advantage in production systems in which in-season leaching is significant but beyond the control of the grower, or where there are cultural constraints on in-season fertilizer application. Neither of those conditions is typical of the California industry. Annual rainfall in the major vegetable producing regions averages less than 400 mm, with the majority of that received during winter months when vegetable production is limited; in-season leaching occurs almost exclusively from irrigation. The alluvial soils favored for vegetable production tend to be relatively fine-textured, with high water-holding capacity, allowing for efficient irrigation. The widespread adoption of drip irrigation allows for multiple applications of less expensive fertilizers in synchrony with crop demand. Under representative California field conditions it has been difficult to show either an agronomic or environmental benefit from the use of CRFs, and the higher cost of these products has therefore limited their use.

2:00–6:00 pm **Herberger Ballroom 1/2**

Symposium 1: Small Fruit and Grape Crop Injury Across the U.S. from the Historic Freeze in April 2007

Presiding: Michele Warmund, University of Missouri
Barclay Poling, North Carolina State University

Symposium Organizing Team:

Michele Warmund, Univ. of Missouri, WarmundM@missouri.edu
Barclay Poling, North Carolina State Univ., barclay_poling@ncsu.edu
Sara Spayd, North Carolina State Univ., Sara_Spayd@ncsu.edu

Objective: To summarize the climatic conditions and discuss protective strategies used during the unprecedented freeze of April 2007 and present current research methods used to study ice nucleation during low temperature events.

Summary: A historic freeze on April 7 and 8, 2007 occurred from the central and southern Plains into the Midwest and southeast, following the nation's second warmest March on record. While freezing has been studied extensively on grapes, blueberries, raspberries, and blackberries at pre-bloom stages of floral development, much less low temperature research has been conducted on these crops at post-budbreak and bloom stages due to the infrequent occurrence of freezing at these developmental stages. Recently, new methods have been developed to study ice nucleation and injury on frost-susceptible tissues. Because strawberry flowers are more frequently exposed to sub-freezing temperatures, strategies have been devised to protect this crop from injury. Damage assessments of small fruit crops and wine-grapes from the April freeze will be presented, as well as current and potential strategies for preventing low temperature injury to small fruit crops at post-budbreak stages of development.

2:00–2:30 pm

Temperatures and Cold Damage Across the Eastern U.S. Associated with the April 2007 Freeze

Michele Warmund and Patrick Guinan

University of Missouri, Division of Plant Sciences and Missouri Climate Center

The nation's second warmest March on record occurred in 2007. In early April, an arctic cold front moved across the Eastern United States causing an advective freeze over a widespread region. While the National Weather Service issued warnings, many small fruit growers were unable to protect their crops from low temperature injury for various reasons. While published tables on critical temperatures for strawberries, blueberries and grapes at various stages of floral development were used to guide decisions on protecting the crop, many attempts to save the crops failed with crop losses up to 100%. In the aftermath of this devastating freeze, new information has been gained and new research on ice nucleation and low temperature survival has been initiated.

2:30–3:00 pm

Using Infrared Thermography to Study Freezing in Plants

Michael Wisniewski

USDA–ARS, Appalachian Fruit Research Station, Kearneysville, WV

Factors that determine when and to what extent a plant will freeze are complex. While thermocouples have served as the main method of monitoring the freezing process in plants, infrared thermography offers distinct advantages and the use of this latter technology has provided new insights on the processes of ice nucleation and propagation. This technology is based on the fact that freezing is an exothermic event. The temperature and spatial resolution of a high-resolution infrared camera has enabled researchers to clearly define initial sites of nucleation as well as monitor the ice front as it spreads into surrounding tissues. Ice nucleation is induced by both extrinsic and intrinsic nucleators. Ice-nucleation-active bacteria and moisture are two major extrinsic agents. In herbaceous plants, the influence of extrinsic ice nucleators on ice nucleation can be moderated by thick cuticles or the application of synthetic hydrophobic barriers. The situation in woody plants, however, is different. Woody plants appear to possess native, intrinsic nucleating agents that are as active as many extrinsic agents. The identification of the intrinsic nucleating agents in woody plants is not known. Despite the presence of intrinsic nucleating agents, barriers exist in woody plants that inhibit growth of ice from older stems into primary, lateral appendages. This is important because many tissues in woody plants that are frost sensitive are flowers and primary, elongating, shoot tissues that arise from buds attached to older stems. Video segments of the freezing process will be presented, as will data on the ability to block nucleation via the use of hydrophobic kaolin.

3:00–3:30 pm

Crop Decision Support Tools and Specific Cold Protection Techniques Used in North Carolina to Minimize Injury to the Strawberry Crop

Barclay Poling

Department of Horticultural Science, North Carolina State Univ., Raleigh, NC

Spring radiation frosts and freezes can seriously damage unprotected strawberry buds and blossoms, but strawberry plasticulture growers across the North Carolina are accustomed to using overhead sprinkler irrigation and/or row covers to minimize crop losses from cold events such as the Easter 2007 freeze. Most of the state's 768 ha strawberry crop was saved from the Easter freeze by the use of active cold protection techniques. The author will discuss an electronic advisory of the NC Cooperative Extension Service, *berry-mg*, that growers and agents in North Carolina use in formulating cold protection strategies during this particular freeze event. These e-mail advisories provide advance information about "key" characteristics of the cold event so that the growers can formulate a cold protection strategy that will have the best chance of minimizing crop losses. In using overhead sprinkler irrigation, it is important to have accurate information on the event's expected minimum temperature so that the grower can choose the correct precipitation rate for the sprinkler system. During certain types of weather events, row covers may actually be a better alternative to sprinkler irrigation. But, in using row covers effectively, it is also important to have a reliable weather forecast on minimum temperature so that the correct weight row cover is deployed. Also, wind speeds will have a profound influence on determining nozzle orifice size and precipitation rates with sprinkler irrigation, but are of less concern with row covers. In using sprinkler irrigation, it is also critical to have access to hourly wet bulb temperatures so that appropriate decisions can be made on when to safely start the sprinkler system irrigation up, and also to when shutdown. The author will discuss the reliability of several private weather services that were used during the Easter weekend cold event, and some reference will be made to the problems strawberry growers who use sprinkler irrigation encountered with unreliable forecasts on wind speeds. The *berry-mg* advisory prior to the Easter morning cold event recommended that *both* sprinkler irrigation and row covers would be needed, and growers who followed this recommendation had generally successful strawberry seasons in Spring 2007.

3:30–4:00 pm

Wine-grape Cold Injury Assessment in Post-budbreak Period

Sara E. Spayd

Department of Horticultural Science, North Carolina State Univ., Raleigh

Unseasonably warm temperatures during late March and early April 2007 stimulated early bud break and vine growth in western NC vineyards, particularly in early breaking cultivars. During the period 14 April to 16 April 2007, an arctic front drastically dropped temperatures in the vineyards west of the Raleigh-Durham, NC area with grower-reported low temperatures ranging from –8.9 °C to

–4.4 °C. Shoot and bud damage was dependent on growth stage and minimum low temperature. Chardonnay vines were at about 5th leaf stage. All growing shoots and buds that had not broken that were associated with actively growing shoots were killed when temperatures dropped below –5.0 °C. Surprisingly, vines at similar growth stages in a vineyard that reportedly dropped to –4.4 °C survived. As of mid-May 2007, all *Vitis vinifera*, French-American Hybrid, and *Vitis labruscana* vines examined that are west of the Raleigh-Durham, NC, area have phloem and vascular cambium injury. As of the second week of May 2007, xylem damage was observed in some vines. Further expression of injury should appear as summer temperatures climb, especially in vineyards without irrigation.

4:00–4:30 pm

Muscadine Grape Cold Injury Assessment in Post-budbreak Period and Recommendations for Vine Re-training

Connie Fisk, Stephanie Romelczyk, Barclay Poling

Department of Horticultural Science, North Carolina State Univ., Raleigh, NC.

Unseasonably warm temperatures during early March 2007 stimulated early bud break in North Carolina's muscadine vineyards (485 ha), particularly in early breaking cultivar Carlos which makes up about 90 percent of the state's muscadine crop. Carlos shoot and bud damage was dependent on growth stage and minimum low temperature. In the state's southeastern coastal plain, Carlos had already broken bud in mid-March and by April 8, new shoots were at the first to fourth leaf development stage. Minimum temperatures ranged from –4.4 °C to –8.8 °C, depending on vineyard location. Further inland, Carlos vines were less advanced and sustained only moderate bud/shoot injury by comparison to the southeastern counties in the state. Two year Carlos vines in areas with temperature minimums of –4.4 °C, or lower, commonly had splits or cracks in the cordons, and growers were advised to remove the injured cordons, and to train new shoots from the head of the vine as replacement arms. The splits in cordons (and trunks) can be prime sites for disease infection, especially Macrophoma rot (*Botryosphaeria dothidea*). In 1-year and 2-year vines with splits in the trunks, suckers emerging from the base of the vine in early May were used for trunk replacement. In a separate experiment where dormant Carlos vines had been hand pruned to 200, 300, or 400 count buds, cold injury from the Easter freeze was far more severe in hand pruned vines than in vines that were mechanically hedged in late winter, and had in excess of 1,000 count buds per vine after pruning.

4:30–6:00 pm

Discussion period

3:00–4:00 pm **Noble Boardroom**

Tex Frazier Lecture Committee Meeting

Presiding: Milton McGiffen

3:00–4:00 pm **Merriam A**

Organic Horticulture (ORGH) Working Group Business Meeting

Chair: William Sciarappa

3:30–4:00 pm **Merriam B**

Crop Physiology (CRPP) Working Group Business Meeting

Chair: Thomas Björkman

4:00–5:00 pm **Rainmakers Ballroom A**

Undergraduate Student Oral Competition

Chair: Erin Cathcart, ACB President

4:00–5:00 pm **Noble Boardroom**

Marketing and Economics (MKEC) Working Group Business Meeting

Chair: Jennifer Dennis

4:00–5:00 pm **Merriam B**

Plant Nutrient Management (PNM) Working Group Business Meeting

Chair: Eric Hanson

4:00–5:00 pm **Merriam A**

Produce Quality, Safety and Health Properties (QUAL) Working Group Business Meeting

Chair: Bhimanagouda S. Patil

4:15–6:00 pm **Greenway A/B**

Oral Session 4: Vegetable Breeding

Moderator: Beiquan Mou

4:15–4:30 pm

Evaluation of Greenhouse, Field and Heirloom Tomato Varieties in Hydroponic Greenhouse Production

Barbara E. Liedl*, Kristen Wilfong, Melissa Smith, Velvet L. Worstell, Jeremy M. Sisson

4:30–4:45 pm

Evaluation of Resistance to White Mold Disease in Snap Bean Based on Greenhouse Tests and Field Trials

Yong Suk Chung*, James Nienhuis

4:45–5:00 pm

Inheritance of Resistance to Leafminers in Lettuce

Beiquan Mou*

5:00–5:15 pm

Development of Uniform Double-crossed Varieties using Near-isogenic Lines Produced by Marker-assisted Selection in Radish (*Raphanus sativus* L.)

Suhyoung Park*, Moo-Kyoung Yoon, Soo-Seong Lee, Ki-Taek Kim, Changhoo Chun, Hyo-Guen Park

5:15–5:30 pm

The Anthocyanin Fruit Tomato Gene (Aft) is Associated with a DNA Polymorphism in a MYB Transcription Factor

Peter Boches*, James Myers

5:30–5:45 pm

Genetic Diversity in Chinese Melon (*Cucumis melo* L.)

Jack Staub*, Feishi Luan, Isabelle Delannay

5:45–6:00 pm

The Evolution of Tropical Supersweet Corn

James Brewbaker*, Ian F. Martin, Taweesak Pulam

4:30–6:00 pm **Rainmakers Ballroom B**

Oral Session 5: Viticulture and Small Fruits 1

Moderator: S. Kaan Kurtural, skkurt2@uky.edu

4:30–4:45 pm

Rooting-zone Restriction—A New Prosperous Technique in Fruit Tree Cultivation

Shiping Wang*, Caixi Zhang, Wenping Xu

4:45–5:00 pm

Demographic Analysis of Consumer Purchase, Consumption Habits, and Attitudes for Locally Grown Table Grapes

Sean Lynch*, Bradley H. Taylor, S. Alan Walters, Wanki Moon

5:00–5:15 pm

Deficit Irrigation Enhances Arbuscular Colonization of Fine Roots by Mycorrhizal Fungi in Grapevines

R. Paul Schreiner*, Julie Tarara, Russell Smithyman

5:15–5:30 pm

Analysis to Separate Direct Biochemical Influences of Vintage, Site, and Vine Vigor on Pinot Noir Grape Anthocyanins and Proanthocyanidins Profiles from Indirect Scaling

Jessica Cortell, Timothy Righetti

5:30–5:45 pm

Geographic Information Systems Assist with Site Selection of Vineyards in Midwestern United States

S. Kaan Kurtural*, Imed E. Dami

5:45–6:00 pm

Field Testing of Transgenic Grapevine for Bacterial and Fungal Disease Resistance

Dennis Gray, Zhijian Li, Sadanand Dhekney, Manjul Dutt, Donald Hopkins, Thomas Zimmerman

4:00–5:45 pm **Rainmakers Ballroom C**

Oral Session 6: Organic Horticulture 1

Moderator: Dario Stefanelli, stefanel@msu.edu

4:00–4:15 pm

The Response of 'Pacific Gala' on Three Rootstocks to Three Orchard Floor Management Systems under Organic Protocol

Dario Stefanelli*, Ronald Perry

4:15–4:30 pm

Fine Root Development of Apple as Affected by Orchard Floor Management Systems under Organic Protocol

Dario Stefanelli*, Ronald Perry

4:30–4:45 pm

Evaluation of Soil Particulate Organic Matter as a Sensitive Indicator of Soil Fertility in Sweet Cherry Orchards

Jennifer Moore-Kucera*, Anita Azarenko, Lisa Brutcher, Annie Chozinski

4:45–5:00 pm

Spring and Fall-Winter Production of Leafy Vegetables in Organically Managed High Tunnels in Ohio: Compost Matters

Matthew Kleinhenz*, Sonia Walker, Donald Beam, Deborah Stinner

5:00–5:15 pm

Assessing Ethnic Consumer Demand for Horticultural Crops

William Sciarappa*, Ramu Govindasamy, Richard Van Vranken, Albert Ayeni, Jim Simon

5:15–5:30 pm

High Tunnels Trigger Early Flowering and Fruit Set in Organic Southern Highbush Blueberry

Andrew Ogden*, Gerard Krewer, Marc van Iersel

5:30–5:45 pm

Soil Management History (Conventional, Organic) and Compost Incorporation Affect Lettuce, Sweet Corn and Tomato Seedling Growth

Sasha Bogdan*, Matthew Kleinhenz

4:00–6:00 pm **Lowell A/B**

Workshop 29: New Trends in Transplant Production

Sponsor: Seed and Stand Establishment (SSEST) Working Group

Presiding: Juan Diaz-Perez, University of Georgia, Tifton, GA

Rapid advances in computing technology, electronics and biology are likely to bring new developments in horticultural technologies in this new century. The success of the horticultural crops largely depends on the production of high quality transplants. The production of transplants offers challenges and opportunities, particularly in the areas of grafting, plant nutrition and irrigation, and organic production. This workshop brings together growers and researchers to discuss some of the most pressing issues on the production of vegetable and ornamental plant seedlings.

The objective of this workshop is to bring together a variety of speakers from growers to researchers to discuss the current and future challenges and opportunities in transplant production.

4:00–6:00 pm **Kirkland**

Workshop 4: Cultivar Evaluation Strategies for Nut Tree Crops

Sponsor: Temperate Tree Nut Crops (NUTS) Working Group

Presiding: Patrick Conner
Univ. of Georgia, Tifton, GA

The most fundamental step in nut production is the selection of varieties or cultivars to be planted in the orchard. Planting the wrong variety can be a costly mistake, requiring considerable time and expense to correct. Having accurate information on the strengths and weaknesses of new cultivars is therefore vital to the health of the industry. However, cultivar testing in nut crops presents many significant challenges to the researcher because of traits inherent to the crops including: long juvenile periods, alternate bearing cycles of production, large tree size, and wide geographic distribution of grower orchards. In addition, many testing programs have been discontinued, leaving fewer researchers to produce the needed data. The speakers will present the current status of cultivar testing in their prospective programs and address topics such as how long cultivars are tested, what type of data is gathered, replication of cultivar entries, number of testing sites utilized, past successes and failures, when to release new cultivars, and handling cooperators and grower tests. By evaluating the successes and failures of each of these programs a better understanding of the important features of cultivar evaluation in these crops will be realized. The information presented in this workshop should have broad appeal to researchers working in many other woody perennial crops which face similar challenges.

Objective:

In this workshop experts will discuss successes and challenges in

the current testing methods for four important nut crops: almond, pecan, pistachio, and walnut. Active discussion among the participants will lead to a better understanding of what makes a successful cultivar testing program.

Personal Reflections From an Ongoing Program for Evaluating Potential Pistachio Cultivars

Craig Kallsen*; Univ. of California, Cooperative Extension, Bakersfield, CA

Pistachio growers in California have few cultivars to choose from for the following reasons: pistachio is a relatively new crop (large plantings initiated in 1970s), 'Kerman', the dominant female cultivar has been very successful, and the long period before trees come into bearing (5 to 7 years) has been discouraging to potential breeders. In the San Joaquin Valley of California, the search for new cultivars over the past 17 years has largely been limited to trials involving a few cultivars introduced from the Middle East by private growers and selections from crosses made in the late 1980s as part of a now discontinued breeding program. The ongoing evaluation of these materials has been a large cooperative endeavor among researchers and others, and for me, participation has been a valuable learning process. My interpretation of experiences encountered in ten years of evaluating potential cultivars will be discussed. This discussion includes; luck, the politics of funding, importance of focus and salesmanship, working with grower cooperators, how varieties are replicated in a trial, evaluation of nut quality, grower versus marketing concerns, rootstock issues, and problems with protecting property rights. Many of these topics may have applications to breeding in other crop species as well.

Cultivar Evaluations for Walnut Breeding

Gale McGranahan*; Univ. of California, Davis, CA

The current goal of the Walnut Breeding Program is to develop new cultivars that combine the outstanding yield and kernel characteristics of Chandler walnut with an earlier harvest date. Controlled cross pollination of selected parents is used to produce seedlings. The seedlings are evaluated at three or four years from planting in a seedling block. Seedlings that have not flowered by year 5 are culled. The traits under evaluation include phenology (dates of leafing, male and female bloom and harvest), precocity, lateral fruitfulness, estimated yield, blight incidence and crack out characteristics (shell shape, texture, thickness and strength, kernel weight, percent kernel and kernel color, fill plumpness and ease of removal of halves). Data is evaluated at the annual 'crack out' meeting that includes growers, processors, nursery owners and Farm Advisors who often become cooperators in field trials. Selections, formally selected at the crack out meeting, are repropagated into three selection blocks in the north central and south walnut growing regions, 4 trees each, where evaluations continue. Growers are given the opportunity to test the selections in whatever numbers and configuration that suit them. Formal yield trials are undertaken before or after a selection has been designated a cultivar. It is preferable to conduct these field trials prior to release unless the attributes are clearly outstanding. It has taken between 11 and 21 years from seed to release a new cultivar.

Cultivar Evaluation Strategies for California Almonds

Joseph Connell*[1], Thomas Gradziel[2], Bruce Lampinen[2], Warren Micke[2], Mario Viveros[3], Paul Verdegaal[4]; [1]Univ. of California, Davis, Oroville, CA; [2]Univ of California, Davis, Davis, CA; [3]Univ. of California, Bakersfield, CA; [4]Coop. Ext. Serv, Stockton, CA

Adequate commercial testing is one of the greatest difficulties in new almond cultivar selection in California. Three regional almond variety trials (RAVTs) were planted in 1993; one in California's northern growing region; one in the central region; and one in the southern region. These RAVTs evaluate newer cultivars in single rows of 20–40 trees planted alternately with rows of standard cultivars such as 'Nonpareil' or 'Mission' that bloom at the same time for cross pollination and comparison. Farmed commercially, these trials range in size from 20–37 acres and each have the same cultivar composition, providing some replication by location. Parameters evaluated include bloom time, hull split and harvest dates, yield, and kernel characteristics and quality. Trees are evaluated for size, shape, structure, vigor, and bearing habit. Pest and disease susceptibilities and genetic disorders such as non-infectious bud failure are noted as they occur. These RAVTs are used by almond growers and others in the California industry to compare cultivars by visual observations as well as through data generated by researchers. Comparing new cultivars to currently grown standards has helped our industry learn new cultivars characteristics and has successfully identified those with serious faults prior to their widespread commercial planting. These trials are a cooperative effort between the Univ. of California, the Almond Board of California, Chico State Univ., Delta Community College, and the commercial almond industry.

The Univ. of Georgia Pecan Testing Program

Patrick Conner*; Univ. of Georgia, Tifton, GA

Pecan trees require several years of growth before producing a harvestable crop, and several more years to come into full-bearing. However, once in production, pecan trees are an extremely long-lived crop. Orchards over 90 years old are still bearing and productive. Once trees are in place it is very expensive to replace them, making cultivar choice an extremely important decision. Cultivar evaluation at the Coastal Plain Experiment Station began in 1921 with the establishment of a test orchard by O.J. Woodard. The priority of the testing program is to evaluate newer accessions for potential use in the breeding program or for suitability as new cultivars. Tree productivity is measured by shaking each tree independently and measuring the amount of nuts which drop within a specified area under the tree. A random subsample is taken from the nuts harvested from individual trees and quality is measured in terms of nut size, percent kernel, specific gravity, percent fuzz, and kernel color. Cultivars are also evaluated for leaf scab, nut scab, black aphid damage, and sooty mold buildup. Results are communicated to growers in a timely fashion via talks and articles, and to the research community via peer-reviewed publications. Difficulties encountered in the testing program include the long maturation period for some cultivars, the alternate bearing habit of mature trees, variability of seedling rootstocks, and the time and expense of carrying out trials at grower sites.

4:00–6:00 pm **Powell A/B**

Workshop 5: Roots—Now in 3-D! 3-D Root Architecture Imaging and Its Use in Structural–Functional Models

Sponsor: Root Growth and Rhizosphere Dynamics (RHIZ) Working Group

Moderator: Kevin Kosola
Univ. of Wisconsin, Madison, Madison, WI

Root systems are 3-dimensional structures, yet traditional methods for analysis of root system architecture are based on imaging of an excavated root system, which inevitably collapses into 2 dimensions. In this workshop, we will discuss recent developments in 3-dimensional imaging of root systems (e.g., x-ray tomography, ground penetrating radar). We will also discuss recent developments in including these measurements of 3-D root architecture information into structural-functional models.

Objective:

To discuss new methods for obtaining 3-D images of root system

structure, and utilization of this information in understanding root system form and function.

Populus Root Architecture and Demography From X-ray Imaging to Mesocosms

Alexander Friend*; USDA Forest Service, Houghton, MI

Research Tools for Visualizing and Quantifying Tree Root Architecture

David Burger*; Univ. of California, Davis, CA

Studying the growth and developmental structure of tree root systems requires at least three steps. First, the root system must be exposed or excavated. Next, measurements of root position, size and direction must be made. Finally, the measurements must be organized into meaningful descriptors. The advantages and disadvantages of hydro- and pneumatic-air excavation techniques will be discussed. Several techniques for the marking and measurement of exposed root systems will be introduced. The use of digital photography and creation of 3-D computer models will be demonstrated along with techniques for root orientation calculations using 3-D arithmetic. A non-disruptive approach to tree root visualization using ground-penetrating radar will be explored.

Differences in Fine Root Physiology and Longevity With Order: Measurement and Implications

Christina Wells*; Clemson Univ., Clemson, SC

All roots are not alike: they differ markedly in anatomy, physiology and life history depending on their order within the branched hierarchy of the root system. These differences are most pronounced in woody plant root systems whose highest orders consist of long-lived structural roots. However, differences also exist among orders within the fine, absorptive root system (<1–2 mm in diameter) of woody and non-woody plants. Higher-order roots are always older than the lower-order roots that arise from them, and many physiological differences among root orders reflect this fact. However, differences also exist independently of root age. Roots that are destined to give rise to several hierarchical levels of lateral roots are often developmentally and physiologically distinct from those that will remain lower-order roots throughout their life span. How is root order assessed? When is it useful to incorporate such positional information into the analysis of root data? Do certain techniques introduce bias into root order measurement? In this session, we will review recent literature on differences in nutrient and water uptake, carbon allocation, and life history among fine root orders. We will discuss ways to collect and interpret root order data, including rhizotrons, minirhizotrons and washed root sampling. A free, open-source software package for minirhizotron image analysis (http://www.ces.clemson.edu/~stb/rootfly/) will be demonstrated.

Functional-Structural Modeling of Plant Growth

Yaffa Grossman*; Beloit College, Beloit, WI

Functional-structural models permit the testing of hypotheses about the effects of environment and genetics on the spatial pattern of plant growth by integrating information about the spatial position and physiological capabilities of plant parts with environmental parameters. Such models represent the spatial position of model elements (e.g., leaves, stems, roots, flowers, and fruits) geometrically by using three-dimensional coordinates and topologically by providing information about how the elements connect to one another. Carbon fixation, respiration, and other physiological functions of each model element are simulated based on the type of element, its position, and environmental conditions. The techniques used by functional-structural models to partition newly-fixed carbon among the model elements range from empirically-based partitioning coefficients to simulations of competitive interactions among plant parts. Although functional-structural models often require a substantial investment in acquiring spatial information, it is possible to develop such models from limited measurements by taking advantage of the repeated patterns that occur in plant structure as demonstrated by the spatially-explicit model 3D Fractal-Tree (Jungck et al. 2006 BioQUEST Curriculum Consortium). L-PEACH, a transport-resistance functional-structural model of peach tree growth and development combines this approach to simulating spatial structure with a source-sink carbon partitioning model that includes storage and mobilization of carbohydrates throughout the growing season (Allen et al. 2005 New Phytologist 166:869-880).

5:00–6:00 pm **Noble Boardroom**

Horticultural Landmarks Committee Meeting

Presiding: Stephen Myers

5:00–6:00 pm **Poolside**

Student Reception ($15 fee)

Come hang out and meet other undergraduate and graduate students attending the conference. A poolside gathering with light snacks and refreshments will be served. This will also be another opportunity to network or talk one-on-one with the speakers from the Student Workshop and possibly about your future plans with regard to career and post-graduate options...or you can just have fun in the pool!

5:00–6:00 pm **Merriam B**

Plant Biotechnology (BTCH) Working Group Business Meeting

Chair: Alan G. Smith

5:00–6:00 pm **Rainmakers Ballroom A**

Floriculture Education (FLED) Working Group Business Meeting

Chair: Erik Runkle

5:30–6:00 pm **Rainmakers Ballroom B**

Intellectual Property Rights (IPR) Working Group Business Meeting

Chair: Janice Strachan

6:00–6:30 pm **Powell A/B**

Root Growth and Rhizosphere Dynamics (RHIZ) Working Group Business Meeting

Chair: Kevin Kosola

6:00–6:30 pm **Kirkland**

Temperate Tree Nut Crops (NUTS) Working Group Business Meeting

Chair: Patrick Connor

6:00–6:30 pm **Greenway A/B**

Vegetable Breeding (VGBR) Working Group Business Meeting

Chair: Ryan Hayes

6:00–6:30 pm **Merriam A**

Water Utilization & Management (WUM) Working Group Business Meeting

Chair: Tom Yeager

7:00–8:30 pm **Marshall's Outpost**

Welcome Reception & ASHS Endowment Fund Raffle

Come celebrate our 104th birthday at the opening reception for the ASHS-2007 Annual Conference.

Meet and greet your colleagues and friends while enjoying some light snacks. In addition, the ASHS Endowment Fund will again be sponsoring a raffle with many fabulous prizes. All of the proceeds will benefit the ASHS Endowment Fund, which supports horticulture education and research through student scholarships and other educational tools. Raffle tickets are available for advance purchase. Winners will be announced during this reception (you do not need to be present to win). Raffle Tickets are $10.00 each or 3 for $25.00. *Remember, this is your opportunity to win valuable prizes while also supporting a good cause*. Light snacks will be provided, however, this event is not planned as a dinner function.

Tuesday, July 17

7:00 am–1:00 pm **Herberger Ballroom 3**

ACB Commodity Judging Contest Set-Up

Undergraduate students from member clubs compete by rating the quality of horticultural commodities, identifying a large number of plants, many from out of their region, and by taking general exam of horticultural knowledge.

7:00 am–7:00 pm

Tucson & Sonora Desert Museum Tour

A trip to Tucson will reveal a city and surrounding area of lush Sonoran desert scenery and much of Arizona's colorful history. Included is a visit to the San Xavier del Bac Mission, the "White Dove of the Desert." This newly restored Mission dates back to 1692, and is Arizona's most historic example of its Spanish heritage.

7:30 am–6:00 pm **Culturekeepers Hall West**

Registration Desk Open

8:00–9:00 am **Noble Boardroom**

Membership Committee Meeting

Presiding: Anita Azarenko

8:00–9:30 am **Lowell A/B**

Oral Session 7: Nursery Crops

Moderator: Richard C. Beeson, rcbeeson@ufl.edu

8:00 am–8:15 am

Growth and Physiology of Landscape Trees in Response to Varying Nutrient Levels for Pot-in-Pot Production

Wendy Klooster*, Bert Cregg, R. Tom Fernandez, Pascal Nzokou

8:15–8:30 am

Forest Residuals: New Substrates for Container-grown Crops

Cheryl R. Boyer*, Glenn B. Fain, Charles H. Gilliam, Thomas V. Gallagher, H. Allen Torbert, Jeff L. Sibley

8:30–8:45 am

Responses of Five Nursery Plant Species to Chlorinated Water and Efficacy of Using Chlorine to Control Diseases in Irrigation Water

Diane Feliciano Cayanan*, Youbin Zheng, Calvin Chong, Thomas Graham, Ping Zhang, Jennifer Llewellyn, Weizhong Liu, Michael Dixon

8:45–9:00 am

ETo-based Operational Model for Irrigation of Container-grown Woody Ornamentals

Richard Beeson*

9:00–9:15 am

Fertilizer, Irrigation, and Mycorrhizal Effects on Container-grown Nursery Crop Biomass Accumulation and Leachate Nutrient Content

Gladis Zinati*, John Dighton, A.J. Both

9:15–9:30 am

Viburnum Root Mass and Fall Carbohydrate Levels as Affected by Container Type

Catherine Neal*, Richard Beeson

8:00–9:30 am **Rainmakers Ballroom A**

Oral Session 8: Citrus Crops

Moderator: Arnold W. Schumann, schumaw@ufl.edu

8:00–8:15 am

Controlled-release Fertilizers Reduce Groundwater Nitrate Concentrations in Citrus Orchards

Arnold Schumann*, Kelly Morgan

8:15–8:30 am

Lime (Kagzi lime): A Novel Source of Bioactive Principles

Jaiparkash R. Patil*, Mahadev Chetti, Guddadarangavvanahalli K. Jayaprakasha, Bhimanagouda S. Patil

8:30–8:45 am

Growth Flush and Flowering is Delayed by Winter Drought Stress in 'Valencia' Orange Trees

Juan Carlos Melgar*, James P. Syvertsen, Gene Albrigo

8:45–9:00 am

Nitrogen and Phosphorus Applications for Fertigated Young Navel Orange Trees in Arizona

Ayako Kusakabe*

9:00–9:15 am

Effect of KNO_3 Fertilization and Rootstock on Grapefruit Response to Salinity

Eran Raveh*, Yoseph Levy

9:15–9:30 am

Effect of High-density Planting on Vigor and Yield in Kinnow Mandarin (*Citrus reticulata* Blanco)

Waqar Ahmed*, Muhammad Mumutaz Khan, Muhammad Azhar Nawaz, Raheel Anwar, Zahid Iqbal

8:00–10:15 am **Rainmakers Ballroom B**

Oral Session 9: Crop Physiology 2

Moderator: Fumiomi Takeda, Fumi.Takeda@ars.usda.gov

8:00–8:15 am

Crop Load and Time of Defoliation in Imperial Gala Apple Trees: Effects on Leaf Photosynthesis, Fruit Growth, and Yield

Gustavo Lobos*, Paolo Sabbatini, Jim Flore, Alejandro del Pozo, Jorge Retamales

8:15–8:30 am

Source-Sink Relationship: Effect on Crop Load, Photosynthesis and Carbon Isotope Discrimination of 'Imperial Gala' Apple Tree

Paolo Sabbatini*, Jim Flore

8:30–8:45 am

Development of Short-day-type Strawberry Transplants that Flower in Fall

Fumiomi Takeda*, David Michael Glenn

8:45–9:00 am

Pistillate Flower Abortion and Pollination-induced Ethylene Production in English Walnut

Holly Johnson*, Vito Polito

9:00–9:15 am

Gibberellins' Effect on the Reproductive Development of *Brassica oleracea*

Denise Duclos*, Thomas Björkman

9:15–9:30 am

The PGR, Trinexapac-Ethyl Reduces Lodging in Desert Durum Wheat

Kurt Nolte*

9:30–9:45 am

Effects of Frond Harvesting on Absorption, Translocation, and Accumulation of Arsenic by *Pteris vittata* L. —Chinese Brake Fern

Seenivasan Natarajan*, Robert Stamps, Lena Ma, Uttam Saha

9:45–10:00 am

Role of Phospholipid Signaling in Citrus Leaf and Fruit Abscission

Anish Malladi*, Jacqueline Burns

10:00–10:15 am

Ethylene Perception and Biosynthesis Gene Expression in Valencia Orange Fruit and Leaves are Altered during Abscission

Karthik-Joseph John-Karuppiah*, Jacqueline Burns

8:00–10:00 am **Greenway A/B**

Oral Session 10: Organic Horticulture 2

Moderator: Kathleen Delate, kdelate@iastate.edu

8:00 am–10:00 am

Weed Suppression with Mulches for High Tunnel Organic Cucumbers

Elsa Sanchez*, William J. Lamont, Jr., Michael D. Orzolek

8:15 am–8:30 am

Impacts of Organic Transplant Media on Plant Growth and Root Rhizosphere Bacterial Communities

Anusuya Rangarajan*, Allison Jack, Janice Thies

8:30–8:45 am

Alternative Management of Purple and Yellow Nutsedge in Southern California Vegetable Production System

Guangyao Wang*, Milton McGiffen, Eddie Ogbuchiekwe

8:45–9:00 am

Organic Seed Use in Certified Organic Production

Kathleen Delate*

9:00–9:15 am

Organic Greenhouse Production of Basil and Spearmint: Nutrient Uptake and Postharvest Quality

Danielle Treadwell*, George Hochmuth, Eric Simonne, Steve Sargent, Lei Lani Davis, Wanda Laughlin, Yuncong Li, Teresa Olczyk, Richard Sprenkel, Lance Osborne

9:15–9:30 am

Effect of Tillage Interval on Purple Nutsedge Suppression

Carlene Chase*, Rosalie Koenig, Carrie Brinton

9:30–9:45 am

Managing Phosphorus for Organic Crop Production

Robert Mikkelsen*

9:45–10:00 am

Plant Population, Variety, and Sampling Effects on Organic Kraut-type Cabbage Plant and Head Traits

Matthew Kleinhenz*, Michelle Sutter

8:00–10:00 am **Kirkland**

Workshop 6: Grafting Vegetables for Enhanced Production and Quality

Sponsor: Production and Mechanized Harvesting (MECH) Working Group

Presiding: Jackie Burns
Univ. of Florida, Lake Alfred, FL

Grafting of vegetables has been done for centuries in the world, but is a recent introduction in North America. Grafting is done to avoid soil-borne diseases and to enhance early production (such as induced chill tolerance). Interest in grafting in North America started with research in alternatives to methyl bromide, disease avoidance in watermelons, greenhouse production of tomatoes and peppers, and for enhanced productivity and/or use of heirloom tomatoes, watermelon, muskmelon, and eggplant, especially in organic production systems. In this workshop, an overview of grafting strategies, methods, and uses will be presented to explore this new area of horticulture.

Introduction to the Workshop

Penelope Perkins-Veazie*; USDA–ARS, SCARL, Lane, OK

Vegetable Grafting: History, Use, and Current Technology Status in North America

Chieri Kubota*; Univ. of Arizona, Tucson, AZ

Grafting of vegetable seedlings is a unique horticultural technology practiced for many years in East Asia to overcome issues associated with intensive cultivation using limited arable land. This technology was introduced to Europe in the late 20th century, along with improved grafting methods suitable for commercial production of grafted vegetable seedlings. Later, grafting was introduced to North America from Europe and it is now attracting much interest, both from greenhouse growers and organic producers. Grafting onto specific rootstocks generally provides resistance to soil borne diseases and nematodes and increases yield. Use of grafting is known to be an effective technology for sustainable crop production using reduced soil fumigants in many other countries. To use this technology widely in North American fresh vegetable production, more information and locally collected scientific and technical data are needed. Currently over 40 million grafted tomato seedling are estimated to be used annually in North American greenhouses, and several commercial trials have been conducted for promoting use of grated melon seedlings in open-fields. Nevertheless, there are issues identified that currently limit the further promotion of the use of grafted seedlings in North America. An issue unique to the U.S. is the large number of seedlings needed in a single shipment particularly for large scale open-field production. Semi- or fully-automated grafting robots were invented by several agricultural machine industries in 1990s, yet the models available in the U.S are limited. The lack of flexibility (e.g., in tray size and plant size) of the existing robots also limits their adaptation to U.S. propagators. Strategies to resolve these issues include use of highly controlled

environment for producing standardized seedlings suitable for automation, introduction of sorting and grafting robots, and better storage techniques, which will be discussed in the present workshop.

Grafting for Disease Resistance

Stephen King*[1], Angela Davis[2], Bubba LaMolinare[3], Wenge Liu[1], Amnon Levi[4];

[1]Texas A&M Univ., College Station, TX; [2]USDA–ARS, Lane, OK; [3]Vegetable and Fruit Improvement Center, College Station, TX; [4]USDA–ARS, Charleston, SC

The primary purpose of grafting vegetables worldwide has been to provide resistance to soil born diseases. The potential loss of methyl bromide as a soil fumigant combined with pathogen resistance to commonly used pesticides will make resistance to soil born pathogens even more important in the future. The major disease problems that have been addressed by grafting include Fusarium, Verticillium, Monosporascus and MNSV. If the area devoted to grafting increases in the future, there will likely be a shift in the soil microbial environment that could lead to the development of new diseases or changes in the pathogen population of current diseases. There have been reports of Fusarium attacking certain varieties of *Lagenaria siceraria,* which were previously considered resistant to this disease. We have also found that cucurbit rootstocks can transmit Watermelon Fruit Blotch, a common seed born disease of cucurbits. While most watermelon seed lots are tested for the presence of WFB, it is not known how extensive testing is on rootstocks for the presence of this disease. While grafting can control many common diseases, the ultimate success will likely depend on how well we monitor for changes in the pathogen population and other unexpected consequences.

Grafting Effects on Vegetable Quality

Angela Davis*[1], Stephen King[2], Penelope Perkins-Veazie[1], Amnon Levi[3];

[1]USDA–ARS, Lane, OK; [2]Texas A&M Univ., College Station, TX; [3]USDA–ARS, Charleston, SC

In the United States, vegetable grafting is rare and few experiments have been done to determine optimal grafting procedures and production practices for different geographical and climatic regions in America. Grafting vegetables to control soil-borne disease is a common practice in Asia, parts of Europe, and the Middle East. Vegetable grafting started in the 1920s Japan and Korea; currently, in some countries most of the cucurbits and tomatoes grown are grafted. The U.S. cucurbit and tomato industries are looking at grafting as a viable option for disease control and quality improvements. Some seed companies in the U.S. now offer watermelon transplants that are grafted onto squash or gourd rootstocks. There are reports that indicate the type of rootstock alters the resulting yield and quality attributes of the scion fruit. It has been reported that pH, flavor, sugar, color, carotenoid content, and texture can sometimes be affected by grafting and the type of rootstock used. Reports vary on quality in vegetables, with some research showing a negative and others a positive effect of grafting on quality traits. This variation in results indicates the importance in researching the effect of various rootstock scion combinations under multiple climatic and geographic conditions. Data have shown that rootstock influences plant growth, yield, and quality of scion fruit, showing that rootstock-scion combinations are an important consideration in quality effects of grafting.

Grafting Methods and Procedures Involved is Producing Quality Transplants

Richard Hassell*; Clemson Univ. CREC, Charleston, SC

Grafted vegetables were first launched in Japan and Korea in the late 1920s by grafting watermelons to gourd rootstocks. At present, most of the watermelons, oriental melons, greenhouse cucumbers, and several other solanaceous crops in Korea and Japan are grafted before being transplanted to the field or greenhouse. In the United States we are just beginning to exam the advantages to grafting. One of the big factors in producing a grafted transplant is the labor cost. At present, the cost on of such a transplant is about $1.00. This is in comparison to 25 cents for a non grafted transplant. Various grafting methods and procedures have been developed to reduce those costs and transplant growers must choose which method produces the highest quality transplants at the lowest for there operation. Grafting methods vary considerably with the crops being grown, rootstock material selected, and scion material chosen. Just as important a consideration is the growth stage needed for both the rootstock and scion material need for the graft to be successful. For example, hole insertion graft would be convenient for watermelons because of the their small seedling size compared to the size of the rootstock seedling, however, this method only works with the gourd rootstock. Five methods are currently being evaluated: approach graft, hole insertion graft, one cotyledon graft, hypocotyl insertion graft, and the Rogers graft. Each graft requires different materials as well as different procedures in order for it to be successful. Each of these method and procedures will be discussed during the workshop. Just as important in the whole grafting procedure is the post grafting care. Having the proper healing chamber is critical for the graft union to take. Grafted plants should be maintained at 77 °F and 100% humidity in a growth chamber for between 5 to 7 days prior to moving them into the greenhouse. These can be very simple to construct with will costs involved. Several chambers will be discussed.

Introduction of a New Fully Automated Grafting Robot for Use in Cucurbits

Kenta Shigematsu*[1], Ken Kobayashi[1], Takahiro Ohkoshi[2];

[1]Bio-oriented Technology Research Advancement Institution (BRAIN), Japan; http://brain.naro.affrc.go.jp/index-e.html; [2]Iseki Co. Ltd., Japan

8:00–10:30 am **Kierland Grand Ballroom**

Undergraduate Student Poster Competition

8:00–12:00 pm **Herberger Ballroom 1**

Colloquium 1: Transgenic Horticultural Crops: Challenges and Opportunities

Primary Sponsor: Genetics and Germplasm (GG) Working Group

Co-Sponsors: Intellectual Property Rights (IPR); Ornamental Plant Breeding (OPB); Plant Biotechnology (BTCH); Vegetable Breeding Working Group (VGBR) Working Groups, and the Working Group of Asian Horticulture (WGAH)

Presiding: Beiquan Mou, U.S. Dept. of Agriculture, Salinas, CA

Transgenic crop production is a major issue in agriculture today. A decade after the initial commercialization, the global planted area of genetically engineered crops has soared to 90 million hectares in 21 countries in 2005, of which 50 million hectares (55%) were in the United States. Now, 89% of the soybeans, 83% of the cotton, and 61% of the corn grown in the United States are biotech varieties, primarily with herbicide tolerance, insect resistance, or stacked genes for the two traits. Despite demonstrated benefits, the commercialization of transgenic horticultural crops (vegetables, fruits, nuts, and ornamentals) has largely lagged behind, although considerable research is still being conducted on these crops. A major reason for this is consumer concern over genetically modified (GM) food, which results in the reluctance of processors and marketers to accept the biotech products already developed. Also, the limited acreage of most horticultural crops makes it more difficult to recover the costs of research, development, and segregation

of GM and non-GM commodities. Current practices in patenting and intellectual property protection have added barriers to the use of biotechnology for the creation and commercialization of new horticultural crop varieties. Meanwhile, science-based research is needed to assess the impact of genetic engineering on biodiversity, environmental safety, and human health. There are also other challenges including technical difficulties in the transformation of certain horticultural crops, regulatory approval in different countries, and post-commercialization stewardship. As the world debates the risks and benefits of plant biotechnology, the proportion of the global area of transgenic crops grown by developing countries has increased every year. In this colloquium, experts from different disciplines will assess the current status of transgenic horticultural crops, examine the challenges for the creation and commercialization of horticultural biotechnology, and identify opportunities for future progress.

Objective:

1) To assess the current status of transgenic horticultural crops in the United States and in other countries.

2) To examine the hurdles and potential risks for the creation and commercialization of biotech horticultural crops.

3) To identify the opportunities, strategies, and priorities for future research and development in this field.

Virus-resistant Transgenic Papaya: Development, Impact, and Challenges

Dennis Gonsalves*; USDA Pacific Basin Agricultural Research Center, Hilo, HI

Papaya ringspot virus (PRSV) is the most widespread and destructive virus that affects papaya, a tropical fruit that is widely grown commercially and in back yards. Starting in 1985, efforts to develop PRSV-resistant transgenic papaya for Hawaii were begun by using the 'pathogen-derived resistance' approach. Basically, the coat protein gene of PRSV-HA from Hawaii was mobilized into the genome of the commercial Hawaiian solo papaya 'Sunset'. Two commercial transgenic cultivars 'SunUp' and 'Rainbow' were developed by 1995 and were deregulated and commercialized in 1998. The release was timely as it stemmed the destruction being caused by PRSV in Puna, where 95% of Hawaii's papaya were being grown. The transgenic papaya is widely grown in Hawaii and resistance has been durable nearly a decade after its commercialization. Some challenges is the continual growing of nontransgenic papaya in Puna that is necessary to supply the Japan market, since the transgenic papaya is not yet deregulated in Japan. A workable system of co-existence of transgenic and nontransgenic papaya has emerged in Puna. Efforts to deregulate the transgenic papaya in Japan are continuing. Lastly, the transgenic papaya case will be discussed in relation to the potential commercialization of other horticultural crops outside of the commodities.

Biotechnology of Crops for Use in the Ornamental Horticulture Industry

David Clark*; Environmental Horticulture Dept., Univ. of Florida, Gainesville, FL

The ornamental horticulture industry is technically well-developed and is characterized by the use of a plethora of different plant species. In the last 5–10 years, there has been a dramatic increase in the number of flowering plant species available to consumers worldwide, and this trend is continuing. With such a diverse industry it is logical to assume that the application of biotechnology to ornamental crops is going to be very difficult. Turnover of new cultivars is constant, which means that by the time a researcher has transformed a new trait into a particular cultivar and proven that the trait is of commercial interest, the original cultivar may actually have been replaced by a new "improved" cultivar. As a result, it will be important to get commercially viable transgenes into breeding stocks, whether the goal is to produce a crop that will be reproduced by seeds or by vegetative propagules. Once a new biotech ornamental crop is produced, calculating the value-added by a trait is very difficult. Calculating increases in yield of agronomic crops may be relatively straightforward, but determining how much a more fragrant plant is worth is a bit more difficult. Along with the high amount of genetic diversity, there is a significant bottleneck in the number of ornamental plant species that have been genetically transformed to date. Although there have been published reports describing the genetic transformation of several of the major floriculture crops such as rose, carnation, and petunia, other important ornamental crops such as poinsettia and impatiens have still not been reliably transformed. Even in crops that have been transformed, it has been difficult to develop transformation protocols that can be used successfully on all cultivars of a given plant species. In many cases, biotechnology applications are proving to be very difficult, but there have been several advances made with engineering a wide variety of genetic traits in floriculture crops and turfgrass. The purpose of this talk is to provide a status report on the progress that has been made in applying biotechnology to plants grown for the ornamental characteristics, and to project where research efforts will be focused over the next few years.

Consumers' Acceptance of GM Food Crops: Traits, Labels and Diverse Information

Wallace Huffman*; Iowa State Univ., Ames, IA

This paper reviews the successes and failures of commercial marketing of GM-crops in the US, including the evolution of input- and consumer-traits, and the role of food labels and diverse information in consumers' acceptance of and willingness to pay for GM crops and crop products relative to their non-GM counterparts. In the final section, some conclusions and predictions about likely future developments in important horticultural crops are made.

Public Intellectual Property Resources for the Development of Transgenic Horticultural Crops

Alan Bennett*; Univ. of California, Davis, CA

Patented technologies related to agricultural biotechnology have increased dramatically since 1982 in both the public and private sectors. Public and non-profit research institutions have invented approximately 25% of the technologies in this field - a proportion which is approximately 10-fold greater than most other technology sectors. In spite of the significant proportion of patented technologies from public institutions, this public sector technology portfolio is highly fragmented across institutions who have found that the public research sector itself is increasingly restricted in its ability to develop new crops with the technologies it has itself invented - particularly in the development of transgenic crops. Many of these public/non-profit institutions share a common philosophy supporting broad technology access but there has been no mechanism for collaborative management of patented technologies. To more effectively manage patented technologies, 45 universities and non-profit research centers in 13 countries have joined forces to form the Public Intellectual Property Resource for Agriculture (PIPRA), an organization committed to strategically manage intellectual property to enable the broadest commercial and humanitarian applications of existing and emerging agricultural technologies. PIPRA and its members believe this landscape of intellectual property can be more effectively managed collaboratively and by using a set of shared principles. PIPRA's primary strategies to improve access to patented technologies are to: 1) provide a one-stop intellectual property clearinghouse for access to public sector patented technologies, 2) provide a resource for the analysis of patented technologies for implementation of specific projects, 3) develop gene transfer and gene-based trait technologies that have maximum legal "freedom to operate".

Impact of Virus-resistant Transgenic Crops: Lessons from Environmental Safety Assessment Studies and the First Decade of Release

Marc Fuchs*, Dept. of Plant Pathology, Cornell Univ., New York State Agricultural Experiment Station, Geneva, NY

Many virus-resistant transgenic crops have been developed and tested under field conditions over the past two decades. Most of them result from the application of the concept of pathogen-derived resistance. Virus-resistant transgenic squash and papaya have been commercialized and transgenic plum is presently considered for deregulation. Potential safety issues on the environment and human health have been raised with the release of virus-resistant transgenic crops with regard to the expression of virus genes and their introgression into free-living relatives. The commonly perceived areas of concern, including functional complementation, recombination, gene flow, impact on nontarget organisms, and food safety in terms of allergenicity, have been extensively addressed over the past 15 years. Nonetheless, risk assessment studies need to be realistic to provide valuable insights into the real significance of safety issues. Studies with vegetable and fruit crops have indicated a reasonable certainty of limited, if any, impact beyond natural background events. There is also a documented safe commercial use of virus-resistant transgenic squash and papaya over the past decade. To date, lessons from risk assessment studies and commercial releases clearly indicate that virus-resistant transgenic crops are safe for the environment and consumers. These findings should facilitate the future release of new horticultural crops. They also should facilitate an informed dialogue on agriculture biotechnology.

Transgenic Ornamentals: an Industry Perspective

Michael Dobres*, President & CEO; NovaFlora Inc., Philadelphia, PA

Technology for the development of transgenic ornamentals has been available for the past two decades. Despite the attempts by numerous companies and an ever-increasing spectrum of available trait technologies, there is only a single example of a commercialized transgenic ornamental. This is stark contrast to the extensive commercialization of transgenic commodity crops. This presentation will examine the technical, business, market, regulatory and intellectual property factors that have contributed to the dearth of commercially available transgenic crops.

8:00–12:00 pm **Powell A/B**

Symposium 2: The Role of Horticulture in International Development: Updates, Opportunities and Challenges

Co-Sponsored by: ASHS Working Groups: International Horticultural Consultants (ICON) and International Topics of Concern to Horticulturists (ITCH), and AVRDC—The World Vegetable Center

Moderator: Jeff Olsen, Oregon State Univ.

8:00 am

Introduction to the Symposium

Jeff Olsen*, Oregon State Univ.

8:10 am

The USAID Global Horticultural Assessment

Patrick Brown*, Univ. of California at Davis, http://caes.ucdavis.edu/IntProg/GHAPublication2005Web.pdf

8:50 am

AVRDC—The World Vegetable Center's Programs for Development

Thomas Lumpkin*, Director General, AVRDC—The World Vegetable Center, Tianan, Tiawan http://www.avrdc.org/

The World Vegetable Center, founded in 1971 as the Asian Vegetable Research and Development Center (AVRDC), is the world's leading international research organization focused on vegetables. Its mission is "*To alleviate poverty and malnutrition in the developing world through the increased production and consumption of safe vegetables*." Its headquarters is in Taiwan with approximately 250 professional staff and a 2006 budget of over USD17 million primarily from donors such as COA, GTZ, SDC, USAID, ACIAR, Rockefeller Foundation and the Bill and Melinda Gates Foundation. The Center also operates from regional offices in Thailand, India and Tanzania as well as from program offices in five other developing countries.

The Center conducts research for development; from breeding and production of vegetables to their consumption and their socio-economic impacts on communities. In addition to managing the world's largest collection of vegetable germplasm—currently over 55,000 accessions—and the development of new lines and varieties, other core activities include developing safe and sustainable production systems and crop protection. The Center has extensive research for development programs on nutritional security and human health as well as on postharvest management of vegetables, market opportunities and income generation for smallholder farmers.

Over the last three years, the Center has significantly expanded the breadth and depth of its global research and development work, with a major increase in its budget and a growing presence particularly in Sub-Saharan Africa and South Asia. In addition to its long-term varietal research on globally important vegetables (including tomato, cabbage, alliums, and peppers), the Center has begun a cucurbit breeding programme and is expanding its use of molecular technologies for genetic enhancement. In conjunction with government and private partners its CIMBAA project is pioneering new approaches to use GM technologies to overcome major pest problems and pesticide misuse in brassicas in South Asia.

With support from the Bill and Melinda Gates Foundation, the Center is embarking on a major program to breed new exotic and indigenous vegetable varieties for Africa—the world's undeveloped vegetable seed market, and to strengthen local seed companies to make improved varieties widely available to smallholder farmers. This will build on the Center's collection of over 10,000 indigenous vegetables. Easy to grow and highly nutritious, such crops are an underappreciated but vital component in the diets of the world's poorest communities.

9:30 am

Break

9:50 am

Ramifications of New Technologies in Horticulture: Risks And Opportunities for the Poor

Remi Kahane*, The Global Horticulture Initiative, GlobalHort, www.globalhort.org; rkahane@globalhort.org AVRDC—The World Vegetable Center, Shaunhua, Taiwan, ROC

Horticulture is labor intensive and requires many other inputs, many of which require a high level of skill, knowledge and technology. Advances in horticultural production, post-harvest handling, and in marketing have resulted from considerable investment in technology in recent years. However, most of these technologies have been designed and adapted for industry in advanced economy countries.

Rather few innovations can be immediately applied to smallholder farmers in developing countries. Nonetheless, these technologies are considered as opportunities for developing countries, just as fertilizers and pesticides signified modernity 30 years ago in the North. Therefore, it seems wise to carefully evaluate the risks and benefits of latest 'new' technologies and to consider the opportunities and modifications required to positively impact the developing world. Three cases are discussed in this presentation: hybrid seeds, IPM and the internet. In all cases, a high level of knowledge and education is required, meaning that successful uptake and application of these new technologies is predicated on a sufficient capacity in developing countries to educate, farmers, traders, processors, policy makers and even consumers. If not, the gap between North and South, rich and poor, will continue to widen. The mission of GlobalHort is to improve the health and income of the poor in developing countries through sustainable, demand driven, horticultural production, processing and marketing systems. GlobalHort will promote higher education and output-oriented research. Information and communication technologies will be the main tool for connecting the fragmented community in horticultural research for development, for sharing knowledge and know-how, and for linking the actors of the horticultural chain to each other.

10:30 am

Consultative Group on International Agricultural Research Centers (CGIAR) Alliance Horticultural Programs

William Dar*, International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), http://www.cgiar.org/

11:10 am

Tomato Yellow Leaf Curl Resistance in Tomato for West Africa

Jeffrey S. Gordon, Kari W. Perez, Virginie Levasseur, Issoufou Kollo Abdourhamane, Robert L. Gilbertson, Molly Jahn*, Univ. of Wisconsin

11:25 am

University and Government Relations, Including the USAID Horticultural Program(s)

L. George Wilson*, North Carolina State Univ. /USAID–Washington

Information on university and government relations, including the USAID horticultural program(s) will be presented. Government and university relations, long a part of the higher education and research components of agriculture in the United States, include the 108 1862, 1890 and 1994 Land Grant institutions. Their teaching/training, research, and extension/outreach missions have served as an engine of economic growth for American agriculture. The 1975 Title XII legislation has strengthened Land Grant universities and other institutions—to apply more effective agricultural sciences to increase world food production through partnerships with USAID and the private sector. The proposed USAID Global Horticultural Support Program (GHSP) will focus on: capacity building and institutional strengthening, improving marketing systems, and strengthening the enabling and policy environment. The GHSP will develop in parallel with the rethinking of alternate management structures for Title XII programs and the new Foreign Assistance Framework, in compliance with the U.S. Government's goals for Transformational Diplomacy.

11:50 am

Wrap up, Conclusions, Next Steps, etc.

Harish Ratnayaka*, Xavier Univ.

12:00 pm

Adjourn

8:00 am–6:00 pm **Cushing A/B**

Employment/Internship Services (Placement) Open

9:00 am–6:00 pm **Kierland Grand Ballroom**

Exhibit and Poster Hall Open

9:00–10:00 am **Noble Boardroom**

Fellows Screening Committee

Presiding: Dewayne Ingram

9:30–10:30 am **Merriam B**

Continuing Education Committee

Presiding: Elizabeth Lamb

9:30–10:30 am **Mapmakers A/B**

Environmental Stress Physiology (STRS) Working Group Business Meeting

Chair: William Bauerle

10:00–10:30 am **Noble Boardroom**

Industry Advisory Council Meeting

Presiding: Craig Campbell

10:00–12:30 am **Rainmakers Ballroom C**

Oral Session 11: Postharvest 1

Moderator: D. Mark Hodges, HodgesM@AGR.GC.CA

10:00–10:15 am

Effects of Harvesting Time and Storage Period on the Quality of Winter Squash Grown in Korea

Jae Wook Lee*, Cheng Hao Zhang, Kyoung Sub Park, Alexander Joel G. Gige

10:15–10:30 am

Effect of Edible Coatings on the Flavor of 'Valencia' Oranges

Maria-Llanos Navarro-Tarazaga, Anne Plotto*, Kevin Goodner, Elizabeth Baldwin, Maria-Bernadita Perez-Gago

10:30–10:45 am

Evaluation of Apple Fruit Aroma Character from the Geneva Malus Core Collection

Nobuko Sugimoto*, Philip Forsline, William Srmack, Randy Beaudry

10:45–11:00 am

Effect of Increased Ascorbate Content on Postharvest Quality of Fresh-Cut Spinach Leaves

D. Mark Hodges*

11:00–11:15 am

Microbial Growth in fresh-cut Lettuce is Increased when Wound-induced Phenolic Accumulation is Suppressed

Mikal Saltveit*, Margarita Barros

11:15–11:30 am

Effect of trans-Resveratrol Treatment on Bioactive Compounds of Satsuma Mandarin

Keerthi Cherukuri*, Floyd Woods, William Dozier, Robert Ebel, Lloyd Walker, Rudy Pacumbaba

11:30–11:45 am

Hexanal Vapor Inhibits Fungal Growth and Controls Postharvest Fruit Decay

Lihua Fan, Jun Song*, Debra Moreau, Paula Allan-Wojtas, Craig Doucette, Leslie Campbell-Palmer

11:45 am–12:00 pm

Optimizing Protein Extraction Protocols for Two-dimensional Electrophoresis and Mass Spectrometry Analysis

Jun Song*, QiFa Zheng, Kristen Doncaster, Leslie Campbell-Palmer

12:00–12:15 pm

Phospholipase A2 Activity is Involved in Development of Peel Pitting in Citrus Fruit

Yolanda Lluch*, Fernando Alferez, Jacqueline Burns

12:15–12:30 pm

Comparing Carotenoid Profile in Peel and Juice of Two Orange Cultivars Treated with the Abscission Chemicals Ethephon and 5-chloro-3-methyl-4-nitro-1H-pyrazole (CMNP)

Fernando Alferez*, Luis Pozo, Jacqueline Burns

10:15 am–12:00 pm **Rainmakers Ballroom B**

Oral Session 12: Vegetable Crops Management 2

Moderator: Harlene Hatterman-Valenti, H.Hatterman.valenti@ndsu.edu

10:15–10:30 am

Control of Root Rot of Melon by Hot Water Soil Sterilization in Consecutively Cultured Fields

Jung Sup Lee*, Jong Han Park, Kyoung Suk Han, Seoung Ryoung Cheong, Sang Tae Seo, Jae Wook Lee

10:30–10:45 am

An IPM Strategy for Managing Phytophthora Blight (*Phytophthora capsici*) in Cucurbit Fields

Mohammad Babadoost*

10:45–11:00 am

The Effect of Time of Whitefly Infestation and Plant Nutrition on the Development of Tomato Irregular Ripening Disorder

Cindy McKenzie*, Joseph Albano

11:00–11:15 am

Broadleaf Weed Control in Transplanted Cabbage

Harlene M. Hatterman-Valenti*, Collin P. Auwarter

11:15–11:30 am

Variable Rate Balan® Application Reduces Lettuce Injury, Enhances Yield

Kurt D. Nolte*, Barry Tickes

11:30–11:45 am

Effect of Fruit Development on Susceptibility of Diverse Cucurbits to Infection by *Phytophthora capsici*

Kaori Ando*, Rebecca Grumet

11:45–12:00 pm

Overcoming Compaction Limitations on Cabbage Growth and Yield in the Transition to Reduced Tillage

Maren Mochizuki*, Anusuya Rangarajan

10:30–11:00 am **Noble Boardroom**

Presidents Corporate Council Meeting

Presiding: Craig Campbell

10:30–11:30 am **Tribal Room A/B**

Fruit Breeding (FRBR) Working Group Business Meeting

Chair: Christopher Owens

10:30–11:45 am **Kirkland**

Oral Session 13: Floriculture 1

Moderator: Mike Compton, compton@uwplatt.edu

10:30–10:45 am

Growth of Showy and Yellow Lady Slipper Orchids in Soilless Media using Anaerobic Digestion-Derived Biosolids or Coconut Coir

Michael Compton*, Timothy Zauche

10:45–11:00 am

Effects of Phosphorus on Morphology of Hydroponically Grown *Scaevola aemula* R. Br. 'Whirlwind Blue'

Stephanie Burnett*, Donglin Zhang, Lois Stack, Zhongqi He

11:00–11:15 am

Effect of High Temperature on Extreme Substrate Acidification by Geranium (*Pelargonium* ×*hortorum* Bailey)

Matthew Taylor, Paul Nelson*, Jonathan Frantz

11:15–11:30 am

Effects NO_3-N to NH_4-N Ratio on Growth and Flowering of a Hybrid Phalaenopsis Planted in a Bark Mix or Sphagnum Moss

Yin-Tung Wang*, Chin-Jung Tsai

11:30–11:45 am

Growth of Poinsettia Plants in Soilless Media using Anaerobic Digestion-derived Biosolids Compared to Peat-based Growing Media

Michael Compton*, Timothy Zauche

10:30–12:00 pm **Greenway A/B**

Oral Session 14: Environmental Stress Physiology

Moderator: Carole Bassett, Carole.Bassett@ars.usda.gov

10:30–10:45 am

Leaf Dry Matter Content Determines Pigment Concentrations in Kale and Spinach Greens

Mark Lefsrud*, Dean Kopsell, James Wills, Carl Sams, Arend Jan Both

10:45–11:00 am

The Effect of Water Super-saturated with Oxygen on Plant Growth

Albert Markhart*

11:00–11:15 am

Radish Growth and Development is Sustained under Hypobaric Pressures

Gary Stutte*, Neil Yorio, Jeffrey Richards, Sharon Edney, Raymond Wheeler

11:15–11:30 am

Bark Cracking

Kyle Daniel*, Hannah Mathers, Luke Case

11:30–11:45 am

Mapping Transcript Start Sites for Three Peach (*Prunus persica* L. Batsch.) Dehydrins: Differences in Transcript Initiation during Fruit Development

Carole Bassett*, Gregory Richart, Michael Wisniewski, Timothy Artlip, Robert Farrell, Jr.

11:45–12:00 pm

Growth and Gas Exchanges of Four Oleanders in Response to Drought Stress

Genhua Niu*, Denise Rodriguez, Wayne Mackay

10:30 am–12:00 pm **Lowell A/B**

Association of Collegiate Branches (ACB) Annual Business Meeting

Presiding: Erin Cathcart, ACB President

11:00–12:00 pm **Noble Boardroom**

Technical Program Committee

Presiding: Dennis Ray and Carl Sams

12:00–12:45 pm **Kierland Grand Ballroom**

Graduate Student Poster Competition (Group 3)

Presiding: Barbara Liedl

12:00–12:45 pm **Kierland Grand Ballroom**

Poster Session 12: Human Issues in Horticulture

(068) A Community Healing Garden—A Multi-generational, Multi-discipline Approach

Angela O'Callaghan*, Claudia Collins, Daniel Ortega

(069) The Relationship Between Student Use of Campus Green Spaces and the Arboretum and Perceptions of Quality of Life of Univ. Students

Amy McFarland*, Tina Waliczek, Jayne Zajicek

(070) Service Learning through a School Garden Program in Uganda

Gail Nonnecke*, C. Lee Burras, Bernard Obaa, Kevin Saunders, David Acker

(071) Communicating a Historical Perspective through Univ. Special Collections and Garden Catalogs

Gail Nonnecke*, Jeanine Aune, Tanya Zanish-Belcher, Kevin Saunders

(072) Service-learning Univ. Students Benefit from Teaching a Garden-based Science Curriculum

Carl Motsenbocker*, Leanna Smith

(073) Designing a Roof Top Horticultural Therapy Garden for a Geriatric Behavior Center

Jenny Pfeffer*, Dennis Deyton, Curtis Stewart

(074) Adults and Gardening: The Motivation of Gardening Throughout a Lifetime

Aime Sommerfeld*, Jayne M. Zajicek

(075) Gardening as a Moderate Intensity Physical Activity for Older Adults

Sin-Ae Park*, Candice Shoemaker, Mark Haub

(076) Sustainable Agriculture Training Programs Benefit Mapuche Growers of Chile

Teresa Salame Donoso*, Paula Astudillo, Monica Ozores-Hampton, Kelly Morgan

(077) Learning Habitats for Schoolyards

Emily Hoover*, Nancy Mulholland, Tim Kenny, Sandy Tanck

(078) Effects of Junior Master Gardener® Health and Nutrition from the Garden on Fifth-grade Children and Their Parents through School Enrichment

Kathryn Orvis*, Heather Light

(079) Removal Efficacy of Volatile Organic Pollutants by Soil Microorganisms and Foliage Plants Inoculated with Bacterial Population

Mung Hwa Yoo*, Youn Jung Kwon, Se-Chul Chun, Ki-Cheol Son, Stanley Kays

(080) An Alaska Native Plant-based Horticulture Curriculum for Elementary Schools

Allison Peterson*

12:00–12:45 pm **Kierland Grand Ballroom**

Poster Session 13: Floriculture 2

(346) Effect of Temperature on Propagation, Growth and Flowering of New Guinea Impatiens

Ching-Jung Tsai*, Nean Lee

(347) Heat Tolerance of Petunia

Jeff Kuehny*, Miao Liu

(348) Flowering Responses of Five Gaillardia Cultivars to Vernalization, Photoperiod and Daily Light Integral

Sonali Padhye*, Catherine Whitman, Erik Runkle, Arthur Cameron

(349) Response of Ivy Geranium with Whitening Disorder to Low Night Temperature

Ritu Dhir*, Richard L. Harkess, Brian S. Baldwin

(350) Effects of Photoselective Shadecloths and Plastic Film on the Growth and Flowering of Poinsettia and Easter Lily

Kent Kobayashi*

(351) *Celosia argentea* var. *plumosa* is Responsive to Floral-inducing Short-day Exposures Very Early in Development

Ryan M. Warner*

(352) Variation in Efficacy of Limited Inductive Photoperiod Treatments for Floral Induction of Four Bedding Plant Species

Ryan M. Warner*

(353) Effects of Photoselective Shadecloths on Flowering of Potted *Dendrobium* Remy Hartmann Orchids

Kent Kobayashi*, Edwin Mersino

12:00–12:45 pm **Kierland Grand Ballroom**

Poster Session 14: Ornamentals/Landscape and Turf 1

(399) *Ceanothus* Species and Cultivars Grow and Flower Well in Western Oregon Landscapes

Neil Bell*

(400) Evaluation of Western United States Native Oak Species for Use in the Midwest

Pamela Trewatha*, Clydette Alsup

(401) Influence of Tree Stock Size on Urban and Suburban Canopy Restoration

Matthew Ross*, Robert Schutzki

(402) Invasive Plants—What are They and What Should We Do About Them?

Alex Niemiera*, Betsy Von Holle, J. Roger Harris

(403) Monitoring of Floral Species in Collection of USAMV Cluj for Preservation and Utilization on the Landscape

Maria Cantor*, Adelina Dumitras, Dumitru Zaharia, Rodica Pop

(404) Natural Habitat of *Rhododendron delavayi* Franch

Xun Chen*, Donglin Zhang, Weijie Li, Bixia Xie

12:00–12:45 pm **Kierland Grand Ballroom**

Poster Session 15: Organic Horticulture 1

(031) Microbial Tea Applications did Not Improve Yields of Collards or Spinach
Sharon Knewtson*, Edward Carey

(032) Evaluation of Asparagus Cultivars Grown Using Organic Or Conventional Production Methods
Mark G. Hutton*, David T. Handley, Heather Bryant, Eric Sideman

(033) Evaluation of Optimal Substrates and Fertilizers for Organic Vegetable Transplant Production in Alabama
C.J. McGrath*, J.M. Kemble, A.N. Wright, W.G. Foshee III

(034) Evaluation of Nitrogen Uptake in Processing Tomato Grown with Hairy Vetch Mulch Labeled with 15N
Hajime Araki*, Toshiyuki Hirata, Naomi Asagi, Hideo Ueno

(035) Transitioning to Organic: Fertility Management in Irish Potato Production
Lacey Dupre Bacque*, Carl Motsenbocker

(036) Nitrogen Uptake by Organic Broccoli from a Legume/Cereal Mix Cover Crop
Richard Smith*, Joji Muramoto, Jim Leap, Carol Shennan, Steven Gliessman

(037) Composts for Organic Bell Pepper Production
Emily K. Cook*, Elsa S. Sanchez

(038) Mustard-derived Biofumigation for Lettuce in Coastal California
Oleg Daugovish, James Downer, Maren Mochizuki*

(039) Insect and Disease Challenges Encountered During the Third Year of High Tunnel Organic Production at Beltsville, Maryland
Donald Krizek*, Mary Camp, David Clark, John Teasdale, Mark Davis, Bryan Butler

(040) Season Extension Methods for Market Gardeners
Natalie Bumgarner*, Sven Verlinden

(041) Mulch Effects on Weed Pressure and Organic Watermelon Yield
Anthony Silvernail, Michael Bomford*

12:00–12:45 pm **Kierland Grand Ballroom**

Poster Session 16: Vegetable Crops Management 2

(273) Water Use and Yield Response of Three Common Dry Bean Cultivars to Cereal Cover Crop and Tillage Practices
Wayne Whitehead*, Bharat Singh

(274) Large Bed Vegetable Cropping Systems Enhance Productivity and Water Conservation
Kurt D. Nolte*, Charles A. Sanchez, Jonathan Dinsmore

(275) Carrot Yield and Quality Response to the Regulator Folcysteine
J. Pablo Morales-Payan*

(276) Effect of Bovine Manure Application on Cactus Pear Vegetable Production Under Desert Conditions
Fabián Robles-Contreras*, Rubén Macías-Duarte Raul Leonel Grijalva-Contreras, Manuel de Jesus Valenzuela-Ruiz

(277) Characterization of Iron and Zinc Uptake in Sweetpotato
Mary Singleton*

(278) Effect of Sea Water and Triazole Treatments at Seedling Stage on Growth and Yield of Squash (*Cucurbita maxima*)
Seong Ki Cheol*, Chun Hwan Kim, Jin Su Lee, Young Cheol Um, Sang Kyu Lee

(279) The Effects of Plant Growth Promoting Rhizobacteria on *Asparagus officinalis* L. Subjected to Water Stress
Scott Liddycoat*, David Wolyn

(280) ABA Improves Chilling Resistance in Watermelon
Jiyoung Oh*, Todd Wehner

12:00–12:45 pm **Kierland Grand Ballroom**

Poster Session 17: Temperate Tree Nut Crops 1

(310) The Occurrence of Pecan Kernel Necrosis
Michael Smith*

(311) Effects of Foliar Boron Application on Pecan
Lenny Wells*

(312) Rest Completion of Six Eastern Black Walnut Cultivars
Michele Warmund*, Mark Coggeshall

(313) Early Production of Eastern Black Walnut (*Juglans nigra* L.) Cultivars in Missouri
Mark Coggeshall*, Michele Warmund

(314) Establishment of Grafted Chestnut Trees Under Ontario Growing Conditions
Cathy Bakker*, Sean Westerveld, Alan McKeown

(315) Adaptation of Grafted Heartnut Cultivars to Ontario Growing Conditions
Sean Westerveld*, Cathy Bakker, Alan McKeown

(316) Early Differences in Alternate Bearing among Five Pistachio Varieties
Craig Kallsen*, Dan Parfitt, Brent Holtz

(317) Performance of Two UC Pistachio Cultivars After Five Years of Harvestable Yield
Dan Parfitt*, Craig Kallsen, Brent Holtz, Joseph Maranto

12:00–2:00 pm **Rainmakers Ballroom A**

Member/Colleague Luncheon/Session: Topic: "The Future of Horticulture"

Presiding: L.G. Wilson, Chair

An active on-line "Forum: Future of Horticultural Science within Academia" at http://www.ishs.org/future/ has been operating since 2005. This has reinforced open discussions on this subject, including those that have taken place at the last three annual conferences of ASHS. The issue: Despite unprecedented growth in the size, diversity, and value of horticultural industry worldwide, horticultural science within academia is experiencing a crisis. This is, in part, because students often fail to perceive horticulture as a science and certainly not as a career option. Can this trend be reversed? Recent positive developments include the launching of the Global Horticultural Initiative by the AVRDC/World Vegetable Center and plans by the US Agency for International Development (USAID) for a Horticultural CRSP (Collaborative Research Support Project). A representative from USAID will participate in this luncheon discussion. Recommendations resulting from this dialogue will be used to deal realistically with these challenges, and ultimately contribute to the development and implementation of a strategy for strengthening horticultural science as an academic pursuit worldwide.

1:00–2:00 pm **Kierland Grand Ballroom**

Graduate Student Poster Competition (Group 4)

Presiding: Barbara Liedl

1:15–2:00 pm **Kierland Grand Ballroom**

Poster Session 18: Produce Quality, Safety & Health Properties 1

(001) Offering Consumers What They Want
Aziz Baameur*, Maria Giovanni

(002) Two-year Comparison of Vitamin C and Antioxidant Properties in Organically and Conventionally Grown Melons (*Cucumis melo* L.)
Karen Salandanan*, Frank Stonaker, Cecil Stushnoff, Marisa Bunning, Oktay Kulen, Jeannette Stushnoff

(003) Cultural Practices Affect Fruit Quality and Antioxidant Capacity in Blueberries
Shiow Wang, Chi-Tsun Chen, William Sciarappa, Chien Wang*

(004) Response of Fruit Quality and Yield Components of Genotypes of Okra (*Hibiscus esculentus* L.) under Different Planting Densities in the Dry Tropics of Mexico
Francisco Radillo-Juarez*, Juan Manuel González-González, Jaime Molina-Ochoa, Iván Castañeda-Álvarez

(005) Grafting Increases Lycopene in Seedless Watermelon
Penelope Perkins-Veazie*, Xingping Zhang, Guiping Lu, Jin Huan

(006) Effectiveness of Acidic Calcium Sulfate as an Inhibitor of *Escherichia coli* 0157:H7 in Apple Cider
Jayne Stratton, Rachel Reuss*, Durward Smith, Paul Read, Gordon Huber

(007) Acidic Calcium Sulfate to Control Microbial Growth in Apple Wine
Rachel Reuss*, Durward Smith, Paul Read, Jayne Stratton, Gordon Huber

(008) USDA/CSREES International Science and Education (ISE) Competitive Grants Program—2006 Funding to Establish Strong Network for Vegetable Improvement Vegetable Science International Network (VEGINET)–USA Chapter
Usha Rani Palaniswamy*, Prem Nath

1:15–2:00 pm **Kierland Grand Ballroom**

Poster Session 19: Viticulture and Small Fruits 1

(324) Productivity and Fruit Quality in 'Flame Seedless' for Table Grape on Three Rootstocks
Manuel de Jesus Valenzuela-Ruiz, Fabián Robles-Contreras*, Raul Leonel Grijalva-Contreras, Rubén Macias-Duarte

(325) Effect of Stylet Oil and Soybean Oil on Delay of Budbreak in Grapes
Sanjun Gu, Kirk Pomper*, Kaan Kurtural

(326) Yield and Fruit Composition of *Vitis vinifera* L. and Hybrid Wine Grape Cultivars under the Climatic Conditions of Vermont
M. Elena Garcia*, Lorranine P. Berkett, Marlys Eddy

(327) Effect of Living or Straw Mulch on Vineyard Weed and Soil Quality Management
Craig Dilley*, Gail Nonnecke

(328) Determination of Chilling Requirements for Concord and Cabernet franc Grapevines
Imed Dami*, David Scurlock

(329) Ferric Oxide does Not Contribute to the Chlorosis Paradox in 'Concord' Grapevines Grown at High pH
Brandon Smith*, Lailiang Cheng, Carl Sams

(330) Identification of Quantitative Trait Loci Responsible for Fruit Shape and Other Phenotypic Characters in Hybrid Table Grapes
Andrew Wycislo*, John Clark, Christopher Owens

1:15–2:00 pm **Kierland Grand Ballroom**

Poster Session 20: Genetics and Germplasm 1

(171) Mapping of QTL for the Number of Seeds, Total Seed Weight, and Single Seed Weight in Melon
Soon Park*, Zhoo-Hyeon Kim, Kevin Crosby

(172) Mapping of QTL Affecting Sugars in Ananas Melon
Soon Park*, Zhoo-Hyeon Kim, Kil Yoo, Kevin Crosby

(173) Mapping of QTL Controlling Fruit Size and Shape Traits in Ananas Melon
Soon Park*, Zhoo-Hyeon Kim, Kevin Crosby

(134) Three Watermelon Cultivars *Citrullus lanatus* L. Grafted on Three Cucurbit Species Utilized as Rootstocks Under Greenhouse Conditions
Josefina Romo, Everardo Zamora, Jesús López*

(174) Construction of a RAPD Marker-based Linkage Map in Ananas Melon
Soon Park*, Kevin Crosby

(175) Germplasm Preservation of Vegetatively Propagated Crops at the National Center for Genetic Resources Preservation
M.M. Jenderek*, B. Ambruzs, G. Holman, D. Skogerboe, E. Staats, M. Turner, Dave Ellis

(176) Identifying a Core *Pelargonium* Collection using Molecular Markers
Rose Palumbo*, Jinguo Hu, Richard Craig, James Locke, Charles Krause, David Tay, Guo-Liang Wang

(177) Development of a Genetic Linkage Map for Tetraploid Highbush Blueberry using SSR and EST-PCR Markers
Patricio Brevis*, James Hancock, Lisa J. Rowland

(178) Assessment of the Utility of Microsatellites Isolated from Grapevine (*Vitis vinifera*) for Evaluating the Genetic Relationships between Muscadine Grape (*Vitis rotundifolia*) Cultivars
Blake Branch, Patrick Conner*

(179) Identification of Interspecific Hybrids between *Cornus kousa* and *C. florida* L. Using SSR Markers
Xinwang Wang, Ashley Gann, Sandra Reed, Mark Windham, Robert Trigiano*

1:15–2:00 pm **Kierland Grand Ballroom**

Poster Session 21: Environmental Stress Physiology 1

(126) Using Electrical Conductivity (EC) for Monitoring Stem Water Content Changes in Horticultural Orchards
Eran Raveh*, Arie Nadler

(127) Effects of Regulated Deficit Irrigation on Water Use Efficiency of Drip-Irrigated Muskmelon
John Jifon*, Juan Enciso, Bob Wiedenfeld

(128) Growth and Aesthetic Quality of Pentas as Influenced by Irrigation Frequency
Michele Scheiber, Brian Pearson*

(129) Post-establishment Landscape Performance of Florida Native and Exotic Shrubs under Irrigated and Non-Irrigated Conditions
Sloane Scheiber*, Edward Gilman, David Sandrock, Maria Paz

(130) Relation Between Soil Moisture and Plant Water Tensions in Irrigated Fraser Fir (*Abies fraseri*)

Nicholas Gooch*, Pascal Nzokou, Bert Cregg

(131) Soil Moisture, Gas Exchange, and Growth Characteristics of Mature Sweet-gum (*Liquidamber styraciflua*) Trees as Affected by Different Pavement Options

Astrid Volder*, Todd Watson

(132) Measuring and Modeling Carbon Sequestration in a Mixed Species Nursery Subject to Soil Water Deficit

Robert Reynolds, William Bauerle*, Ying Wang

(133) Measuring and Modeling Species-specific Transpiration in a Deciduous Hardwood Nursery

Joseph Bowden, Andrews McAngus, William Bauerle*

1:15–2:00 pm **Kierland Grand Ballroom**

Poster Session 22: Consumer Horticulture and Master Gardeners 1

(042) Hortline—Over 20 Years of Providing Service to Iowans with Horticulture Questions

Richard Jauron*, Cynthia Haynes

(043) GardenData.org—An Interactive, Online Database of Home and Garden FAQ for Kentucky

Richard Durham*

(044) Attitudes of Green Industry Members and Master Gardeners Concerning Invasive Plants

Lois B. Stack, Donglin Zhang*, Mary Rumpho

(045) Results of a Client Survey of Users of the Oregon State Univ. Master Gardener Clinic in Yamhill County

Linda McMahan*

(046) Development of an Evaluation Approach for Educational Programs at Public Gardens

Aaron Steil*, Robert Lyons

(047) MSU Veterans Memorial Rose Garden

Ekaterina Jeliazkova, Pamela Collins*

(048) Nutrition in the Garden: Grow Yourself Healthy

Kerrie B. Badertscher*, Michael Havercamp, Jackie Reilly, Kerry Seymour, Karen Spears, Trish Freed, Leigh Metcalfe

(049) The Harvest House Food Pantry Garden: Realizing Cooperative Extension's Goals for Healthy Communities

Brian Oleksak*

(050) Native Wildflower Seed Collection in the Owyhee Mountains of Idaho

Stephen Love*, Thomas Salaiz

(051) Consumer Preferences and Knowledge of Nutritional Attributes of Pecans

Leonardo Lombardini, Tina M. Waliczek*, Jayne Zajicek

1:15–2:00 pm **Kierland Grand Ballroom**

Poster Session 23: Growth Regulators in Fruit Production

(097) How Application Times of 2,4-DP Influence Fruit Retention of 'Braeburn' Apples

Patricia Garriz*, Graciela Colavita, Hugo Alvarez, Francisco Chiofalo, Valeria Blackhall

(098) Influence of Crop Load Overwhelms Response to Bioregulators in Apple

Tory Schmidt*, Don Elfving, Jim McFerson, Matt Whiting

(099) Control of Preharvest Fruit Drop with NAA, AVG, and Sprayable 1-MCP in 'Golden Supreme' and 'Golden Delicious' Apples

Rongcai Yuan*, David Carbaugh

(100) Effects of Temperature on Ethephon-induced Fruit Thinning in 'Golden Delicious' Apples

Rongcai Yuan*

(101) Effect of a Sprayable 1-MCP Formulation on Fruit Maturity, Fruit Quality, and Postharvest Quality of 'Golden Delicious' and 'Law Rome' Apples

Jim Schupp*, Katie Reichard

(102) Ethephon and Graft Transmissible Agents Affect Bloom and Fruit Characteristics in Two Peach Cultivars

Gregory Reighard*, David Ouellette, Kathy Brock

(103) Effect of Foliar Application with TiO_2/Nano Particle Solution Spray on the Fruit Qualities of Asian Pear Niitaka

Wol-Soo Kim*

2:00–3:00 pm **Noble Boardroom**

Citrus Crops (CITR) Working Group Business Meeting

Chair: Glenn C. Wright

2:00–3:45 pm **Greenway A/B**

Oral Session 15: Ornamentals/Landscape and Turf 1

Moderator: Edward Bush, EBush@agcenter.lsu.edu

2:00–2:15 pm

Particle Size Distribution Effects of Bark on Physical and Chemical Characteristics

Edward Bush*, Mike Richard, Al Owings, Paul Wilson

2:15–2:30 pm

^{15}N as a Tracer to Evaluate Fertilizer N Uptake and Partitioning in Out-Planted Immature and Mature Common Hackberry

Laura Jull*, Les Werner

2:30–2:45 pm

Using Palm Trunk Fibers as Peatmoss Replacement for Container Media

Donald R. Hodel*, A. James Downer

2:45–3:00 pm

Efficacy and Phytotoxicity of Preemergence Herbicides in Container-grown Landscape Plants

Teri Howlett*, David Staats, James Klett

3:00–3:15 pm

Comparison of Landscape Mulch Types and Herbicide Application Methods for Yellow Nutsedge Control in Landscape Beds

Yan Chen*, Ron Strahan

3:15–3:30 pm

Distribution of Trunk-Injected ^{14}C Imidacloprid in *Fraxinus* Trees: A Test of the Sectored–flow Hypothesis

Sara Tanis*, Bert Cregg, David Mota-Sanchez, Deb McCullough, Therese Poland, Robert Hollingworth

3:30–3:45 pm

Effects of Preplant Incorporation and Postplanting Application of a Palm Special Fertilizer on Five Species of Landscape Palms

A. James Downer*, Donald R. Hodel, Maren Mochizuki

2:00–3:30 pm **Powell A/B**

Oral Session 16: Vegetable Crops Management 3

Moderator: Chad M Hutchinson, cmhutch@ufl.edu

2:00–2:15 pm

Effects of Genotype, Location, and Planting Date on Mineral Content of Spinach

Hallie Dodson*

2:15–2:30 pm

Irrigation and Nitrogen Impact on Artichoke Yield, Head Quality, and Phenolics

Togo Shinohara*, Shinsuke Agehara, Kil Sun Yoo, Hae Jin Bae, Daniel Leskovar

2:30–2:45 pm

The Interactive Effects of Soil Moisture and Nitrogen Fertilization on the Yield and Recovery of Slicer Carrots

Rajasekaran R. Lada*, Azure D. Adams

2:45–3:00 pm

Evaluation and Analysis of N Fertilizer Rates for Florida Tomato Production in Context of Best Management Practices

Monica Ozores-Hampton*, Eric Simonne, Eugene McAvoy, Phil Stansly, Sanjay Shukla, Fritz Roka, Tom Obreza, Kelly Morgan, Phyllis Gilreath, Darrin Parmenter, Kelly Morgan

3:00–3:15 pm

Development of a Nitrogen Fertigation Program for Grape Tomato

Eric Simonne*, Robert Hochmuth, David Studstill, Monica Ozores-Hampton

2:00–3:45 pm **Kirkland**

Oral Session 17: Fruit and Nut Production 1

Moderator: Sheri Crabtree, sheri.crabtree@kysu.edu

2:00–2:15 pm

Evaluation of Novel Abscission Agents to Facilitate Mechanical Harvesting of Raisin Grapes

Matthew Fidelibus*, Jacqueline Burns

2:15–2:30 pm

New Developments Toward Mechanizing Sweet Cherry Harvest

Erick Smith*, Matthew Whiting

2:30–2:45 pm

Roles of Gibberellins in Increasing Fruit Size and Sink Demand in Japanese Pear Fruit during Rapid Fruit Growth

Caixi Zhang*, Kenji Tanabe, Fumio Tamura, Akihiro Itai, Katsuhiro Matsumoto, Akira Yoshida

2:45–3:00 pm

The Importance and Benefits of Using Gibberellic Acid (GA) on Fruit Trees

Abdelfattah Wally*

3:00–3:15 pm

Seasonal Carbohydrate Storage and Mobilization in Bearing and Non-bearing Pistachio Trees

Timothy Spann*, Robert Beede, Theodore DeJong

3:15–3:30 pm

Within-cluster Hand-thinning Increases Fruit Size in Pawpaw (*Asimina triloba*)

Sheri Crabtree*, Kirk Pomper

3:30–3:45 pm

The VCHERRY Computer Model of Sweet Cherry Tree Training for Simulation of Canopy Development, Crop Yield and Fruit Quality

Gregory Lang*

2:00–4:00 pm **Rainmakers Ballroom C**

Oral Session 18: Postharvest 2

Moderator: Randy Beaudry, beaudry@msu.edu

2:00–2:15 pm

Sorption of 1-MCP by Produce

Nunchanok Nanthachai*, Benjamas Ratanachinakorn, Manit Kosittrakun, Randolph Beaudry

2:15–2:30 pm

Sorption of 1-MCP by Oak Bin Material: Depletion of 1-MCP and Loss in Treatment Efficacy

Randolph Beaudry*

2:30–2:45 pm

The Effect of Delays between Harvest and Treatment of fruit with 1-MCP and DPA

Seok-Kyu Jung*, Jacqueline Nock, Christopher Watkins

2:45–3:00 pm

Postharvest Low Oxygen Pretreatment Prevented Superficial Scald and Bitter Pit Symptoms in Granny Smith Apples

Edna Pesis*, Susan Ebeler, Elizabeth Mitcham

3:00–3:15 pm

Programmed Cell Death is Activated by Ethylene Treatment of Immature Mini-cucumber Fruit

Brandon Hurr*, C.E. Vallejos, Don Huber

3:15–3:30 pm

Preharvest Applications of 1-MCP Delay Maturity and Ripening in 'Bartlett' Pears (*Pyrus communis*)

Max Villalobos*, Elizabeth Mitcham, Bill Biasi

3:30–3:45 pm

ACS and ACO Activity in Pear Fruit (*Pyrus communis*) Treated After Harvest with 1-MCP as Affected by Storage and Ripening Conditions

Max Villalobos*, Bill Biasi, Elizabeth Mitcham

3:45–4:00 pm

Postharvest 1-MCP Dip Method Maintains Preharvest Fruit Quality in Cantaloupe

Daniel Leskovar*, Shinsuke Agehara

2:00–4:00 pm **Lowell A/B**

Workshop 7: Efficient Use of Nutrients in Horticultural Systems

Sponsor: Plant Nutrient Management (PNM) Working Group

Presiding: Eric Hanson, Michigan State University, East Lansing, MI

The efficient use of mineral nutrients is a key goal in the production and management of most horticultural plants. Improving the efficiency of nutrient use can reduce the cost of growing horticultural commodities so that producers can compete more effectively in markets. Inefficient use of nutrients in plant production or management often has adverse effects on water resources. Speakers in this workshop will discuss the economic and environmental issues that affect nutrient management practices in several different segments

of the horticulture industry. They will review new approaches being implemented by industry, and describe current research on other techniques that show promise for improving nutrient use efficiency and limiting adverse impacts on the environment.

Objective:

Speakers in this workshop will review key issues related to nutrient use in several horticultural production and management systems, and discuss approaches towards improving the efficiency of nutrient use.

The Need for Efficient and Effective Nutrient Use
Paul Fixen*, Director of Research, Brookings, SD

Improving the Efficiency of Nutrient Use in Vegetable Production
Donald Horneck*, Associate Professor, Oregon State Univ., Hermiston, OR

Nitrate Uptake, Nitrate Assimilation, and Nitrogen Use Efficiency in Turfgrass
Zhongchun Jiang*; Associate Professor, State Univ. of New York, SUNY, Cobleskill, NY

Efficient Use of Nutrients for Sustainable Orchard Systems
Denise Neilsen*, Gerry Neilsen; Agriculture and Agri-Food Canada, Pacific Agri-Food Research Centre, Summerland, BC, Canada

Improving the Efficiency of Nutrient and Water Use in Container Nursery Systems
Christopher Catanzaro*; Assistant Professor, Tennessee State Univ., Nashville, TN

Improving the Efficiency of Nutrient Use in Greenhouse Production
Brian Whipker*; North Carolina State Univ., Raleigh, NC

2:00–5:00 pm **Herberger Ballroom 2**

Workshop 8: The Time is Now for Horticulture—The Specialty Crops Initiative — Clark

Sponsor: ASHS National Issues Task Force (NITF)

Presiding: John R. Clark, Univ. of Arkansas, Fayetteville AR

The goal of the Workshop is to provide information to ASHS members on the growing importance of specialty crops in national agricultural policy and the potential for increased support for research, extension and education programs in the 2007 Farm Bill.

A coalescence of emphasis from national and regional commodity groups and others has been working in recent years to highlight the value of horticultural crops. The approach has been to examine the value of these crops combined, and calling this compilation "specialty crops." In the United States, the economic value of specialty crops now accounts for 45% of total farm production value, more than any of the major "program" or row crops which have traditionally gotten the major share of federal support through the Farm Bill. In January 2007, Secretary of Agriculture Mike Johanns announced the administration's plan to invest $1 billion (folks that is billion with a "b") over a 10-year period to establish a Special Crops Initiative to provide science-based tools for the specialty crop industry. Further, it was stated that enhancement of research, extension, and education programs are needed to help producers address the challenges in specialty crop production. The implications of this shift in national policy might be the most dramatic event ever for horticulture research and extension. Nevertheless, there are forces within the agricultural community who are not supportive of the new farm bill and it is not at all certain whether the changes we anticipate and support will actually end up in the final bill that is drafted by Congress. How might ASHS members be involved in supporting these exciting changes? How might they help to contribute toward informed decisions by members of congress, agricultural policy makers, and granting entities? How might these changes help members in funding programs? These are a few of the many questions that this workshop will attempt to address. Our speakers have been selected based on their vision and experiences in support of specialty crops and they have helped to bring about the dramatic changes and potential opportunities we may see in the future.

2:00–2:10 pm

Introduction to the Workshop
Julia Kornegay*, Professor and Head, Dept. of Horticultural Sciences, North Carolina State University, Raleigh, N.C.; Chair of the ASHS Administrators Working Group

2:10–2:20 pm

ASHS National Issues Task Force: Approaches and Actions
John R. Clark*; Professor, Dept. of Horticulture, University of Arkansas, Fayetteville, Ark.; Chair, National Issues Task Force and Research Division Vice-President, ASHS

2:20–2:35 pm

ASHS Becomes Visible on the Hill
Jonathan Moore*; ASHS National Issues Consultant, Alexandria, Va.

2:35–3:05 pm

The 2007 Farm Bill and USDA Perspective
Gale Buchanan*; Undersecretary of Agriculture, Washington D.C.

3:05–3:25 pm

Public University Education and Extension Perspectives
Randy Woodson*; Dean, Purdue Univ., West Lafayette, Ind.; President, ASHS

3:25–3:40 pm

Break

3:40–4:00 pm

Impacts of Specialty Crops on Southern Region Experiment Station Research Priorities
Eric Young*, Executive Director, Southern Association of Agricultural Experiment Station Directors, Raleigh, N.C.

4:00–4:20 pm

Impacting National Policy: Viewpoint from a Commodity Group
Jim McFerson*; Director, Washington Tree Fruit Research Commission, Yakima, Wash.

4:20–4:40 pm

Making a Difference—How Can an ASHS Member Impact Policy?
Thomas Björkman*; Associate Professor, Cornell University and New York State Agricultural Experiment Station, Geneva, N.Y.

4:40–5:00 pm

Questions, Answers, Discussion

All Speakers and Audience Participation

2:00–5:30 pm **Herberger Ballroom 3**

Commodity Judging Contest & Written Exam

2:00–6:00 pm **Mapmakers A/B**

Colloquium 2: Breeding Horticultural Crops for Sustainable and Organic Production

Sponsor: Vegetable Breeding Working Group (VGBR)

Presiding: Ryan Hayes, USDA, Salinas, CA

The demand for horticultural crops produced in sustainable and/or certified organic environments continues to increase. Consumers value these products due to the actual or perceived benefits of increased healthfulness and reduced environmental impact. Differences between sustainable/certified organic environments and markets, and those characterizing convention production systems may necessitate cultivars with new ideotypes, while similarities may streamline the process. This may require a higher prioritization of traditional breeding objectives such as disease and insect resistance, but may also include new objectives such as adaptation to wide environmental fluctuations, cultivars that compete successfully with weeds, improved nutritional quality, and improved taste, color, shape, and texture that has increased consumer appeal. Furthermore, specific regulations such as those governing seed production for certified organic production, the exclusion of GMOs, and possible future regulations of other established breeding methods may warrant new or alternate strategies. The validity and impact of these regulations will be discussed.

Objective:

1) Identify key differences and similarities between sustainable, certified organic, and conventional production environments that affect crop ideotype.

2) Overview of current development of vegetable, fruit, and ornamental cultivars for sustainable and certified organic production.

3) Define future needs, directions, and research for sustainable and organic breeding of horticultural crops.

Breeding for Organic and Sustainable Systems: One Size Does Not Fit All

Rebecca Grube*; Univ. of New Hampshire, Durham, NH

A significant challenge in identifying or developing varieties that will thrive in organic production systems is defining what constitutes a representative organic system. Certainly, all organic farms include a focus on using organic inputs to foster soil fertility, and the use of cultural practices that promote biodiversity throughout the system, including crop plants, non-crop plants, insects, and microbes. Particularly for small diversified farms in regions where microclimates are highly variable, however, organic farms often differ as much or more from one another as from conventional farms. For each farm, soil structure and fertility, amendments used, biota present, weather/climate, cropping patterns, labor availability, and countless other factors will impact different varieties' performance. To define what ideal varieties for organic systems might look like, we will explore some of the differences between organic and conventional farming systems in both major (California) and minor (New England) horticultural crop production areas and discuss how they may impact breeding for organic systems. What makes varieties consistent, reliable and robust across inherently variable environments? Because of the great diversity among organic farms, a small number of varieties that are universally adapted may not be a realistic goal. Further, it is unclear whether selection of specific traits in isolation is an effective way to breed for complex organic systems. An enhanced focus on place-based breeding to develop regionally-adapted varieties may be not only helpful but essential for organic growers, and may simultaneously provide great benefit to conventional growers located outside major crop production regions.

Breeding Open Pollinated (OP) Broccoli Cultivars for Organic Production Systems.

James Myers*, Deborah Kean; Oregon State Univ., Department of Horticulture, Corvallis, OR

Plant breeders can seek to understand what makes a particular production system unique, and base their breeding strategy on selection for traits that are associated with that uniqueness. Alternatively, breeders can breed by selecting for cultivars that perform well in the production system in question without understanding specific constraints. We have developed a farmer participatory method designed to develop breeding populations for outcrossed crops. Specifically, we are developing improved open pollinated broccoli cultivars that are adapted to organic production systems. Because essentially all broccoli cultivar development is based on F_1 hybrids, genetic improvement of open pollinated cultivars have been neglected. Organic fresh market growers would like to have open pollinated cultivars of which they could save their own seed that have the improved quality traits found in F_1 hybrids. Our population was initiated by allowing OSU broccoli inbreds and commercial hybrids to randomly inter-mate. This was followed by three cycles of random mating and selection for quality traits under conventional production. Farmer participatory breeding was initiated by sending a portion of seed to any organic farmer willing to grow and select the population, then return a portion of seed to us, where it was blended for the next season. Three cycles of selection have been practiced in this manner. Some of the difficulties encountered involve 1) contamination by other cole crops in farmers' fields, 2) lack of follow-through by some farmers who are growing in areas that are marginal for broccoli seed production, and 3) potential for seed borne disease to become an issue. We are now at a point where inbreds may be extracted from the population and/or trimming of phenotypic extremes can be practiced to develop and OP cultivar.

The Organic Seed Partnership, An Example of Participatory Breeding

Molly Jahn*; Univ. of Wisconsin, Madison, WI

Values in Organic Agriculture and Their Consequences for a Process-oriented Evaluation of Plant Breeding Techniques

Edith Lammerts Van Bueren*; Louis Bolk Institute, LA Driebergen, Netherlands

Organic agriculture is promoting organic seed production and organic plant breeding to obtain varieties better adapted to organic farming systems. In 1999 a discussion in Europe started on how to translate the ecological values of organic farming into criteria to evaluate the appropriateness of all available plant breeding and propagation techniques for organic agriculture. Since recent years also ethical aspects are taken into account based on the concept of "naturalness" as applied in organic agriculture. Naturalness includes three complementary approaches: the non-chemical approach, the agro-ecological approach and the integrity approach. Integrity of cultivated plants refers to the inherent, characteristic nature of plants, their wholeness, completeness, their species-specific characteristics and their being in balance with the organic environment. This concept of the nature of plants can be made operational by deriving criteria from the relevant characteristics at four different levels of the nature of plants: integrity of life, plant-typic integrity, genotypic integrity and phenotypic integrity. Respecting the naturalness of

plants implies that breeding techniques at whole plant or crop level are in line with the values of organic agriculture, respecting the self-reproductive ability and the reproductive barriers. In-vitro techniques and techniques at DNA level are not compatible with the integrity of plants. Recently, several novel breeding techniques are being developed, e.g., cis- or intragenesis and reverse breeding, including genetic engineering in such a way that the end product in future might not be classified as genetic modified organism (GMO) by the European GMO regulations. As the organic values are process rather than product oriented, also these novel breeding techniques do not comply with the organic values. The consequences of respecting the integrity of plants and the urgent need for improved varieties require identification and prioritization of short-term and long-term steps for the practical development of organic seed production and plant breeding.

Citrus Genetic Improvement and the Role of Biotechnological Approaches

Frederick Gmitter*; Univ. of Florida, Citrus Research and Education Center, Lake Alfred, FL

Citrus is among the most widely grown and economically significant fruit crops in the US and in the world. Beyond its global economic significance, it also plays an important role in many developing regions as a local source of essential nutrition. Citrus production is threatened by the global spread of extremely devastating diseases such as Huanglongbing (greening), canker, and many others. Likewise, urbanization and changing land use patterns are restricting production to less desirable growing areas. Genetic improvement strategies are restricted based on factors of reproductive biology, and therefore many of the essential objectives for improvement can not be achieved through standard breeding approaches. This presentation will focus on these and other challenges to citrus production; examples of a range of alternative biotechnological and genomics-based approaches to meet these requirements will be presented.

Long-term Breeding Strategies for Sustainable Cropping Systems

Stephen Jones*, Kevin Murphy; Washington State Univ., Pullman, WA

Involving farmers more directly in University-assisted Participatory/Evolutionary breeding strategies and the need for dedicated breeding programs for unique systems such as organic or very low input will be discussed. Involving farmers in developing their own plant varieties will lead to the development of specific adaptation for local environments and/or systems. It will also insure that if farmers wish to grow and retain seed for planting they may do so legally. Evolutionary breeding was described by Coit Suneson at UC Davis in the 1950s. We have modified the approach by including a participatory element. This type of breeding strategy is designed for long term stability and sustainability. It is common to hear organic agriculture criticized as low-yielding. We show that poorly adapted cultivars (bred under high input conditions) are partially responsible for lower yields often found in organic farming systems when compared with conventional farming systems. An analysis of variance for wheat yields between paired organic and conventional systems showed highly significant ($P < 0.001$) genotype × system interactions in four of five locations. Genotypic ranking analysis showed no correlation between rankings for yield in four of five locations. This indicates that increasing yield in organic systems through breeding will require direct selection within organic systems rather than indirect selection in conventional systems. Direct selection in organic systems produced yields 15%, 7%, 31% and 5% higher than the yields resulting from indirect selection for locations one through four, respectively. With cultivars bred in, and adapted to, the unique conditions inherent in alternative systems such as organic, these systems will be better able to realize their full potential as high-yielding alternatives to conventional agriculture.

2:00–6:00 pm **Herberger Ballroom 1**

Symposium 3: Unique Methodologies to Assess Morphological and Physiological Plant Stress

Sponsor(s): Environmental Stress Physiology (STRS) Working Group

Moderator: Dean Kopsell, Assistant Professor, Contact Only, The Univ. of Tennessee, Knoxville, TN, dkopsell@utk.edu

Stress is a term used to collectively describe numerous conditions that have negative impacts on plant performance. Reactions and/or adaptations to stress are usually best measured by characterizing morphological and physiological responses. These responses form continuums of very rapid physiological changes or much slower morphological changes. Identification of stress and the accurate measurement of that stress are the major challenges facing horticultural researchers. Some of the unique methods of assessment for environmental stress used in turfgrass physiology can have applicability to other horticultural or agronomic crops. These methods include: digital image analysis to quantify turf color and assess the stress factors that can influence color development; infrared thermal imaging to understand how freezing develops and ramifies throughout the plant, which may be used in the development of improved management or cultivar improvement for cold tolerance; biochemical analysis of carotenoid pigment concentrations to investigate adaptation of plant species to shade and full-sun environments; remote sensing technology using time domain reflectometry (TDR) technology for measurements of soil water relations; and methodologies to compare the effects of vehicle (Segway versus golf car), traffic type (stop/start versus turning), and foot traffic on turf quality, turf coverage, and surface hardness. The turfgrass environment offers many challenges in the management of plant stressors, and researchers in this area have adapted several different assessment strategies to improve plant performance.

Objective:

Symposium objectives will be to highlight methodologies used to assess and quantify plant stress as they relate to turf environments. Topics will discuss physical, physiological, and biochemical approaches to measure turfgrass responses to such factors as foot and mechanical traffic, shade vs. high light environments, cold temperature stress, and changing water relations. The symposium is designed to inform ASHS members of the research methods used to evaluate stress in turfgrass environments and, most importantly, the opportunities to apply these unique methodologies to other horticultural crop species.

Technologies for Monitoring Water Stress in Turf

Bernd Leinauer*, Yoshiaki Ikemura, Jose Makk; New Mexico State Univ., Las Cruces, NM

Despite the recreational, aesthetic, and economic benefits of turfgrass, the present day potable water shortages in the summer clearly set limits on expectations and water consumption for turf irrigation. Consequently, irrigation water conservation strategies must be implemented. These strategies include the installation of irrigation scheduling technologies which are aimed at determining minimum irrigation requirements of turfgrasses. Water requirements and subsequent irrigation are calculated from the plants water status which can be assessed visually by examining the plants for signs of stress, by monitoring soil moisture, or by the use of remote sensing technologies. These technologies include digital image analysis and spectroradiometry, which measure plants light reflectance in response to stress. Research was conducted at New

Mexico State Univ. to investigate the accuracy of soil moisture sensors and to evaluate remote sensing technologies for quantifying stress in turf. Soil moisture readings from wireless soil moisture sensors correlated highly ($r^2 > 0.94$) with actual values and were not affected by salinity levels between 1 and 4 dS/m. Percent green cover, hue values obtained from digital image analysis and Normalized Difference Vegetation Indices (NDVI) calculated from spectral reflectance readings were moderately to highly correlated with visual ratings, leaf osmolality and relative water content. Soil moisture measurements, spectral reflectances, and digital image analysis effectively predicted drought stress and may have applications in turfgrass management as rapid and non-destructive methods to assess water status in turf.

Evaluating Cold Stress Responses in Turfgrasses

John Stier*; The Univ. of Wisconsin, Madison, WI

Lack of cold tolerance, both chilling injury and low temperature kill, limits the use of C4 turfgrasses to warmer climes and occasionally damages certain C3 species even in their zone of adaptation. C3 grasses cold acclimate to a significantly greater degree than C4 grasses with some C4 grasses incapable of cold acclimation. Various physical and physiological changes occur during cold acclimation. In C3 grasses, acclimation results in prostrate growth; leaf extension slows as cell expansion is diminished while cell walls may thicken and intercellular spaces shrink. Morphology of C4 grasses is less subject to change: Leaves simply die below 10 °C and are replaced by meristems at or below the soil surface in the spring. During acclimation, moisture content decreases while osmotic pressure increases as specialized proteins are produced and nonstructural carbohydrates increase. The amount of unsaturated fatty acids in cell membranes increases to provide fluidity. Membrane integrity is key for survival. Chromatographic methods have been used to identify the types and relative amounts of unsaturated lipids in cell membranes. CO_2 exchange rates, chlorophyll fluorescence, and Rubisco levels are used to detect injury to photosynthetic apparatus. Pigments are assayed by spectrophotometry while sugars are measured using either spectrophotometry or high pressure liquid chromatography. Plant samples are collected from field plots during the winter to evaluate temporal changes. Controlled climates are used to evaluate specific biochemical or genetic responses to cold temperature. Submersion of meristematic tissues in cold baths or whole plant exposure in controlled environments and/or field plots are routinely used to determine LT_{50} values. A few researchers are beginning to apply molecular biology methods to identify genes associated with cold tolerance.

Carotenoids: Antioxidant Activity and Their Application to Turfgrass Management

J. Scott McElroy*; The Univ. of Tennessee, Knoxville, TN

Carotenoids are important photo-protection and light-harvesting pigments within the photosynthetic apparatus. Carotenoids function in photo-protection by quenching free radical triplet-state chlorophyll and singlet oxygen before oxidative damage can occur or by active non-photochemical quenching, or heat dissipation, of excess light energy. Carotenoids also function as light-harvesting pigments by channeling photons unabsorbed by the chlorophyll molecule to the reaction center for photosynthesis. The xanthophyll cycle (or violaxanthin de-epoxidase cycle) is the primary cycle attributed to photo-protection and light-harvesting. In conditions of excess light, reversible de-epoxidation of violaxanthin to zeaxanthin occurs as a means of photo-protection. Conversely, in reduced light conditions, zeaxanthin is reversibly converted to violaxanthin which potentially functions as a light harvesting antennae pigment. Little information is available regarding carotenoid physiology in turfgrass species. Recent research at the Univ. of Tennessee has evaluated the functionality of the carotenoid cycle in creeping bentgrass (*Agrostis stolonifera*). Our research indicates that creeping bentgrass is adaptable to low-light conditions, but only for a short-time period. Further, creeping bentgrass produces carotenoid amounts comparable to many green, leafy vegetables. Additional research is needed to investigate carotenoid physiology in turfgrass species. Greater understanding of carotenoids in turfgrass species could allow for comparison of heat- or shade-tolerant cultivars, or cultural practices and xenobiotics that may increase turfgrass fitness in harsh environments.

Assessing Wear and Mechanical Stress on Turfgrass Systems

John Sorochan*; The Univ. of Tennessee, Knoxville, TN

Turfgrasses are unique in that they grow in a contiguous community, withstand frequent mowing/defoliation, and tolerate regular traffic. Unlike agronomic crops which are measured for yield, and horticultural crops which are measured for yield or quality, turfgrass is measured for functionality/playability, as well as aesthetics. Whether it is turfgrass for a home lawn, golf course, or athletic field, how well that turfgrass functions in the landscape determines its overall success. Turfgrass traffic is defined as any wear applied as a result of a sporting event, maintenance, or regular foot traffic during its during use as a ground cover. Simulated or mechanical traffic can be applied to turfgrass to determine the playability, functionality, and the overall impact on turf quality. Assessing the impact of traffic on turfgrass is accomplished through qualitative and quantitative measurements. Turfgrass color, percent cover, and overall quality are typical methods for assessing turfgrass. Turfgrass shear strength, recuperative potential, density, and surface hardness are other methods of data collection performed to assess wear in turfgrass stands. Putting green speeds and ball bounce are also collected when assessing turfgrass playability. Proper management is essential to reduce wear and mechanical stress while optimizing overall turf quality and functionality.

Digital Imaging Analysis to Assess Stress in Turfgrass and Other Crop Species

Doug Karcher*; The Univ. of Arkansas, Fayetteville, AR

Turfgrass researchers customarily use subjective ratings to evaluate turfgrass responses to treatment effects. Subjective ratings are often used because alternative objective methods either do not exist or require significantly more time and labor. Tools are available capable of extracting information from digital images of turf so that parameters such as percent cover, color, and disease incidence can be objectively quantified. Studies conducted at the Univ. of Arkansas have demonstrated that digital image analysis of the aforementioned parameters is significantly more accurate and precise compared to subjective ratings. With the use of image analysis software and customized macros, digital image analysis of turf responses requires similar time as subjective ratings. Furthermore, highly trained personnel are not needed to digitally analyze turf plots, in contrast to subjective ratings. Hardware and software requirements will be discussed and digital image analysis methods will be demonstrated through the use of several example analyses.

3:00–4:00 pm **Noble Boardroom**

Horticulture Hall of Fame Selection Committee Meeting

Presiding: Dan Lineberger

3:30–4:00 pm **Powell A/B**

Vegetable Crops Management (VCM) Working Group Business Meeting

Chair: Wesley Kline

4:00–5:00 pm **Merriam B**

International Topics of Concern to Horticulturist (ITCH) Working Group Business Meeting

Chair: Harish Ratnayaka

4:00–5:00 pm **Noble Boardroom**

Production and Harvest Mechanization (MECH) Working Group Business Meeting

Chair: Jacqueline Burns

4:00–6:00 pm **Greenway A/B**

Oral Session 19: Produce Quality, Safety and Health Properties

Moderator: Don Humpal, don_humpal@dai.com

4:00–4:15 pm

Extended Preservation of Small Fruit by Release of 2E-hexenal from Poly(lactide) Films

Eva Almenar*, Rafael Auras, Bruce Harte, Maria Rubino

4:15–4:30 pm

Effect of Soil Moisture and Sunlight Prevailing During the Week Before Harvest on Quality of Lettuce

Jorge Fonseca*, Hyun-Jin Kim

4:30–4:45 pm

Food Safety and SPS Systems in the Transition Economies of Eastern Europe

Donald Humpal*

4:45–5:00 pm

Potential Perchlorate Exposure from Horticultural Crops Irrigated with Colorado River Water

Charles Sanchez*, Robert Krieger, Ben Blount

5:00–5:15 pm

Potential Heavy Metal Exposure from Vegetable Crops Produced in the Southwestern United States

Charles Sanchez*, Robert Krieger

5:15–5:30 pm

Identification of Bioactive Citrus Limonoids using HPLC-Collision-induced Dissociation Method

Deepak Dandekar*, G.K. Jayaprakasha, Shane Tichy, Bhimanagouda Patil

5:30–5:45 pm

Total Free Radical Scavenging Capacities of Kumquats (*Fortunella japonica* Swingle)

Guddadarangavanahally Jayaprakasha*, Melissa Etlinger, Bhimanagouda S. Patil

5:45–6:00 pm

The Influence of Organic Production on Nutritional Quality of Fruit and Vegetables: a Meta-analysis

Xin Zhao*, Ted Carey, Charles Benbrook

4:00–6:00 pm **Kirkland**

Workshop 9: Weed Management in Sustainable/Organic Production Systems For Horticultural Crops

Sponsor: Weed Control and Pest Management (WCPM) Working Group

Presiding: J. Pablo Morales-Payan
Univ. of Puerto Rico-Mayaguez, Mayaguez

Weeds are commonly cited as one of the main constraints in sustainable/organic horticultural production systems. In this workshop, researchers on different means of weed management applicable to sustainable/organic production of horticultural crops (such as mulching, flaming, and using biocontrol agents) will present current practical and/or basic information in their fields of expertise.

Objective:

To present current information on several means of weed management acceptable in horticultural sustainable/organic production systems.

Weed Management in Sustainable/Organic Production Systems for Horticultural Crops

J. Pablo Morales-Payan*; Univ. of Puerto Rico, Mayaguez

Growers often cite management of undesirable vegetation as the main problem in sustainable/organic horticultural production. Means of weed management applicable to sustainable/organic production of horticultural crops (such as cover crops, mulching, flaming, biocontrol agents, and integrated management systems) have been devised and tested by researchers and growers in many different places. Adequacy and efficacy of those means and strategies for weed control vary depending on various factors. The workshop "Weed management in sustainable/organic production systems for horticultural crops" is not exhaustive on the subject, but is intended to present current practical and/or basic information in this field, and to generate discussion and collaboration to expand the body of knowledge on weed management in non-conventional systems.

Mulches as a Means to Control Weeds in Sustainable/Organic Vegetable Production Systems

J.C. Diaz-Perez*[1], J. Silvoy[1], S.C. Phatak[1], J. Ruberson[2], R. Morse[1]; [1]Dept. of Horticulture and [2]Dept. of Entomology, UGA–Tifton Campus, Tifton, GA 31793; [3]Dept. of Horticulture, Virginia Tech., Blacksburg, VA 24061

Weeds are a major limiting factor in organic vegetable production. The integration of no-till and cover crops offers potential for weed control in sustainable/organic systems but the results have been variable. The utilization of plastic film mulches and wheat straw mulch in sustainable (no-till) and organic systems has resulted in increased levels of weed control and increased yields compared to conventional systems. Plastic mulch (black) offers the additional advantage of warming the soil, which reduces the number of days to harvest. Organic mulches control weeds primarily by reducing light penetration into the soil, although some crops, such as rye, have allelopathic properties that contribute to weed control. A more holistic approach to weed control is necessary to increase the effectiveness in organic and sustainable vegetable production systems.

Flame Weeding: The History, Principles, and Practice

Annette Wszelaki*; Plant Sciences Department, Univ. of Tennessee, Knoxville, TN

Flaming was widely used as an agricultural application for field crops, fruits and vegetables from the late 1930s until the mid-1960s. As the availability and affordability of herbicides grew, interest in flaming subsided. Recent developments, including an increasing number of herbicide resistant weeds, higher costs of herbicides, and more concern about pesticides in the environment, have resulted in a resurgence of flaming for weed control. Flaming kills weeds by heating the cell sap, causing it to expand, which disrupts the cell membranes, and thereby dehydrates the plants. Lethal temperatures range from 55 to 94 ºC, with exposure times in milliseconds. As with most weed control measures, flaming is most effective when weeds are small, ideally in the cotyledon stage. Broadleaf weeds are more successfully controlled by flaming than grasses, as grasses have a protected growing point, though repeated flamings can be used for control of grasses and some perennials. Flaming can be applied to a

stale seedbed, or pre- or post- crop emergence. Flaming tolerance is crop, size, speed, and type dependent. Flamers range from hand-held single torch models to tractor-powered 8-row models. In addition to direct flaming, infra-red, steam, and hot water applications have attracted attention. Besides the initial investment, which varies by type, flame weeding is economical, with reported costs of as little as five dollars per acre. Other advantages of flaming include, in contrast to cultivation, no disruption to the soil surface, thus reducing the risk of soil erosion and bringing buried weed seeds to the soil surface, where germination is likely to occur. Also, human-powered flaming applications can be used when fields are too wet or stony for cultivation. Flaming may provide insect or disease control and a reduction in physiological disorders, as well. Flaming can be a valuable option in an organic weed management plan.

Use of Bioherbicides in Horticultural Crops: State of Science and Technology

Raghavan Charudattan*; Plant Pathology Department, Univ. of Florida/IFAS, Gainesville, FL

The principles underlying the development and use of microbial plant pathogens as bioherbicides will be reviewed in this talk. Several empirical and practical examples will be presented. The following bioherbicide agents will be described in detail: *Phomopsis amaranthicola* for weedy *Amaranthus* spp., *Drechlera gigantea* for weedy grasses, and Tobacco mild green mosaic virus for some solanaceous weeds, including *Solanum sarrachoides*.

The Long and Winding Road Towards Integrated Nutsedge Management in Organic/Sustainable Horticultural Crop Systems

J. Pablo Morales-Payan*; Univ. of Puerto Rico, Mayaguez

Nutsedges (*Cyperus rotundus* and *C. esculentus*) are among the most troublesome weeds known to conventional and organic growers. Management of nutsedges in organic horticultural crops, particularly vegetables, herbs and new fruit orchards, is time consuming and arduous. Nevertheless, nutsedge management is necessary, as these weeds can drastically reduce crop growth and/or cause severe crop yield loss. In horticultural crops, single means of nutsedge management rarely provide the desired extent of weed suppression, and thus the integrated management of nutsedges is commonly advocated. The roles of bioherbicides, nutrients, biostimulants, and other practices and inputs that may affect horticultural crop/nutsedge relationships in organic/sustainable systems are discussed.

4:00–6:00 pm **Rainmakers Ballroom B**

Workshop 10: Germplasm and Crop Improvement for Semi-arid and Arid Land Horticulture

Sponsor: Genetics and Germplasm (GG) Working Group

Moderator: M.M. Jenderek
USDA, ARS, NCGRP, Fort Collins, CO

Vast regions of North America and several other countries occur in semi-arid and arid environments with no or limited water supply. Such regions usually have the poorest economy. Understanding the genetics governing tolerance to drought and high temperature as well as improvement of crops able to grow in such environments is essential to agro-horticultural sustainability of such lands. The workshop will address the importance of arid land plant germplasm improvement, classical and molecular breeding approaches in developing drought tolerant crops, and the selection and breeding of desert-adapted new ornamental plants.

Objective:

To discuss progress of genetic research and germplasm improvement for crop cultivation under drought conditions.

Importance of Germplasm Improvement for Semi-arid and Arid Land Horticulture

Dennis T. Ray*; Univ. of Arizona, Tucson, AZ

Large areas of North America, as well as worldwide, are semi-arid and/or arid environments with abiotic stresses, such as temperature and water supply, limiting agricultural production. Improved germplasm with increased tolerance to drought and heat can help support farming/horticultural sustainability of these areas, as well as the development of new crops to replace traditional agricultural production.

The Application of Molecular Technology in The Improvement of Drought Tolerance in Sorghum

Cleve Franks*; USDA, ARS, Plant Stress and Germplasm Development, Lubbock, TX

While sorghum is recognized as an inherently drought tolerant species, breeders have made great strides in enhancing this trait using traditional methods. The recognition of two distinct types of drought tolerance and the introgression of exotic germplasm via the Sorghum Conversion Program have led to widespread acceptance of the importance of the "staygreen" trait. With the sequencing of the sorghum genome, breeders and molecular geneticists stand poised to decipher some of the basic mechanisms underlying drought tolerance in sorghum, and these discoveries may have far-reaching applications across a range of species. New techniques in molecular mapping and gene discovery will likewise lead to a greater level of understanding of these complex mechanisms, and will greatly enhance our ability to utilize this new information.

Lessons Learned While Breeding Peanut for Improved Drought Tolerance

C. Corley Holbrook*[1], Emily Cantonwine[2], Dana Sullivan[3], Baozhu Guo[3], Weibo Dong[2]; [1]RL, USDA, ARS, Tifton, GA; [2]Univ. of Georgia, Tifton, GA; [3] USDA, ARS, Tifton, GA

Peanuts become contaminated with aflatoxins when subjected to prolong periods of heat and drought stress. We have documented that improved drought tolerance can result in reduced aflatoxin contamination, and we are using drought-tolerance as an indirect selection technique to develop peanut cultivars that are less susceptible to preharvest aflatoxin contamination. We have tried many different approaches to attempt to maximize breeding progress for drought tolerance. These included measurements using carbon isotope discrimination, the SPAD chlorophyll meter, minimum epidermal conductance, and ground-based remote sensing of canopy reflectance. The advantages and disadvantages of these, and other approaches, will be discussed. These efforts have resulted in late generation breeding lines that have high relative yield and low relative aflatoxin contamination when subjected to late season heat and drought stress.

Ornamental Plants for Arid Land Horticulture

Janet Rademacher*; Mountain States Wholesale Nursery, Lichfield Park, AZ

Learn how Arizona grower of desert-adapted plants breeds, selects, evaluate, and markets new plants for arid regions. Get a sneak preview of upcoming new selections.

4:00–6:00 pm **Lowell A/B**

Workshop 11: Advance of Fresh-cut Technologies Especially in the Asian Countries

Sponsors: Working Group of Asian Horticulture (WGAH) and Postharvest Working Group (PH)

Presiding: Jinhe Bai
Oregon State Univ., Hood River, OR

The market for fresh-cut vegetables and fruits is estimated at $10–12 billion annually which makes up more than 15% of all fresh produce marketed in the U.S. (IFPA, 2004). The European market value was about $3 billion in 2004, and the sales increase has been greater than 10% annually in the last few years. The development of fresh-cut produce is expected to rise even faster as the economy bursts in Asian countries. There are unique technologies developed by the Asian countries, such as using electrolyzed water, ozonated water, wasabi and pepper extractions to protect fresh-cuts from microbial contamination which show promise in the organic food industry. The market for fresh-cut vegetables and fruits is estimated at $10–12 billion annually which makes up more than 15% of all fresh produce marketed in the U.S. (IFPA, 2004). The European market value was about $3 billion in 2004, and the sales increase has been greater than 10% annually in the last few years. The development of fresh-cut produce is expected to rise even faster as the economy bursts in Asian countries. There are unique technologies developed by the Asian countries, such as using electrolyzed water, ozonated water, wasabi and pepper extractions to protect fresh-cuts from microbial contamination which show promise in the organic food industry. Various approaches have been tried to reduce microbial growth, discoloration, and other deteriorative events. Such approaches include proper cultivar selection, harvest maturity and ripening stage regulation, surface treatments with sanitizers, anti-browning agents, firming agents, or edible coatings, use of modified atmosphere packaging to maintain high humidity and appropriate gas atmosphere around the cut pieces, low temperature storage, and other special treatments, such as 1-MCP, methyl jasmonate, and ethanol vapors. This workshop will address the major technologies for the fresh-cut fruit and vegetables, to help the industry to improve quality of fresh-cut products.

Objective:

Provide an overview of the current development of fresh-cut technology especially the new technology in Asian countries, and promote information exchanges between scientists residing in the Western and the Orient countries in this new industry.

Techniques for Maintaining Quality of Fresh-Cut Fruits

E.A. Baldwin*, J. Bai, A. Plotto, J. Narciso; USDA–ARS Citrus & Subtropical Products Laboratory, Winter Haven, FL

Use of different sanitizers, enzymes, citric acid, ethanol vapor, heat or 1-methylcyclopropene (1-MCP) gas prior to processing into fresh cut slices for apple, orange and mango was evaluated. Slices were then treated or not with sanitizers, anti-browning agents, citric acid and/or coatings to prolong shelf life and reduce decay. Color, firmness, respiration, ethylene, and flavor compounds were analyzed over the storage period along with sensory studies. Results showed that heat and ethanol effectively reduced ethylene and maintained firmness for 'Gala' apple, and 1-MCP reduced browning, ethylene and maintained firmness for 'Braeburn' apple, but not 'Gala'. Heat, however, reduced volatile levels in apple and ethanol vapor treatment resulted in an altered volatile profile and flavor. Infiltration of citric acid along with enzymes resulted in reduced microbial populations for oranges segments. For mango use of peroxyacetic acid on whole fruit resulted in reduced microbial counts on the subsequent cut slices. Ethanol vapor and 1-MCP treatment of whole fruit resulted in better appearance of the cut product during storage and reduced decay for ethanol-treated fruit. The ethanol treatment created some off-flavor which was minimized by shortening the treatment time. Use of antioxidants on apples reduced browning and use of coatings delayed weight loss and may have helped retain aroma in mango.

Understanding 1-methylcyclopropene Action in Horticultural Produce

Farid Moradinezhad*[1], Lung Wong[2], Amikha Prasad[2], Tim O'Hare[2], Margaret Sedgley[3], Amanda J. Able[4]; [1]The Univ. of Adelaide, Waite, South Australia, Australia; [2]Queensland Department of Primary Industries and Fisheries, Gatton, QLD, Australia; [3]The Univ. of New England, Armidale, NSW, Australia; [4]The Univ. of Adelaide, Glen Osmond, SA, Australia

1-Methylcyclopropene (1-MCP) inhibits the action of ethylene such that it controls ripening and slows senescence. 1-MCP is now commercially available in a number of countries for use on crops such as banana. To ensure the efficacy of 1-MCP is consistent, we have been examining how factors such as maturity, temperature, timing of application and ethylene availability might impact in a range of horticultural crops. The effect of 1-MCP on the physiology of senescence and ripening has also allowed us to further understand preharvest and postharvest factors that might affect its efficacy. A particular focus has been fresh-cut Asian leafy vegetables such as pak choy (*Brassica rapa* var. *chinensis*). Ethylene does not appear to play a causal role in the onset of yellowing in Asian leafy vegetables. However, 1-MCP contributes to senescence control in leaves of a certain physiological age and offers protection against exposure to exogenous ethylene and wounding. Interesting comparisons with findings that time of year at harvest, maturity, temperature and presence of ethylene also impacts upon ripening and/or senescence in other horticultural crops (such as banana) will be discussed with regards to their physiological impact on the efficacy of 1-MCP.

Modified Atmosphere Packaging for Today's Food Processor

Sarah K. Coulter*; Air Products and Chemicals, Inc. Allentown, PA

Consumer demand for fresh, convenient food has increased significantly in recent years. To remain competitive, food processors and retailers need to understand the basics of all available technologies that help extend the shelf-life of their food product and maintain the quality of their product. Modified Atmosphere Packaging (MAP) is a technology that utilizes the properties of gases, coupled with appropriate packaging materials and cold chain handling, to significantly extend the shelf-life of food products. This talk will focus on the basics of modified atmosphere packaging from a technical point of view, and will explore how this technology can help food processors increase the shelf-life of fresh-cut produce. We will explain the benefits of MAP, how it works, things to consider before implementing and ways to improve an existing system. 'Real world' examples will be explored, from a technical specification point of view, with an emphasis of how this technology has helped fresh-cut fruit and vegetable processors meet the needs of their consumers.

Study and Commercialization of Electrolyzed Water and Other Antimicrobial Agents in Fresh-cut Industry in Japan

Hidemi Izumi*; Kinki Univ., Uchita, Nara, Japan

Fresh-cut products have been popular in Japan over the past decade. In the commercial produce plant, washing the produce is an important step to reduce microbial population during the processing operations, because microbiological control and safety are of major concern in preparation of fresh-cut produce. Some chemical disinfectants and natural antimicrobial agents from plant and animal are effective alternatives to sodium hypochlorite. One of the disinfectants is electrolyzed water (pH 2.7 or 6.5, 20 to 60 ppm available chlorine), which is approved as a food additive by Ministry of Health, Labor, and Welfare of Japan in 2002. The treatments with electrolyzed

water reduced total microbial counts of fresh-cut cucumber, carrots, and spinach by 1 to 3 logs CFU/g relative to non-treated samples without quality loss. Ozonated water (5 and 10 ppm) also reduced the microbial counts by 1 log and was more effective on fresh-cut cabbage than on lettuce. Among the natural antimicrobial preservatives, a 0.5% ferulic acid agent (2% of ferulic acid) or 1% fumaric acid agent (20% of fumaric acid) applied on fresh-cut lettuce, 0.1% mustard and hop extract agent (10% of allyl isothiocyanate and 7% of ^{2}-acid) on fresh-cut cabbage, and 0.05% calcined calcium agent (91% of calcium) on fresh-cut cucumber reduced the microbial counts by 0.3 to 1.5 logs as compared to water-dipped control. The fumaric acid agent followed by electrolyzed water treatment was the most effective in reducing microbial counts with fresh-cut lettuce and cucumber. Since the microbicidal effectiveness of disinfectants and agents was dependent on type of fresh-cut vegetables, it is important to understand which disinfectant and agent are best for each fresh-cut vegetable.

4:15–5:30 pm **Powell A/B**

Oral Session 20: Vegetable Crops Management 4

Moderator: Chiwon W. Lee

4:15–4:30 pm

Growing 'Okinawan' Purple-fleshed Sweetpotatoes in Louisiana: Preliminary Data for Yield and Quality Factors

Arthur Villordon*, Jason Franklin, Timothy Talbot, William McLemore, Christopher Clark, Mary Hoy, Don LaBonte

4:30–4:45 pm

Squash Cultivar Evaluation and Selection for Production of Male Blossoms in South Florida

Darrin Parmenter*, Nancy Roe, Kelly Morgan, Russell Nagata

4:45–5:00 pm

Changes in Ethnic Vegetable Crops Grown in Miami–Dade and Broward Counties and the People Who Grow Them

Mary Lamberts*, Ray Rafie, Samuel Scott

5:00–5:15 pm

Production of Confectionery Seed Pumpkins in the Northern Plains Region

Chiwon W. Lee*, Harlene Hatterman-Valenti, Sang Gyu Lee, Chun Ho Pak, Yong Beom Lee

5:15–5:30 pm

Leafy Greens as a Winter Crop in Washington State

Kristy Ott*, Rich Koenig, Carol Miles, John Reganold, Joe Powers Bradley Jaeckel

4:30–5:45 pm **Rainmakers Ballroom C**

Oral Session 21: Herbs, Spices, and Medicinal Plants

Moderator: Alain Boucher, aboucher@interchange.ubc.ca

4:30–4:45 pm

Potential of 'BetaSweet' Carrot in Cancer Prevention

Kotamballi N. Chidambara Murthy*, Guddadarangavvanahalli K. Jayaprakasha, Leonard M Pike, Bhimanagouda S. Patil

4:45–5:00 pm

Anti-inflammatory Bioassays to Guide Selection of Therapeutically Desirable *Echinacea angustifolia* Genotypes

Alain Boucher*, Shannon Binns, Sidney Katz, Robert Harris

5:00–5:15 pm

Productivity, Content, and Composition of the Essential Oil of Three Basil Genotypes as a Function of Harvesting

Valtcho Zheljazkov*, Charles L Cantrell

5:15–5:30 pm

Hypocotyl Grafting for Teaoil Camellia and Its Grafting Union Development

Jiangfan Yu, Donglin Zhang*, Wenbin Liang, Bixia Xie, Riqing Zhang

5:30–5:45 pm

Ginkgo Cultivation in China with Reference to Varietal Taxonomy

Riqing Zhang, Donglin Zhang*, Fang He, Yiqiang Wang

5:00–6:00 pm **Merriam B**

Association of Horticulturists of Indian Origin (AHIO) Working Group Business Meeting

Chair: Bhimanagouda S. Patil

5:00–6:00 pm **Noble Boardroom**

Plant Dormancy Research (ZZZZ) Working Group Business Meeting

Chair: Rajeev Arora

6:00–6:30 pm **Rainmakers Ballroom B**

Genetics and Germplasm (GG) Working Group Business Meeting

Chair: Maria Jenderek

6:00–6:30 pm **Kirkland**

Weed Control & Pest Management (WCPM) Working Group Business Meeting

Chair: J. Pablo Morales-Payan

6:00–7:30 pm **Merriam A**

International Attendee/Guest Reception

This reception is in recognition of ASHS's diverse international membership from over 80 countries. Network with your international colleagues who have come from different parts of the world to meet in Scottsdale, Arizona. All delegates are invited to attend this event (including those from the United States). (Fee $35)

6:00–8:00 pm **Noble Boardroom**

American Pomological Society Board Meeting

6:30–10:00 pm **Rainmakers Ballroom A**

Extension/Industry Reception & Dinner

This Dinner recognizes ASHS members involved in Extension work and those members involved in Industry. Network with colleagues from all over the world and honor the Extension Division Award recipients. If you want to have fun, this is not an event you will want to miss. You can kick back and enjoy some of the flavor of the Wild West. (fee: $59).

Wednesday, July 18

7:30–8:00 am **Rainmakers Ballroom B**

Viticulture Small Fruit (VSF) Working Group Business Meeting

Chair: Ed Stover

7:30–5:30 pm **Culturekeepers Hall West**

Registration Desk Open

8:00 am–12:00 pm

Native Cultures and Plants of the Southwest Tour

The Heard Museum and the Desert Botanical Garden have come together to present a wonderfully insightful Southwest experience, acquainting your group with the diversity of the Sonoran Desert and the resourcefulness of the native people.

8:00–9:00 am **Noble Boardroom**

Emeriti (EMER) Working Group Business Meeting

Chair: Sal J. Locascio

8:00–9:00 am **Merriam A/B**

Pomology (POM) and Growth Regulators in Fruit and Nut Production (PGR) Joint Working Group Business Meeting

Chair: Peter Petracek (POM, and Renee Moran (PGR)

8:00–10:00 am **Rainmakers Ballroom A**

Administrators Working Group Breakfast

Chair: Ron Perry

8:00–10:00 am **Rainmakers Ballroom C**

Oral Session 22: Floriculture 2

Moderator: Matthew D. Taylor, mdtaylo3@ncsu.edu

8:00–8:15 am

Irrigation Scheduling in Greenhouses: Substrate Water Content Effects on Growth and Physiology of Vinca (*Cataranthus roseus*)

Jong-Goo Kang*, Marc van Iersel, Stephanie Burnett

8:15–8:30 am

Effect of Calcium on Postproduction of Fresh Cut Sunflower

Sergio Sosa*, Jeff Kuehny

8:30–8:45 am

Modified Atmosphere Use in Extending Unrooted Cutting Quality and Viability

W. Roland Leatherwood*, John Dole

8:45–9:00 am

Endogenous Carbohydrate Status Influences Postharvest Ethylene-promoted Leaf Senescence in Pelargonium Unrooted Cuttings

Vijaya Rapaka*, James Faust

9:00–9:15 am

Ethephon Residual Catalysis on Unrooted Cuttings and Stock Plants

W. Roland Leatherwood*, John Dole

9:15–9:30 am

Ethylene Production by *Fusarium oxysporum* f.sp. *tulipae* in Live Bulbs, and In Vitro Using Freeze-dried Tulip Bulb Powder

Gerardo J. Suazo*, William B. Miller, Gary C. Bergstrom

9:30–9:45 am

Effect of Phosphorus Deficiency and High Temperature on Ammonium and Nitrate Uptake by Geranium (*Pelargonium* ×*hortorum* Bailey)

Matthew Taylor*, Paul Nelson, Jonathan Frantz, Thomas Rufty

9:45–10:00 am

In Vitro Propagation of Korean Native Lilies

Dae Hoe Goo*, Hak Ki Shin

8:00–10:00 am **Kirkland**

Oral Session 23: Consumer Horticulture and Master Gardeners

Moderator: Robin Brumfield, Brumfield@Aesop.Rutgers.edu

8:00–8:15 am

Using Web Broadcasting (Webcasting) via Macromedia Breeze for Delivery of Master Gardener Training

James Romer*, Cindy Haynes

8:15–8:30 am

Intranet: An Effective Strategy for Reducing the Administrative Load of Managing a Large Volunteer Program

Lucy Bradley*

8:30–8:45 am

Trials of Low-cost Greenhouses for Use by Growers and Gardeners

Barbara E. Liedl*, Melissa Smith, Kristen Wilfong, Jeremy M. Sisson

8:45–9:00 am

Detection of Pesticides in Runoff from Residential Sources

Loren Oki*, Robert Mazalewski, Tamara Majcherek, Sveta Bondarenko, Darren Haver, Jay Gan

9:00–9:15 am

Improving Stream Health by Meeting Homeowners as Gardeners Rather than Restoration Ecologists

Linda McMahan*, Carolyn Devine, Brad Withrow-Robinson

9:15–9:30 am

Consumer Preferences for Price, Color Harmony and Information Level of Container Gardens

Shannon Mason*, Terri W. Starman, Bridget K. Behe, R. Daniel Lineberger

9:30–9:45 am

Appeal of Specialty Vegetables to Consumers

S. Alan Walters*, Bradley H. Taylor, Wanki Moon

9:45–10:00 am

How Can Greenhouse Managers Deal with Rising Energy Costs?

Robin Brumfield*

8:00–10:00 am

Student Landscaping Tour

This behind-the-scenes tour at the Westin Kierland Resort and Spa will showcase landscaping techniques used at this desert resort.

Advance registration required ($5).

8:00–10:00 am **Powell A/B**

Workshop 12: The Specialty Crop Regulatory Initiative: Navigating the Regulatory Process

Sponsors: Marketing and Economics (MKEC) and/or Genetics and Germplasm (GG) Working Groups

Presiding: Michael Dobres, President & CEO, NovaFlora Inc., Philadelphia, PA

Over the past two decades significant progress has been made in the commercialization of biotechnology derived commodity crops such as corn and soybean. However very few biotechnology derived specialty crops are on or close to market. One of the major hurdles facing developers of biotechnology derived crops are the regulatory costs and complexities of bringing such crops to market. In the U.S.A., regulatory clearance requires approval by as many as three federal agencies and requires the filing of comprehensive data packages compiled from multi year greenhouse and field trials. Differences in regulatory procedures and standards throughout the world further complicate commercialization of such crops. In the United States, the Specialty Crop Regulatory Crops Initiative (SCRI) has been formed to guide developers of specialty crops through the existing regulatory framework in the U.S.A. The organization will rely on a partnership between public and private sector entities. Public partners will include universities and government research as well as the organization itself. The SCRI will work within the existing regulatory system to help clarify regulatory data requirements, collect required data, maintain a database of information for future applications, and serve as a liaison with regulatory agencies. This workshop will present and discuss the history, status and strategies for implementation of SCRI through presentations and panel discussions.

Objective:

To present and discuss objectives of the SCRI with developers of transgenic specialty crops and other stakeholders present at the conference

Additional presenters:

Ann Marie Thro*; National Program Leader for Plant Breeding and Genetics, Cooperative State Research, Education, and Extension Service USDA, Washington DC, United States

Kellye Eversole*; President, Eversole Associates, Bethesda, MD

8:00–10:00 am **Lowell A/B**

Workshop 13: Light Emitting Diodes (LEDs) in Horticulture

Sponsor: Controlled Environment (CE) Working Group

Presiding: Raymond Wheeler, NASA, Kennedy Space Center, FL

The concept of using light emitting diodes (LEDs) as a light source to grow plants gained momentum through the 1990s. LEDs are solid state, electric devices that do not involve an arc discharge or incandescent principle, and their operating life can surpass most high intensity discharge (HID) and fluorescent lamps. But the spectral output of LEDs is quite narrow and the optimal combinations of LED wavelengths for growing plants are still under study. High intensity LED arrays for growing plants can be expensive, but these costs will likely drop as different applications and market demands increase. Commercial plant production facilities using LEDs already exist in Japan, and will likely expand around the world as costs drop and efficiencies improve. The narrow spectral output of LEDs provides a convenient tool for conducting photobiological research and may offer advantages for manipulating spectral environments in commercial production systems.

Objective:

The workshop will review the history and development of light emitting diodes (LEDs) for plant lighting applications. The advantages and disadvantages of LEDs will be discussed, and data from controlled environment studies with plants will be presented. The potential for using LEDs in photobiological research and commercial production systems Controlled Environment Agriculture (CEA) will also be addressed.

LEDs: What Are They?

Mike Bourget*; Electrical Project Engineer, Orbital Technologies Corp., Space Center, Madison, WI

Light Emitting Diodes (LEDs) are semiconductor devices that produce non-coherent, narrow-spectrum light when a forward voltage is applied. LEDs range in wavelength from the UVC band to infrared and are available in packages from milliwatts to more then 10 watts. The first LED was an infrared emitting device and was patented in 1961. In 1962, the first practical, visible spectrum LED was developed. The first high power (1 watt) LEDs were developed in the late 1990s.

LEDs create light via a semiconductor process called electron-hole recombination; rather then with a superheated element, ionized gas, or an arc-discharge as in traditional light sources. The wavelength of the light emitted is determined by the materials used to form the semiconductor junction.

LEDs produce more light per electrical watt then incandescent lamps, with the latest devices rivaling fluorescent tubes in energy efficiency. They are solid-state devices, which are much more robust then any glass-envelope lamp, and contain no hazardous materials as fluorescent lamps do. LEDs also have a much longer lifetime then incandescent, fluorescent, and HID lamps.

While LEDs possess many advantages over traditional light sources, a total system approach must be considered when designing an LED-based lighting system. LEDs do not radiate heat directly, but do produce heat that must be removed to ensure maximum performance and lifetime. LEDs require a constant-current, DC power source rather then a standard AC line voltage. Finally, since LEDs are directional light sources, external optics may be necessary to produce the desired light distribution. A properly designed LED light system is capable of providing performance and lifetime well beyond any other traditional lighting source.

LEDs in Horticulture

Robert Morrow*; Plant Physiologist, Orbital Technologies Corp., Space Center, Madison, WI

Solid-state lighting based on the use of light emitting diodes (LEDs) is potentially one of the biggest advancements in horticultural lighting in decades. LEDs can play a variety of roles in horticultural lighting, including use in controlled environment research, providing tissue culture lighting, and supplemental and photoperiod lighting for greenhouses. LED lighting systems have several unique advantages over existing horticultural lighting, including the ability to control spectral composition, the ability to produce very high light levels with low radiant heat output, and the ability to maintain useful light output for years without replacement. LEDs are the first light source to have the capability of true spectral composition control, allowing wavelengths to be matched to plant photoreceptors to optimize production and to influence plant morphology and composition. Because they are solid state devices, LEDs are easily integrated into digital control systems, facilitating complex lighting programs like varying spectral composition over the course of a photoperiod or with plant development stage. LEDs are safer to operate than current lamps since they do not have glass envelopes or high touch temperatures, and they do not contain mercury. The first sustained work with LEDs as a source of plant lighting occurred in the mid-

1980s to meet the need for a new lighting system for plant growth systems being designed for the space shuttle and space station. These systems progressed from simple red only LED arrays using the limited components available at the time to high density, multi-color LED chip on board technologies. The performance of LEDs has continued to improve steadily over the last several years and LED systems are now poised to become economically feasible in large scale horticultural lighting applications.

Plant Studies and Responses with LEDs

Gioia Massa*; Plant Physiologist, Purdue Univ., West Lafayette, IN

Light-emitting diodes have tremendous potential as supplemental and sole-source lighting for crop-production systems, both on and off Earth. Their small size, durability, long-life, wavelength specificity, relatively cool emitting surfaces, and linear output in response to input current make these solid-state light sources ideal for use in plant-specific lighting designs. Because the output waveband of monochromatic LEDs is much narrower than that of other sources of electric lighting used for plant growth, one challenge in designing an optimum plant-lighting system is to determine essential wavelengths for specific crops. Work at the Kennedy Space Center has focused on the proportion of blue light required for normal plant growth, as well as the optimum wavelength of red and the red/far-red ratio. Also, the addition of green wavelengths for improved plant growth as well as for visual monitoring of plant status has been addressed. Studies on light quality have shown dramatic effects on crop anatomy and morphology, as well as nutrient uptake and pathogen development. Work at Purdue Univ. has focused on light delivery to improve energy efficiency of a plant-designed lighting system. Additionally, foliar intumescence developing in the absence of UV light or other less understood stimuli becomes a serious limitation for some crops lighted by narrow-band LEDs. Ways to prevent this condition are being investigated. Automated switching and control systems that can work only with solid-state lighting like LEDs are being developed to enhance the energy-saving potential of this evolving light source for plant growth. This work was funded by NASA.

Using LED-generated Steady-Signaling States to Control Plant Growth and Development

Kevin Folta*, Stefanie Maruhnich, Dibyendu Kumar; Univ. of Florida, Gainesville, FL

Aside from its role in photosynthesis light plays a critical role in directing plant development and architecture. Discrete wavelengths, fluence rates and photoperiods influence plant attributes relevant to traits of horticultural interest. Traditionally the use of light in plant cultivation has been a passive process, utilizing available ambient illumination from the sun or lighting fixtures to satisfy photosynthetic and developmental requirements. However, as discrete roles for plant light sensors and their cognate wavebands have been delineated it is theoretically possible to actively control plant growth and development to suit grower need. For instance, precise combinations and photoperiods of red, far-red, blue and green light should allow the grower to influence plant height, leaf expansion, leaf angles and the transition from vegetative to reproductive growth. We test this hypothesis using light emitting diodes (LEDs), solid-state semiconductors that produce electrically efficient, narrow bandwidth illumination. We have designed and fabricated specialized lighting chambers and attendant circuitry to precisely control the quantity, quality and duration of ambient illumination. Studies in strawberry and Arabidopsis indicate that the use of LED light allows us to predictably control specific attributes of plant growth and development, such as stem elongation, root development, petiole length, leaf area, plant biomass and time to flowering. One interpretation is that "steady signaling states", or equilibria among light sensory pathways, establish a condition where slight variations in spectral quality induce conspicuous changes in physiology or morphology. The long-term vision of this work is that LED-generated steady signaling states may be useful to cultivation, serving to optimize plant stature, synchronize plant-product output, and replace some growth regulators. Ultimately narrow-bandwidth illumination may be tailored to individual species to optimize and control growth habits of economic interest.

8:00–10:00 am **Rainmakers Ballroom B**

Workshop 14: Cold-Hardiness and Cold-Protection: Examples in Grape and Blueberry

Sponsor: Viticulture and Small Fruit (VSF) Working Group

Presiding: Ed Stover, Curator & Research Leader, USDA/ARS, Davis, CA

Cold damage remains a significant threat to small fruits and grapes in many production areas. The main concerns regarding cold-hardiness are mid-winter low temperature tolerance, and susceptibility to cold snaps after plants begin to deacclimate in spring. In this workshop we will explore examples of applied research in which mid-winter and spring cold hardiness and protection are demonstrated using wine grape as the representative crop. Recent genomic studies on gene expression in response to cold have been conducted in blueberry and will be discussed in the context of that crop and with speculation regarding applications to other small fruits and grape. Physiological studies on deacclimation of diverse blueberry cultivars will be presented and related to their response to spring frost damage.

Understanding Cold Tolerance in Blueberry Using EST Libraries, cDNA Microarrays, and Subtractive Hybridization

Lisa J. Rowland*[1], Anik L. Dhanaraj[1], Dhananjay Naik[1], Nadim Alkharouf[2], Ben Matthews[3], Rajeev Arora[4]; [1]United States Department of Agriculture; Agricultural Research Service, Beltsville, MD; [2]Towson Univ. ; Department of Computer and Information Sciences, Towson, MD; [3]United States Department of Agriculture; Agricultural Research Service, Soybean Genomics and Improvement Laboratory, Beltsville, MD; [4]Iowa State Univ., Department of Horticulture, Ames, IA

To gain a better understanding of changes in gene expression associated with cold acclimation in the woody perennial blueberry (*Vaccinium corymbosum* L.) and ultimately use this information to develop more freeze tolerant cultivars, a genomics approach based on the analysis of expressed sequence tags (ESTs) and microarrays was undertaken. Initially, two standard cDNA libraries, constructed using RNA from cold acclimated (CA) and non-acclimated (NA) floral buds of the blueberry cultivar Bluecrop, were used for the generation of about 2400 ESTs, half from each library. Putative functions were assigned to cDNAs based on homology to other genes/ESTs from GenBank. From contig analyses, 796 and 865 unique transcripts were identified from the CA and NA libraries, respectively. The most highly abundant cDNAs that were picked many more times from one library than from the other were identified as representing potentially differentially expressed transcripts. A cDNA microarray was constructed and used to study gene expression under cold acclimating conditions in the field and cold room. Results indicated that the abundance of transcripts of numerous blueberry genes change during cold acclimation including genes not found previously to be cold-responsive in Arabidopsis, and, interestingly, more transcripts were found to be upregulated under cold room conditions than under field conditions. Finally, forward and reverse subtracted cDNA libraries were prepared from Bluecrop RNA, in such a way to enrich for transcripts that are expressed

at higher levels in floral buds at 400 hours and at 0 hours of low temperature exposure, respectively. Many genes encoding putative transcription factors and other proteins related to signal transduction were identified from both libraries.

Cold Tolerance of Blueberry Genotypes throughout the Dormant Period from Acclimation to Deacclimation

Lisa J. Rowland*[1], Elizabeth L. Ogden[1], Mark K. Ehlenfeldt[2]; [1]U.S. Department of Agriculture, Agricultural Research Service, Fruit Laboratory, Beltsville, MD; [2]U.S. Department of Agriculture, Agricultural Research Service, Blueberry and Cranberry Research Center, Chatsworth, NJ

Cold hardiness in woody perennials is determined by complex interacting factors: the timing and rate of cold acclimation; the degree of cold tolerance attained; the maintenance of cold tolerance during the winter; and the rate of loss of cold tolerance or deacclimation upon resumption of spring growth. For highbush blueberry, the degree of winter freezing tolerance and susceptibility to spring frosts have been identified as the most important genetic limitations of current cultivars. Depending on the winter and the location, both can cause damage to floral buds or flowers resulting in substantial losses in yield. In a previous study, in order to identify genotypes that are particularly slow or late to deacclimate and thus may be useful in breeding for spring-frost tolerant cultivars, we compared deacclimation kinetics under field conditions among 12 blueberry genotypes. Clear genotypic differences in timing and rate of deacclimation were found. The species *V. constablaei* was identified as particularly late to deacclimate, and 'Little Giant', a 50:50 hybrid of *V. constablaei* and *V. ashei*, was nearly as late to deacclimate as 100% *V. constablaei*. In a more recent study, we extended our cold tolerance measurements from October through April, comparing acclimation kinetics, maximum cold tolerance, and deacclimation kinetics among seven blueberry genotypes. Although all genotypes appeared to reach maximum cold tolerance about mid-December, genotypic differences were detected in other aspects, including initial cold tolerance, rate of acclimation, maximum cold tolerance, length of the plateau, and rate of deacclimation. Understanding how cold tolerance levels change throughout the dormant period should help us to develop cultivars better suited to their environments.

Challenges Faced by Eastern Winegrape Growers in Active Frost Protection

Barclay Poling*; NC State Univ., Department of Horticultural Science, Raleigh, NC

Spring frosts following bud break can dramatically reduce yields, especially in early budburst vinifera winegrape varieties like Chardonnay. The best way to avoid frost hazard is to do a good job with site selection, which is the first and best defense against damaging spring frost. But with much of the recent expansion of North Carolina's winegrape industry in areas of central and western piedmont that are not frost-free, it is essential to understand the benefits and limitation of wind machines, heaters, overvine sprinklers, helicopters, foggers, and sprays that inhibit frost. This paper will review these various options for active frost control in grape vineyards, as well as provide important background information on cold damage mechanisms in grapes, and discuss critical temperatures under varying environmental conditions. And finally, despite the uncertainties and complications associated with pinpointing critical temperatures and durations required for cold injury in grape tissues, the author outlines some practical methods that have been adopted by North Carolina grape growers in using wind machines and overvine sprinkling to prevent cold injury in winegrapes.

How Cold Can You Go? Frost and Winter Protection for Grape

Joan Davenport*, Markus Keller; Washington State Univ., Prosser, WA

Although a warm climate during the growing season, grapes grown in the inland Pacific Northwest are exposed to colder than optimal temperatures at several times during the year. Intermittent winters with little to no snow cover and subzero temperatures can cause vine dieback and death. Sudden drops in temperature to below freezing in the autumn, before dormancy, and in spring, near bud break, can cause bud damage. Periods of cold air settling can cause problems in both the spring and the autumn in grape growth and development. This paper will discuss the use of critical temperatures, modifying pruning methods, the use of wind machines for air turbulence, and general effects of plant stress on frost and cold tolerance in both wine and juice grapes.

8:00–10:00 am **Rainmakers Ballroom A**

Workshop 15: Sustaining the Urban Landscape

Sponsor:Ornamentals/Landscape and Turf (O/LT) Working Group

Presiding: Jason Griffin, Kansas State Univ., Haysville, KS

Whether residential or commercial, the demand for green space and landscaping of the highest quality continues to increase. Healthy, pest free turfgrass and woody plants require a substantial amount of artificial inputs. Likewise, herbaceous perennials and color beds require frequent nutritional inputs to maintain appealing new growth. In addition to nutritional and pest control inputs, ubiquitous automatic irrigation systems have made mesic landscapes possible in some of the worlds most arid regions. While the landscaping industry is the backbone of the OLT Working Group constituency, reducing the necessary inputs while maintaining the quality of the urban landscape, is beneficial for both industry and the environment. This workshop will present current research that is exploring environmentally responsible landscaping and cultural practices designed to improve the efficiency and reduce the quantity of artificial inputs into the urban landscape.

Objective:

To present current information pertaining to policies and practices that potentially reduce the inputs required in maintaining an urban landscape without sacrificing the quality of woody and herbaceous plant material and turfgrass.

Utilization of Weed Suppressive Groundcovers for Low Maintenance Landscape and Roadside Settings

Leslie Weston*[1], Andrew Senesac[2]; [1]Cornell Univ., Ithaca, NY 14853; [2]LIHREC–Suffolk County Extension, Riverhead, NY

Over the past 6 years we have performed numerous field studies in two locations to evaluate the success of over 100 cultivars and species of herbaceous perennial groundcovers in both managed and unmanaged landscape and roadside settings. In these studies, groundcovers were evaluated for their ability to successfully establish in full sun settings, without supplemental irrigation or fertility in both sandy and silty clay loam soils. Greenhouse studies were also performed to evaluate the ability of groundcovers to tolerate saline conditions. Groundcovers were transplanted at recommended spacings, and later evaluated for their ability to overwinter, form a dense canopy, and suppress weeds successfully in heavily infested sites. Successful performers were also later placed in field demonstrations in roadside and landscape settings across New York State. Key parameters that were significantly

correlated with weed suppression include plant height, density of canopy cover, light received underneath the groundcover canopy, and planting density of groundcover. Successful performers in the field and along roadsides included catmint, coral bells, ornamental goldenrod, dianthus, sedum, lady's mantle, creeping phlox, laurentia, fleece flower, aromatic sumac, creeping thyme, lambsears and heath aster. We also have evaluated numerous cool and warm season turfgrass species for their ability to suppress weeds and maintain aesthetic appeal in both unmowed or managed landscape settings. In replicated research trials evaluating over 100 fine fescues and 20 turfgrass species, as well as in demonstration sites, certain fine fescues continuously outperformed other grasses and suppressed establishment of all major turf weeds by more than 95% once established. Best turfgrass performers included chewings or strong creeping fine fescues, Russian wild rye, wheatgrass and redtop in low maintenance settings. Weed suppressive fescues showed strong evidence for allelopathy through production of root exudates containing m-tyrosine, a potent inhibitor of weed germination and growth. We recommend single cultivar or mixed plantings of Intrigue, Wilma, Columbra, or Sandpiper chewings fescues or Oxford or Reliant II hard fescues in mowed landscapes or roadsides. Because of the ability of these grasses to easily establish in poor, droughty soils, as well as their weed suppressive characteristics, several are now being planted along highways, reclamation sites and in low maintenance landscape settings across New York.

Landscape Sustainability Issues in the Phoenix Metro Area

Chris Martin*; Arizona State Univ., Mesa, AZ

Landscape sustainability is commonly defined in terms of best management practices, enhanced environmental quality, and conservation of natural resources. Landscapes within the Phoenix metro area are uniquely a complete human construct and the outcome of Phoenix landscape sustainability is parameterized by water availability and quality. Data presented summarizes portions of 10 years of interdisciplinary studies of landscape sustainability in the Phoenix metro area. Landscape biodiversity indices were influenced by legacy effects and present stratification of human socioeconomics. Landscape productivity was affected by management practices, but also limited by high temperature during summer months. Urban microclimates were correlated with landscape vegetation density and land cover characteristics. Survey data suggested that landscape design is strongly influenced by human perception of the local desert environment. In summary, these studies emphasize the interdependence of Phoenix landscapes on the interactions of people, plants and the Sonoran Desert environment. Future threats to landscape sustainability in the Phoenix metro including salt deposition will be discussed.

The Role of Green Roofs in Sustainable Landscapes

D. Bradley Rowe*; Michigan State Univ., Dept. of Horticulture, East Lansing, MI

As our forests and agricultural lands are replaced with impervious surfaces due to urban development, the necessity to recover green space is critical for the health of our environment as well as our well-being. Vegetated or green roofs are one potential remedy for this problem as they can partially replace the vegetated footprint that was destroyed when the building was constructed. Establishing plant material on rooftops provide numerous ecological and economic benefits including improved stormwater management, energy conservation, mitigation of the urban heat island effect, increased longevity of roofing membranes, as well as providing a more aesthetically pleasing environment to work and live. Rapid runoff from roof surfaces can exacerbate flooding, increase erosion, and may result in raw sewage that is discharged directly into our rivers. Research at MSU has shown that green roofs can retain 60-100% of the stormwater they receive and release it slowly over a period of several hours. We are also quantifying the differences in water retention and water quality among roof vegetation types, substrate depths, and roof slopes. In regards to thermal properties, the roof of the Plant and Soil Science Building is equipped with heat flux sensors and thermocouples at various points in the roof profile that allow us to measure the influence of roof vegetation on roof membrane temperatures, heat flux into and out of the building, and energy consumption. Ongoing research is also evaluating numerous succulents and native species for rate of establishment, water and nutrient requirements, substrate composition and depth, environmental tolerances, plant competition, carbon sequestration potential, survival, and succession over time.

Integrating the Urban Forest into Stormwater Management: A First Step in Restoring Hydrologic Function to Urbanized Environments

J. Roger Harris*[1], Susan Day[1], Nina Bassuk[2],Qingfu Xi[3], Julia Bartens[1], Ted Haffner[2], Joe Dove[1], Theresa Wynn[1]; [1]Virginia Tech, Blacksburg, VA; [2]Cornell Univ., Ithaca, NY; [3]UC Davis, Environmental Horticulture, UC Davis

Stormwater runoff in urban areas can impair aquatic habitats, prevent groundwater recharge, and adversely affect water quality. Because urban land can also be scarce and valuable, there may be little space for conventional stormwater management systems that retain water on site. Stormwater removal by directly integrating tree root systems into temporary water storage areas in highly built environments has not been evaluated. In a series of coordinated projects, we are evaluating such a system in terms of water uptake by tree roots, tree and root system development, infiltration potential, water quality, and porous wearing surfaces. The test system includes an under-pavement reservoir specially constructed using structural soils to both allow tree root growth and temporarily store stormwater. In one study, *Quercus bicolo*r and *Fraxinus pennsylvanica* were grown in either CUSoil or Carolina Stalite structural soil mixes in pots fitted with valves to simulate three subsurface drainage rates. Seasonal water uptake patterns and root growth distribution were affected by drainage regime, with the extremely slowly drained systems reducing transpiration and restricting rooting depth. In a separate experiment, roots penetrated the subsoils and increased infiltration rates by 63% through a compacted soil system. Structural soils, even without tree roots, were highly effective at removing pollutants from stormwater, however, this removal capacity was diminished after multiple events. Multiple surface treatments, including turf and porous pavement have been evaluated for wear and permeability. By increasing available rooting volume, structural soils can increase tree canopy development, thus enhancing rainfall interception. Stormwater management systems such as the test system that completely integrate trees into their operation may enhance hydrologic function of urban landscapes by increasing rain interception, directing rainfall to open soil areas via trunkflow, and increasing soil permeability and ecological function through root activity.

8:00–11:15 am **Herberger Ballroom 1/2**

Colloquium 3: Crop Yield and Quality: Can We Maximize Both?

Sponsor: Postharvest (PH)

Presiding: Jennifer DeEll, Contact/Presenter, O M A F, Simcoe, ON

Research has shown that factors that maximize yield, such as nitrogen and water (irrigation), are also likely to reduce the storability and other postharvest quality attributes of fruits and vegetables. Recently there has been publication of research claiming that 'Environmental and genetic methods can increase crop yields [but] increased yields

may reduce concentrations of some nutrients (Davis, D.R. 2005. Trade-offs in agriculture and nutrition. Food Technology 59 (3): 120.). For instance, research by Davis et al. (J. Amer. Coll. Nutr. 2004. 23:669–682) and White and Broadley (J. Hort Sci. & Biotech. 2005. 80:660–667.) suggest that nutrient content values for fruits and vegetables have declined between the 1930s and the present. Thus, it is implied that the search for increased yield during that time has sacrificed loss in some quality parameters.

This colloquium will include speakers who will address this issue from various perspectives that should appeal to other Working Groups.

Objective:

A long-standing goal in horticulture is to maximize yield. However, there is some scientific evidence that increasing yield may dilute certain horticultural quality attributes. This colloquium summarizes our knowledge on what quality components may be subject to this dilution effect, how much is due to changes in cultivars and/or production inputs, and interpret its significance to the industry.

Declining Fruit and Vegetable Nutrient Composition—What Is the Evidence?

Donald R. Davis*; The Univ. of Texas, Austin, TX

Three kinds of evidence point toward declines of some nutrients in fruits and vegetables available in the United States and the United Kingdom:

1. Early experimental studies of fertilization found inverse relationships between crop yield and some mineral concentrations.
2. Two recent reviews of historical food composition data have found apparent average declines of some minerals in groups of fruits and vegetables; one such study also considered vitamins and protein, which showed similar apparent declines.
3. Recent side-by-side plantings of low- and high-yield cultivars of broccoli and wheat have found consistently negative correlations between yield and mineral concentrations.

Evidence 1 led to recognition in the 1970s of the widely cited dilution effect, an environmental effect. Evidence 3 points toward a genetic dilution effect, though this evidence is narrow so far. Evidence 2 is inherently limited to the nutrients measured decades ago, to averages over groups of many foods, and by uncertainties about data quality. Fortunately, none of these limitations is inherent to other kinds of research. Future studies of the relationship between yield and nutrient concentrations can focus on single crops of any kind, can include any nutrient of interest, and can be carefully controlled. Such future studies can also test proposed methods to minimize or overcome the diluting effects of yield. These methods may include both environmental measures and improvements through plant breeding.

The Effects of Yield on Nutritional Quality: Lessons from Organic Farming

Charles Benbrook*; The Organic Center, Enterprise, OR

A majority of carefully designed studies comparing nutrient density in organically and conventionally produced fruits and vegetables show modest to moderate increases in organic produce. Likewise, organic produce is either as or more flavorful than conventional produce, and tends to store better. Physiological factors explaining these observations will be explored including the impacts of high levels of nitrogen, average cell size, and concentrations of plant secondary metabolites.

USDA's Composition Data for Fruits and Vegetables—Sources, Measurement, and Variation

Joanne Holden*[1], Susan Gebhardt[1], David Haytowitz[1], James Harnly[2]; [1]Nutrient Data Laboratory, BHNRC, ARS, USDA, Beltsville, MD; [2]Food Composition Laboratory, BHNRC, ARS, USDA, Beltsville, MD

For more than 100 years the US Department of Agriculture (USDA) has supported the generation and compilation of food composition data. Today the Agricultural Research Service, USDA develops and maintains the National Nutrient Data Bank, a repository of food composition data which provides the foundation for most other U.S. food composition database applications including the databases for the U.S. National Health and Nutrition Examination Survey (NHANES): What We Eat in America as well as for the development of food and nutrition policy, product development, food regulation, trade, and education. As a result, the data must be accurate for the current food supply. USDA food composition data are disseminated via the website www.ars.usda.gov/nutrientdata. In recent years there has been some concern about the apparent decline of some nutrient values for selected fruits and vegetables since 1950. These observations have been based, in part, on the publicly available USDA datasets for this period. Sources of data for these databases have included scientific literature, the food industry, standard calculations, and, from time to time, USDA experimental studies for food analysis. In earlier times most of the data were obtained from the scientific literature. Various factors, including specificity of nutrient components, state of analytical methods, representativeness of sample units, and agricultural and environmental factors including cultivars influence mean levels and variability of values. Through collaboration with the U.S. National Institutes of Health, the USDA has developed the National Food and Nutrient Analysis Program to generate original analytical data for important foods. The challenging process of maintaining a dynamic reservoir of accurate, current, and specific estimates for components in foods requires continuous efforts and support for analytical methodology research, data generation, including studies of variability, and data compilation. Cooperation with the food industry, the scientific community and government agencies is essential to this process.

Interactions between Yield and Mineral Concentrations in Potatoes

Philip White*[1], John Bradshaw[1], Gavin Ramsay[1], John Hammond[1], Martin Broadley[3]; [1]Scottish Crops Research Institute, Invergowrie, Dundee, United Kingdom; [2]Warwick HRI, Univ. of Warwick, Wellesbourne, Warwick, United Kingdom; [3]Plant Sciences Division, Univ. of Nottingham, Sutton Bonington, Leicest, United Kingdom

Humans require more than 22 mineral elements. These can all be supplied by an appropriate diet. Nevertheless, it is estimated that over 60% of the world's 6 billion people are Fe deficient, over 30% are Zn deficient, 30% are I deficient and about 15% are Se deficient. Deficiencies of Ca, Mg and Cu are also common. Mineral malnutrition can be addressed through dietary diversification, increasing mineral concentrations in edible crops (biofortification), food fortification and/or supplementation. There is some concern, however, that modern cultivars and/or agronomic practices have resulted in reduced concentrations of essential mineral elements in crops. Indeed, a number of recent studies have shown that concentrations of several mineral elements are lower in genotypes yielding more grain and/or shoot biomass than in older, lower-yielding, genotypes when grown under identical conditions. Potato is a significant crop, world-wide, yet few studies have reported the effects of genotype on tuber mineral concentrations. Recent surveys at SCRI indicate considerable variation between potato genotypes in the concentrations of mineral elements in their tubers, and that, as in other crops, higher-yielding genotypes often have lower concentrations of mineral elements in their tissues than lower-yielding genotypes. To address the general decline in mineral concentrations in produce, two simple strategies are available. There are immediate opportunities (1) for growers to improve cultural practices, for example by fertilising

with specific mineral elements, and (2) for breeders to develop mineral-rich genotypes.

A Plant Breeder's Perspective on Maximizing Yield and Quality of Horticultural Crops

James Luby*; Department of Horticultural Science, Univ. of Minnesota, St. Paul, MN

The proponents of the possible loss of quality with increase in crop yield have suggested that one explanation is a shift in crop cultivars towards new cultivars selected for their genetic capacity to produce higher yields. The implication is that the search for higher-yielding cultivars has been at the expense of quality. Some support for this argument exists in scientific research and plant breeders' experiences in agronomic crops with the assumption that the same applies to horticultural crops. This presentation will explore the theoretical and actual evidence for and against this argument using a selection of horticultural crops. Important distinctions exist between agronomic and horticultural crops. In agronomic crops yield is usually determined as mass produced on dry matter basis. Premiums or discounts to price are still most often applied based on traditional quality parameters such as oil or protein content that can be analytically determined. In some cases, premiums may be offered for specific genotypes with recognized quality attributes. In horticultural crops, high-moisture fresh mass is the basis for yield and, furthermore, the condition of that fresh mass is absolutely critical in determining the price or even the marketability of the crop. Each horticultural crop usually has several specific parameters of quality that determine price or marketability and these are often subjectively determined by the consumer. Plant breeders must consider whether negative relationships potentially exist between yield and quality parameters based on genetic linkage, physiological limitations, or correlated responses to biotic and abiotic factors.

8:00–12:00 pm **Mapmakers A/B**

CSREES, USDA Integrated Competitive Programs Grantsmanship Workshop (Morning Session)

Writing grant proposals is an important part of gaining funding for research, projects, etc. There is so much information on the subject that this special presentation has been broken into two separate sessions. Plan on attending one or both.

8:00 am

Welcome, Objectives of the Workshop, Preview of the Day

Introduction to CSREES Integrated Competitive Programs

Deborah Sheely*, Integrated Programs Director, CSREES

9:00 am

Understanding the Peer Review Process

Kimberly Whittet*, Program Specialist, CSREES

9:45 am

Break

10:00 am

Tips for Success

Thomas Bewick*, National Program Leader, CSREES

10:45 am

SBIR Programs of Interest

William Goldner*, National Program Leader, CSREES

11:15 am

NRI Programs of Interest

Gail McLean*, National Program Leader, CSREES

11:45 am

Adjourn until afternoon session

8:00–5:30 pm **Cushing A/B**

Employment/Internship Services (Placement) Open

9:00–10:00 am **Noble Boardroom**

Graduate Student Activities Committee

Presiding: Barbara Liedl

9:00–10:00 am **Merriam A/B**

Controlled Environment (CE) Working Group Business Meeting

Chair: Jonathan Frantz

9:00–10:00 am **Tribal Room A/B**

International Horticultural Consultants (ICON) Working Group Business Meeting

Chair: Jeff Olsen

9:00–5:30 pm **Kierland Grand Ballroom**

Exhibit and Poster Hall Open

10:00–11:00 am **Merriam A/B**

Floriculture (FLOR) Working Group Business Meeting

Chair: Bodie Pennisi

10:00–11:00 am **Tribal Room A/B**

Seed and Stand Establishment (SSEST) Working Group Business Meeting

Chair: Juan Carlos Diaz

10:00–11:30 am **Greenway A/B**

Workshop 16: Exploring Edible and Medicinal Plants of Arid Regions

Sponsor: Herbs, Spices, and Medicinal Plants (HSMP) Working Group

Moderator: Barbara Hellier, USDA–ARS Plant Introduction and Testing, Pullman, WA

Moderator, J. Pablo Morales-Payan, Associate Professor, Univ. of Puerto Rico-Mayaguez, Mayaguez, PR

Edible and Medicinal Plants of the Sonoran Desert

Steve Carter*; Boyce Thompson Arboretum, Superior, AZ

Desert Habitat's Potential for Beneficial Compounds

Letitia McCune*; Univ. of Arizona, Department of Nutritional Sciences

This presentation will focus on the desert environment as a habitat that can favor plant production of compounds that benefit humans. The desert's unique habitat produces stresses to both humans and plant species in association with high levels of UV, salts and drought. Emphasis will be placed on the uses of plant species by Indigenous Peoples of these regions and the grey line between uses for food and medicine. Data from other habitats will be referenced to illustrate the desert's favorable conditions for developing species with antidiabetic properties, in particular antioxidants. Examples will be presented of traditional crop species as well as those species usually collected from the wild.

Medicinal Properties of Arid Land Plants: The Need for Responsible Research

Peter Felker*; D'Arrigo Bros, Salinas, CA

As an example of the potential of medicinal properties of arid land plants, the young tender growth of *Opuntia ficus indica*, known as nopalitos is the 5th most important horticultural crop (per capita consumption) in Mexico and it is very widely used in Mexico to control diabetes by the local population. There are approximately 10 scientific papers in Mexico reporting such effects. In spite of the presence of 20 million Hispanics of Mexican origin in the U.S.A., there is not a single clinical trial in the U.S.A. where nopalitos have been evaluated for control of Type II diabetes. Even if nopalitos have no benefit to controlling Type II diabetes, it would be important to know if there are interactions with prescription drugs currently being used to treat diabetes and consumption of nopalitos. There are a plethora of implied claims of medical benefits for many arid plants. In the recent outbreak of *E. coli* in spinach, CEOs of agricultural companies were notified they would be personally criminally liable for illness and death of consumers. Companies are very wary of taking on new products with health benefits due to liability of unforeseen side effects. Well documented research by medical scientists are required to minimize this issue. Interactions between the agricultural and medical community are necessary for RESPONSIBLE growth in agriculture related to health benefits of products from arid lands.

Ethnobotany, Production, and Uses of Edible and Medicinal Plants of the Dry Regions of the Dominican Republic and Puerto Rico

J. Pablo Morales-Payan*, Department of Horticulture, Univ. of Puerto Rico at Mayagüez

Using medicinal plants for minor and major health problems is traditional in the Hispanic Caribbean, including the Dominican Republic (DR) and Puerto Rico (PR). The flora of the arid regions of both countries is similar, as are the medicinal applications. Some of the medicinal plants are native to the islands; others have been introduced since 1492. Some are commercial crops in their own right while others are semi-domesticated or wild plant foraged for their useful properties. The ranks of medicinal plants in the arid regions of the DR and PR include, among others, species in the genera Aloe, Anacardium, Ananas, Agave, Argemore, Bromelia, Bixa, Guaiacum, Jatropha, Kalanchoe, Lippia, Manihot, Mangifera, Prosopis, Tamarindus, and Psidium, various herbaceous plants regarded as weeds, and a number of cacti and related species. The presentation concentrates on the production and/or harvesting methods, as well as traditional uses and known active ingredients of several medicinal plants growing in the arid regions of the DR and PR.

Objective:

Many valuable edible and medicinal plants, such as prickly pear (*Opuntia* sp), mesquite (*Prosopis juliflora*), jojoba (*Simmondsia chinensis*), and agave (*Agave* sp.), are native to arid regions. We will explore the ethnobotanical background, production and medicinal uses of these and other species

10:00–12:00 pm **Noble Boardroom**

Publications Committee Meeting

Presiding: Yin-Tung Wang

10:15–12:00 pm **Lowell A/B**

Oral Session 24: Teaching Methods

Moderator: Tim Smalley, tsmalley@uga.edu

10:15–10:30 am

Using Student Learning Outcomes in Course Design and Implementation

Candice Shoemaker*

10:30–10:45 am

Use of Gaming to Promote Student Learning in Greenhouse Operation and Management

Michael Compton*

10:45–11:00 am

An Integrated, Simple, Effective Horticulture Assessment Model

Terry Ferriss*

11:00–11:15 am

Using Global Positioning Technology to Reinforce Recognition and Retention in Horticultural Plant Materials Classes

George Fitzpatrick*

11:15–11:30 am

Understanding the International Travel Views of Undergraduate Students Related to Horticultural Opportunities

Carolyn W. Robinson*, Luther Waters, Jr., Amy N. Wright

11:30–11:45 am

Maximizing Learning and Mimizing Costs through Cooperative Study Abroad Garden Tours

Timothy Smalley*, Marc van Iersel

11:45–12:00 pm

Evaluation of the College Horticulture Internships at Longwood Gardens

Abby Hird*, Robert Lyons

10:15–12:00 pm **Powell A/B**

Oral Session 25: Genetics and Germplasm 1

Moderator: Fenny Dane, DANEFEN@auburn.edu

10:15–10:30 am

Evaluation of Horseradish Cultivars for *Meloidogyne incognita* Resistance

S. Alan Walters*, Jason P. Bond

10:30–10:45 am

'Chiquitita', A New Olive Cultivar for High-density Hedgerow Orchards

Luis Rallo*, Raúl De la Rosa, Lorenzo León, Diego Barranco

10:45–11:00 am

Exploring North and South Carolina in Search of Collard Landraces

Mark Farnham*, Ed Davis, John Morgan, Powell Smith

11:15–11:15 am

Genetic Diversity of the *Malus sieversii* collection in the USDA-ARS National Plant Germplasm System

Gayle Volk*, Christopher Richards, Adam Henk, Ann Reilley, Philip Forsline

11:15–11:30 am

Evolutionary History of the American Castanea Species

Fenny Dane*

11:30–11:45 am

Screening the Watermelon Germplasm Collection for Resistance to Powdery Mildew Race 2

Antonia Tetteh*, Todd Wehner, Angela Davis

11:45–12:00 pm

The Inheritance of Resistance to Race 1 Isolates of *Verticillium dahliae* in Lettuce

Ryan Hayes*, Gary Vallad, Krishna Subbarao

10:15–12:00 pm **Rainmakers Ballroom B**

Oral Session 26: Viticulture and Small Fruits 2

Moderator: Kevin Kosola, kkosola@wisc.edu

10:15–10:30 am

Nitrate Use by Cranberry–88 Years of Conflicting Data Resolved?

Kevin Kosola*, Beth Ann A. Workmaster, Piero A. Spada

10:30–10:45 am

Determining the Correct Phosphorus Rate for Productive Cranberries

Carolyn DeMoranville*, Teryl Roper, Joan Davenport

10:45–11:00 am

Using Anion Exchange Membranes to Monitor Soil-available Phosphorus for Cranberries

Teryl Roper*, William Schmitt

11:00–11:15 am

Evaluation of Two Organic Fertilizer Blends for Highbush Blueberry Production in Oregon

Handell Larco*, Wei Qiang Yang, Bernadine Strik

11:15–11:30 am

A Century of Strawberry Breeding in The Northeastern United States

Rebecca Harbut*, Marvin Pritts

11:30–11:45 am

Variation and Inheritance of Vegetative and Reproductive Traits in Black Raspberry (*Rubus occidentalis* L.)

Michael Dossett*, Chad Finn

11:45–12:00 pm

Chlorine Dioxide to Control Postharvest Decay and Extend Shelf Life of Berries

Eric Hanson*, Luis Rodriguez

10:30–11:00 am **Rainmakers Ballroom C**

Commercial Horticulture (CHEX) Working Group Business Meeting

Chair: Karen L. Panter

10:30–11:00 am **Kirkland**

Ornamentals/Landscape and Turf (O/LT) Working Group Business Meeting

Chair: Jason Griffin

11:00–12:00 pm **Kirkland**

Oral Session 27: Ornamentals/Landscape and Turf 2

Moderator: Garry V. McDonald, g-mcdonald@tamu.edu

11:00–11:15 am

Ozone Efficacy of *Phytophthora capsici* In Recirculated Irrigation Water

Garry V. McDonald*, Michael A. Arnold

11:15–11:30 am

Developing a Knowledge Center for Water and Nutrient Management for the Nursery and Greenhouse Industry

John Lea-Cox*, David Ross, Theodore Bilderback, Thomas Yeager, J. Roger Harris, Chuanxue Hong, William Bauerle, Susan Day, Andrew Ristvey, John Ruter, Richard Beeson, Cindy Zhao

11:30–11:45 am

Ecophysiological Performance of Three Novel Woody Species under Water Stress: *Calycanthus occidentalis, Fraxinus anomala,* and *Pinckneya pubens*

J. Ryan Stewart*, Reid D. Landes

11:45–12:00 pm

Growth and Nutrient Partitioning of Containerized *Malus trilobata* Schneid. and *Acer syriacum* Boiss. and Gaill. Under Two Fertigation Regimes

Hala Zahreddine*, Daniel Struve

11:00–12:00 pm **Merriam A/B**

Produce Quality, Safety, and Health Properties (QUAL) Working Group Business Meeting

Chair: Bhimanagouda S. Patil

11:00–12:00 pm **Tribal Room A/B**

Human Issues in Horticulture (HIH) Working Group Business Meeting

Chair: Kathryn Orvis

11:15–12:00 pm **Rainmakers Ballroom C**

Oral Session 28: Commercial Horticulture (High Tunnels)

Moderator: Carol Miles, milesc@wsu.edu

11:00–11:15 am

Soil Quality in High Tunnels: Producer Perception and Reality in the Central Great Plains

Sharon Knewtson, Edward Carey*

11:15–11:30 am

Alternatives to Plastic Mulch in Vegetable Production Systems

Carol Miles*, Liz Nelson, Jenn Reed

11:30–11:45 am

Strategies for Germinating Lettuce with Drip Irrigation

Michael D. Cahn*, Richard Smith, Steven Fennimore, Husein A. Ajwa, Arnett Young

11:15–12:00 pm **Herberger Ballroom 1/2**

Postharvest (PH) Working Group Business Meeting

Chair: Jennifer DeEll

11:30–12:00 pm

Herbs, Spices and Medicinal Plants (HSMP) Working Group Business Meeting

Chair: Barbara Hellier

12:00–12:45 pm **Kierland Grand Ballroom**

Poster Session 24: Ornamental Plant Breeding 1

(210) Assessing the Genetic Diversity of Seven *Rhododendron* spp. section *Pentanthera* Native to the Eastern United States

Matthew Chappell*, Carol Robacker, Tracie Jenkins

(211) Development of Microsatellite (SSR) Markers from Kousa Dogwood

Phillip A. Wadl*, Xinwang Wang, Tim A. Rinehart, Robert N. Trigiano

(212) Insertion of a Novel Retrotransposon into Flavonoid 3',5'-hydroxylase Gene in Lisianthus [*Eustoma grandiflorum* (Raf.) Shinn.]

Daraluck Yauwapaksopon*, Keiichi Shimizu, Fumio Hashimoto, Jun Ogata, Isselmou Ould Rabah, Yusuke Sakata

(213) Studies of Anthocyanin Regulatory Genes in *Phalaenopsis* using a Transient Expression System

Hongmei Ma, Robert Griesbach, Margaret Pooler*

(214) Inheritance of Leaf Spots and Their Genetic Relationship with Leaf Shape and Vein Color in Caladium

Zhanao Deng*, Fahrettin Goktepe, Brent Harbaugh

(215) Resistance to Powdery Mildew in Hydrangeas

Yonghao Li*, Mark Windham, Robert Trigiano, Alan Windham, Sandra Reed, Margaret Mmbaga, James Spiers, Timothy Rinehart

12:00–12:45 pm **Kierland Grand Ballroom**

Poster Session 25: Floriculture 3

(354) Callus Induction and In Vitro Plant Regeneration in Daylily

Surinder Gulia*, Johnny Carter

(355) Development of a Field-portable Method to Determine the Anthocyanin Content of Hydrangea Sepals

Henry Schreiber*, Nicholas Wade

(356) In Vitro Multiplication of Weigela Genus

Maria Cantor*, Doina Clapa, Rodica Pop

(357) Anthocyanin Content of Red and Blue Sepals from Various Hydrangea Cultivars

Henry Schreiber*, Nicholas Wade, Kathryn Phar, Kelly Mayhew

(358) Micronutrient Concentrations of Sphagnum Peat and Fresh-ground Rice Hulls Over Time in a Greenhouse Environment

Johann Buck*, Michael Evans, Paolo Sambo

(359) Electrical Conductivity, pH, and Macronutrient Concentrations of Sphagnum Peat and Fresh-ground Rice Hulls Over Time in a Greenhouse Environment

Johann Buck*, Michael Evans, Paolo Sambo

(360) Biomass and Carbohydrate Partitioning of Herbaceous Perennials

Obdulia Baltazar Bernal*, William B. Miller

(361) Interveinal Chlorosis in *Oxalis regnellii*

Chad T. Miller*

(362) Treatments for Producing Potted Paeonia Paula Fay for Mother's Day and Valentine's Day

Amihan Lubag-Arquiza*, Hans Christian Wien

(363) Water and Fertilizer Leaching During Cutting Propagation

Kathryn Santos*, Paul Fisher, William Argo

(364) Cold Hardiness of Floral Buds of Deciduous Azaleas: Dehardening, Rehardening, and Endodormancy in Late Winter

Scott Kalberer, Norma Leyva-Estrada, Stephen Krebs, Rajeev Arora*

12:00–12:45 pm **Kierland Grand Ballroom**

Poster Session 26: Plant Biotechnology/Genetics

(193) Cryopreservation of Dendrobium Hybrid Mature Seeds

Wagner Vendrame*, Virginia Carvalho, José Dias

(194) A Regeneration Protocol for the Genetic Transformation of Yard-Long Bean (*Vigna unguinculata* spp. *sesquipedalis* L. Verdicourt)

Eugene Parsons*, Mathew Jenks

(195) Molecular Analyses of Genes Regulating Flowering in Apple

Nobuhiro Kotoda*, Naozumi Mimida, Shin-ichiro Kidou, Tomohiro Igasaki, Mitsuru Nishiguchi, Hiroshi Iwanami, Sae Takahashi, Shigeki Moriya, Kazuyuki Abe

(196) Expression of an Arabidopsis CAX4 Gene in Tomatoes Increases Calcium Levels with No Alteration of Morphology

Chang Kil Kim*, Se-Woon Jeong, Jeung-Sul Han, Joung-Youl Oh, Jae-Dong Chung

(197) Genomic Isolation and Characterization of Genes Encoding Starch Branching Enzyme II (SBEII) in Apple

Yuepeng Han, Elise Bendik, Feng-Jie Sun, Ksenija Gasic, Schuyler Korban*

(198) Gene Expression Profiling and the Physiological Role of t-Zeatin Riboside (ZR) in Sweetpotato Storage Root Initiation and Enlargement

Marceline Egnin*, Hui Gao, Desmond Mortley, Jessica Scoffield, Jack Sherwin, Benjamin Bey

(199) Molecular Marker Linked to Natural Astringency-loss in Chinese-type PCNA Persimmon (*Diospyros kaki* Thunb.) Fruit

Keizo Yonemori*, Sai Eguchi, Ayako Ikegami, Yoshihisa Sakaguchi, Takashi Akagi, Akira Kitajima, Masahiko Yamada, Dan E. Parfitt

(200) Citrus Limonoids Inhibit Protein Biosynthesis in *Escherichia coli* O157:H7

Amit Vikram*, Palmy R. Jesudhasan, Suresh D. Pillai, Bhimanagouda S. Patil

(201) Foliar Pigment Content and Antioxidant Capacity of Bigtooth Maples Indigenous to a Wide Geographic Region

Clare Bowen-O'Connor*, Cynthia Killough, Greg Bettmann, Rolston St. Hilaire

12:00–12:45 pm **Kierland Grand Ballroom**

Poster Session 27: Ornamentals/Landscape and Turf 2

(405) Evaluation of Urban Soil Compaction by Measurement of Dry Density and Soil Water Content Using MD+I Instrument

Sandra Gonzales, Sudeep Vyapari*, Charles Holder, Mahmood Nachabe

(406) A Comparison of Water Requirements for 12 Monostands and 11 Mixtures of Intermountain West Native and Adapted Grass Species to Kentucky Bluegrass and Tall Fescue

Tracy Dougher*, Toby Day

(407) Growth and Garden Performance of Fifteen Bedding Plants under Dry and Hot Environment

Genhua Niu*, Denise Rodriguez

(408) Correlations of Pigments and Chemical Components of *Prunus virginiana* 'Schubert' in Different Leaf Position

Xiang Shen*, Qingju Wang, Yanli Hu, Ling Guo

(409) Crown Reconfiguration and Trunk Stress in Shade Trees

Brian Kane, Mike Pavlis, J. Roger Harris*, John Seiler

(410) Leaf Removal from *Washingtonia filifera* does Not Prevent Infection by *Phaeocoropsis neowashingtoneae*, but Does Predispose Palms to Early Death from Pink Rot, *Gliocladium vermoeseni*

A. James Downer, Donald R. Hodel

(411) Poor Postharvest Handling and Storage of Transplanted *Washingtonia robusta* Palms does Not Slow or Prevent Establishment in Landscapes

A. James Downer*, Donald R. Hodel, Dennis R. Pittenger, Maren Mochizuki

(412) An Analysis of Plant Problems Related to Magnesium Chloride Use for Summer Dust Control on Gravel Roads in a Mountain Community in Colorado

Curtis Swift*

12:00–12:45 pm **Kierland Grand Ballroom**

Poster Session 28: Citrus

(306) 'Persian' Lime (*Citrus latifolia* Tan.) Productivity on Two Rootstoks: *Citrus volkameriana* and *Citrus macrophyla* in the Dry Tropics of Mexico

Juan Manuel Gonzalez-Gonzalez, Salvador Guzman-Gonzalez*, Emilio Sanchez-Arevalo, Roberto Fonseca-Gongora, Luis Castellon-Garcia

(307) Yield of Commercially Valuable Large Size Clementine Mandarin Fruit in Response to GA_3 is Crop Load-dependent in California

C. Thomas Chao, Carol J. Lovatt*

(308) Effect of Petroleum Oil Sprays on Mite Control, Fruit Production, and Fruit Quality of Satsuma Mandarin (*Citrus unshiu* Marc.)

Monte Nesbitt*, Robert Ebel, William Dozier, Henry Fadamiro

(309) Satsuma Mandarin Response to Selected Physiological Regulators in an Ecologically Marginal Production Region

J. Pablo Morales-Payan*

12:00–12:45 pm **Kierland Grand Ballroom**

Poster Session 29: Postharvest 2

(245) Sprayable 1-Methylcyclopropene Influences 'Bartlett' Pear Fruit Quality

Jennifer DeEll*, Dennis Murr

(246) Exposure to Ultraviolet Light as a Means of Predicting Damage in Oranges Exposed to Freezing Conditions

David Obenland*, Mary Lu Arpaia, Dennis Margosan, David Slaughter, Jim Thompson, Sue Collin, Jim Sievert, Kent Fjeld

(247) UV Treatment Enhances Flavonoid Content in Blueberries

Chi-Tsun Chen, Shiow Wang, Chien Wang*

(248) Alteration of 'Granny Smith' Apple Peel Metabolic Profiles by Postharvest UV/Visible Irradiation

David Rudell*, Jim Mattheis

(249) Effect of Controlled Atmosphere in the Postharvest Life of Blueberry (*Vaccinium ashei* R.) cv. Choice

Luis Luchsinger, Antonio Lizana*, G. Villalobos

(250) Effect of Field Sprays of 1-MCP on Quality and Storability of 'd'Anjou' Pears

Jinhe Bai*, Kristi Barckley, Robert Spotts, Maryna Serdani, Debra Laraway

(251) 1-Methylcyclopropene Delayed Softening of Kiwifruit During Storage at Low Temperature and Ripening at Room Temperature

Jin Su Lee*, Seong Cheol Kim, Ki Cheol Seong, Chun Hwon Kim

(252) Temperature Conditioning Alters Transcript Abundance of Genes Related to Chilling Stress in Grapefruit

Greg McCollum*, Pilar Maul, Charles Guy, Ron Porat

(253) Analytical and Sensory Quality Characteristics of Twelve Blueberry Cultivars

Robert Saftner*, James Polashock, Mark Ehlenfeldt

(254) Accumulation of Gamma Aminobutyric Acid in Apple, Strawberry, and Tomato Fruits in Response to Postharvest Treatments

Rujira Deewatthanawong*, Chris Watkins

(255) Potential Heat Treatments for Quarantine Security of Exotic Tropical Fruits

Marisa Wall*, Peter Follett, John Armstrong

(256) Effect of trans-Resveratrol Treatment on Color Retention of Satsuma Mandarin Fruit

Keerthi Cherukuri*, Floyd Woods, William Dozier, Robert Ebel, Douglas White

12:00–2:00 pm **Rainmakers Ballroom B**

Pi Alpha Xi Luncheon

Pi Alpha Xi is the national honorary floriculture and ornamental horticulture society. Join fellow members and their guests at this casual lunch. Don't let another year go by without taking this opportunity to visit with fraternity members. (fee: $27.00).

1:15–2:00 pm **Kierland Grand Ballroom**

Poster Session 30: Viticulture and Small Fruits 2

(318) Effect of N Limitation on Growth, Yield and Photosynthetic Characteristics of Strawberry (*F. ×ananassa*)

Rebecca Harbut*, Lailiang Cheng, Marvin Pritts

(319) Rotation with Cover Crops Increases Yield of Strawberry and Suppresses Weeds

Dennis Portz*, Gail Nonnecke

(320) Row Cover Usage Modifications for Northern Strawberry Plasticulture

Kathleen Demchak*, Elsa S. Sanchez

(321) Strawberry Plant Growth and Yield Response to Increasing Prohexadione-calcium Rates in a Plasticulture System

David Handley, Mark Hutton*, Renae Moran

(322) Nitrate Concentration Effects on N Assimilation and Yield in Strawberry (*Fragaria ×ananassa*)

Alan Dandorf*, Rebecca Darnell

(323) Effect of Prohexadione-calcium on Runner Suppression and Plant Quality of 'Darselect' Strawberries

Duane Greene*, Sonia Schloemann

1:15–2:00 pm **Kierland Grand Ballroom**

Poster Session 31: Produce Quality, Safety & Health Properties 2

(009) Evaluation of Nutritional Properties of Transgenic Sweetpotato under Field Conditions

Lianghong Chen*

(010) Effect of Irrigation Water Salinity on Carotenoid and Phenolic Compounds of Romaine Lettuce (*Lactuca sativa* L.)

Hyun-Jin Kim, Jorge Fonseca*, Ju-Hee Choi, Chieri Kubota

(011) Antioxidant Activities in Lemon (*Citrus lemon* L. Burm) Seeds

Jin Hee Kim*, G.K. Jayaprakasha, Bhimanagouda Patil

(012) Cyanidin 3-Rutinoside Levels and Antioxidant Properties in Black Raspberries As Impacted by Fruit Maturation and Storage Temperature

Artemio Tulio, Jr.*, R. Neil Reese, Mustafa Ozgen, A. Raymond Miller, Joseph Scheerens

(013) Chromaticity of Pawpaw (*Asimina triloba*) Pulp and Its Relationship to Phenolic Content

Hideka Kobayashi*, Kirk Pomper, Changzheng Wang

(014) Potential Cancer Prevention by Citrus: Nomilin and its Deacetalated Form Induce Phase II Detoxifying Enzymes

Jose Luis Perez*, G.K. Jayaprakasha, Hassan Ahmad, Bhimu S. Patil

(015) Impact of Selenium Fertilization on Glucosinolate Concentration in *Arabidopsis thaliana* and Rapid Cycling *Brassica oleracea*

Thomas Barickman*, Dean Kopsell, Carl E. Sams

(016) Evaluation of Functional Component and Development of Micropropagation in Japanese Wild Blueberry, Natsuhaze (*Vaccinium oldhamii*)

Makiko Sato*, Ryoko Takaki, Hirotoshi Tsuda, Takuya Tetsumura, Chizuko Yukizaki, Miho Sakai, Takanori Kai, Kazuo Nishiyama, Yasuhiro Sugimoto, Hisato Kunitake

1:15–2:00 pm **Kierland Grand Ballroom**

Poster Session 32: Ornamental and Fruit Plant Breeding

(216) Three New Cold-hardy Polyantha Rose Cultivars from the Univ. of Minnesota Woody Landscape Plant Breeding Program

Stan C. Hokanson*, Kathy Zuzek, Vance M. Whitaker, Steve McNamara

(217) Open Problems in *Celtis* L. (Cannabaceae) Breeding

Richard T. Olsen*, Alan T. Whittemore

(218) Classification of Abnormal Flowers in the Genus *Penstemon*

Dale Lindgren*, Daniel Schaaf, Drew Anderson, Jay Fitzgerald

(219) Evaluation of Aquilegia Species for Vigor and Aesthetics Under Three Watering Regimes

Mary Jane Clark*, J. Alan Sullivan

(220) Stratification Procedures Optimizing Seed Germination, Emergence, and Seedling Efficiency in Bottlebrush and Red Buckeye

Ann Chanon, Daniel K. Struve, Pablo S. Jourdan, Joseph C. Scheerens*

(221) "Heritage" Apple Cultivars Carry Useful Levels of Resistance to Apple Scab

Cheryl Hampson*

(222) The Olive Breeding Program of Córdoba, Spain

Luis Rallo*, Raúl De la Rosa

1:15–2:00 pm **Kierland Grand Ballroom**

Poster Session 33: Commercial Horticulture

(056) Season Extension with High Tunnels in Kentucky

Michael Bomford*, Anthony Silvernail, Brian Geier

(057) Watercress Production Utilizing Flow-through Aquaculture Effluent

Nichole Smith*, Todd West, Karen Buzby, Roger Viadero, Kenneth Semmens

(058) Performance Trials of Composted Mint Distillery Waste

Noah Bonds, Lynne Carpenter-Boggs, Steven Verhey, Joan Davenport*, Steve Ullrich

(059) Comparison of Organic and Inorganic Substrates in Greenhouse Tomato Production

David M. Ingram, Glenn B. Fain*, Charles H. Gilliam, Cheryl R. Boyer, Peter M. Hudson, K. Kieth Crouse

(060) Dynamic Modeling of Tree Growth and Energy Use in a Nursery Greenhouse using MATLAB and SIMULINK

Jamison Hill*

(061) Development of Renewable, Biologically Based Corrosion Inhibitors for Use in Protecting Rebar in Concrete

Amokoe Ajavon, Jessica Worsley, T.S. Handwerker*, J.A. von Fraunhofer, Shawn White

(062) Evaluation of Inline HPLC Technology for Greenhouse Application

Glenn Roberts*

1:15–2:00 pm **Kierland Grand Ballroom**

Poster Session 34: Organic Horticulture 2

(023) Avoiding Volunteer Seedlings After a Buckwheat Cover Crop

Thomas Björkman*

(024) Organic Control of Broadleaf Weed Seed Germination

Suzanne Lang*, Muralee Nair, Tara Valentino, Ron Calhoun, John Rogers

(025) Vermicompost and Metalosates Fertilizers Used as Nitrogen Sources in Tender Pod Cactus (*Opuntia* spp.) Production

Santiago Ayala*, Everardo Zamora, Cosme Guerrero, Jose Juvera

(026) A Model for Screening Potential Ethylene-inducing Compounds as Organic Fruit Thinners of Apple

Jason McAfee*, Curt Rom

(027) Tracking Effects of Soil Community Management in Sweet Cherry Orchards Using Nematode Community Measures

Lisa Brutcher*, Jennifer Moore-Kucera, Anita Azarenko, Russ Ingham, Annie Chozinski, David Myrold

(028) Control Pistachio Fungal Pathogens with Biocontrol Yeast

Dan Parfitt*, Sui Sheng T. Hua, Wai Gee, Siov Bouy Ly, Ali Almehdi, Helen Chan, Mike Braga, Tome Martin-Duvall, Brent Holtz

(029) Effects of Ground Cover Management and Nutrient Source on Tree Growth and Nutrient Status of a Young Organically Managed Apple Orchard

Hyun-Sug Choi*, Curt Rom

(030) Thinning 'GoldRush' Apples in a Certified Organic Orchard

James Schupp*, Katie Reichard, Lynn Kime

1:15–2:00 pm **Kierland Grand Ballroom**

Poster Session 35: Environmental Stress Physiology 2

(116) Changes in Photosynthesis during Flush Development in Avocado (*Persea americana* Mill.)

Michael Mickelbart*, Stuart Larsen, Robert Heath, Mary Lu Arpaia

(117) High Temperature Decreases the Photosynthesis in Some Oncidium Alliance

Yao-Chien Alex Chang*, Hsiao-Wei Chen, Nean Lee

(118) Environmental Stresses Induce Health-promoting Phytochemicals in Lettuce

Myung-Min Oh*, Edward Carey, Channa Rajashekar

(119) Expressed-sequence Tag (EST) Analysis of the Response of Apple (*Malus ×domestica*) to Low Temperature and Water Deficit

Michael Wisniewski*, Carole Bassett, John Norelli, Dumitru Macarisin, Ksenija Gasic, Schuyler Korban

(120) The Use of a Molecular Imprinting Tool in the Study of the Plant Stress Response Hormone Abscisic Acid

Patrick Baldwin, William Bauerle*

(121) Bigtooth Maples from Selected Provenances Can Cope with Short-term Root Zone Salinity

Emad Bsoul, Rolston St. Hilaire*

(122) Effects of Supplemental Sulfur on Growth of Three Woody Ornamental Species

Michael Mickelbart*, Nick Wasmer, Sachit Revankar, Lucy Collier-Christian

(123) The Influence of Ethylene and Hypobaria on CO_2 Assimilation, Dark-period Respiration, and Growth of Lettuce (*Lactuca sativa* L. cv. Buttercrunch)

Chuanjiu He, Fred T. Davies*, Ronald E. Lacey, Sheetal Rao

(124) Arbuscular Mycorrhiza and Hydrocarbonoclastic Microorganisms Enhance Phytoremediation of Petroleum-contaminated Soil

Alejandro Alarcon, Fred T. Davies*, Robin L. Autenrieth, David W. Reed, David A. Zuberer

(125) Phytoremediation of Benzo[a]pyrene Utilizing Glomus intraradices and Hydrocarbonoclastic Microorganisms

Alejandro Alarcon, Fred T. Davies*, Robin L. Autenrieth, David W. Reed, David A. Zuberer

1:15–2:00 pm **Kierland Grand Ballroom**

Poster Session 36: Nursery Crops 2

(392) Multi-site Woody Plant Evaluation in Colorado

James Klett*, Robert MacDonald

(393) Determination of Optimum Species for Tree Liner Production in Ohio

Luke Case*, Hannah Mathers

(394) Wrapping Materials for *Camellia oleifera* Abel Hypocotyl Grafting

Donglin Zhang*, Jiangfan Yu, Xuemin Zhao, Shaoliang Zhang, Qiuping Zhong

(395) Evaluation of New Container Media for Improved Aglaonema Production

Sandra Wilson*, Keona Muller, M. Regina Incer, P. Christopher Wilson, Peter Stoffella, Donald Graetz

(396) Post-transplant Landscape Evaluation of Bedding Plants Grown in a Pine Chips Substrate

Brian Jackson*

(397) Seed Germination and Survival of *Shepherdia rotundifolia*, *Purshia mexicana*, and *S. argentea* in Three Substrates

Taun Beddes*, Heidi Kratsch

2:00–3:30 pm **Herberger Ballroom 1/2**

ASHS Presidential Address and Annual Business Meeting

Presidential Address:

William R. Woodson, ASHS President

ASHS Annual Business Meeting

(immediately follows the Presidential Address)

Presiding: Paul E. Read, Chair, ASHS Board of Directors (2006–07)

Board of Directors Report

Observation of a moment of silence for deceased members

Open discussion on matters of importance to Members

Association of Collegiate Branches (ACB) report

Presentations in recognition of services to ASHS

Introduction of the 2007–2008 ASHS President and Board of Directors

3:30–4:30 pm **Noble Boardroom**

Propagation (PROP) Working Group Business Meeting

Chair: Todd West

3:30–4:30 pm **Merriam A/B**

Teaching Methods (TCHG) Working Group Business Meeting

Chair: Lurline Marsh

3:30–5:00 pm **Rainmakers Ballroom C**

Oral Session 29: Ornamental Plant Breeding

Moderator: Cynthia McKenney
Email: Cynthia.McKenney@ttu.edu

3:30–3:45 pm

'Blue Myth', A Novel New *Trichostema*

Bruce Dunn*, Jon Lindstrom

3:45–4:00 pm

'Raider Azure' Mealy Blue Sage, a New Salvia for Semiarid Landscapes

Cynthia McKenney*, Sandra Balch

4:00–4:15 pm

Breeding Intra- and Interspecific *Cornus* Species

Phillip A. Wadl*, John A. Skinner, Xinwang Wang, Tim A. Rinehart, Sandra M. Reed, Vince R. Pantalone, Mark T. Windham, Robert N. Trigiano

4:15–4:30 pm

Resistance to Western Flower Thrips Feeding Damage in Commercially Available Impatiens Cultivars

Daniel F. Warnock*

4:30–4:45 pm

Induction of Tetraploidy in Japanese Barberry (*Berberis thunbergii* DC.) Seedlings through Exposure to Colchicine and Oryzalin

Jonathan Lehrer*, Mark Brand, Jessica Lubell

4:45–5:00 pm

Construction of a Microsatellite Based Genetic Map for the Diploid Rose

Ching-Jung Tsai*, David Byrne

3:30–5:00 pm **Kirkland**

Oral Session 30: Plant Nutrient Management

Moderator: Lailiang Cheng, LC89@Cornell.edu

3:30–3:45 pm

Fertilization Affects Western Flower Thrips Abundance, Total Phenolics, and Growth Characteristics in *Gerbera jamesonii*

Jay Spiers*, Fred Davies, Chuanjiu He, Scott Finlayson, Kevin Heinz, Amanda Chau, Terri Starman

3:45–4:00 pm

Transitional Responses of Adult Pear to a Split Nitrogen Fertigation and Drip Irrigation System

Xinhua Yin*, Clark Seavert, Jinhe Bai

4:00–4:15 pm

Yield Variability in Pistachio: A Case Study in Precision Horticulture

Todd Rosenstock*, Patrick Brown

4:15–4:30 pm

A Review of Phosphorus Use in the Ornamental Horticultural Industry

Andrew G. Ristvey*, John D. Lea-Cox

4:30–4:45 pm

Nitrogen Demand-Supply Relationship of High-density 'Gala' Apple Trees

Lailiang Cheng*, Richard Raba

4:45–5:00 pm

Vegetative Growth, Fruiting ,and Fruit Size of Gala Trees in Response to Nitrogen Supply

Guohai Xia*, Lailiang Cheng, Alan Lakso

3:30–5:15 pm **Greenway A/B**

Oral Session 31: Biotechnology for Horticultural Crops

Moderator: Hazel Wetzstein, hywetz@uga.edu

3:30–3:45 pm

Functional Characterization of Novel Rosaceae Genes in *Arabidopsis* and Strawberry

Kevin Folta*, Thomas Davis, Cody Steeves, Maureen Clancy

3:45–4:00 pm

Gametophytic Self-incompatibility in Japanese Plum (*Prunus salicina*)

Gal Sapir*, Martin Goldway, Raphael (Raffi) Stern, Sharoni Shafir

4:00–4:15 pm

The Development of 'HoneySweet'—A Transgenic Plum Pox Virus (PPV)-resistant Plum and the Application of Intron-hairpin (ihp) RNA Technology for PPV Resistance in Stone Fruits

Ralph Scorza*

4:15–4:30 pm

Microsatellite Genotyping of Seedlings from Somatic Hybrid and 'Tetrazyg' Citrus Rootstock Candidates to Determine Maternal or Zygotic Origin

Jude Grosser*, Chunxian Chen, Julie Gmitter, Fred Gmitter, Jr.

4:30–4:45 pm

Ectopic Expression of an Arabidopsis CAX2 Variant Facilitates the Growth of Both Bottle Gourd and the Scion Grafted onto the Transgenic Rootstock

Jeung-Sul Han*, Dae-Geun Oh, Kyeong-Ho Chung, Chang-Kil Kim, Sunghun Park, Thoshiro Shigki, Kendal D. Hirschi, Cheol Choi

4:45–5:00 pm

Factors Affecting In Vitro Regeneration of *Buddleia* Species

Wenhao Dai*, Cielo Castillo

5:00–5:15 pm

In Vitro Culture for the Propagation and Conservation of Georgia Plume, *Elliottia racemosa*

Hazel Wetzstein*, Seongmin Woo

3:30–5:30 pm **Rainmakers Ballroom A**

Consulting Editors Meeting

Presiding: LeRon Robbins

3:30–5:30 pm **Tribal Room A/B**

Leafy Vegetable Crop Germplasm Committee Meeting

Presiding: to be announced

3:30–5:30 pm **Mapmakers A/B**

CSREES, USDA Integrated Competitive Programs Grantsmanship Workshop (Afternoon Session)

Writing grant proposals is an important part of gaining funding for research, projects, etc. There is so much information on the subject that this special presentation has been broken into two separate sessions. Plan on attending one or both.

3:30 pm

Welcome

Deborah Sheely, Integrated Programs Director, CSREES

3:35 pm

SBIR Presentation

Speaker to be announced

4:05 pm

NRI Presentation

Speaker to be announced

4:35 pm

Integrated Presentation

Speaker to be announced

5:05 pm

Q&A with Successful Applicants

3:30–5:30 pm **Powell A/B**

Workshop 17: Development of New Characters in Table Grapes

Sponsor: American Pomological Society

Presiding: Terence Robinson, Cornell Univ., Geneva, NY

This workshop will detail the history of table grape breeding and the recent efforts to incorporate new flavors and colors. Presentations will cover the diversity that exists in grapes and breeding efforts in both the eastern U.S. and western U.S. to develop new and interesting varieties that are well adapted and have interesting market niches.

Objective:

Present advances in table grape breeding which recently has included new flavors.

Table Grape Genetic Resources at the Davis California National Clonal Germplasm Repository

E. Stover*, B. Prins, M. Aradhya; USDA, ARS National Clonal Germplasm Repository, One Shields Ave., Univ. of California, Davis, CA

The Davis, California National Clonal Germplasm Repository

(NCGR) houses most Mediterranean-adapted fruit and nut crop collections in the U.S., including grapes (*Vitis*). The NCGR is part of the USDA National Plant Germplasm System (NPGS). Our missions are to acquire, preserve, characterize and distribute germplasm resources of our designated crops. The NCGR grape collection includes 2926 different accessions, of which 1346 are considered table grapes. These include 574 named *V. vinifera* cultivars, 626 "hybrids" (203 American hybrids, 171 French hybrids and 52 *V. rotundifolia* hybrids and 113 advanced breeder selections), 23 *V. labrusca* cultivars and 123 *V. rotundifolia*. Among these are 94 seedless accessions and 62 tetraploids. The amazing diversity in this collection offers opportunity for breeders to select parents providing a host of distinctive traits and also may provide interesting niche varieties for small acreage plantings. The table grape collection includes great variability for fruit color, bloom date, fruit ripening date, compactness of clusters, size of clusters, cold tolerance, disease tolerance/ resistance, crop size, plant vigor and many other traits. Grape breeders might be interested in *vinifera* traits such the huge clusters and berries of the 'Uzbekistan Muscat', the early ripening of 'Yaghotti No 2' or 'Perlette', or the long shelf life of 'Calmeria'. Within hybrid accessions, interesting traits include the disease resistance of some varieties bred in Florida by Fennell and Mortensen, 45 cm-long clusters of 'Koshu Sanjaku', or unusual colors found in some *labrusca* hybrids. A niche marketer might be interested in French heirloom 'Chassalas' table grapes with their soft translucent skins, the enormous clusters of 'Marvel of Vaucluse', the albino berries with green rachis in 'Sultana Marble' or the intense perfume flavors of 'Suavis'. They may also wish to target cultivars from specific countries for specialized ethnic markets. It is NPGS policy to distribute plant material, free of charge, to research interests around the world. Please contact us (http://www.ars.usda.gov/pwa/davis/npgs) for further information.

Eastern U.S. Table Grape Breeding

John R. Clark*; Dept. of Horticulture, Univ. of Arkansas, Fayetteville, AR

Table grape breeding of bunch grapes, including seedless genotypes, in the eastern U.S. (east of the Rocky Mountains) has been ongoing for over 100 years. The longest-running effort has been at the New York State Agricultural Experiment Station, Geneva, N.Y. Other public programs have included table grapes in breeding objectives, although often in a much smaller scale compared to wine grape breeding efforts. Currently, the Univ. of Arkansas has the largest effort in the eastern U.S. emphasizing table grapes while several other programs continue crossing for table genotypes including the New York A.E.S. and Univ. of Minnesota programs. However, commercial utilization of table grape cultivars has been very limited compared to production in California. Many substantial challenges exist in eastern U.S table grape improvement including fruit cracking resistance, winter hardiness, disease resistance, and quality. The area of quality poses the most substantial challenge in that the increase of *Vitis vinifera* germplasm for enhanced quality in crosses with *V. labrusca* usually results in the problems mentioned such as hardiness, cracking, and disease issues. However, the combination of thinner skins, non-slipskin/crisp texture, and complete seedlessness coupled with some of the exceptional flavors derived from eastern U.S. grapes holds great promise in improving table grape quality and customer appeal.

Muscadine Grape Breeding at the Univ. of Georgia—Past, Present, and Future

Patrick J. Conner*; Department of Horticulture, Univ. of Georgia, 4604 Research Way, Tifton, GA 31793

Muscadine grapes have been cultivated commercially in the southeastern United States since the middle of the 18th century. Production trends have waxed and waned, but there is a renewed interest in this grape because of recent studies indicating their high nutraceutical content. Early cultivars were simply selections from the wild, but current cultivars were all developed from breeding programs. The Univ. of Georgia (UGA) operates the oldest and largest breeding program dedicated to the improvement of the muscadine grape. The UGA program began in 1909 and over the years has released over 30 cultivars. One of those cultivars, the bronze skinned 'Fry', is the leading cultivar for fresh market use and is widely grown. More recent releases such as 'Summit' and 'Tara' are gaining in popularity. Current goals of the breeding program include the development of new cultivars which combine large berry size with perfect flowers, earlier and later maturing cultivars, berries with dry stem scars and edible skins, and increased cold hardiness. Recently work has begun in using several *Euvitis _ Muscadinia* hybrids in order to introduce disease resistance and quality traits into *V. rotundifolia*.

New Diversity in Table Grapes

David Cain*; International Fruit Genetics LLC, Delano CA

With at least seven private breeding programs and two public programs, table grape breeding is alive and well in California. The primary goal of these programs is the development of seedless grapes. Other major breeding criteria are crisp texture, vibrant color, naturally large berry size, strong stem attachment, minimal bruising, good storage potential, high consistent yields and good flavor. Seedless table grapes are more responsive to cultural manipulation than most other fruit crops. However they require high levels of inputs and labor to be commercially acceptable. In addition to the "neutral" flavor of *V. vinifera*, there is increased interest in "exotic" flavors like Muscat and concord types. Insect and disease resistance especially to mildew diseases are breeding priorities. Numerous *Vitis* species occur across North America, Europe and into eastern Asia. All of these species freely interbreed and offer an amazing array of genetic variation for breeders. Specific cultivars possessing useful characteristics and germplasm with potentially useful genes will be described and discussed.

3:30–5:30 pm **Lowell A/B**

Workshop 18: Is Your Compost Organic?

Sponsor: Waste Utilization in Horticulture (WUH) Working Group

Chair: William Evans, Mississippi State Univ., Crystal Springs, MS

Composts are now quite common in horticultural systems. Although one usually thinks of compost as "organic," many composts (and their feed stocks), do not meet the standards for use in certified organic systems as regulated in the USDA National Organic Standards. This workshop will explore what makes a given compost suitable, or unsuitable, for use in certified organic systems. Questions to be explored include: when is a feedstock not "organic;" how must the composting process be managed to assure compliance with organic regulation; and how does the compost need to be used to retain organic integrity? Issues of perception and science will be addressed in a participatory format.

3:30–5:30 pm **Rainmakers Ballroom B**

Workshop 19: Gardening for Health

Sponsor: Consumer Horticulture/Master Gardener; Human Issues in Horticulture (HIH); Organic Horticulture (ORGH)

Presiding: Angela O'Callaghan, Univ. of Nevada, Reno, Las Vegas, NV

Small scale horticultural enterprises have been important in maintaining people's health for many years. These efforts occur in a range of contexts. Victory gardens improved the diets of many Americans during wartime, and community gardens now do the same for people in low income locations. The benefits of gardening

have been documented in a range of situations, and it continues to be incorporated into new and different settings. Horticultural therapy is a recognized modality for working with patients suffering from both psychiatric and physical illness. When they are given the opportunity to grow their own vegetables, elementary school children have shown improved acceptance of eating vegetables.

Research into the effects of horticulture on individuals and groups has included studies of school, incarcerated, and hospitalized populations, among others. The information gleaned from these investigations will aid those who are incorporating horticulture into other mileux, such as assisted living facilities, schools and day care centers.

Use of synthetic fertilizers and pesticides is frequently eschewed by those who are gardening in small settings. Under these conditions, an organic approach to horticulture is common. The benefits and drawbacks of organic practice are under scrutiny, both from proponents and antagonists.

This workshop will highlight the teaching and research components of gardening for health in settings such as health care facilities, schools and correctional institutions. In addition, it will include a report on organic horticulture as an important facet of gardening for health.

Objective:

Provide a forum where several groups interested in how small scale horticulture can improve physical, emotional health of individuals and communities.

4:30–5:30 pm **Noble Boardroom**

Tropical Horticultural Crops (TROP) Working Group Business Meeting

Chair: Bhimanagouda Patil

4:30–5:30 pm **Merriam A/B**

Working Group of Asian Horticulture (WGAH) Business Meeting

Chair: Jinhe Bai

5:00–6:00 pm **Rainmakers Ballroom C**

Ornamental Plant Breeding (OPB) Working Group Business Meeting

Chair: Andrew Riseman

5:30–6:00 pm **Powell A/B**

American Pomological Society Grape Tasting Session

Presiding: Ed Stover

5:30–6:00 pm Rainmakers Ballroom B

Consumer Horticulture and Master Gardeners (CHMG) Working Group Business Meeting

Chair: Kerrie Badertscher

5:30–6:30 pm **Lowell A/B**

Waste Utilization in Horticulture (WUH) Working Group Business Meeting

Chair: William Evans

6:00–8:00 pm **Powell A/B**

American Pomological Society Annual Business Meeting

Presiding: Ed Stover

Thursday, July 19

7:00–11:00 am

Undergraduate Student Hummer Tour

Guides share their expert knowledge of the plant and animal life of the Sonoran desert. (fee: $25)

7:00 am–7:30 pm

Grand Canyon National Park & Navajo Indian Reservation Tour

Travel north through the Sonora Desert, with views of amazing Ponderosa Pine forests. Visit the Cameron Trading Post on the Navajo Indian Reservation, and the Grand Canyon.

8:00–9:00 am **Noble Boardroom**

HortTechnology Editorial Board Meeting

Presiding: Neal DeVos

8:00–9:30 am **Powell A/B**

Oral Session 32: Postharvest 3

Moderator: Tom Davenport, tldav@ufl.edu

8:00–8:15 am
Storage of Ripe Mango (*Mangifera Indica* L.) Fruits in Elevated Carbon Dioxide
Hameed Ullah*, Saeed Ahmad, Anthony Keth Thompson, Muhammad Mumutaz Khan, Raheel Anwar

8:15–8:30 am
Effect of Preharvest Micronutrient Foliar Sprays on Postharvest Vase Life of Gladiolus (*Gladiolus grandiflorus*)
Pratap Manyamgari*, Amarender S. Reddy, Gladis Zinati

8:30–8:45 am
Intact and Postharvest Behavior of Tropical Fruit Stomata
Thomas L. Davenport*, Nelson Guaqueta, Stanley P. Burg

8:45–9:00 am
Optimising Pre- and Post-storage Ripening Protocol and Determining Packaging Effects on Mango (*Mangifera indica* L.) Fruit Ripening
Raheel Anwar*, Aman Ullah Malik, Abdul Jabbar, Muhammad Amin

9:00–9:15 am
Physio-Biochemical and Genetic Changes in Stored Pea (*Pisum sativum* L.) Seeds
Muhammad Mumutaz Khan*, Rana Mazhar Abbas,Faisal Saeed Awan, Muhammad Ali, Waqar Ahmed, Raheel Anwar

9:15–9:30 am
Fruit Quality Characteristics of Antisense ACC-oxidase Galia F_1 Hybrid Melons (*Cucumis melo* L. var. *Reticulatus* Ser.).
Jeanmarie Mitchell*, Daniel Cantliffe, Harry Klee, Steven Sargent, Peter Stoffella

8:00–10:00 am **Greenway A/B**

Oral Session 33: Fruit and Nut Production 2

Moderator: Duane Greene, dgreene@pssci.umass.edu

8:00–8:15 am
Characterizing the Interaction Between NAA and BA on Fruit Growth in Different Apple Cultivars
Martin J. Bukovac*, Paolo Sabbatini, Philip G. Schwallier, Michael Schroeder

8:15–8:30 am

Influence of Tergitol TMN-6 as a New Blossom Thinner on Stone Fruit and Apple Fruit Set and Quality

Esmaeil Fallahi*, James R. McFerson

8:30–8:45 am

Effects of NAA, AVG, and Sprayable 1-MCP on Ethylene Biosynthesis, Preharvest Fruit Drop, Fruit Maturity, and Quality of 'Red Delicious' Apples

Rongcai Yuan*, Jianguo Li, David Carbaugh

8:45–9:00 am

Differentially Reducing Growth in the Upper Canopy of Apple Trees with Naphthalene Acetic Acid and Prohexadione-Ca

Winfred Cowgill*, Wesley Autio, Martha Maletta, Jon Clements, James Krupa

9:00–9:15 am

Effect of Abscisic Acid (ABA) and Benzyladenine (BA) on Fruit Set and Fruit Quality of 'McIntosh' Apples

Duane Greene*

9:15–9:30 am

Carbohydrate Availability and Sorbitol Metabolism in Apple Buds and Fruit from Bud Swell to Fruit Drop

Douglas Archbold*, Marta Nosarzewski, Pavani Vuppalapati

9:30–9:45 am

Comparison between the Sunburned Peel and the Non-sunburned Peel of 'Gala' Apple in Terms of Photooxidation and Photoprotection

Lisong Chen*, Lailiang Cheng, David Felicetti, Larry Schrader

9:45–10:00 am

Development of Apple Integrated Pest Management in Korea

Dong Hyuk Lee, Kyung Hee Choi, Jai Kwon Cheong, Cheol Choi, Jal Youl Uhm

8:00–10:00 am **Merriam B**

Nominations & Elections Committee Meeting

Presiding: Larry Knerr

8:00–10:00 am **Merriam A**

Root & Bulb Vegetable CGC Meeting

Presiding: Christopher Cramer

8:00–10:00 am **Rainmakers Ballroom A**

Workshop 20: Irrigation Scheduling: Pros and Cons of Different Approaches

Sponsor: Crop Physiology (CRPP) Working Group

Moderator: Marc van Iersel, Professor, Univ. of Georgia, Athens, GA

There are increasing concerns about the availability of good-quality irrigation water. This makes efficient irrigation increasingly important in horticultural production. In this workshop, we will explore different approaches to irrigation scheduling, such as evapotranspiration-based models and sensors to determine soil- or plant-water status. Representatives from various companies that make equipment that can be used in irrigation scheduling will be asked to show their latest products. All attendees will be encouraged to share their own experiences with irrigation scheduling, both positive and negative. This workshop will provide insight in the pros and cons of the different approaches to irrigation control, and determine which approaches have been successful under different circumstances.

Objectives:

In this workshop, we will discuss various ways to schedule irrigation of horticultural crops. New sensors will be discussed, and their pros and cons will be evaluated. All attendees are encouraged to share their own experience.

8:00–10:00 am **Rainmakers Ballroom B**

Workshop 21: Horticulture Teaching Tools Exchange

Sponsor: Teaching Methods (TCHG) Working Group

Presiding: Lurline Marsh[1], Tracy Dougher[2]; [1]Univ. of Maryland Eastern Shore, Princess Anne, MD; [2]Montana State Univ., Bozeman, MT

How do you assess learning in fruit production? Discovered an interesting project for turf grass management? Searching for ideas on experiential learning in landscape design? Come share and gather ideas for nine horticulture courses. Topics will include: plant propagation, turf grass management, greenhouse management, landscape design, plant identification, fruit production, vegetable production, public horticulture, and introduction to horticulture. Round tables will be set up in three 35 minute rotations. Discussion can include, but is not limited to, assessing learning, syllabi, projects, case studies, topics covered, experiential learning, and active learning. Syllabi and project descriptions from established courses will be available. Participants are encouraged to bring their syllabi, case studies, rubrics, projects, or samples of student work to be included on a workshop CD.

Objectives:

To provide roundtable forum to enable faculty currently engaged in the teaching of selected horticulture courses to lead discussions and exchange materials with others.

Introduction to Horticulture

Kathryn Orvis*; Purdue Univ., West Lafayette, IN

Plant Propagation

Todd West*; West Virginia Univ., Division of Plant and Soil Sciences, Morgantown, WV

Plant Identification and Materials

Cynthia Haynes*; Iowa State Univ., Ames, IA

Turf Grass Management

Tracy Dougher*; Montana State Univ., Bozeman, MT

Greenhouse Management

Peg McMahon*; Ohio State Univ., Columbus, OH

Landscape Design

Speaker: TBA

Public Horticulture

Robert Lyons*; Univ. of Delaware, Dept. of Plant & Soil Sciences, Newark, DE

Fruit Production

Curt Rom*; Univ. of Arkansas, Department of Horticulture, Fayetteville, AR

Vegetable Production

Brian Kahn*; Oklahoma State Univ., Horticulture and Landscape Architecture Department, Stillwater, OK

8:00–10:00 am **Lowell A/B**

Workshop 22: What Is the New Standard Material Transfer Agreement?

Sponsor: Intellectual Property Rights Working Group

Presiding: Janice Strachan, U.S. Plant Variety Protection Office, Beltsville, MD

The UN Food and Agriculture Organization (FAO) has just concluded negotiations for a Standard Material Transfer Agreement (sMTA). This workshop will bring together U.S. Government negotiators of the Material Transfer Agreement, USDA and industry experts. Come hear how the sMTA may affect you and the perspective from USDA's Agricultural Research Service and the seed industry. The CGIAR started using sMTAs in January 2007. Should the U.S. ratify the treaty or not? What are the pros and cons? This is your opportunity to voice your opinions on the new international treaty. We expect a lively and informative discussion of this important topic.

Overview of the International Treaty on Plant Genetic Resources for Food and Agriculture

June Blalock
USDA–ARS, Office of Technology Transfer, Beltsville, MD 20705-5131, June.Blalock@usda.gov

What Do sMTAs Mean for the Public Sector?

Mark W. Farnham
USDA–ARS, U.S. Vegetable Laboratory, Charleston, SC 29414, mfarnham@saa.ars.usda.gov

Why Not Continue to Do Business as Usual?

Speaker TBA

Who is Going to Pay for This?

John Grace
Pioneer Hi-Bred International, Inc.
Johnston, IA 50131-1004, john.grace@pioneer.com

Group Discussion

Moderator: Janice Strachan
U.S. Plant Variety Protection Office, Beltsville, MD 20705-2351, Janice.Strachan@usda.gov

8:00–12:00 pm **Herberger Ballroom 1**

Colloquium 4: High Tunnels—Season Extension Technology for Production of Horticultural Crops

Sponsor: Commercial Horticulture Extension (CHEX)

Presiding: Karen Panter, Extension Horticulture Specialist, Univ. of Wyoming, Laramie, WY

Plasticulture technology and in particular, season extending technology such as high tunnels for the production of a wide variety of horticultural crops, can offer a possible solution to minimizing the effect of the environment on crop production while also permitting growers to continue to farm in highly populated areas. High tunnels, although resembling traditional plastic covered greenhouses, are a completely different technology. In their purist form, they are considered non-permanent (removable) structures with no electrical service or automated ventilation or heating system, that is covered by a single layer of plastic compared to two layers used in a traditional plastic covered greenhouse. High tunnels do have water service for irrigation of the crops. Ventilation of the high tunnel is accomplished by manually rolling up the plastic sides. They can be used as season extenders in colder climates or as protection from the elements in warmer areas. By bringing in researchers from around the United States, attendees will learn the latest in information on horticultural crop production in high tunnels, practical procedures, physiological responses, and engineering principles pertaining to plant growth in high tunnels.

Objective:

Our objectives are to impart both practical information and related research on commercial practices used to produce horticultural crops (vegetables, small fruits, tree fruits and floral crops) in high tunnel type protective culture in the United States.

Overview of the Use of High Tunnels Worldwide

Bill Lamont*; Pennsylvania State Univ., Univ. Park, PA

In the United States the utilization of high tunnel technology for the production of horticultural crops is a relatively recent phenomena but high tunnels have been used for many years in countries outside of the United States. In the 1993 issue of *HortTechnology*: 3(1) p. 6-19, Dr. Sylvan Wittwer discussed the tremendous impact the use of plastics had on the production of horticultural crops worldwide. At that time there was a tremendous use of high tunnels for the production of horticultural crops in Asia, Italy, Spain, and the Mideast. The number of hectares devoted to production of horticultural crops in high tunnels has only continued to grow in recent years. High tunnels are used throughout the world to either extend (season extension) the marketing season or mitigate the adverse effects that rain (rainout shelters) has on the production of a crop. The use of season extension mainly occurs in the more temperate regions of the world and while the use of rainout shelters occurs in the more tropic regions. The use of high tunnels in their many forms continues to increase worldwide.

Engineering Principles Impacting High Tunnel Environments

Gene Giacomelli*; Univ. of Arizona, Tucson, AZ

High tunnels, a special type of greenhouse, have operational goals of season extension, crop quality improvement and new crop production opportunities to reach unique markets. They capitalize on the greenhouse effect as all enclosed plant growth structures, and they have many of the same design concerns as the larger more complex greenhouses. However, fewer and less automated environmental control systems are required for desired crop production. Tunnel designs are less complex, and less expensive than the large greenhouse ranges but they should be designed and constructed with fundamental assurance of structural stability, safety, efficient layout, appropriate environmental control, and effective crop management in mind. Tunnel super structure is typically steel or aluminum tubing, and the glazing is light weight polyethylene film attached with quick-release connections for removing or changing the covering. Environmental control is ventilation for cooling and de-humidifying. This is accomplished by opening sections of side walls and/or end walls by lifting or rolling the film aside. Watering and fertilization are accomplished by fertigation techniques, using water pressure powered mechanical injector devices that automatically and consistently blend concentrated fertilizer solution with

fresh water. The fertilizer solution is delivered to the crops by a drip irrigation system. This presentation will focus on the engineering aspects of the design, construction and operation of high tunnel plant production systems.

Management of the Soil Environment in High Tunnels

John Biernbaum*, Adam Montri; Michigan State Univ., Plant & Soil Science, East Lansing, MI

High tunnel soil, water and fertility management systems include a wide range of systems from polyethylene-film mulched drip fertigated beds to certified organic management based on maintaining high soil organic matter content (5–10%). Management considerations include: seasonal vs year-round production and exclusion of rain (moveable vs. stationary and three season vs. four season), soil nutrient and soluble salt management in the absence of leaching, impacts of elevated soil temperature, soil organic matter management, crop rotations, seasonal variations in soil moisture, irrigation management, irrigation water quality, and maintenance of long term soil and plant health. Perceived needs for high tunnel soil environment research will be outlined.

Vegetable Production in High Tunnels in the U.S.A.—State of the Art

Ted Carey*; Kansas State Univ. Olathe, KS

High tunnels are an increasingly important tool for vegetable growers in many parts of the USA. They provide a protected environment relative to the open field, allowing for earlier or later production of many crops, and often improving yield and quality, and allowing for improvements in disease and pest management. Producers ranging from small-scale market gardens to larger-scale farms are using high tunnels in various forms and ways to produce for early markets, to schedule production through extended seasons, and to capture premium markets. The rapid ongoing adoption of high tunnels has resulted in numerous grower innovations and increasing university research and extension programming to serve grower needs. We provide a selective overview, by region, of examples of vegetable production in high tunnels, and of research and extension responses to the emerging needs and opportunities presented by high tunnels for vegetable production.

Small Fruit Production in High Tunnels

Kathy Demchak*; Pennsylvania State Univ., Univ. Park, PA

Small fruit crops have been grown in high tunnels at Penn State since 2000. The original objectives were to investigate fall harvest season extension for 'Heritage' and 'Autumn Britten' primocane-bearing red raspberries, and to determine the viability of using tunnels for winter protection of 'Triple Crown' thornless blackberries. Raspberry plants produced at least 2 to 3 times as much marketable fruit in tunnels as in a previous field study at this site. Substantial summer and fall crops were produced, which was attributed to vigorous cane growth. 'Triple Crown' produced very high marketable yields in the tunnels, averaging over 28,000 kg·ha^{-1} during 2001–04, whereas 5 other blackberry cultivars including 'Chester' had failed to produce any fruit over a 6-year span in a previous field study. However, an examination of temperature data collected during the winter of 2001–02 found little difference in low temperatures inside the tunnel relative to outside. Using a close row spacing (1.2-m row centers) with 'Deborah', 'Heritage', and 'Josephine' primocane-bearing red raspberries, and a Wyeberry selection in 2001–02 was found to have numerous disadvantages. Strawberry production in a plasticulture system using either short-day or day-neutral cultivars was found to be viable; however, the primary benefit of high tunnels may be reliability of production rather than a yield increase. Challenges encountered included a change in the pest complex to that more typically encountered in greenhouse production; high soluble salts levels; in one year, considerable strawberry fruit damage from sowbug and earwig feeding; and with blackberries, an infestation of crown borers. Benefits included high yields and minimal disease pressure.

High Tunnel Tree Fruit Production—The Final Frontier?

Greg Lang*; Michigan State Univ., Plant & Soil Science, East Lansing, MI

High tunnel production systems typically utilize horticultural crops that are annually herbaceous, high in value, short in stature, and quick to produce. At best, tree fruits may only fit one of these criteria–high value. The most successful small-statured tree fruit, apples on dwarfing rootstocks, may have insufficient value to produce in high tunnels. However, sweet cherries may command high enough values in premium market niches to make high tunnel production strategies worth attempting. Sweet cherry production can be a risky endeavor, even in optimal climates, due to the potentially devastating effects of preharvest rain; consequently, environmental modification by tunnels in regions like the Great Lakes provides a significant risk reduction. Additional potential benefits such as possible protection from frosts, diseases, insects, wind scarring, etc. add further production value. Research tunnels were established in 2005 at two MSU experiment stations over established and newly-planted sweet cherry trees on dwarfing rootstocks to study and optimize modification of the production environment on: 1) vegetative and reproductive growth; 2) marketing season extension; and 3) reduction of chemical inputs for protection of cherries from diseases, insect pests, and/or physiological disorders. Results with tunnels thus far include: premium fruit quality and high crop value; increased leaf size and terminal shoot growth; decreased radial trunk growth; decreased cherry leaf spot and bacterial canker; increased powdery mildew; no control of brown rot; no infestation by plum curculio or cherry fruit fly; dramatically reduced Japanese beetle damage; and increased aphids and mites. These and other results, and challenges, for high tunnel tree fruit production will be reviewed.

Floral Crop Production in High Tunnels

Chris Wien*; Cornell Univ., Ithaca, NY

High tunnels are well suited for use in the production of floral crops, especially cut flowers. Through the increases in temperature afforded at both ends of the growing season, high tunnels allow earlier and later harvests than is possible in the field. During summer, rain protection and a relatively wind still environment provides an ideal growing environment to cut flower crops. In cool climates, the higher temperatures of a high tunnel permit culture of warm-season crops like celosia. Cut flower production allows intensive production on a small land area, and provides high level of income. For these reasons, high tunnels have become a standard part of cut flower growers' farms. Most commonly, they are single bay structures with roll-up sides, but use of multi-bay complexes is becoming more popular for larger-scale growers. In Southern areas, high tunnels are shaded in summer to lower interior temperatures and enhance production of shade-tolerant species. Overall, techniques of moderating temperature extremes with shading and ventilation,

or use of low tunnels inside to increase minimum temperatures, are important considerations for cut flower production. In the presentation, comparisons will be made in growth, earliness of production and yield, for several cut flower species grown in the field and an adjacent high tunnel.

Pest Control in High Tunnel Production

Laura Pottorff*, Colorado State University

8:00–4:00 pm **Cushing A/B**

Employment/Internship Services (Placement) Open

8:00–4:00 pm **Culturekeepers Hall West**

Registration Desk Open

9:00–10:00 am **Noble Boardroom**

Horticulture Certification Board (CPH Program) Meeting

Presiding: Jeff Norrie

9:00–2:00 pm **Kierland Grand Ballroom**

Exhibit and Poster Hall Open

10:00–10:30 am **Noble Boardroom**

Endowment Fund Committee Meeting

Presiding: Robert Lyons

10:00–11:30 am **Powell A/B**

Workshop 23: Water Conservation Practices for Nursery Crop Production

Sponsor: Nursery Crops WG

Presiding: Wagner Vendrame, Univ. of Florida, Homestead, FL

In October of 2006, the U.S. population hit 300 million and is increasing at the rate of one person every 12 seconds according to the U.S. Census Bureau. With this increasing population comes an increasing demand on water resources by municipal, commercial, industrial, and agricultural enterprises. Horticulture crop producers working together with regulatory and research entities have proactively engaged in the process of water conservation through the BMP process. The aim of this workshop is to discuss the unique challenges in water resource management for the production of container-grown nursery crops under different climatic conditions.

Topics for discussion include:

1. Substrates and Amendments—keeping more water in the pot
   a. Container substrates that improve water retention and quality of leachates
   b. Amendments that improve water retention.
2. Irrigation Water—source and application
   a. Reclaimed water.
   b. Irrigation water recycling/reuse.
3. Water Remediation Systems—preserving water quality
   a. Using plants to improve water quality
   b. Bacterial-based bioreactors

Objective:

The objective of this workshop is to discuss and share information on established, new and/or emerging production practices, systems, and technologies that conserve the quantity and the quality of water in the production of nursery crops.

Container Media That Improve Water Retention and Quality of Leachates

Gladis Zinati*; Rutgers Univ., New Brunswick, NJ

Container production of nursery crops has grown steadily generating quick and greater revenues. With the increase in prices and availability of sphagnum peat moss the interest within the nursery industry increased to identify alternative materials that are suitable for formulating container media. Many studies have evaluated container media derived from numerous organic and non-organic mineral components. Coir, softwood (pine, spruce, and fir) bark, dairy and swine compost, paper mill and municipal waste compost, peanut and rice hulls, cotton-gin, palm trunk fibers, pine chips, fly ash, sand, pumice, vermiculite, and clay are amongst these peat substitutes. Most of the alternative mixes can be used successfully to amend conventional substrates when used at proper ratios. However, with the increase in urban and suburban sprawl at unprecedented rates, the coexistence of urban and agriculture activities, and the stricter environmental regulations on water use and nutrient loading in effluents at production areas, nursery industry is searching for container media that maintain a level of nutrients without affecting crop productivity and minimize nutrient loss in leachates and runoffs into water bodies. Researchers have evaluated many of the conventional and alternative components by determining the chemical and physical properties of components and formulated container media. These properties which include nutrient availability, pH, soluble salts, bulk density, water holding capacity, hydraulic conductivity, and porosity are directly influenced by type, source, processing, consistency, age, particle size, and ratio of the individual components used to formulate the container media. Aeration and nutrient water retention are significant factors affecting plant growth, water use and nutrient losses. Although coir has been reported to have a good buffering capacity with similar or higher water holding capacity, others indicate that coir tends to have higher phosphorus (P) content and increases medium pH over time when compared to peat. The addition of compost swine or dairy compost at 10% or 20% increases water holding capacity and reduces air space than non-amended Douglas-fir bark container media. Research results show that reduction in nitrate nitrogen and ortho-P concentrations in effluents can be achieved by replacing vermiculite with composted pine bark without affecting plant growth. Additionally, substituting peat moss (V/V) with 60% to 80% composted pine bark provides optimum physical and chemical properties for growing nursery crops. Other researchers report that air space is two- to three- times higher in container media formulated with either 75% or 100% pine chips, respectively when compared to 100% pine bark with no significant differences in container capacity, available water, and unavailable water. Studies show that due to gravitational forces, container height affects the relative availability of water versus air. Therefore, reducing container height increases amount of water held in taller container of same volume. With ever changing technology and industry needs, researchers continue to evaluate container media that provide optimum physical and chemical properties, reduce water and fertilizer use, and enhance nursery plant growth.

Amendments That Improve Water Retention

Jim Owen*[1], Stuart Warren[2], Ted Bilderback[2], Dean Hesterberg[2], Alison Prehn[2], Joseph Albano[3]; [1]Oregon State Univ., North Willamette Research and Extension Center, Aurora, OR; [2]North Carolina State Univ., Raleigh, NC; [3]USDA/ARS/U.S. Horticultural Research Laboratory, Fort Pierce, FL

There is a rising need for increased water and nutrient use efficiency in ornamental container production to maximize profits while minimizing environmental impact. This presentation will review the highlights of six years of research, which investigated if pine

bark amended with a palygorskite-bentonite industrial mineral aggregate (clay) could increase water use efficiency, reduce phosphorus (P) leaching, and supply adequate P while maximizing growth of *Cotoneaster dammeri* C.K. Schneid. Skogholm. Clay amended pine bark (11% by vol.) increased substrate available water 4% compared to an 8 pine bark : 1 sand (v/v) substrate. With increasing clay rate from 0% to 20% (by vol.), both plant growth and net photosynthesis increased curvilinearly, with the calculated maximum occurring at H 11% clay amendment rate. Maximum water use efficiency (WUE = mls water retained in substrate ÷ total plant dry mass) and stomatal conductance occurred at 11% clay amendment rate. WUE increased 78% (203 $mL \cdot g^{-1}$) in the clay amended versus sand amended (11% by vol.) substrate. Clay amended substrates decreased dissolved reactive P effluent 34% when compared with the sand amended control. Plant elemental nutrient content of P increased when pine bark was amended with clay versus pine bark alone. The clay aggregate contained hydroxyapatite [$Ca_5(PO_4)_3OH$] as determined by XANES spectroscopy. Reducing the rate of P fertilization from 1.0× to 0.5× rate increased P use efficiency 54% in the clay-amended substrate. In a follow-up study, the clay amendment alone was able to supply adequate P to maximize growth when using an incomplete fertilizer (N and K). A pine bark substrate amended with 11% clay produced an equal size or larger plant with increased P mineral nutrient content that utilized water more efficiently while decreasing effluent P losses compared to an 8 pine bark : 1 sand (v/v) substrate.

Reclaimed Water

Genhua Niu*; Texas A&M Univ., Agricultural Research and Extension Center, El Paso, TX

Reclaimed water is the municipal effluent that has been treated for reuse, rather than discharged into a body of water. It is frequently used for irrigating golf courses and parks in many southern and southwestern states. Due to limited supply of fresh water and intense competition, use of reclaimed water for irrigating nursery crops may be inevitable in the near future. The major concern of using reclaimed water for irrigating ornamental plants is the high salinity which may cause damage and reduce growth on salt sensitive species. Greenhouse and field studies have been conducted by irrigating selected plants with synthesized saline solutions, simulating the composition of local reclaimed water, at various salinity levels. Results indicated that salt tolerance of a number of herbaceous perennials, groundcovers and woody ornamental plants was highly species dependent and a wide range of tolerance to salinity was found among the tested species. In addition to plant species selection, the type of substrate and irrigation management would also impact the salinity tolerance of landscape plants.

Irrigation Water Runoff Recycling/Reuse

Thomas Yeager*[1], Jeff Million[1], Joseph Albano[2]; [1]Univ. of Florida, Gainesville, FL; [2]USDA/ARS U.S. Horticultural Research Laboratory, Fort Pierce, FL

Surface water runoff is an important management issue for container plant production nurseries because nutrient-laden runoff discharged offsite contributes to the impairment of natural waters. Best Management Practices (BMPs) are currently used to address runoff management issues. The use of BMPs ensures the nursery operator of a science-based approach or resolution to a cultural or production practice issue based on best collective judgment. BMPs for surface water runoff and reuse will be discussed. However, the quantitative effect of a given BMP on the nursery is difficult to assess without several years of testing. A computer model to estimate the quantity and nutrient loading of surface water has been developed. Model outcomes based upon historical weather data and selected management practices would be used by nursery operators to help select BMPs, which will minimize the amount and reduce the nutrient content of runoff while minimizing the risks of producing an inferior crop. Runoff estimates would also help determine amounts available for reuse or discharge, which can aid in the development of nutrient and water management plans.

Using Plants to Improve Water Quality

Jyotsna Sharma*; Univ. of Florida, Quincy

Bacterial-based Bioreactors

P. Chris Wilson*; Univ. of Florida, Ft. Pierce

10:00–12:00 pm **Kirkland**

Workshop 24: Biochemistry of Fruit Color Development

Sponsor: Pomology (POM) Working Group

Presiding: Peter D. Petracek, Valent BioSciences Corporation, Long Grove, IL

Color is an important indices for fruit quality. This workshop will present an overview of recent advances in the biochemistry of color development. Recent studies on pathways of anthocyanin and carotenoid biosynthesis and new methods for measuring color pigments will be presented.

Objective:

This workshop will present on the recent advances in the biochemistry of fruit color development

Pathways of Anthocyanin Biosynthesis

John K. Fellman*; Washington State Univ., Pullman, WA

Impact of Carotenoid Biosynthesis on Fruit Color

Penelope Perkins-Veazie*; USDA, Lane, OK

Advances in Analysis of Anthocyanins and Carotenoids

Russell L. Rouseff*; Univ. of Florida, Lake Alfred, FL

10:00 am–12:00 pm **Lowell A/B**

Workshop 25: Demonstration of Laboratories Used in Teaching Plant Propagation

Sponsor: Propagation (PROP) Working Group

Presiding: Todd West, West Virginia Univ, Morgantown, WV

Members of the Propagation Working Group will present laboratories that work in teaching all aspects of plant propagation. Specific laboratories in various types of grafting, tissue culture, cutting propagation, seed propagation, division, separation and layering will be demonstrated. Most will be actual demonstrations with some presented via video display.

Objective:

Specific laboratories that work well in the teaching of propagation will be demonstrated during the workshop. This will be an interactive meeting with some hands on opportunities. The specific objective is to illustrate what works bet in teaching the various types of plant propagation.

Seed Labs for Plant Propagation

Robert Geneve*
Department of Horticulture, Univ. of Kentucky, Lexington, KY 40546

The objectives for my plant propagation course are to 1) exposure students to the technical skills utilized by commercial plant propagators; 2) gain the ability to retrieve and integrate new knowledge for problem solving; 3) conduct and interpret propagation experiments; and 4) clearly communicate the results of propagation experiments in both written and oral forms. Most of the course time used to fulfill these objectives occurs in a three hour lab period where the majority of lab exercises are set up as experiments. Some labs require only

class participation. Each student is responsible for conducting the experiment and then entering their data into a spreadsheet during the class period. Their results instantly update the cumulative class results projected onto the screen through a smart classroom setup. Once completed, students break-up into pairs for 5–10 minutes to discuss these results before initiating a broader class discussion. For three labs, students are required to prepare formal lab reports in a *HortScience* format. The final lab report is based on an independent experiment designed by each student team that is prepared as a poster and presented in an interactive poster session. The lab report format, examples of previous student reports and posters are available to students on-line. Seed lab exercises designed to illustrate the impact of water and light on seed germination and one exercise on seed dormancy principles will be presented and discussed in relation to these teaching objectives.

Use of Tropical Hibiscus for Instruction in Grafting

Kenneth W. Mudge*, Kelly Hennigan, and Peter Podaras
(Presented by Todd P. West)

Department of Horticulture, Cornell Univ., Ithaca, NY 14853. 2Department of Horticulture, SUNY Morrisville, College of Agriculture & Technology, Morrisville, NY

An instructional system involving tropical hibiscus (*Hibiscus rosa-sinensis*) was developed for teaching hands-on grafting skills as part of a traditional comprehensive course in plant propagation and also as part of an online grafting course. The advantages of using tropical hibiscus include the following: the absence of phenological constraints associated with seasonal changes in temperate woody species; the comparative ease of grafting hibiscus, assuring positive reinforcement of the student's learning experience, and the ease of propagating and growing hibiscus in the greenhouse for use at any time of year. The three methods included in these laboratory exercises are top wedge grafting—selected for its ease and high rate of success—T-budding, and chip budding. In addition to development of hands-on skills, the exercises are designed to teach students three of the most important requirements for successful grafting of any species, regardless of method. These requirements include cambial alignment, application of pressure between stock and scion, and avoidance of desiccation. An online rating tutorial and lab report form was developed for students to self-evaluate their grafted plants. This was originally published in *HortTechnology* 13:723-728.

Teaching Undergraduate Students to Use Applied Statistics to Analyze and Interpret Plant Propagation Data

Michael E. Compton*

School of Agriculture, Univ. of Wisconsin-Platteville, Platteville, WI 53818

The concepts of research and data analysis are foreign to many undergraduate and graduate students. However, we as instructors expect our students to understand and apply these concepts when discussing the results of our propagation laboratories. The purpose of this presentation is to demonstrate an exercise that teaches students how to apply the basic concepts of statistics to analyze continuous and non normal data, and how to interpret statistical outputs associated with these types of data. I will conclude with demonstrations on how to best present the results of propagation laboratories using tables and graphs.

Web-based Plant Propagation Lectures and Labs

Mack Thetford*[1] and Sandra B. Wilson*[2]

[1]West Florida Research and Education Center, Milton, FL 32572; [2]Indian River Research and Education Center, IFAS, Univ. of Florida, Fort Pierce, FL 34945-3138,

The UF plant propagation course (PLS 3221/5222C) was initially taught live on-site at each of four locations throughout Florida. In 2002 and 2004, it was completely restructured for state-wide distance delivery using interactive videoconferencing and WebCT. In 2006, it was restructured entirely for web-based statewide delivery to 7 locations, including our main campus in Gainesville. While hands-on labs were still taught at each location, web-based introductions and demonstrations were developed for several lab topics to assist the on site instructors and provide students with additional background information. Examples of web-based labs include an introduction to propagation substrates, preparing a cutting video, germination of fern spores, controlled pollination, rooting hormones, collecting and storing cuttings, an auxin application video, and propagation of woody and herbaceous cuttings. All web-based lecture and lab materials are available online (http://irrecenvhort.ifas.ufl.edu/Propagation/index.html) and password authorization can be obtained by contacting the authors.

10:00 am–12:00 pm **Merriam B**

International Advisory Council Meeting

Presiding: Richard Campbell

10:00 am–12:00 pm **Merriam A**

Cucurbit Crop Germplasm Committee Meeting

Presiding: Robert L. Jarret

10:30–11:00 am **Noble Boardroom**

Investment Trustees Committee Meeting

Presiding: Bruno Moser

11:00–11:30 am

Awards Committee Meeting **Noble Boardroom**

Presiding: George Wilson

11:30–12:00 pm **Noble Boardroom**

Scholarship Awards Committee Meeting

Presiding: Janet Cole

10:00–12:00 pm **Powell A/B**

Nursery Crops (NUR) Working Group Business Meeting

Chair: Wagner Vendrame

12:00–12:45 pm **Kierland Grand Ballroom**

Poster Session 37: Teaching Methods

(052) A Youth Community Garden as a Service Learning Project for the Capstone Course in Horticulture at Colorado State Univ.

Harrison Hughes*

(055) The Ohio State Univ. Nursery Short Course

Cheryl Cuthbert, Hannah Mathers*

(054) Web-facilitated Discussion Increased Knowledge Perception of Health-maintaining Properties of Fruits and Vegetables through the Unique Multi-institute, Multi-state, and Multi-disciplinary Course

Basavaraj Girennavar*, Daniel Lineberger, Bhimanagouda Patil

(053) Development of Organic Tropical Fruit Crop Courses at the Univ. of Puerto Rico

J. Pablo Morales-Payan*

12:00–12:45 pm **Kierland Grand Ballroom**

Poster Session 38: Seed & Stand Establishment

(094) Temperature during Seed Development Affects Size, Germinability and Storability of Lettuce Seeds

Samuel Contreras*, David Tay, Mark Bennett

(095) Pre-sowing Seed Treatment: Effect of Deep Sea Water Priming on Germination and Growth of Rice (*Oryza sativa* L.), Sweet pepper (*Capsicum annum* L.), and Wild Vegetables (*Cirsium setidens, Adenophora triphylla*, and *Codonopsis lanceolata* Trautv.

Won Hee Kang*, Byeong Sung Yoon, Surendra Shrestha

(096) Sensitivity of Lettuce Seeds with Reduced Response to Ethylene to Abscisic Acid during Germination

Jiyoung Hong*, Daniel Cantliffe, Iwanka Kozarewa

12:00–12:45 pm **Kierland Grand Ballroom**

Poster Session 39: Fruit Production/Management

(295) The Impact of Orchard Systems on Yield and Yield Efficiency of Redglobe Peach in the First Six Fruiting Seasons

Desmond R. Layne*

(297) Early Fuji Cultivar Performance in New Jersey

Winfred P. Cowgill, Jr.*, Wesley R. Autio, Martha Maletta

(298) Striped or Blushed? Studies on Honeycrisp Peel Color

Adriana Telias*, Emily Hoover

(299) The Influence of Climate on Fruit Shape for Four Low-chill Peach Cultivars

Todd Wert, Jeffrey G. Williamson*, Jose Chaparro, R.E. Rouse

(300) Alternatives to Traditional Hand Pruning for French Prunes

William Krueger*, Franz Niederholzer, Jeremy Nunes

(301) Seasonal Courses of Soil Respiration in an Olive Orchard under Different Conditions of Soil Humidity

Claudio Bertolla, Riccardo Gucci*

(302) Split Fertigation of Nitrogen and Phosphorus Fertilizers on Pears

Xinhua Yin*, Clark Seavert, Jinhe Bai

(303) Evaluation of Three Graft Methods in Two Grafting Periods with Two Rootstock Diameter and Three Scion Types in Soursop (*Annona muricata* L.) Propagation

Juan Manuel Gonzalez-Gonzalez, Salvador Guzman-Gonzalez*, Francisco Radillo-Juarez, Agustin Barrios-Perez

(304) Kiwifruit Vine Training in 'Hort16A': A Survey of New Zealand Growers

Michelle Leinfelder*, Shane Max

(305) Mobile Platforms Increase Orchard Labor Efficiency

James R. Schupp*, Tara Auxt Baugher, R. Matt Harsh, Katheryn Lesser, Benjamin Wenk

12:00–12:45 pm **Kierland Grand Ballroom**

Poster Session 40: Marketing and Economics 1

(063) An Apple Cultivar Survey to Evaluate Preferences and Buying Habits of Consumers at Roadside Stands

Duane Greene*

(064) Small Farmer Characteristics Influencing Farmers' Market Participation

Patrick Lillard*, Steve King, Jayne Zajicek

(065) Trials and Tribulations of Developing a Regional Farmers' Market

J.K. Pittcock*, Robert B. Young

(066) An Assessment of Indiana's Farmers' Markets

Christa Hofmann*, Jennifer Dennis

12:00–12:45 pm **Kierland Grand Ballroom**

Poster Session 41: Water Utilization & Management 1

(158) Growth of *Lisianthus, Eustoma grandiflorum*, as Affected by Irrigation with Saline Water

Luis A. Valdez-Aguilar*, Catherine Grieve, James Poss

(159) Response of *Ranunculus asiaticus* to Irrigation with Saline Water in Hydroponics

Luis A. Valdez-Aguilar*, James Poss, Catherine Grieve

(160) Developing a System to Compare Water Use of Contrasting Managed Landscapes

Victoria Frietze, Rolston St. Hilaire*

(161) Impact of Low-pressure Drip Irrigation and N Slow-release Fertilizer on Onion Yield and Quality

Alvaro Proano*, John Jifon, Piccinni Giovanni, Daniel Leskovar, Kil Sun Yoo, Shinsuke Agehara

(162) Plant Available Water and Pore-Size Distribution in Soilless Substrates

Krishna Nemali*, David Radcliffe, Marc van Iersel

(163) Managing Phosphorus in Simulated Constructed Wetlands

Sarah White*, Milton Taylor, Stephen J. Klaine, Ted Whitwell

12:00–12:45 pm **Kierland Grand Ballroom**

Poster Session 42: Ornamentals/Landscape and Turf 3

(413) The Green Roof Research Program at Michigan State Univ.

Bradley Rowe*, Kristin Getter, Jeffrey Andresen, John Lloyd

(414) Use of Date Palm in Landscaping

Fahed Al-Mana*

(415) Evaluation of 17 Herbicide Treatments for Phytotoxicity to 12 Ornamental Crops and Control of Two Weeds

Robert Stamps*, Annette Chandler

(416) Evaluation of Competition Between Trees and Turfgrass in the Landscape: Comparison of Rooting Dynamics

Christopher Hendrickson*, Kelly Kopp, Heidi Kratsch

(417) Response to Soil Drying of Three Australian Wildflower Species Varying in Drought Tolerance

Roger Kjelgren*, Lixue Wang, Daryl Joyce

(418) Relative Rooting Depths of Native Grasses and Amenity Grasses Used on Roadsides

Rebecca Brown*, Cynthia Percivalle, Sophia Narciewicz

(419) Influence of Soil Amendments and Microtopography on Rooting in a Created Tidal Freshwater Swamp in Southeastern Virginia

Sarah Dickinson*, J. Roger Harris, Lee Daniels, Alex Niemiera

(420) Evaluation of Urban Soil Compaction by Measurement of Penetration Resistance

Sandra Gonzales, Sudeep Vyapari*, Charles Holder, Mahmood Nachabe

(421) Efficacy and Comparison of Three Different Cultivation Techniques to Alleviate Soil Compaction, Salinity and Sodium Status on Golf Course Fairways

Kai Umeda*, Brian Whitlark

(422) Effect of Soil Moisture on Root Growth of Two Native Landscape Shrub Species

Matt Wilkin, Amy Wright*

(423) Mulch Type Influences Root Growth of Native Woody Shrub Species

Julie Guckenberger, Amy Wright*

12:00–12:45 pm **Kierland Grand Ballroom**

Poster Session 43: Genetics and Germplasm 2

(180) Inheritance of Value-added Traits in *Capsicum*

John Stommel*, Robert Griesbach

(181) Molecular Marker-assisted Selection of the Bs2 Bacterial Spot Resistance Gene in Diverse Pepper Cultivars and Breeding Lines

Soon Park*, Kevin Crosby

(182) Genetic Comparison among Chestnuts and the Related Species in Fagaceae by cpSSR markers

Eiichi Inoue*, Lin Ning, Hiroyuki Anzai, Hiromichi Hara

(183) Assessing Diversity in a Collection of Peach Germplasm using Simple Sequence Repeat (SSR) Markers

Ksenija Gasic, Robert Wallon, Vladislav Ognjanov, Schuyler Korban*

(184) Peach Rootstock Seedling Identification by DNA Fingerprinting with Microsatellite (SSR) Markers

Xiaoyu Liu, Gregory Reighard*, Ginger Swire-Clark, W. Vance Baird

(185) Variation in Root Vascular Bundle Arrangements among *Ipomoea batatas* (L.) Lam. Beauregard and Okinawan Cultivars

Arthur Villordon*, Don LaBonte

(186) Location of Wild Grapevine (*Vitis*)

Omar Franco-Mora*, Adriana Aurora Cortés-Sánchez, Ana del Carmen Rodríguez-Landero, Juan Guillermo Cruz-Castillo, Juan Miguel Pérez, Joaquín Madero-Tamargo

(187) Fruit Anthocyanins in *Vaccinium praestans* Lamb.

Kim E. Hummer*, Robert Durst

(189) Determination of Genetic Distances between Plantain Accessions using RAPD Markers

Salvador Guzman-Gonzalez*, Maria-Rocio Nadal-Medina, Juan Manuel Gonzalez-Gonzalez

1:15–2:00 pm **Kierland Grand Ballroom**

Poster Session 44: Vegetable Crops Management 3

(281) Pruning Systems for Specialty Tomatoes

Welsey Kline*, Stephen Garrison, June Sudal

(282) Effect of Sowing Date on Yield and Bulb Quality in Onion in Northern Sonora, México

Rubén Macias-Duarte, Raul Leonel Grijalva-Contreras*, Fabián Robles-Contreras, Manuel de Jesus Valenzuela-Ruiz

(283) The Impact of Biodiversity during the Transition to Organic Vegetable Production

Ajay Nair*, Mathieu Ngouajio, John A. Biernbaum, Michael J. Brewer, George W. Bird, Sieglinde S. Snapp, Dale R. Mutch

(284) The Impact of Row Width and Plant Population on Table Beet Size and Yield

Julie Kikkert*, Stephen Reiners

(285) Ecophysiology, Dynamics, and Bulking Modeling of Cut and Peel Carrots

Rajasekaran R. Lada*, Azure D. Adams

(286) Kaolin Particle Film Product Applications Before Harvest Begins May Not Improve Marketable Yields of Fresh Tomatoes

Brian A. Kahn*, John P. Damicone, Lynda K. Wells

(287) Enhanced Glucosinolate Concentration in Cabbage by Foliar Jasmonic Acid Application

Vince Fritz*, Anne M. Bode, Veronica L. Justen, Todd Schuster

(288) Cover Crop and Tillage Effects on Leaf Area Index and Above-ground Biomass Yields of Six Common Dry Bean Cultivars

Wayne Whitehead*, Bharat Singh

(289) Growth and Yield of Sweet Pepper (*Capsicum annum* L.) Genotypes in the Dry Tropics of Mexico

Francisco Radillo-Juarez*, Juan Manuel González-González, Jaime Molina-Ochoa, Luis Antonio Vargas-Ortega

(290) Effect of Harvesting Stage on Bulb Firmness and Single-centeredness in Winter-sown onions

Christopher Cramer*, Neel Kamal

(291) Glucosinolate Accumulation in Turnip as Affected by Cultivar and Growth on Colored Mulches

Veronica L. Justen*, Vincent A. Fritz, Min Wang

(292) Two Pruning Evaluation Systems on Three Indeterminate Growth Saladette Tomatoes (*Lycopersicon esculentum* Mill) Hybrids.

Everardo Zamora*, Santiago Ayala, Jose Guerrero, Jose Juvera

(293) Effects of Plant Source, Age, and Foliar Molasses Application on °Brix Readings of Kale Extracts

Lingyu Huang, Changzheng Wang*, Michael Bomford

(294) Comparing Tillage, Rotation, and Production Inputs in a Long-term Vegetable System

Greg Hoyt*

1:15–2:00 pm **Kierland Grand Ballroom**

Poster Session 45: Vegetable Breeding

(223) Interspecific Transferability of Watermelon EST-SSR Markers in Cucurbit Species

Amnon Levi, W. Patrick Wechter, Angela Davis*, Nurit Katzir, Yaacov (Kobi) Tadmor, Kai-shu Ling, Umesh O.U. Reddy

(224) The Use of Transgenic Rootstocks in Vegetable Crops: Trait Movement and Regulatory Issues

Bubba LaMolinare*, Stephen King

(225) 'Pacal' Orange-Casaba, and 'Chujuc' Western-Shipper Cantaloupe: Two New Melon Cultivars from the Texas Agricultural Experiment Station

Kevin Crosby*, John Jifon, Daniel Leskovar

(226) Characterization of New Mutant Affecting Multiple Morphological Traits in Watermelon

Haejeen Bang*, Wenge Liu, Stephen King

(227) Resistance to a New Race of the Cucurbit Powdery Mildew Present in Arizona and California

James D. McCreight*, Michael D. Coffey

(228) Carotenoid Pathway Genes and Accumulation of β-carotene in *Cucumis melo* L.

Hugo E. Cuevas*, Jack E. Staub, Philipp Simmon, James D. McCreight, Juan E. Zalapa

(229) Screening *Cucurbita pepo* for Resistance to *Phytophthora capsici*

Les Padley, Jr.*, Pamela Roberts, Eileen Kabelka

(230) Resistance to *Phytophthora capsici* within Winter Squash (*Cucurbita moschata*) Derived from a Wild *Cucurbita* Species

Eileen Kabelka*, Les Padley, Jr., Pamela Roberts, Leandro Ramos, Miriam Martinez, Waldemar Klassen

(231) Characterization and Selection of Pure-line Plants Developed from Anther Culture for Varietal Improvement of Sweet Pepper (*Capsicum annuum* L.)

Won Hee Kang*, Surendra Lal Shrestha

(232) Characterization of the Gene Encoding Radish (*Raphanus sativus* L.) PG-inhibiting Protein

Byung-Ho Hwang, Kenneth Gross, Jongkee Kim*

(233) Screening Onion Cultivars for Resistance to *Fusarium* Basal Rot Using Multiple New Mexico Isolates

Ashish Saxena*, Christopher Cramer

(234) Second Generation of Tomato Acylsugar Lines With Reduction in *S. pennellii* DNA Content are Resistant To Silverleaf Whitefly and Improved for Fruit Characters

Ricardo Lobato-Ortiz*, David J. Schuster, Martha A. Mutschler

(235) Begomovirus Resistance Not Found in *Solanum habrochaites* Accession LA1777 Recombinant Inbred Lines of Tomato

Aliya Momotaz, John Scott*, David Schuster

1:15–2:00 pm **Kierland Grand Ballroom**

Poster Session 46: Floriculture 4

(365) Year-round Production of Cut Sunflower in Hawaii

Richard A. Criley*

(366) Peonies as Field Crown Cut Flowers for Alaska

Patricia Holloway*, Janice Hanscom

(367) Increasing Snapdragon Cut Flower Yields with Early Pinching

H. Chris Wien*

(368) Effect of Silverthiosulphate (STS) and Sucrose on Postharvest Display Life of Cut Panicles of *Ipomopsis rubra* L.

Wayne Mackay*, Narendra Sankhla, Cynthia McKenney

(369) Establishment of Proper Handling Protocols for Increased Growth After Storage of Dried Tubers of *Ranunculus asiaticus*

Christopher Cerveny*, William B. Miller, Alan G. Taylor

(370) Oklahoma Floriculture Survey

Mike Schnelle*, Todd Cavins

(371) Using Poinsettia Cultivar Trials to Fulfill the University's Teaching Mission: Experiential Student Learning Through an Open House Project

Daniel F. Warnock*

(067) Using Poinsettia Cultivar Trials to Fulfill the University's Research Mission: Consumer Preference Results from a Retail Florist Shop and Two Open House Locations

Kimberly Williams*, Christopher Catanzaro, Laura Brannon

(373) Using Poinsettia Cultivar Trials to Fulfill the University's Engagement Mission: Stakeholder Impacts through Open House Events

Christopher Catanzaro*, Sarabjit Bhatti, Brian Copeland

(375) Consumer Preference of New Guinea Impatiens Grown in South Florida

Kimberly Moore*, Luci Fisher

(376) Virtual Grower: Estimating Greenhouse Energy Costs and Plant Growth Using New Computer Software

Jonathan Frantz*, Erik Runkle, Matthew Blanchard

James Locke, Charles Krause

1:15–2:00 pm **Kierland Grand Ballroom**

Poster Session 47: Postharvest 3

(257) Neural Network Models to Predict Shelf Life of Greenhouse-grown Lettuce

Wayne Lin*

(258) Sensory Evaluation Quality of Tomato 'Florida' 47: Effect of Maturity, Storage Temperature, and 1-MCP

Anne Plotto*, Elizabeth Baldwin, Kevin Goodner, Jan Narciso

(259) Instrumental Evaluation of Flavor Components, Color, and Firmness of Tomato 'Florida' 47: Effect of Maturity, Storage Temperature, and 1-MCP

Elizabeth Baldwin*, Anne Plotto, Jan Narciso, Kevin Goodner

(260) Cold Storage Injury and Antioxidant Systems of Pawpaw During Cold Storage

Federica Galli, Douglas Archbold*, Kirk Pomper

(261) Quality Comparisons among Orange-fleshed Honey Dew Genotypes Following Storage

Gene Lester*, Robert Saftner, D. Mark Hodges

(262) Quality and Shelf-life of Fresh-cut Tropical Pumpkin

Sofia Macchiavelli, Linda Wessel-Beaver*

(263) Predicting Index of Storage Potential of Lettuce

Jeonghee Choi*, Mooncheol Jeong, Dongman Kim, Yejeong Kang, Seung Koo Lee

(264) Packaging Methods and Storage Temperature Affect the Gas Composition and Quality of Chinese Cabbage

Jin-Cheol Jeong*, Ki Deog Kim, Ju Sung Im, Jong Nam Lee, Chun Woo Nam, Dong-Lim Yoo

(265) Short-term Storage Options for Fresh-market Onions

James Shrefler, Penelope Perkins-Veazie*, Merritt Taylor, Tony Goodson

1:15–2:00 pm **Kierland Grand Ballroom**

Poster Session 48: Viticulture and Small Fruits 3

(331) Predicting Berry Splitting Indices in Rabbiteye and Southern Highbush Blueberries Using Fruit Firmness as an Indicator

Donna Marshall*, James Spiers, Stephen Stringer

(333) Nitrogen Fertigation is Less Efficient but Safer than Granular Fertilizer Application in Newly Planted Blueberry

David R. Bryla*, Rui Machado

(334) Interactions of Pollination, Seed Set, Berry Weight, and Yield in Highbush Blueberry (*Vaccinium corymbosum* L.)

Mark Ehlenfeldt*, Robert Martin, Jr.

(335) Season Extension of Primocane-fruiting Blackberry in a Mild Climate using High Tunnels

Ellen Thompson*, Bernadine C. Strik

(336) Evaluation of Alternative Chemicals and a Cultural Strategy for Managing Gray Mold on Raspberries

Graham Sanders*, Elsa Sanchez, Kathleen Demchak

(337) A Heat-unit Model for Predicting Blackberry Flowering Time

Brent L. Black*, James W. Frisby, Kim S. Lewers, Fumiomi Takeda

(338) Effects of Irrigation Method and Level of Water Application on Fruit Size and Yield during the First Year of Production in Red Raspberry

David R. Bryla*, Diane Kaufman, Bernadine C. Strik

2:00–3:00 pm **Lowell A/B**

Oral Session 34: Propagation

Moderator: to be announced

2:00–2:15 pm

Effect of Light and Stem Banding Treatments on Rooting in Quercus bicolor Willd., *Quercus robur* L., and *Quercus macrocarpa* Michx. Cuttings

Naalamle Amissah*, Nina Bassuk

2:15–2:30 pm

Effect of Medium, Date, and Node Position on Rooting of *Miscanthus xgiganteus* Stem Cuttings

Jeong Hong*, Mary Meyer

2:30–2:45 pm

Gibberellin Requirement for Coreopsis Species Seed Germination

Dzingai Rukuni*, Jeffrey G. Norcini, Daniel J. Cantliffe

2:45–3:00 pm

Day-length during Seed Development Affects Size, Germinability, and Storability of Lettuce Seeds

Samuel Contreras*, Mark Bennett, David Tay

2:00–3:00 pm **Rainmakers Ballroom B**

Workshop 26: Technology: Misused or Misunderstood?

Sponsor: Computer Applications in Horticulture (COMP)

Presiding: Michele Scheiber, Univ. of Florida, Apopka, FL

As technological capabilities increase, a question arises: is technology under-utilized or over-utilized in our efforts to efficiently collect, manage and present data. Topics will include but are not limited to novel approaches for managing data acquisition and interpretation and the use of programs such as PowerPoint to enhance (rather than hinder) the efficient and effective presentation of data. In addition, limitations of current technology and the availability of resources including technical support, appropriate training, and funding for equipment will be discussed in an open forum format.

2:00–3:30 pm **Rainmakers Ballroom A**

Oral Session 35: Ornamentals/Landscape and Turf 3

Moderator: Roger Kjelgren; rkjel@usu.edu

2:00–2:15 pm

Water Relations of Three Species Growing as Street Trees in Bangkok, Thailand During the Monsoonal Dry Season

Roger Kjelgren*, Ladawan Puangchit, Chalita Sriladda, Montathip Sommeechai

2:15–2:30 pm

Impact of Saline Water Irrigation on Growth and Garden Performance of Ten Herbaceous Perennials and Groundcovers

Genhua Niu*, Denise Rodriguez

2:30–2:45 pm

Effect of Provenance on Drought Tolerance of *Taxodium distichum*

Geoffrey Denny*, Michael Arnold, Wayne Mackay, Leo Lombardini, H. Brent Pemberton

2:45–3:00 pm

Characterizing the Runoff from Single-family Residential Landscapes

Loren Oki*, Steve Greco, Jay Gan, Marylynn Yates, Darren Haver

3:00–3:15 pm

Production of Lotus (Nelumbo) in Containers

Daike Tian*, KenTilt, Floyd Woods, Jeff Sibley, Fenny Dane

3:15–3:30 pm

Guidelines for Describing Ornamental Peach

Dongyan Hu*, Donglin Zhang, Junqiu Fu, Zuoshuang Zhang

2:00–3:45 pm **Powell A/B**

Oral Session 36: Fruit and Nut Production 3

Moderator: Glenn Wright

2:00–2:15 pm

A Review of the Spanish Olive Industry and Potential Market Development in the United States

Michelle Leinfelder*, Joan Tous Marti, Agusti Romero, Nuria Mallen Vivo

2:15–2:30 pm

Green Pruning of Mazzard-grafted 'Sweetheart' Sweet Cherry Produces Small Pedestrian Trees and Excellent Quality Crops

Roberto Nunez-Elisea*, Maria Lilia Caldeira

2:30–2:45 pm

Exploring the Potential of New Promising Mango (*Mangifera indica* L.) Hybrid cv. Faiz Kareem

Ishtiaq Ahmad*, Saeed Ahmad Malik, Mehboob-ur-Rahman, Aman Ullah Malik, Raheel Anwar

2:45–3:00 pm

Impact of Anthracnose on Avocado on Production in Kenya

Lusike Wasilwa*, Joseph Njuguna, Teddy Morelock

3:00–3:15 pm

Recently Released Asian Pear Cultivars in Korea

Sam-Sog Kang*, Kwang-Sik Cho, Il-Sheob Shin, Yoon-Kyeong Kim, Sang-Bouk Jeong, Dong-Soo Son, Jang-Hoon Song, Hyeon-Mo Cho, Gyung-Hy Hong, Yong-Uk Shin, Myung-Su Kim

3:15–3:30 pm

Performance of High-density Peaches in New York State

Terence Robinson*, Stephen Hoying, Robert Andersen, Gabino Reginato

3:30–3:45 pm

The Date Industry in the United States

Glenn Wright*

2:00–3:45 pm **Greenway A/B**

Oral Session 37: Genetics and Germplasm 2

Moderator: David Zlesak, zles0001@umn.edu

2:00–2:15 pm

A Plant Breeders' Guide to CSREES, or, How to Help CSREES Help You

Ann Marie Thro*

2:15–2:30 pm

Fingerprinting and Genetic Stability of Rubus Using Molecular Markers

Nina Castillo*, Barbara Reed, Nahla Bassil

2:30–2:45 pm

Detecting Cultivar Influence within Invasive Populations of Japanese Barberry (*Berberis thunbergii* DC.) using AFLP

Jessica Lubell*, Mark Brand, Jonathan Lehrer

2:45–3:00 pm

Genetic Diversity of *Fragaria iinumae* and Based on Microsatellite Markers

Wambui Njuguna*, Nahla Bassil, Kim Hummer, Tom Davis

3:00–3:15 pm

A Comparative Analysis of Genetic Diversity in Indian Bitter Gourd (*Momordica charantia* L.) Genotypes using RAPD and ISSR Markers

Tusar Kanti Behera*, Anand Kumar Singh, Jack E. Staub

3:15–3:30 pm

A Dominant Male Sterility Gene, RSMS1, Derived from Female *Rosa setigera* Mich. and Its Introgression into Modern Roses

David C. Zlesak*, Kathy Zuzek, Stan C. Hokanson

3:30–3:45 pm

Development of a Real-time NASBA Assay for Detection of Apple Scar Skin Viroid

Seong Heo*, Hyun Ran Kim, Kyung Hwa Lee, Sam Sog Kang, Hyeon Mo Cho

2:00–4:00 pm **Noble Boardroom**

Education Advisory Council

Presiding: Janet Cole

2:00–4:00 pm **Merriam B**

Extension Advisory Council Meeting

Presiding: Matthew Kleinhenz

2:00–4:00 pm **Kirkland**

Oral Session 38: Floriculture 3

Moderator: Daniel F. Warnock, dwarnock@uiuc.edu

2:00–2:15 pm

Vernalization of Remontant Iris

Richard L. Harkess*, Ritu Dhir

2:15–2:30 pm

The Optimum Temperature for Vernalizing Campanula 'Birch Hybrid' Depends on the Flowering Response being Assessed

Sonali Padhye*, Arthur Cameron

2:30–2:45 pm

Cooling Requirement of a Hybrid Nobile Dendrobium for Flowering

Christine Yen*, Yin-Tung Wang, Terri Starman

2:45–3:00 pm

Preventing Cold-storage-induced Bud Necrosis in 'Mona Lisa' Lilies

Hye-Ji Kim*, William Miller

3:00–3:15 pm

Variation in Chilling Sensitivity among Eight Dieffenbachia Cultivars

Qiansheng Li*, Jianjun Chen, Robert Stamps, Lawrence Parsons

3:15–3:30 pm

Abnormal Flower Formation and S-adenosylhomocysteine Hydrolase Gene Expression in Response to High Temperature of Chrysanthemum

Eun Joo Huh*, Seong Yeol Choi, Young Ran Lee, Dae Hoe Goo, Chun Ho Pak

3:30–3:45 pm

Environment Impacts Impatiens Resistance to Western Flower Thrips Feeding Damage

Daniel F. Warnock*, Saad Hassan

3:45–4:00 pm

Bedding Plant Plugs Suffering from "Stubby Plant Syndrome"

Brian Krug*, Brian Whipker, Jonathan Frantz, Ingram McCall

2:00–4:00 pm **Herberger Ballroom 1**

Workshop 27: Production in High Tunnels: Follow-up to the Colloquium

Sponsor: Commercial Horticulture Extension (CHEX)

Moderator: Karen Panter, Extension Horticulture Specialist, Univ. of Wyoming, Laramie, WY

This Workshop is a continuation of the Colloquium titled "High Tunnels-Season Extension Technology for Production of Horticultural Crops," sponsored by the Commercial Horticulture Extension working group (CHEX). In the Colloquium, a slate of eight speakers will present information on various topics: overview of high tunnels; engineering principles; soil management; production of vegetables, small fruits, floral crops, and tree fruits; and biocontrol of insect pests. Colloquium speakers will be present during this Workshop to answer questions and discuss specifics of uses of high tunnels. Open dialogue is highly encouraged. Time will be allotted for attendees working with high tunnels to relate their experiences.

Objective:

Our objective is to promote open discussion following the Colloquium on high tunnels. Thoughtful comments, questions, and dialogue among speakers, workshop, and colloquium attendees is encouraged. Aspects of crop production in high tunnels discussed during the colloquium will include fruit and ornamentals production, pest management, and soil management.

2:00–4:00 pm **Rainmakers Ballroom C**

Workshop 28: Specialty Crop Production Techniques

Sponsor: Vegetable Crops Management

Presiding: Wesley Kline, Rutgers Univ., Millville, NM

In-depth discussions on production techniques for specialty fruits, herbs and vegetables occur infrequently at ASHS meetings. This workshop has been designed to allow detailed discussions following oral or posters presentations. In addition to the presenters, workshop attendees are encouraged to participate by making short presentations on specific crops in which they have experience. This open-ended approach will allow all members attending the workshop to assume an active role and contribute invaluable resources to the fullest extent possible.

Objective:

The objective of this workshop is to have in-depth discussions on different production techniques related to specialty crops.

3:00–4:00 pm **Rainmakers Ballroom B**

Computer Applications in Horticulture (COMP) Working Group Business Meeting

Chair: Michele Scheiber

Friday, July 20

7:00–6:30 pm

Controlled Environment Tour

Visit the University of Arizona's Controlled Environment Agriculture Center (CEAC), Tucson, AZ, and EuroFresh Farms in Willcox, AZ. Established in 2000 to develop Controlled Environment Agriculture as an economically, environmentally and socially sustainable agricultural option, the CEAC facilities, including advanced technology greenhouses, offer an environment friendly to crop growth, hydroponics and plant research in a controlled environment. EuroFresh Farms is a leader in the greenhouse industry that produces a consistent, high volume supply of premium pesticide-free tomatoes throughout the year using the state-of-the-art controlled environment production facilities. In 2004, Eurofresh Farms produced over 100 million pounds of tomatoes, representing a large share of the U.S. greenhouse tomato market.

American Society for Horticultural Science • *Book Order Form*

	Price		Postage		International		
Title	Member	Nonmember	U.S.	Can/Mex	Surface	Airmail	***Total***
Muscadine Grapes	54.95	59.95	5.00	8.00	8.00	15.00	
Watermelon: Characteristics, Production and Marketing	50.95	59.95	5.00	8.00	8.00	15.00	
Strawberry Research to 2001	29.95	34.95	5.00	8.00	8.00	15.00	
Brooks & Olmo Register of Fruit and Nut Varieties 3RD ED.	39.95	44.95	8.00	12.00	12.00	26.00	
Winning the Organics Game	19.95	19.95	5.00	8.00	8.00	15.00	
Weed Management in Horticultural Crops	10.95	14.95	5.00	8.00	8.00	15.00	
Cucurbitacea '02	35.95	44.95	5.00	8.00	8.00	15.00	
Proceedings of the Greenhouse Tomato Seminar	6.95	6.95	4.00	7.00	7.00	20.00	
Vegetable Production Using Plasticulture	6.95	6.95	4.00	7.00	7.00	20.00	
1st Intl. Conference on the Processing Tomato and 1st Intl. Symposium on Tropical Tomato Diseases	9.95	9.95	4.00	7.00	7.00	20.00	
Classic Papers in Horticultural Science	24.95	29.95	5.00	8.00	8.00	15.00	
Knight's Horticultural Papers	24.95	33.95	5.00	8.00	8.00	15.00	
Trends in New Crops and New Uses	79.95	89.95	8.00	12.00	12.00	26.00	
Progress in New Crops	49.95	54.95	8.00	12.00	12.00	26.00	
Perspectives on New Crops and New Uses	69.95	79.95	8.00	12.00	12.00	26.00	
New Crops Compendium CD-ROM	69.95	69.95	5.00	8.00	8.00	15.00	
SET: Perspectives on New Crops and New Uses + New Crops Compendium CD-ROM	89.95	99.95	8.00	12.00	12.00	26.00	
SET: Progress in New Crops + Perspectives on New Crops and New Uses + New Crops Compendium CD-ROM	139.95	154.95	16.00	24.00	24.00	35.00	
Presidential Addresses 1903–2003	49.95	55.95	5.00	8.00	8.00	15.00	
ARCHIVES:							
1990–93 Journal, HortScience, and HortTechnology	29.95	29.95	5.00	8.00	8.00	15.00	
1994–96 Journal, HortScience, and HortTechnology	29.95	29.95	5.00	8.00	8.00	15.00	
1997–98 Journal, HortScience, and HortTechnology	29.95	29.95	5.00	8.00	8.00	15.00	
1999–2001 Journal, HortScience, and HortTechnology	29.95	29.95	5.00	8.00	8.00	15.00	
2002 Journal, HortScience, and HortTechnology	29.95	29.95	5.00	8.00	8.00	15.00	
2003 Journal	29.95	29.95	5.00	8.00	8.00	15.00	
2003 HortScience	29.95	29.95	5.00	8.00	8.00	15.00	
2003 HortTechnology	19.95	19.95	5.00	8.00	8.00	15.00	
2004 Journal	39.95	39.95	5.00	8.00	8.00	15.00	
2004 HortScience	39.95	39.95	5.00	8.00	8.00	15.00	
2004 HortTechnology	24.95	24.95	5.00	8.00	8.00	15.00	
Anthracnose on Strawberry (CD)	44.95	49.95	2.00	5.00	8.00	10.00	

ORDER ONLINE TODAY:
http://ashs.org/shop/home.php

Virginia residents add 5% sales tax: _____

Total cost: _____

Name _____

Address _____

City _____ State/Country _____ Zip _____

Phone _____ Fax _____ E-mail_____

Payment method (in U.S. dollars, drawn on a U.S. bank). Make checks payable to American Society for Horticultural Science:

___ Check # _____ **Total $** _____ ___ American Express ___ VISA ___ MasterCard

Card #_____ Exp. Date _____ Name on card _____

Signature (req.) _____ Date _____

113 S. West St. #200, Alexandria VA 22314-2851 • 703.836.4606 • fax 703.836.2024 • ashs@ashs.org • ashs.org

rev. 6/06