

*A publication of the International Society for Horticultural Science*

# Chronica Horticulturae



## **Horticultural highlights**

Automated disease detection – cutting edge technology available for farmers in India • History and current status of grafted vegetables in Turkey  
• Propagating crotons from leaves

## **Symposia and workshops**

All Africa Horticultural Congress • Horticulture in Europe • Tropical and Temperate Horticulture • Flower Bulbs and Herbaceous Perennials  
• Apple • Lychee, Longan and Other Sapindaceae Fruits • Persimmon  
• Hortimodel2016 • Sensing Plant Water Status • Postharvest

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# > ISHS representing all continents of the globe

Ryutaro Tao, ISHS Treasurer



> Ryutaro Tao

## Board representation throughout the globe

I am very excited to tell you about the new global representation of the ISHS Board that was approved last year. Since August 2014, I have been serving as the first ISHS Board member from Asia under the Rules of Procedure for Board Elections that were approved by ISHS Council in Fortaleza in 2012. Although my responsibilities on the ISHS Board are to serve ISHS members all over the globe, I find myself in a unique position of being able to convey messages from Asian members and countries and bring Asian issues to the forefront of the ISHS agenda. The Council's decision in 2012 was timely and fruitful and has allowed the Society to develop stronger connections with Asia. For example, the II Asian Horticulture Congress (AHC) was very successful and featured good representation from ISHS and, of course, from Asian country delegates. Needless to say, the III AHC, to be hosted by the Horticultural Science Society of Thailand in 2020, is expected to be just as successful. Considering the positive outcome stemming from the appointment of an Asian representative, the Board decided to further improve its structure by broadening its worldwide representation. It was therefore proposed to the ISHS Council that the new Board should be composed of a President elected at large, plus one elected member from each of the following six regions: North America/Caribbean/Central America, South America, Africa, Europe, Asia, and Oceania. The current "At Large" position will be replaced by a con-

tinental representative. The Board will then consist of seven elected members, an increase of one person in comparison to its current composition. This proposal was accepted by Council at the Quebec meeting last August and will be implemented for the next Board election during IHC2018. With this new Board structure, the Society hopes to be even more representative and responsive to horticulture worldwide.

The ISHS Board members usually meet twice a year to report on their activities, to make decisions on the operations of the Society and to strategically develop future directions and plans for the Society. Board meetings also provide a very good opportunity to interact with local horticultural representatives. Thus, the current Board is making a conscious effort to conduct its meetings on all continents so that it can be exposed to different views, ideas, opinions, and voices from around the globe, to make the ISHS a truly international Society. The first meeting of the current Board was held in Brisbane (Oceania) during IHC2014, followed by Kyoto (Asia), Leuven (Europe), Istanbul (Europe), Taipei (Asia), Quebec City (North America), and Xi'an (Asia). The next meeting is planned to be held in Antananarivo (Africa), in conjunction with the Executive Committee meeting. The last meeting for this Board's term before IHC2018 is likely to be somewhere in South America, and we are exploring this option at the moment. The current Board members are eager to reach out to all corners of the world to promote ISHS and horticulture,

and we are very pleased that the next Board will consist of a broader representation from all around the globe.

## ISHS financial situation and future prosperity

As the Board member responsible for finances, I feel I should report in my editorial on the financial situation and status of the ISHS, especially in view of the increase in membership fees during the fiscal year 2016. The budget for the year 2016 was initially prepared and approved by Council in Brisbane during IHC2014. However, because of a slightly lower than expected membership, and new investments made for publications, the adjusted budget suggested that we would show a deficit. Raising the cost of *Acta Horticulturae* or journal subscription fees was not an option. Thus, at its Istanbul meeting in August, 2015, the Board discussed many options and, in a letter to Council dated September 20<sup>th</sup>, 2015, informed the Council that membership dues needed to be increased to balance the budget for the year 2016. There was little objection by the Council at the time and the result of the actions taken was that our accounts have become healthy again. The Board and the Society are now in a position to make the needed investments without putting the accounts at risk. Fortunately, the increase in dues did not affect the number of ISHS members, a possible consequence we considered when making the decision. Indeed, the membership for 2016 was slightly higher than the previous year. The Board, however, is continuing to work hard to increase membership worldwide and further expand the benefits of being an ISHS member. We feel that promoting the Society to the wider horticultural science community, and particularly to the countries where horticulture is rapidly expanding, should make our Society stronger than ever. Our initiatives focusing on younger members, for example, to award the best student oral and poster presentations at all symposia, and to attract young minds to actively participate in making ISHS into a modern society that meets the needs of emerging horticultural scientists, should also be beneficial for future generations of members. The Board remains in a listening mode and is seeking your suggestions on ways to keep our Society thriving and returning value to its members. ●



> ISHS is a society for members from all around the world.

# Message from the President



## XXX. INTERNATIONAL HORTICULTURAL CONGRESS

12-16 AUGUST 2018  
ISTANBUL / TURKEY  
[www.ihc2018.org](http://www.ihc2018.org)

At the ISHS Board meeting in March this year, the Board confirmed the decision of the ISHS Council in Portugal in 2010 on the venue for IHC2018. The XXX International Horticultural Congress will be convened in Istanbul, Turkey from 12<sup>th</sup> to 16<sup>th</sup> August, 2018.

We wish our colleagues in Turkey all success and invite all members of ISHS to promote and fully support this event – [www.ihc2018.org](http://www.ihc2018.org).

At the last Council meeting in August 2016, there was considerable discussion on whether IHC2018 should be held in Turkey or transferred to another country. At that meeting, the Council requested that the Board thoroughly review the proposal and plans of the IHC2018 Steering Committee. In the interim period, we requested and have received detailed reports from the IHC2018 Steering Committee, and DEKON (the Professional Conference Organiser). In addition, we received letters of support from the Minister for Food, Agriculture and Livestock and Turkish Embassies. We sent a representative of ISHS in January this year to meet with the Ministry for Agriculture, the Steering and Scientific Committees for IHC2018, the Turkish Society for Horticultural Science, the Committee for Sponsorship and Industrial relations and DEKON.

Then in March, under the mandate received from the Council in Quebec in 2016, the ISHS Board thoroughly discussed the issue of IHC2018 remaining in Istanbul, Turkey. We carried out an in-depth risk analysis of every aspect, including the likelihood and possible consequences of any

potential issues, looking at impact and the effect of mitigation measures, both in relation to security for participants and the financial implications for the ISHS. The plans put in place to ensure the venue is safe and secure are very comprehensive. The voting members of the Board, after thorough discussion, unanimously decided that the IHC2018 will remain in Istanbul in August 2018.

The Board wishes to emphasize that the above decision was taken on the basis of horticultural and scientific relevance, financial and security considerations, entirely in accordance with the mission of our Society. We represent ISHS members in 150 countries/regions, which encompass a wide range of cultures and policies. ISHS is a society of individuals, organizations, and governmental agencies devoted to horticultural research, education and industry to improve human wellbeing. We welcome participation from all members from all countries/regions and each member is equally important to us. ISHS is continuing to grow and expand our activities worldwide. At the last Council meeting, it was decided that the next Board would have a representative from Africa and South America in addition to the existing regional representations (see the Editorial for more details). Thus the next Board will have representatives from all continents.

We live in a world that is increasingly aware of food security and the need to feed a rapidly increasing population. There never has been a more important era to work in horticulture. We look forward to working together with all our members to realize the significant role of horticultural crops to meet the needs of our world.

*On behalf of the ISHS Board  
Roderick Drew, President ISHS*



A publication of the International Society for Horticultural Science, a society of individuals, organizations, and government agencies devoted to horticultural research, education, industry, and human well-being.

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Cover photograph: Leaves of croton cultivars range widely in colour and shape (Copyright: Paul Latham/Shutterstock). See article p.19.





Spotlight  
on Honoured  
ISHS Members

## > Jules Janick

### Position

James Troop Distinguished Professor  
in Horticulture, Purdue University,  
West Lafayette, Indiana, USA

### ISHS honour

Fellow and Honorary Member

#### 1. Tell us a bit about yourself (hometown, current locale, family, hobbies, community involvement).

I was born in New York City in 1931 and lived there until I entered Cornell University at the age of 16. My graduate studies were carried out at Purdue University and I joined the staff in 1954 when I received my PhD degree. I have lived in West Lafayette, Indiana, ever since. However, I spent two years in Brazil, as part of a Purdue-Brazil project from 1963-1965 and had sabbatical leave or assignments at the University of Hawaii in Honolulu, University College London, Scuola Superiore Sant'Anna in Pisa, and the Institut Agronomique et Vétérinaire Hassan II Complexe Horticole in Agadir, Morocco.

I met my wife Shirley at a high school junior prom in 1946 at which I found I preferred my friend's date to mine. I am the proud father of Peter (radiologist) and Robin (a lawyer for the Federal Judiciary) and between them I have four over-achieving grandsons. My hobbies are drawing and writing doggerel and song lyrics.

#### 2. What got you started in a career in horticultural science?

I spent summers in Lake Oswawana, Putnam County, New York State, where my parents owned a summer cottage, and I tended a small garden. I was entranced watching my tomatoes grow. Looking back, that small garden turned out to be a key event in my professional career. I did not see myself as a doctor, lawyer, or engineer and very early in life decided on a career as a horticultural scientist/plant breeder. Farm practice experience was a requirement at the time to get accepted into the College of Agriculture at Cornell University and so I worked on farms in New York State for the



> Jules Janick

Victory Farm Corps, starting in the summer of 1945, to help win the war and to start me on my quest. It worked, we won the war in my first year and I was accepted at Cornell.

The first summer on a chicken farm and the second on a dairy farm convinced me that horticulture was the path for me! My career path never wavered. I took all the plant breeding and genetics courses at Cornell as an undergraduate and entered graduate school at Purdue University, the home of the boilermakers, in January 1951. Thus, I have been at this institution for 66 years and am still working full time, although the retirements of my graduate students are sending me strong signals.

#### 3. Give a brief overview of your career/achievements.

My MS and PhD theses involved the genetics of sex determination in spinach on the basis of some seed left by a former professor, Albert P. Lorz. My PhD thesis impressed my major professor, E.C. Stevenson, and I was offered an instructorship as a fruit breeder at Purdue upon receiving in 1954. Again I was fortunate to join a collaborative productive program on scab resistant apple breeding and extended this to pear. This program has released over 20 cultivars of apple and I have released three pears, a crack-resistant tomato cultivar in Brazil (with Homer Erickson), a tissue culture derived pelargonium (with Robert Skirvin), and a late blooming arugula (with Mario Morales). With my graduate students, research was carried out on anthocyanin studies in eggplant, plant population interactions, artemisinin production, and tissue culture studies including somaclonal variation, somatic embryogenesis, synthetic seed, and in vitro flowering. Early in my career I was able to pursue my interests in the history of horticulture with special emphasis



> Jules in China where he served as consultant on loquat breeding.

on iconography. I have explored Caravaggio's fruits, the plants of the Cupid and Psyche ceiling paintings of Raphael Sanzio and festoons by Giovanni Martini da Udine that decorate the residence of Agostino Chigi, now known as the Farnesina palace in Rome, the vegetables and fruits of Juan Sánchez Cotán, the strange 16<sup>th</sup> century manuscript *Histoire Naturelle des Indes* (The Drake Manuscript), crop origins (cucurbits, nightshades, carrots, milkweed), plants of the Taj Mahal, the unicorn tapestries, and illustrated herbals based on Pedanius Dioscorides. I now am immersed in unraveling the Voynich manuscript with my friend and colleague Arthur O. Tucker. It has been a pleasure to be able to combine my interest in horticulture, art, and history.

Throughout the years I have taught a number of courses including genetics, plant breeding, and plant propagation. With Anna Whipkey, my longtime associate, I presently teach History of Horticulture and Tropical Agriculture online with a combined total of 500 students per year.

#### 4. What do you consider were your greatest achievements?

My greatest achievement is the success of my children and grandchildren but it is clear they have succeeded in spite of me. Professionally, my greatest success has been as a writer and editor. Although I had never enrolled or taught the introductory horticulture course, early in my career I convinced two colleagues, Charles Hess and Ken Johnson, to coauthor a college textbook, *Horticultural Science*. They soon dropped out, but I completed it myself. Published in 1963, it proved to be a fortunate career move. The book was well received and went into four editions and was translated into many languages. It was later expanded into a textbook entitled *Crop Science: An Introduction to World Crops*, coauthored with





➤ Jules with his first love, Cleopatra, working on a farm in 1945 for the Victory Farm Corps.



➤ 'GoldRush' apple, one of the outstanding selections of the scab-resistant apple breeding program.



➤ Jules and Shirley, son Peter, and daughter Robin, at a gala celebrating Jules' 65 years at Purdue.

Robert Schery, Frank Woods, and Vernon Rutan. On the basis of these books I became editor of *HortScience* and later took on the *Journal of the American Society for Horticultural Science*. I discovered I had a knack for editing and at one time I was editing four journals simultaneously. I became an inveterate editor of books and proceedings including volumes in fruit breeding, and a series of New Crops Proceedings, ISHS *Acta* and *Scripta Horticulturae*, and various books for ASHS. I proposed that ASHS put out an annual review series but a committee decided there was not enough material, a decision with which I profoundly disagreed, and I founded and edited *Horticultural Reviews* (1979) and then *Plant Breeding Reviews* (1983). I consider these two series my most outstanding accomplishment. In 2016, after a combined total of 84 volumes, I turned the editorship of *Horticultural Reviews* to Ian Warrington and *Plant Breeding Reviews* to Irwin Goldman but remain a member of the Editorial Boards. Partly as a result of my career as editor of journals and books I received honorary degrees at four universities: The University of Bologna (1990), Technical University of Lisbon (1994), Hebrew University of Jerusalem (2007), and The University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, Romania, (2010). In 2009, I was inducted in the ASHS Hall of Fame. That little garden of my childhood had unforeseen consequences.

#### 5. Did you encounter difficulties along your career path and how did you deal with them or how did you turn them into opportunities?

As common to many professors, I am a worrier and anxiety-prone. Many of my shortcomings were made up for my graduate students; especially noteworthy were Wayne Sherman,

E.C. Tigechelaar, Richard Fery, Chi Won Lee, Harrison Hughes, Robert Skirvin, Richard Bell, Ralph Scorza, Sherry Kitto, Antonio Figueira, and Jorge Ferreira. Three of them earned best paper award for their PhD papers. Postdocs and collaborators included Paul Pfahler, Jack Ellis, Muneo Iizuka, Valerie Pence, Dan Wright, Halina & Andrzej Kononowicz, and Jehoshua Saranga. I have had close collaborations and interactions with colleagues including J.R. Shay, E.B. Williams, Harry Paris, Christine Daunay, Irwin Goldman, Rodomiro Ortiz, and Kim Hummer. My international experiences have been particularly rewarding and I treasure my collaboration and friendship with Carlos Portas and Antonio Monteiro of Portugal, Silviero Sansavini of Italy, Shunquan Lin of China, Eliezer Goldschmidt of Israel, A. Ayekin Polat of Turkey, and Radu Sestras of Romania. I have visited about 50 countries, one of the joys of being a Professor in Horticulture.

#### 6. Tell us about one funny/exciting/interesting experience that happened to you during your career.

I had one unusual experience that I now consider humorous. When in Brazil I had to teach in Portuguese but language facility was not one of my strong points. My first course was Seed Production, a branch of horticulture of which I was ignorant at the time. Somehow I managed to teach a subject I did not know in a language I could not speak. I persevered and that gave me confidence that I could do anything if I set my mind to it and work hard.

#### 7. What made you become a member of ISHS and why did you keep the membership? What contribution or role has ISHS played in your career?

I joined ISHS to attend the annual meeting in Brussels in 1962 and have become a loyal

member ever since. I have attended most of the Congresses. I represented the United States on the Council and had the privilege of serving eight years on the Board and was in charge of publications. I relished being editor of *Chronica Horticulturae* and working with Jozef Van Assche.

#### 8. What advice would you give to young people interested in a career in horticulture/horticultural science?

Follow your passion wherever it leads. And I have remained passionate about horticulture: food for body and soul.

#### 9. What are the most interesting new roles or opportunities you see emerging in the future within horticultural science?

Clearly horticulture has tremendous opportunities including plant breeding and genetics; controlled environment agriculture; the discovery of new foods, new uses, new ornamentals; development of new sustainable systems; and advancing and promoting the health aspects of horticulture crops, either as nutritional sources or new medicines. Finally, horticulture must always be considered as part of our humanity.

In the 19<sup>th</sup> century, horticulture was considered as a stepchild of botany, and fought to be recognized as a science in academia. In the 20<sup>th</sup> century, horticulture struggled to find its place at the table of agricultural development where the emphasis was on calories rather than nutrition. Although, horticulture is the source of beloved foods, ornamental plants, turf, shade trees, medicines and beverages, it now has an image problem because in the mind of young people it is associated (incorrectly) with low skilled jobs and low salaries. This is our new challenge. 🍏



# > ISHS student award winner summaries

Below is a selection of research summaries from winners of ISHS student awards for best oral and poster presentations at ISHS symposia. To view other exciting research summaries by other winners, please visit [www.ishs.org/student-awards](http://www.ishs.org/student-awards)

## Emerson's enhancement effect revisited: increasing photosynthetic rate and quantum yield of photosystem II with far-red LEDs



> Shuyang Zhen

Shuyang Zhen received her BSc in Landscape Gardening at Huazhong Agricultural University, China in 2011. Shuyang then went to graduate school at the University of Maine, USA and completed an MSc in Horticulture in 2013. Her Master's research, under the direction of Dr. Stephanie Burnett, focused on improving irrigation efficiency for the production of orna-

mental plants. Shuyang is currently studying for her PhD under the direction of Dr. Marc van Iersel (lab website: <http://hortphys.uga.edu>) at the University of Georgia. Her aim is to improve the efficiency of supplemental lighting for horticultural crop production in controlled environments. Greenhouses commonly use high power lamps to supplement sunlight to enhance photosynthesis and increase crop quality and growth under low light conditions, especially in winter. Crop production costs increase substantially because of the high electrical consumption of these lamps. Light use efficiency could be improved by providing plants with light levels and quality (spectral distribution) that result in the greatest plant biomass production. Part of her work examined the use of chlorophyll fluorescence measurements to quantify how efficiently plants use light to produce biomass under different light intensities, and thus develop more efficient lighting protocols for a range of plant species. Another part of Shuyang's work focused on developing improved light spectra for more effective

photosynthetic lighting using light emitting diodes (LEDs). Certain light wavelengths are absorbed and utilized more efficiently by plants for photosynthesis than others, and combining the optimal combination of narrow spectrum lights may have a positive synergistic effect on photosynthesis. Her results indicated that the light from commonly used white or red/blue LEDs can be used more efficiently if they are supplemented with far-red light. An LED company in Athens, GA, USA, has already revised the design of their LED lights based on these findings. Shuyang Zhen won an ISHS student award for the best poster at the VIII International Symposium on Light in Horticulture in USA in May 2016.

### > Contact

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## Investigations on the chemical composition of cuticular waxes in twelve *Fragaria* L. genotypes

The important role of cuticular waxes in the defense systems of plants is undeniable. However, very little is known about the chemistry of cuticular wax in the genus *Fragaria* L. The epicuticular wax crystal morphology was determined using scanning electron microscopy. A wide range of different structures were described. Twelve strawberry genotypes, including ten wild species, one cultivar and one hybrid after wild species introgression, covered the detected range of epicuticular crystal structures. They were also chosen because of their susceptibility to spider-mites (*Tetranychus urticae* Koch) and powdery mildew (*Podosphaera aphanis* (Wallr.) U. Braun & S. Takam.). To study the chemical wax composition on leaves, extraction of the cuticular waxes was accomplished using chloroform as an organic unpolar solvent. The adaxial and abaxial leaf surfaces were analysed independently using gas chromatography coupled with flame ionisation detection. Single compounds were identified using coupled gas



> Henning Wagner

chromatography-mass spectrometry. Remarkable differences in total mass and qualitative composition between the ab- and adaxial leaf surfaces and between different genotypes were detected. Alkanes, fatty acid alkyl esters and aldehydes were detected as major components. Further different aliphatic compounds, triterpenoids and non-identified compounds

were present in minor quantities. In addition, cinnamic acid alkyl esters were detected solely on adaxial leaf surfaces, whereas secondary alcohols were detected only on abaxial leaf surfaces. Additional inoculation trials with spider-mites and powdery mildew were performed to obtain data for later correlation studies. This study was funded by the German Federal Ministry of Education and Research (BMBF, FKZ 031A216 A and B). Henning Wagner won an ISHS student award for the best oral presentation at the VIII International Strawberry Symposium in Canada in August 2016.

### > Contact

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## A comparative analysis of postharvest rind colour and antioxidant composition of 'Marsh' grapefruit harvested from different canopy position of the tree

Olaoluwa Omoniye Olarewaju obtained his BAgri (Hort) from the Federal University of Agriculture Abeokuta, Nigeria. He is currently a Doctoral Fellow at the University of KwaZulu-Natal, South Africa. His research focuses on identifying pre-symptomatic bio-markers and non-destructive prediction of physiological rind disorders of citrus fruit with a view to identifying innovative techniques of managing postharvest losses in the fresh fruit industry.

Olaoluwa Omoniye Olarewaju won an ISHS student award for the best poster at the III All Africa Horticultural Congress in Nigeria in August 2016.

### > Contact

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> Olaoluwa Omoniye Olarewaju

## A crop simulation model supporting multiple ecosystem services analysis in apple orchards

The rising concept of ecosystem service has highlighted the importance of non-marketed performances delivered by ecosystems. In fruit production, providing acceptable food production levels while preserving natural resources and functions is currently a major challenge, and can be analyzed from the ecosystem service concept perspective. Apple orchards appear to be an interesting study field, as perennial production strongly impacts biogeochemical cycles and pest management within apple orchards deals with both market regulations and reduced use of pesticides. In this study, we considered four ecosystem services: fruit production, soil nitrogen availability, climate regulation based on carbon sequestration and nitrogen denitrification prevention, and maintenance and regulation of the water cycle including water quality. Multiple ecosystem services present different types of relationships depending on the interactions occurring among their underlying ecosystem functions, as well as on the agricultural management and pedoclimatic conditions that impact them. We described these relationships using ecosystem service and ecosystem function indicators and quantified them with a crop simulation model: STICS.



> Constance Demestihis

The model was parameterized and evaluated on two experimental apple orchard sites in the south-east of France, each consisting of three different cropping systems and different soils and climates. Correlations between ecosystem functions and ecosystem services were investigated, while considering the effects of agricultural practices and pedoclimatic conditions. N denitrification and leaching prevention appeared to be in conflict with yield and C sequestration, especially through the nitrogen absorption function. Nitrogen fertilization management and planting density had an important impact

on the delivery of multiple ecosystem services. However, pedoclimatic conditions also strongly contributed to the provision of services. For each of the nine studied cropping systems, it was therefore a combination of multiple factors that delivered a specific ecosystem service profile. Experiments need to be carried out on a larger set of apple orchard cropping systems in order to perfect the model parameterization and to analyze further relationships among agricultural practices, ecosystem functions and ecosystem services.

Constance Demestihis won an ISHS student award for the best oral presentation at HortiModel2016: V International Symposium on Models for Plant Growth, Environment Control and Farming Management in Protected Cultivation in France in September 2016.

### > Contact

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# Leaf Area

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## Analysis of the mechanism of flower color mutation in carnation MINAMI series



► Hayato Morimoto

Carnations that have various petal colors have been generated not only by conventional cross breeding, but also by bud sport. Flower color mutation by bud sport is thought

to occur as a result of periclinal chimaeras or transposons, however, the mechanism is still unknown. To elucidate the mechanism of flower color mutation by bud sport, I used a mutant cultivar group (MINAMI series) showing various petal colors, which had occurred by bud sport. The MINAMI series includes 10 commercial cultivars showing cyanic or acyanic flowers that originated from a pale yellow-flowered genotype. Firstly, the composition of flower pigments was analyzed using HPLC. Cyanic cultivars of the MINAMI series had the highest content of pelargonidin 3,5-malylidiglucoside, which is an anthocyanin. However, acyanic cultivars of the MINAMI series had the highest content of chalcone 2'-glucoside, which contributes to yellow floral coloration. Secondly, to reveal the cause of the flavonoid component change in the MINAMI series, I investigated the extent of expression of several genes

associated with flavonoid biosynthesis, i.e. dihydroflavonol reductase (*DFR*), chalcone glucosyltransferase (*CHGT*) and glutathione S-transferase (*GSTF*). The results showed that expression levels of some genes were different among these cultivars, suggesting that the amount of expression of these genes may determine the petal coloration in the MINAMI series.

Hayato Morimoto won an ISHS student award for the best oral presentation at the II Asian Horticultural Congress (AHC2016) in China in September 2016.

### ► Contact

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## Effect of ethylene absorber on banana during storage

The aim of this study was to investigate the effect of ethylene absorber (EA) on the post-harvest life of bananas. EA could delay the senescence of bananas by reducing ethylene concentrations in storage chambers. Bananas selected for the study were at mature-green stage 2 of ripening, according to the banana ripeness chart (Postharvest Technology Center, UC Davis). Fruit were stored in the presence or absence of sachets of Ethyl Stopper (Bioconservacion S.A., Spain) containing  $\text{KMnO}_4$  at 20 or 14°C, and 95% relative humidity for 16 days. Surface color, weight loss, and an index of chlorophyll quantity in banana peel were measured and disease severity assessed (on a scale from 1 to 5). Assessments were made before storage (day 0) and at 4-d intervals up to 16 days of storage. The use of EA decreased the weight loss of bananas by 2% compared to the control samples. Moreover, disease severity was lower for fruit stored with EA at 14°C for 16 d than for other treatments. No chilling injury was observed



► Lien Phuong Le Nguyen

throughout storage at 14°C. The combination of cold temperature and EA slowed the yellowing of bananas and disease development in comparison with other treatments for up to 16 d of storage. The vulnerability of banan-

as depended on temperature. The ripening process of fruit stored at 20°C was faster than that at 14°C. These results indicate there is potential for using EA to maintain the quality of bananas during storage.

Lien Phuong Le Nguyen won an ISHS student award for the best oral presentation at the VI International Symposium on Tropical and Subtropical Fruits in Egypt in September 2016. 🍌

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# > Automated disease detection – cutting edge technology available for farmers in India

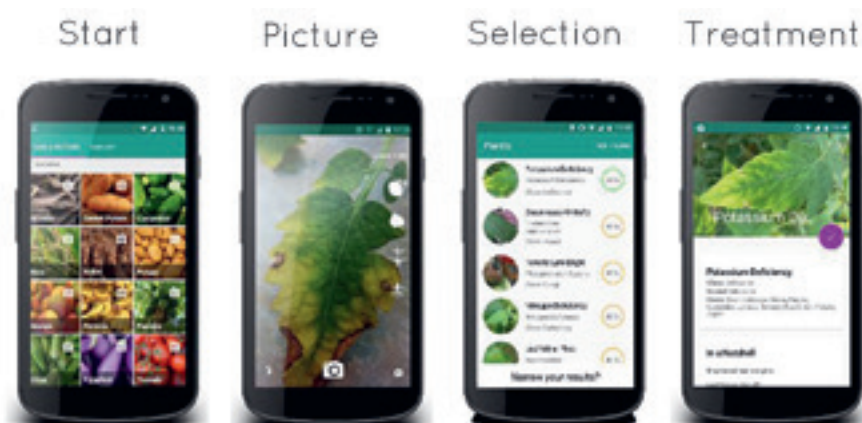
Srikanth Rupavatharam, Charlotte Schumann, Alexander Kennepohl and Ram Kiran Dhulipala

Agricultural production all around the world faces major challenges to feed the ever growing population while utilizing natural resources in a sustainable way. Droughts, other effects of climate change, and the demands of global food markets continuously pose new challenges to farmers. For example, many farmers have switched from traditionally grown cultivars to cash crops to secure their livelihoods. Other farmers have

started using crop cultivars that were developed in response to changed weather conditions or nutrient supply, and these cultivars have different cultivation requirements than traditional cultivars. Plant protection systems are stretched to their limit to alleviate crop production losses. Beyond that, whole ecosystems are changing because of genetic modifications, which have resulted in formerly minor pests becoming major pests and

vice versa (Bergé and Ricroch, 2010). These changes demand the blending of traditional, established agricultural knowledge with new technologies and latest scientific insights.

Agricultural extension systems play a major role in assisting farmers to face these challenges by providing personalized information in each situation. In India, agricultural extension services are rendered by the government, however, there are reports of farmer-led extension services through non-governmental organizations and community-based organizations (Kokate et al., 2016). However, in reality, the number of farmers and the geographic distances in rural areas of India have limited extension help to farmers. In India the provision of a one-to-one extension service is a herculean task, with limited resources stretched well beyond their capacity. Infrastructure and the ratio of farmers to extension officers (1:2000) are major restrictions to this important knowledge exchange. On average, a farmer in India is assisted 40 minutes per year by an extension worker. An adequate extension service would require more than 675,000 extension personnel – an impossible number. At the same time, investments from



■ Figure 1. Basic function flow of Plantix App.



■ Figure 2. Focused group discussion with farmers in Narayangaon, Maharashtra, India.



■ Figure 3. Field demonstration of the Plantix App.



■ Figure 4. Field demonstrations of Plantix App with extension students in Bapatla, Andhra Pradesh, India.

state and federal level government (budget) are diminishing, which will further aggravate this situation (Salunkhe and Deshmush, 2012). Today, innovative digital technologies have become a means of providing knowledge in extension services. For example, they have been applied to overcome information problems that hinder market access for smallholder farmers and to enhance opportunities for supply chains in agriculture (Deichmann et al., 2016). Ryan et al. (2016) made general recommendations to invest in digital infrastructure and develop digital skills for accessing the internet through open data connectivity. This study reported that internet access could help raise women and girls from poverty who are in most cases on the disadvantaged side of the digital divide. Against this background, it is not surprising that information and communication technology solutions (ICT) to assist farmers are booming worldwide, especially in IT-prone India. One “lighthouse” project in India was ICT’s e-choupal, which linked farmers with suppliers of inputs and seeds to overcome infrastructure weaknesses in rural areas while eliminating margins paid to intermediaries (Upton and Fuller, 2004). More recent attempts to use ICT include innovative projects like ‘Digital Green’, in which participatory video and mediated instruction was used to provide agricultural extension (Gandhi et al., 2007). Now, with the advent of smartphones, framework conditions for mobile apps for farmers in India are comparably good and are constantly being expanded. The mobile sector is booming and state initiatives like the National Optical Fiber Network, as well as private projects, will bring internet access to every rural nucleus in the near future. This policy atmosphere is conducive to mobile wifi penetration, with initiatives like the Prime Minister’s Digital India launched on 1<sup>st</sup> July, 2015, to promote digital literacy in rural India (Wani et al., 2016). It has been envisioned that

digital agriculture will play a pivotal role in achieving the objectives of food security and nutritional security for the nation.

However, when it comes to assisting farmers with specific plant pest and disease problems, current ICT solutions exist only in the form of digital books that the farmer must work through by him- or herself and invest time finding the right solution. They imitate analogous knowledge transfer while digital communication already offers the possibility of customizing information to each single demand.

Shi et al. (2015) proposed a system to monitor plant diseases and insect pests based on the Internet of Things (IoT) using sensors, big data processing and mining. However, until now, no individually customized problem analysis or options for treatment have been available and suitable for farmers wanting to use these new technologies.

PEAT is a German AgTech company based in Hanover, Germany, that set out to empower farmers and extension workers to answer one question: “Are my plants doing well?” In order to assist farmers with this question, PEAT developed the smartphone application, Plantix, a mobile guide for testing and treating plant diseases, nutrient deficiencies and pests (Figure 1). Plantix assists in identifying the cause of damage on plants with the help of a smartphone picture and image recognition. After selecting the affected crop within the guide, the user takes a picture, which is then sent to the servers and is automatically analyzed by PEAT’s algorithms. These algorithms are able to identify optical patterns of a steadily growing number of types of plant damage based on PEAT’s large database with training datasets. Once the picture has been sent, the user receives the result within seconds. Farmers and gardeners from all around the world are able to receive detailed information on symptoms, triggers, chemical as well as biological treatments and even

preventive measures for avoiding the identified problem. Plantix is free of fee for private end users. Currently, a large database is being prepared for India to register regionalized products as well as alternative measures that will be shown together with the result list.

Big data will be the key to smart agriculture that uses plant protection measures only where they are really needed and treats every square meter of a field as a unique place in space and time that receives tailor-made treatment to harness its full potential. With every picture that is sent, the application registers information about the user’s GPS position and time. Together with the automated disease detection result, this information feeds into what may become the largest ground data database on the occurrence as well as the spread of plant diseases. Based on these maps, the spread and development of major plant diseases can be analyzed and the results will be provided to decision makers in the field of natural resource management and agriculture, helping them to monitor threats on a regional level. Within this attempt to make information and data transparent, PEAT protects each individual user. Neither the data nor the image can be referred back to single farmers.

Plantix was first published in Germany in 2015, where the application was a major success among gardeners (> 20,000 downloads). Its success and widespread support indicated the potential value of applying it to professional agriculture worldwide. In 2017, Plantix will be launched in India, Tunisia, Mali, USA and Brazil. In all these countries, agronomists, farmers and scientists are working together with the PEAT team to integrate descriptions of local diseases in local languages and to adapt Plantix features to the needs of farmers. Importantly, a worldwide database allows for many synergies. For example, content added in Mali or other countries in the semiarid tropics will be accessible everywhere and will improve the usefulness of Plantix in countries like India as well. Plantix will be equipped with features for offline detection, as well as a non-text based version in order to make knowledge available to illiterate people. In this way, a global initiative for changing agricultural practices can be built.

In April 2016, PEAT’s team visited India for the first time, to prepare the launch of Plantix in cooperation with Indian partners. In terms of diversity, India is a challenge when aiming to create a knowledge communication tool. Follow-up field visits in November, 2016 (Figures 2-4) were useful for discussions with primary users like extension workers and farmers. Local experts are crucial partners in adapting content to local languages and to incorporate regional crops and practices, as well as available products. PEAT has been adapted to a





■ **Figure 5.** Damage caused by leaf miner (fly) observed during a recent visit to India (left side). A photo such as this can be loaded onto Plantix for a diagnosis. If you're online, you can instantly discover the many support features of Plantix (scan the QR-code on the right side).

consortium approach for the development of crop disease databases for Indian crops like rice, groundnut, millets, and pulses. Updating PEAT's database will be a continual process based on partnerships with international organisations like the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) as well as with regional associations

with agricultural universities, Krishi Vigyan Kendras (KVKs) and public/private organisations. Apart from cooperating with these experts, Plantix works as a citizen science project – every user that uploads pictures helps to improve the database and detection accuracy of diseases. One collaborative project in India will involve the development of a tablet-based system for extension professionals, called the “Green Phablet” developed by ICRISAT.

As a next step, PEAT is planning to use the data on occurrence and spread of diseases in a specific area by combining with other crop ecology data, e.g. soil, weather and climate, for real time monitoring and early warning systems. Based on this monitoring, farmers can be informed in a timely manner of upcoming weather that may be conducive to a particular disease or when certain plant diseases are spreading. In this way, every single picture can be connected to a larger set of data that helps farmers to reduce crop shortfalls, while applying minimal and appropriate doses of plant protection products for more productive and sustainable agriculture. Automated disease detection can be of use to farmers

on all scales. In the future, the technology can be used to improve greenhouse camera surveillance software or to equip agricultural machinery with monitoring software that will support a differentiated and timely treatment of plant damage on large fields as well.

As this example shows, big data can be useful to smaller farmers, not only large corporates. Via ICT tools, knowledge can be adapted precisely to the needs of very different groups in the agricultural sector and can empower them to make informed decisions on their field management. In addition, farmer's groups can be enabled to organize and collaborate via ICT tools to resolve infrastructure and supply chain issues. One crucial factor enabling this development will be the extension of mobile phone coverage and internet access in rural areas, a task to be resolved in close collaboration between the public and private sector. If you're online, you can instantly discover the many support features of Plantix (Use the QR code beside Figure 5 to instantly be linked with the Google Playstore and download Plantix). We are very interested in your comments and feedback. ●

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› Srikanth Rupavatharam



› Charlotte Schumann



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› Ram Kiran Dhulipala

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# > History and current status of grafted vegetables in Turkey

Halit Yetişir

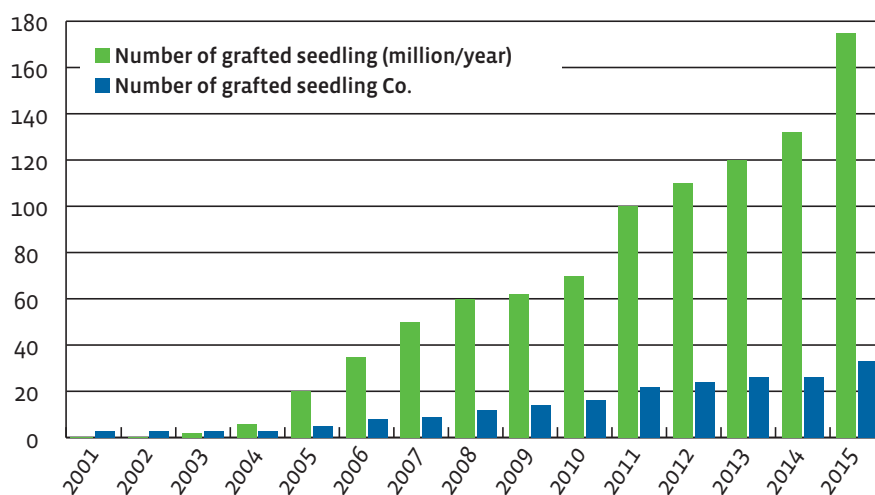


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## Introduction

Grafting herbaceous seedlings is a unique horticultural technique practiced for many years in East Asia, to solve problems associated with intensive cultivation given limited arable land for vegetable production. According to Lee and Oda (2003), a self-grafting technique to increase fruit size in bottle gourd, by increasing root volume through bunch grafting, was described in an ancient book written in China in the 5<sup>th</sup> century and in Korea in the 17<sup>th</sup> century (Mudge et al., 2009).

The first record of interspecific grafting in fruit-bearing vegetables as a strategy to manage pests/diseases and to increase yield was for watermelon [*Citrullus lanatus* (Thunb.) Matsum. & Nakai], using a squash (*Cucurbita moschata* Duch.) rootstock and *Lagenaria*



■ Figure 1. Total number of grafted seedlings and grafted seedling companies in Turkey from 2001 to 2015 (Young Plant Union, 2015).



■ Figure 2. General view of grafted watermelon seedlings from Antalya (Antalya Tarım, 2015).

*siceraria* (Ashita, 1927). This graft was reportedly performed by a watermelon producer in Japan (Tateishi, 1927). The success of these trials led to increased numbers of grafted vegetable species and a larger cultivation area. Research on cucumber (*Cucumis sativus* L.) grafting also started in the late 1920s, but wider commercial applications did not occur until 1960 (Sakata et al., 2007). In the *Solanaceae* family, the first grafted crop was eggplant

(*Solanum melongena* L.) on scarlet eggplant (*Solanum integrifolium* Poir.) in the 1950s (Oda, 1999). Grafting tomato (*Solanum lycopersicum* L.) was introduced as a commercial practice in the 1960s (Lee and Oda, 2003). At present, grafted plants are used for fruit production of most watermelon, tomato, eggplant, cucumber, melon and pepper. Grafting of these crops is performed for both open field and protected cultivation in Japan and Korea, as well as in

China, Spain, Italy, Greece, Turkey and Israel. In short, grafting occurs wherever fruit bearing vegetables are being cultivated intensively (Ryu et al., 1973; Lee, 1994; Davis et al., 2008). The ban of methyl bromide (MB) soil fumigation led to research on alternative control methods for soil borne pathogens in vegetable production, particularly in protected cultivation. Although alternative chemical applications and other cultural practices have

■ Table 1. Major advantages and disadvantages of grafting in vegetables (Lee et al., 2010).

Advantages	Disadvantages
Disease resistance/tolerance	Additional expenses for rootstock seed
Nematode resistance/tolerance	Additional labor cost
Yield increase	Experienced labor needed
Low temperature tolerance	Selection of scion/rootstock combinations
High temperature tolerance	Different combinations for production season
High salt tolerance	Different combinations for production methods
Wet soil tolerance	Increased infection of seed borne diseases
Enhanced nutrient uptake	Increased vegetative growth
Enhanced water uptake	Delayed fruit harvesting
Shoot growth promotion	Lower fruit quality (taste, color, flavor, etc.)
Multiple and/or successive production	Physiological disorders
Heavy metal and organic pollutant tolerance	Late incompatibility
Quality changes	Requirement of different cultural practices
Convenient production of organic wastes	Higher price of grafted seedlings
Ornamental value for exhibition and education	Insufficient information about new scion/rootstock combinations
Extended harvest period	

been tested and developed, one of the best methods to control soil borne diseases is to graft susceptible cultivars onto resistant rootstocks. Furthermore, grafting onto suitable rootstocks affects plant growth parameters, including flowering, fruit maturation date, yield, and quality. After MB fumigation was phased out in Turkey, researchers and producers began to use grafting as an alternative method to avoid soil borne pests and diseases. The advantages and disadvantages of using grafted seedlings are listed (Table 1). Grafting of fruit bearing vegetables is used to control soil borne wilt diseases caused by *Fusarium* and *Verticillium* (Lee, 1994; Yetişir et al., 2003), to increase low temperature tolerance (Tachibana, 1989), salinity tolerance (Behboudian et al., 1986), and to increase plant growth and fruit yield by enhancing water and nutrient uptake (Lee, 1994; Oda, 1995; Ruiz et al., 1996, 1997).

Cucurbit species (watermelon, melon and cucumber) are grafted onto *Cucurbita moschata*, *C. maxima*, *C. ficifolia*, *Benincasa hispida* or *Lagenaria siceraria*; onto interspecific (*C. maxima* and *C. moschata*) hybrids rootstocks (Lee, 1994; Oda, 1995) or onto rootstocks of the same species. Tomato is grafted onto *Solanum lycopersicum*, *S. melongena*, and *S. lycopersicum* × *S. habrochaites*. Eggplant is grafted onto *S. melongena* and *S. torvum*, and pepper onto *Capsicum annuum*. Currently, several rootstock cultivars for vegetable grafting have been bred and released by Turkish and international companies.

Grafting in fruit bearing vegetables was suggested in vegetable growing courses in Turkey in the 1980s. The first scientific research was conducted around that time on the effect of double root systems on yield and quality of

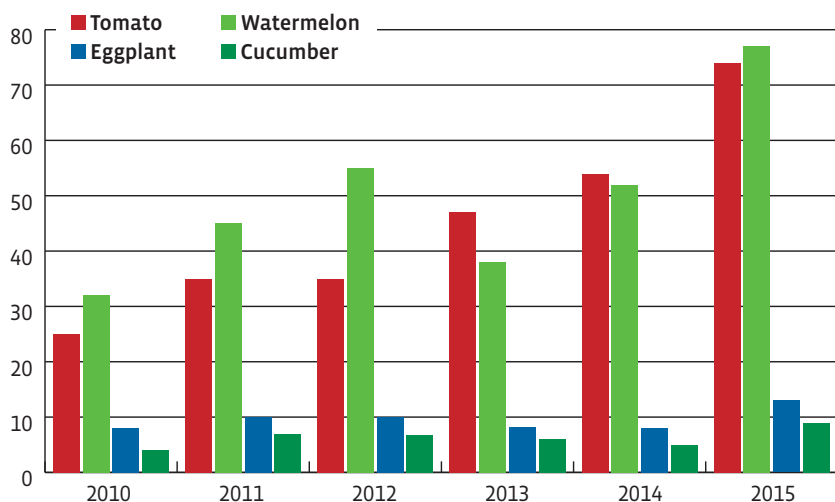


■ Figure 3. General view of grafted tomato seedlings from Antalya (Antalya Tarım, 2015).

tomato (Dizdaroğlu, 1985). It was followed by Vuruşkan (1989) investigating the effects of tomato rootstocks on graft compatibility and yield in eggplant. Until 2000, there were no reports published on vegetable grafting in Turkey. However, research and commercial applications of vegetable grafting in Turkey began after 2000, and was accompanied by the expansion of protected vegetable cultivation. Preliminary studies on watermelon grafting were performed but they were unpublished. In an initial study on watermelon grafting, 'Crimson Tide' was grafted onto 10 different rootstocks and all grafted plants exhibited resistance to *Fusarium oxysporum* f. sp. *niveum*. Grafted plants had significantly greater vegetative growth, fruit yield and quality, except in cases of graft incompatibility (Yetişir et al., 2003). After the first successful trial on grafted watermelon production, private companies and public research institutes carried out several experiments on

grafted watermelon. Research on the effect of using rootstocks for fruit bearing vegetables on biotic stresses (Yetişir et al., 2003; Yılmaz et al., 2007; Curuk et al., 2010; Karaca et al., 2012; Karaağaç, 2013), abiotic stresses (Özmen, 2009; Yetişir and Uygur, 2009, 2010; Öztekin, 2009; Semiz and Suarez, 2015), yield and quality (Yetişir and Sari, 2003; Yarı, 2003; Öztekin, 2009; Cansev and Ozgur, 2010; Karaca et al., 2012; Karaağaç, 2013; Özdemir et al., 2016) and rootstock breeding (Yetişir et al., 2007; Karaca et al., 2012; Balkaya et al., 2010) were conducted for different vegetable species. Currently, many Turkish researchers are examining the mechanism of stress physiology and quality in relation to grafting. Their results are published in Turkish research journals and presented at symposia and congresses. The number of articles published in indexed international journals is also gradually increasing. The high costs associated with the production of grafted seedlings, particularly the costs of





■ Figure 4. Number (million) of grafted seedlings for the four major vegetables from 2010 to 2015 in Turkey (Young Plant Union, 2015).

■ Table 2. Rootstocks used in solanaceous crops in Turkey.

Tomato			Eggplant		Pepper
61-53RZ	Force	Mecano	Ahtapot	KNLF	Gelafut
Arazi	Ground	Nirvana	Beafourt	Maxifort	Capital
Arstrong	Hamarat	Rootex	Brutus	Nirvana	DRO3413
Beufort	Heman	Resistar	Emperador	Rootex	Foundation
Big Power	Kemerit	Spirit	Endam	Sarafin	Ferrai
Body	King Kong	Tm 10043	Kemerit	Tpk-Ro	Güçlü
Brigeor	KNFL	To-Ro	King-Kong	Yedi	Harry
Buffon	Kudret	Vigomax			Kapital
Dohkko	Kyndia	Yedi			Scarface
Endam	Maxifort				Snooker
					Tresor

■ Table 3. Rootstocks used in cucurbitaceous crops in Turkey.

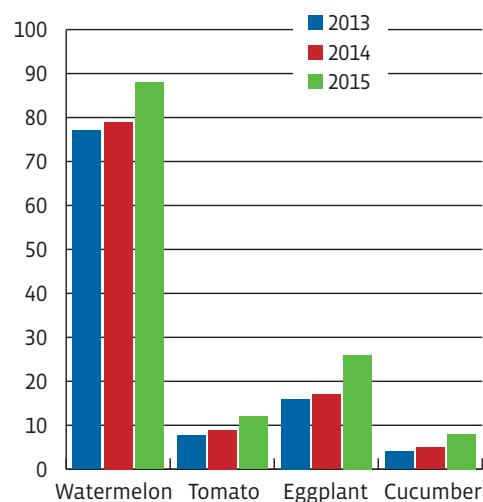
Watermelon			Cucumber		Melon
Ayfer Port	Dinamo	Obez	64-10 RZ	Harry	Azman
All Star	Ferro	Parlatan	Affyne RZ	Maximus	Cobalt
Argentario	Flexiport	RS841	AS3507	Mendoza	Ferro
Avar	Jumbo	Shintoza	Cobalt RZ	Nun 9075	Flexiport
Azman	Macis	Strong Tosa	Delfin	Obez	Jumbo
Carnivor	Maximus	Vitally	Desousa	Parlatan	Nun 9075
Cobalt RZ	Macis	Zorba	Ferro	RS841	RS841
CSQ1371	Nun 9075		GS20002	TZ148	Spinx RZ
			GS2005	Zorba	Strong Tosa

intensive labor, rootstock seed and after-graft care, have prevented this technology from being widely adopted in Turkey. However, in the early 21<sup>st</sup> century, mass production techniques for grafted vegetable transplants were improved, and new rootstocks with desirable traits and compatibility with selected scion cultivars and grafting technology were introduced from Europe. This was achieved through the marketing efforts of local and international seed companies and through information exchange among research communities. Grafted vegetable seedling production has increased markedly during the last

decade (Young Plant Union, 2015). The purpose of this article is to briefly describe the scientific and commercial status of the grafted vegetable seedling sector in Turkey.

### Present status of vegetable grafting in Turkey

Vegetable seedling production has exhibited remarkable development during the last 20 years. More than 100 vegetable nursery companies produce more than 4 billion vegetable seedlings annually. Since 2001, Turkish companies have introduced and developed grafting methods suitable for commercial vegetable

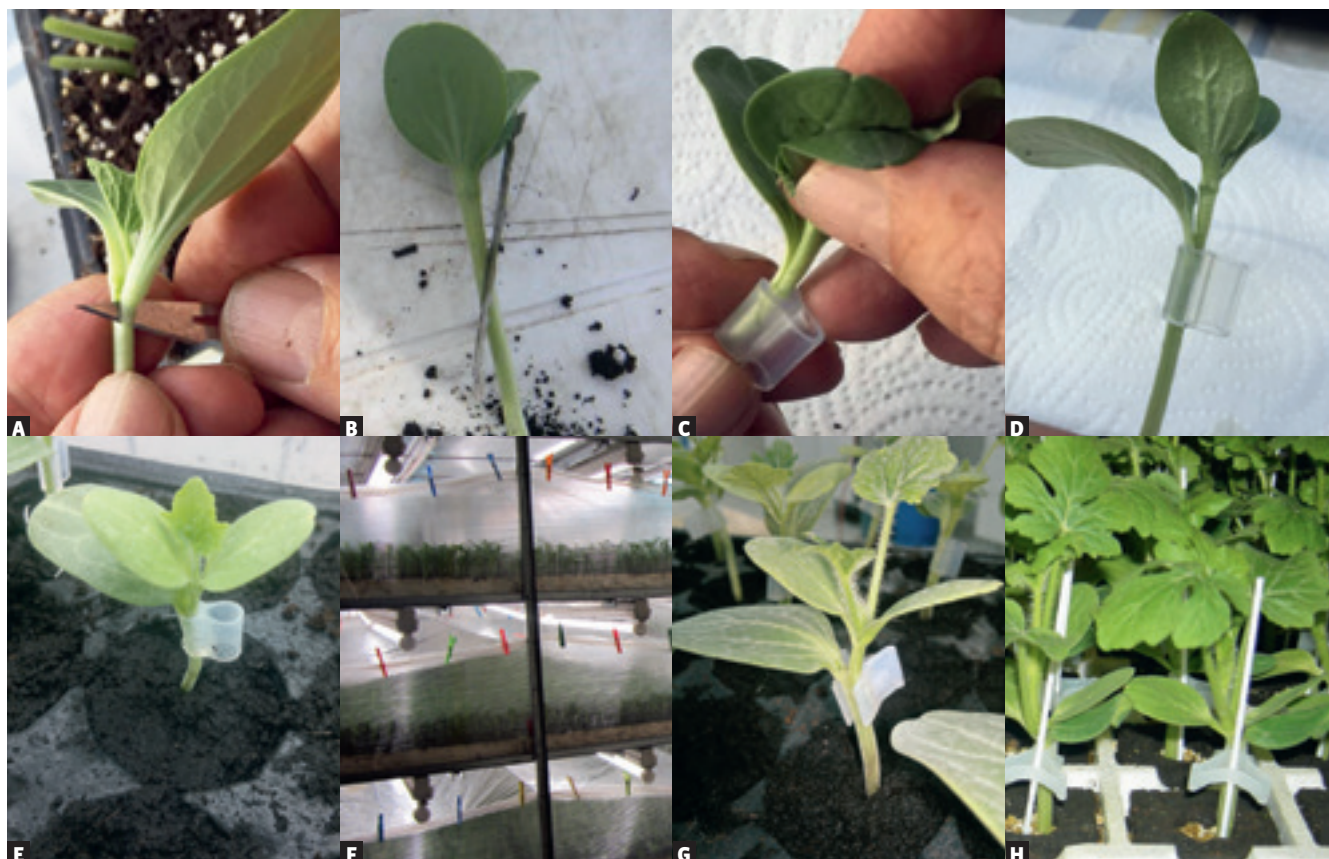


■ Figure 5. Proportion (%) of seedlings of watermelon, tomato, eggplant and cucumber that were grafted from 2013 to 2015 in Turkey (Young Plant Union, 2015).

production. Grafted seedlings of watermelon, tomato, eggplant, cucumber, melon and pepper are produced by 33 seedling companies in Turkey. In 2015, they produced 175 million seedlings. The total number of grafted seedlings in Turkey has increased more than ten-fold in the last decade (Figure 1).

The grafted seedling industry in Turkey is located mainly in Antalya Province, where a significant amount of protected vegetable cultivation occurs. In addition, about 2 million grafted watermelon seedlings have been exported to neighboring countries, such as Bulgaria and Hungary. Turkish companies have made considerable investments in vegetable transplant (grafted/ungrafted) production areas, particularly in infrastructure and human resources. The sector has gained significant experience and knowledge within this period. Many companies have been established that can produce healthy and high quality grafted/ungrafted seedlings (Figures 1-3). The number of grafted seedlings based on species and year, from 2010 to 2015, is shown in Figure 4. As in other countries, tomato (with 74 million transplants per year), and watermelon (with 77 million per year), were the most grafted vegetable species. Eggplant and cucumber followed. Recently, production of grafted melon and pepper has begun. In 2015, 260,000 seedlings of melon and 70,000 seedlings of pepper were grafted. Producers are looking for melon and pepper scion/rootstock combinations that will result in higher yields and quality under common biotic (soil borne pests and diseases) and abiotic (low soil temperature, salinity, and high pH) stresses.

The proportion of seedlings that were grafted, for the four major grafted vegetables, has



■ Figure 6. Splice/cut grafting method in cucurbits. A. rootstock preparation; B. prepared scion; C. insertion of tube and scion; D. grafted watermelon seedling; E. replanted grafted watermelon seedling; F. seedling in post graft care unit; G, H. grafted seedling ready to transplant.

increased over the last 10 years and the trend from 2013-2015 is shown in Figure 5. In 2015, the proportion of watermelon, tomato, eggplant and cucumber that were grafted was 88, 12, 26 and 8%, respectively. Most of the grafted seedlings are used in protected cultivation (lower plastic tunnels and greenhouses) in the Mediterranean and Aegean regions of Turkey.

### Grafting methods and rootstocks

Different grafting methods have been applied to the cucurbitaceous family in Turkey. Approach, cleft, hole insertion, splice grafting (cut or single cotyledon), and root removal with splice, are just a few of the techniques employed.

Splice/cut grafting (Figure 6) is the most popular technique used by Turkish producers because it is suitable for use with interspecific squash seedlings as rootstocks. The root removed splice/cut grafting method is another common procedure used by Turkish seedling companies.

Tube, approach and cleft grafting methods are used for solanaceous vegetables. Tube grafting (Figure 7) is commonly used by nursery houses. Detailed information about vegetable grafting techniques has been previously described (Davis et al., 2008; Lee et al., 2010). At present, manual grafting is still the primary form of grafting for vegetables in Turkey. However, semi or fully automated grafting

robots have been developed by several agricultural machine companies. Some models are available from the Far East and some from European countries. Vegetable species are grafted onto intra- or inter-specific hybrid rootstocks bred from species mentioned above. There are many rootstocks used in Turkey for solanaceous (Table 2) and cucurbitaceous (Table 3) crops.

### Present problems of vegetable grafting in Turkey

Turkey is an important vegetable-producing country. One key component for successful high quality and high yielding vegetable production is to begin with high quality transplants. Seedling quality is one of the primary concerns among farmers. High quality transplants can be produced through grafting and more farmers are purchasing grafted seedlings from professional nurseries. There remains considerable potential to increase the use of grafted seedlings using suitable scion/rootstock combinations in Turkey. However, the following issues should be addressed to overcome limitations of grafted vegetables.

#### The high cost of grafted seedlings

Grafted seedlings are expensive. This high cost is the result of extra labor and investment. Investment is needed for propagation and grafting, the long production period, and

rootstock costs. With the rapid increase in Turkish labor costs, the increasing expense of producing grafted seedlings often discourages potential growers. Therefore, investigation into easy grafting methods, mechanization of grafting and improved acclimatization systems will assist in the mass production of grafted seedlings at a lower cost.

### Sanitation problems in grafted seedling production

Seed borne diseases (bacterial fruit blotch, bacterial canker, and cucumber green mottle mosaic virus) are a serious problem in both grafted and ungrafted seedling production. Seed testing and disinfection are neglected in some seedling nurseries. However, transmission of diseases in the production process of grafted seedlings occurs more easily than in regular seedling production. This is probably because some diseases can be transmitted easily by cutting tools from seedling to seedling. In addition, the cut surfaces of both the rootstock and the scion may be easy entry points for pathogens, and high relative humidity and ambient temperature in the healing chambers promote the spread of diseases.

### Lack of compatible multi-disease resistant rootstocks

Appropriate rootstocks can provide disease resistance, better abiotic stress tolerance,





■ Figure 7. Tube grafting method in tomato. A, B. rootstock preparation; C. rootstock, cut and tube inserted; D. prepared scion; E. grafted tomato seedling; F. replanted grafted tomato seedlings in post graft care unit; G. grafted seedling with double shoot (Altın Fide, 2015).

and higher yield and product quality. Unfortunately, commercial rootstocks with desired traits and high graft compatibility are limited. Hence, breeding and identification of compatible multi-disease resistant/tolerant rootstocks with tolerance to abiotic stresses is a basic requirement for continued success. In addition, breeding rootstocks tolerant to high temperature for long season cultivation, and cucurbit rootstocks that have small cotyledons, will be high priorities in future research.

### Limitation of available rootstock information

Most seedlings are currently grafted onto a limited number of common rootstocks. There is only limited information on the use of other rootstocks, compatibility to other cultivars, and performance of grafted seedlings in various climatic and cultural conditions. Information about cultural practices for each rootstock (grafting through to harvest) and for every growing condition should be provided to nursery house owners and producers.

### Some negative effects of grafting on fruit quality

Fruit quality of watermelon and melon can be negatively affected by rootstocks. For instance, a reduction in fruit soluble solids content was reported in some studies (Yetişir and Sari, 2003). There are several conflicting reports on the effect of grafting on fruit qual-

ity. The differences observed in the various studies may be the result of different growing conditions and agricultural practices, types of rootstock/scion combinations used, and harvest dates. Thus, it is very important to breed rootstocks that produce high quality vegetables.

### The small scale of grafted seedling production

Small scale systems to produce grafted seedlings cannot ensure the quality (physiological and pathological) of the seedlings. Proper acclimatization and sanitation are critical for grafted seedlings to survive. The failure of small scale producers to control and maintain suitable conditions during the healing and hardening processes can result in lower quality grafted seedlings.

### Conclusions and future prospects

Vegetable grafting has been successful in many Asian countries since the 1950s, and is becoming increasingly popular worldwide. New rootstocks have been developed and distributed by several multinational breeding companies through their commercial activities. Breeding and identification of suitable rootstocks for each species with tolerance/resistance to biotic and abiotic stresses is a basic requirement for successful ongoing application of this technique. The development and introduction of mechanization and automation technology

will promote large-scale production, which will reduce costs. Efficient labor management has been recognized as a key to success in mass production of grafted seedlings. Vegetable producers in Turkey can now purchase grafted seedlings of any specific combination from many commercial nursery houses rather than doing the tedious grafting themselves. Although the advantages of grafted seedlings are now well known around the world, production of uniform, healthy grafted seedlings at a feasible cost is the crucial factor limiting wider use, especially for those growers with limited experience and knowledge. The Young Plant Union has established an open access database, which will provide information about rootstocks, scion/combination, and cultural practices of grafted material. This database will benefit from the participation of all stakeholders and will help to improve the success of this technology. Researchers from universities, research institutes and industries should work together to develop the use of this technology as a critical tool for sustainable vegetable production in Turkey.

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# > Propagating crotons from leaves

N. Deepa Devi

*Codiaeum variegatum*, commonly known as croton, and sometimes called Joseph's Coat, belongs to the family *Euphorbiaceae* and is a popular ornamental plant because of its vivid foliage colors and varied leaf shapes. The plant is native to South East Asia and it grows well in regions that have a warm, humid climate. Crotons are colorful foliage plants in tropical and mild subtropical climates. They are grown in the ground or in pots, and pot plants are very popular for indoor gardening.

alternate, broad, oblong, elliptic, narrowly lanceolate, linear, narrow linear, spatulate, fiddle-shaped, lobed or constricted in the middle, margins entire, crisped, specially twisted or with appendages. Sometimes the leaf blade is interrupted along the midrib and becomes divided into an upper and lower part. Young leaves are usually green, bronze, yellow, or red, and later change as they mature to gold, cream, white, scarlet, pink, maroon, purple, black or brown. Sometimes,

Leaf color also varies in different seasons, affected by temperature and humidity, light intensity and duration. In general, light is essential to produce bright colors on the foliage. In dry heat, however, exposure to direct sun throughout the day or for a long period when the light intensity is very high in summer months, will result in scorching of leaves. In mild climates, they can tolerate sun for a longer period. Too much shade, on the other hand, makes the leaves green and



## *Codiaeum variegatum* description

*Codiaeum variegatum* is an evergreen bush with leaves that display a wide variety of size, shape and color. It is a popular foliage plant grown in pots and in the ground and grows up to 6 m in height, but is usually maintained at 60-90 cm.

More than 200 cultivars of croton exist around the world and this gives rise to a vast range of different leaf sizes, shapes and color patterns. Crotons have glossy, leathery leaves that are variable in shape and color (Figure 1). Leaf shape can be simple,

■ Figure 1. Croton leaves are highly variable in color and shape (Copyright: A. Passakorn Umpornmaha/Shutterstock, B. Thawatchai Phoonkaew/Shutterstock, C. akramer/Shutterstock, D. Athi Achawaradt/Shutterstock).

distinct forms of leaves and color variations occur on the same plant. The leaf is probably green in its original natural state, but in cultivated forms, it is variously marked, streaked, blotched or banded with green, white, red, orange, purple, pink, indigo, violet, yellow, crimson, scarlet, brown or cream color when grown in appropriate light conditions. The plant may change color as it matures (Ogunwenmo et al., 2007).

less attractive. Low humidity and high temperatures can cause drooping of the leaves. High humidity (60-70%), the optimum range of temperature (20-32°C), and bright light are good environmental conditions for growing crotons. Compost, nutrients and moisture in the growing media also have an effect on growth and foliage color.

Flowers are monoecious, in simple, axillary racemes (Figure 2). Flowers are small, long,



■ Figure 2. Flowers are monoecious, in simple, axillary racemes:  
A. male flowers; B. female flowers  
(Copyright: A. Lapis2380/Shutterstock, B. Kroton).

axillary, and usually unisexual racemes. Fruit are globular capsules, 3-8 mm in diameter. Numerous cultivars of croton are listed in nursery catalogues as variations in shape, size and color of leaves appear in seedlings and through natural mutation. Some cultivars with colorful foliage are described below.

#### **Variegatum ‘Bangalore Beauty’**

This cultivar has a bushy plant and leaves that are oblong elliptic, 18-20 cm long and variegated with different shades of red and yellow. Lower leaves develop green in color variegated with deep red.

#### **Variegatum ‘Bankok Queen’**

This is an unusually attractive dwarf plant. Leaves are roundish and are attractively variegated with shades of red, coppery green and light yellow.

#### **Variegated ‘Carnival’**

This is a handsome dwarf plant. Leaves are small, narrow-linear and display a variety of colors.

#### **Variegatum ‘Crispum’**

This is an attractive dwarf bush. Leaves are narrow-linear, drooping up to 25 cm long, green and yellow when young, but becoming crimson and yellow with age.

#### **Variegatum ‘Delaware’**

This is a well-shaped, medium sized plant. Leaves are large, obovate and are variegated with yellow and green. Leaf veins are prominent.



■ Figure 3. Root formation from croton leaves.

#### **Variegatum ‘Elite’**

This is a remarkable cultivar with large leaves, lobed near the apex. Upper leaves have a red midrib and veins, and lower leaves contrast with red, yellow and green.

#### **Variegatum ‘Exotic’**

This is an unusually attractive plant, with leaves that are almost round and have a yellow border and a deep green centre.

#### **Variegatum ‘Fantasy’**

This is a specimen from Indo-American Hybrid Seeds, Bangalore. Leaves are of various shapes, roundish, some with a narrow, twisted apex. Upper leaves are predominantly yellow and green, whilst lower leaves are brilliant red.

#### **Variegatum ‘Fire’**

This is another very attractive form of croton. Leaves are of various shapes and sizes, with upper leaves being brilliant red and lower ones deep green, red and yellow.

#### **Variegatum ‘Glory’**

This is a very colorful cultivar. Leaves are mostly narrow and elongated, twisted, and variegated with bright crimson, black coppery and yellow colors.

#### **Variegatum ‘Golden Ring’**

This is a showy cultivar with long twisted, drooped narrow leaves that are variegated with golden yellow and green.

#### **Variegatum ‘H.D. Maity’**

This is a sport from the cultivar ‘Reidii’. Leaves are large, obovate, with a midrib. Veins of older leaves are deep red and laminae are coppery green.

#### **Variegatum ‘Princess’**

This cultivar has leaves of various shapes and sizes, including those that are twisted or weavy, and they are variegated with crimson, yellow and dark maroon.

#### **Variegatum ‘Punctatum Aureum’**

This has a branched, compact bush with dense foliage. Leaves are narrow-linear, and they are glossy green and spotted with yellow. Plants can be used to form a neat and compact hedge.

#### **Variegatum ‘Rainbow’**

This is a colorful cultivar, with many elliptic leaves on the upper part of the branches. New leaves are broad with a golden yellow band at the centre and yellow veins. The midrib and veins of the leaves turn reddish with age.

#### **Variegatum ‘Warrenii’**

This is a tall-growing cultivar, with drooping leaves, 30-45 cm long, that are mainly on the upper end of the branches. Leaves are narrow, twisted, and variegated with red, yellow and green.

A few popular croton cultivars grown in India are ‘Dr.B.P.Pal’, ‘Bravo’, ‘Gandhiji’, ‘Happiness’, ‘Indira Gandhi’, ‘President’, ‘Pride of India’, ‘Pride of Mysore’, ‘Vivekananda’, ‘Vishnu’ and ‘Wild Beauty’.

In addition to their aesthetic value as indoor plants, crotons are also well known for their medicinal value. The leaf extracts of crotons are reported to have many medicinal properties including purgative, sedative, antifungal, antiamebic and anticancerous activities (Deshmukh and Borle, 1975; Kupchan et al., 1976). The plant is also well reputed for the



production of valuable secondary metabolites of alkaloids, terpenes and flavanoids (Puebla et al., 2003; Martins et al., 2002).

## Propagation of crotons

Crotons can be propagated by various methods, such as cuttings, grafting, seed and air layering. Generally, crotons are multiplied vegetatively by means of cuttings and air layering. This process is slow and requires a large number of mother or stock plants. Micropropagation is an alternative method that is able to meet the high demand for this plant in a relatively short time. An improved and enhanced protocol has been established for the in vitro propagation of croton.

From shoot tip cuttings, one mother/stock plant can yield only 20 plants per year (Nasib et al., 2008; Mulabagal and Tsay, 2004). Because the rate of conventional multiplication is low, the demand for plant material is increasing. Micropropagation is

a relatively new technology and application of innovative methods have served to overcome barriers to speed up the multiplication of elite cultivars, and further improvements are anticipated. In vitro growth and development is considerably influenced by several factors like genotype, the age and size of the mother plant and explant, the season, growth conditions, media composition, and various other physiological factors. As a means of securing pathogen free plants, culture of apical shoot meristems is ideal. Another advantage of this method is that there is rapid multiplication of plants within a short period of time, irrespective of the season (Mulabagal and Tsay, 2004). Micropropagation has been identified as a preferable propagation method because of difficulties with conventional breeding, however it is limited by (i) the sophisticated facilities that are required, and (ii) the need for greater skills in handling and

maintenance compared to conventional techniques (Shibata et al., 1996; Orlikowska et al., 1995, 2000). Therefore, a simple study was undertaken to determine whether propagation using croton leaves might be a successful alternative.

Leaves were placed in water in a flower vase and kept under observation. Within a month, roots appeared from the petiolar region of 90% of the leaves in the trial. The root length varied from 1.5-4 cm. Further, secondary roots were also observed from primary roots after one month (Figure 3). The rooted leaves were then placed in coir pith media and watered regularly. However, there was no sign of shoot formation from the leaves. Leaves remained green for a few months without showing any sign of wilting or drying. Further work is needed to encourage the development of new plantlets from leaves, to make this an easy and viable method of propagating croton plants. ●

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Gröning, G. (2016). *From Dangast to Colorado Springs. Irma Franzen-Heinrichsdorff 1892-1983. Notes on the Life and Work of the First Woman Graduate in Landscape Architecture*. CGL-Studies, Volume 24, translated by H. Kaal (Munich, Germany: AVM-edition), pp.166. ISBN 978-3-95477-061-8 (hardcover). € 49.90. [www.avm-edition.de](http://www.avm-edition.de)

*In memory of Irma Franzen-Heinrichsdorff, the first German woman graduate in landscape architecture, "Born in the wrong century".*

When I held the book "From Dangast to Colorado Springs" in my hands and scrolled the pages one by one, it was the pictures of Irma Franzen-Heinrichsdorff that first caught my attention. In almost all of the photos, except for those taken when she lived in the United States, Irma's face looks serious, sometimes grim, or sometimes vacant. Later in her life, in Colorado Springs, Irma appears more inclined to smile, more relaxed, almost happy, but never truly happy. The impressions and emotions that these photos evoked became clear to me when I read the text written by Professor Dr. Gert Gröning. The professional and private life of this great woman was restricted by expectations of the German bourgeois society of the 1900s, and by the tragedy of the two World Wars of the last century, which charted and marked, not only Irma's fate, but that of many people.

Professor Gröning, who is also a landscape architect, developed Irma Franzen's profile clearly. Gröning and Franzen belong to different eras. Irma Franzen was born in 1892; Gröning in 1944. Fate has them meeting in

Dangast, Germany, a place pervaded by the spirit of Irma and where Gert spent part of his childhood. Before writing the book, Gert knew very little of Irma's life. He wrote the book after his wife Elisabeth had read a few lines about Irma in the book "Round about the old Kurhaus Dangast," by Lena Tapken. Elisabeth reminded Gert of his very short entry about Franzen-Heinrichsdorff in the 1997, "Grüne Biographien", a biographical manual for 20<sup>th</sup>-century landscape architecture in Germany, which he had written together with Joachim Wolschke-Bulmahn. This inspired Gert to follow Irma's footprints.

With this book, Professor Gröning saved Irma's story and her unusual professional profile from oblivion. More than that, he embellished the book with personal stories of Irma. These anecdotes allow us to understand the difficult life journey of this woman, whose "fault" was to try to do what she liked: work in the gardening sector. Additionally, Irma suffered from another "great guilt." She was "born in the wrong century," as she often said, in a time when the practice of landscape art was a privilege reserved for men. At that time, women of the bourgeoisie were pre-ordained to a "domestic permanent occupation" interrupted by visits to the theater, to the movies, or walks in the park. Therefore, the story as told by Professor Gröning has a wider narrative value. It offers points for reflection on a woman's right to have equal opportunities, a right still today not completely recognized in all countries of the world. Another point for reflection is the impact of war, a monster that kills lives, breaks hopes and takes away the freedom to choose one's own destiny.

The book begins with a description of the garden and the house where Irma spent her childhood. In this way Professor Gröning indicates that often the choices of life are influenced by the perception of childhood environments. Such was the case with Irma. "Bowled over" by the vision of the garden at her home, she decided that "when grown up, she wanted to do gardening." In this context, the first bud of Irma's interest to become a landscape architect bloomed, though it was an uphill career choice for a woman of that time! Gert describes how in Germany at that time it was difficult or almost impossible for women to access one of the few schools for gardening studies. In contrast, in neighboring England, gardening schools were already widespread and women had free access to them. For this

reason Irma went to England to fulfill her dreams, supported by her father, although some relatives considered her to be the "black sheep of the family."

After a few years in England, Irma was forced to return to Germany because of the outbreak of World War I. Nevertheless, she had acquired a lot of garden experience and hoped for a good job in Germany. The task was not easy because gardening and landscape design was considered an "exclusively male domain." Irma realized this a few years later when she participated anonymously in a garden design competition. In the selection process her work was ranked first among all the designs (the others were all by men, of course) and was recommended for the competition. However, when the judges learned that the designer was a woman, they downgraded her work to second place! The jury wanted to avoid the embarrassment of a woman being awarded first place. Recounting this episode, Professor Gröning allows a glimpse into the male dominated society of Germany in those days, which tried to push women back to the second line. Irma, however, was determined, and step by step achieved her goal. In 1924, she became the first woman in German history to pass the master examination in landscape gardening at the Gardener Training Institute in Berlin-Dahlem. A group photo with 20 other (male) colleagues from the institute corroborates this.

The image of a determined but eclectic woman, capable of expressing her many talents including those in music and painting, emerges from the book. Although Irma had two children with renowned flute virtuoso Alfred Tibursky, she did not marry him. Instead, she married landscape architect Gustav Heinrichsdorff to end family quarreling about her single mother status. Heinrichsdorff did not mind asking his wife to prepare supplementary paintings for his projects, though he did not cite her as co-author. After just five years this pro-forma marriage was dissolved. At the age of 38, Irma was again alone with two children to raise. Family-related and professional difficulties forced Irma to give up her landscape architecture career. At the isolated North Sea coast village of Dangast, Germany, her father bought her a house where she went on to manage a children's home for the following twenty years. In this place – together with her own two children and three foster children – she faced the tragedy of World War II that, once again, decided her fate. At the end of the



war, tired and proven, like all those people who lived through that dark period, Irma left Germany and moved from Dangast to Colorado Springs, Colorado, United States. With the help of her son Gernot, as well as Jochen and Peter Wurfl, two of her foster children who had immigrated to the United States, she was reborn into a second life. She returned to express herself as a fully respected landscape architect in the Colorado Springs vicinity. Here Irma began to smile again, reflecting in her heart on the unforgettable childhood memory of Irmenfried, the peaceful sanctuary of her first life. Irma died in Colorado Springs in 1983. Hans Kaal, an accomplished translator of scholarly studies in the United States, and the third of Irma's foster children, translated this book from German to English.

*Reviewed by Damiano Avanzato, Chair,  
ISHS Commission Plant Genetic Resources*



Cumo, C. (2016). *Plants and People: Origin and Development of Human-Plant Science Relationships* (Boca Raton, FL, USA: CRC Press Taylor & Francis Group), pp.278. ISBN 978-1-4987-0708-4. \$63.96 (paperback), \$55.97 (eBook). [www.crcpress.com](http://www.crcpress.com)

This new book caught my interest in the CRC booth at the Annual Meeting of the American Society for Horticultural Science in Atlanta in 2016 and I agreed to review it as I am interested in the subject. The author was unknown to me and the book had no blurb for identification but a google search showed that Cumo is the author of *The Ongoing Colom-*

*bian Exchange: Stories of Biological and Economic Transfer in World History, Seeds of Change: A History of the Ohio Agricultural Research & Development Center, Science and Technology in 20<sup>th</sup> Century American Life, and A History of the Ohio Agricultural Experiment Station 1883-1997*. Mr. Cumo is well versed in a number of topics of importance to agricultural history. However, I found the title *Plants and People* misleading; although it is a very common title or subtitle at present. A more appropriate title might be *Topics in the History of Agriculture*.

There are 11 chapters: The Biology of Plants, Evolution of Plants and People, Early Uses of Plants, The Neolithic Revolution, Rise of Empiricism in Antiquity, Columbian Exchange, The Rise of The Land Grant College Complex, Hybrid Corn Revolution, The Green Revolution, Plant Biotechnology, and The Malthusian Crisis. The topics are too huge to be fully explored in such a brief text, but the book is an interesting introduction to these subjects. There are, however, a number of bloopers. While the red Venus flytrap does demonstrate that a plant need not be green and there are many red-leaved plants as a result of heavy concentrations of anthocyanins, they all do

contain chlorophyll. Pollen of angiosperms are not gametes but in fact are microspores that contain, not one, but two haploid sperm nuclei – one combines with the egg nucleus to produce the diploid embryo and the other combines with the two haploid polar nuclei to produce the triploid endosperm, an important tissue that is never mentioned. He includes the fact that President James Buchanan vetoed the Morrill Act that would have created the Land Grant Colleges in the US in 1957, but I was disappointed that he did not mention that Abraham Lincoln signed the bill in 1862. His discussion about the Columbian exchange concentrates on only three plants from the Old World (sugarcane, soybeans, and rice) and three plants from the New World (potato, sweet potato, and maize). Soybean is a relatively modern introduction and does not fit classical Columbian exchange and I suggest that wheat would have been a better choice than rice. Overall, I found the book interesting and suggest it would be useful as supplementary readings for introductory college courses on the history of agriculture.

*Reviewed by Jules Janick,  
Purdue University, USA*

### > New titles

Hershey, C., ed. (2017). *Achieving Sustainable Cultivation of Cassava. Volume 1: Cultivation Techniques* (Cambridge, UK: Burleigh Dodds Science Publishing), pp.380. ISBN 978-1-78676-000-5 (hardback). £180.00. <https://shop.bdspublishing.com/checkout/Store/bds/Detail/WorkGroup/3-190-52640>

**A 20% discount will be received by entering the code "ISHS20" when ordering through <https://shop.bdspublishing.com/checkout/Store/bds/Detail/WorkGroup/3-190-52640>**

Hershey, C., ed. (2017). *Achieving Sustainable Cultivation of Cassava. Volume 2: Genetics, Breeding, Pests and Diseases* (Cambridge, UK: Burleigh Dodds Science Publishing), pp.280. ISBN 978-1-78676-004-3 (hardback). £130.00. <https://shop.bdspublishing.com/checkout/Store/bds/Detail/WorkGroup/3-190-52641>

**A 20% discount will be received by entering the code "ISHS20" when ordering through**

<https://shop.bdspublishing.com/checkout/Store/bds/Detail/WorkGroup/3-190-52641>

Polashock, J.J., Caruso, F.L., Averill, A.L., and Schilder, A.C., eds. (2017). *Compendium of Blueberry, Cranberry, and Lingonberry Diseases and Pests*, 2<sup>nd</sup> edn (St. Paul, MN, USA: APS Press), pp.231. ISBN 978-0-89054-536-2 (softcover). \$149.00. [www.shopapspress.org](http://www.shopapspress.org)

Steeves, T.A., and Sawhney, V.K. (2017). *Essentials of Developmental Plant Anatomy* (Oxford, UK: Oxford University Press), pp.184. ISBN 9780190657055 (hardback). \$69.95 / £45.99. [global.oup.com](http://global.oup.com)

Taiz, Lincoln and Taiz, Lee (2017). *Flora Unveiled: The Discovery and Denial of Sex in Plants* (Oxford, UK: Oxford University Press), pp.528. ISBN 9780190490263 (hardback). \$69.95 / £45.99. [global.oup.com](http://global.oup.com)



> [www.actahort.org](http://www.actahort.org)  
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# > Courses and meetings

The following are non-ISHS events. Make sure to check out the Calendar of ISHS Events for an extensive listing of all ISHS meetings. For updated information log on to [www.ishs.org/calendar](http://www.ishs.org/calendar)

11° Curso Internacional en Tecnología Post-cosecha y Procesado Mínimo, 29 March – 4 April 2017, Cartagena, Murcia, Spain. Info: Dr. Francisco Artés Hernández, Grupo de Postrecolección y Refrigeración (GPR-UPCT), Salón de Actos de la Escuela Técnica Superior de Ingeniería Agronómica, UPCT, Paseo Alfonso XIII 48, 30203 Cartagena, Murcia, Spain, E-mail: [gpostref@upct.es](mailto:gpostref@upct.es), Web: [www.upct.es/gpostref](http://www.upct.es/gpostref)

International Symposium: Advances in Lamiaceae Science, 26-29 April 2017, Antalya, Turkey. Info: Prof. Dr. Fatih Demirci, University of Anadolu, Faculty of Pharmacy, Department of Pharmacognosy, Eskisehir, Turkey, Phone: 0090 222 335 0580 / 3711, Fax: 0090 222 335 0750, E-mail: [demircif@gmail.com](mailto:demircif@gmail.com), Web: [www.lamiaceae2017.org](http://www.lamiaceae2017.org)

2nd International on-line Course on Postharvest & Fresh-cut Technologies, 8 May

– 15 September 2017. Info: Dr. Francisco Artés-Hernández, Postharvest & Refrigeration Group (GPR), Universidad Politécnica de Cartagena, Paseo Alfonso XIII, 48, 30203 Cartagena, Murcia, Spain, E-mail: [postharvest@upct.es](mailto:postharvest@upct.es), Web: <http://www.upct.es/gpostref/>

Horticultural Lighting Conference Europe, 23 May 2017, Eindhoven, The Netherlands. Info: <http://horticulturelightingconference.com/europe/programme/>



## Fascination of Plants Day May 18<sup>th</sup> 2017

The fourth international “Fascination of Plants Day” 2017 will be launched under the umbrella of the European Plant Science Organisation (EPSO). The goal of this activity is to get as many people as possible around the world fascinated by plants and enthused about the importance of plant science for agriculture, in sustainably producing food, as well as for horticulture, forestry, and all of the non-food products such as paper, timber, chemicals, energy, and pharmaceuticals. The role of plants in environmental conservation will also be a key message.

Everybody is welcome to join this initiative! We invite you to organize for the 18<sup>th</sup> of May 2017 a fascinating activity related to plants attracting and interacting with the public. Our goal is to break the record of 1000 events you organized in 2013. May 18<sup>th</sup> 2017 will be the Fascination of Plants Day itself and most events will be organised for this day. In addition, where this is not suitable, events will be organised throughout May 2017 (and even throughout the year 2017). Just contact your national coordinator (find at [www.plantday.org](http://www.plantday.org) – countries – your country – your NC contact details on right top) or the EPSO Coordinators via [epsos@epsomail.org](mailto:epsos@epsomail.org) to discuss and get hints for using the Fascination of Plants Day. The Fascination of Plants Day corporate design can be downloaded for free at the “PR-toolbox” on this webpage to be used to prepare, hold and report on this day, see “Main Menu”.

We invite many others to join in, ranging from schools to horticulture and anyone who feels to have a suited contribution to this initiative. Many plant science institutions, universities, schools, botanical gardens, and museums, together with farmers and companies, have opened their doors at the Fascination of Plants Day 2012, 2013 and 2015 with a variety of plant-based events for all the family – just look at the “Success Story” links in the given countries by clicking “Countries”. Again, the media are invited to join in, and scientists, farmers, politicians and industrialists will discuss with them and present the latest state-of-the-art research and breakthroughs in the plant science world and explore all of the new potential applications plant science can offer.

The Fascination of Plants Day will be backed up by a range of events in public spaces, theatres, cafes, central city squares and parks designed to get everyone thinking about plants.

We invite you to join the communication about the Fascination of Plants day via social media using #PlantDay.

## > Contact

Przemysław Wojtaszek, FoPD Coordinator European countries, [fopdpw@amu.edu.pl](mailto:fopdpw@amu.edu.pl); Trine Hvosløf-Eide, FoPD Coordinator beyond Europe, [trine.hvosløf-eide@umb.no](mailto:trine.hvosløf-eide@umb.no); or Karin Metzlauff, EPSO Executive Director, [epsos@epsomail.org](mailto:epsos@epsomail.org), [www.plantday.org](http://www.plantday.org)

Mediterranean Agribusiness School (MABS) 2017 Summer Program – Spanish Food Culture: the Mediterranean Diet and the Agro-food Industry, 5-30 June 2017, Zaragoza, Spain. Info: Mediterranean Agronomic Institute of Zaragoza (IAMZ) – CIHEAM, Avenida de Montañana 1005, 50059 Zaragoza, Spain, Phone: +34 976 716000, Fax: +34 976 716001, E-mail: [mabs@iamz.ciheam.org](mailto:mabs@iamz.ciheam.org), Web: <http://www.mediterraneanagribusinessschool.education>

XV Congress of the Mediterranean Phytopathological Union: Plant Health Sustaining Mediterranean Ecosystems, 20-23 June 2017, Córdoba, Spain. Info: Scientific Secretariat Mediterranean Phytopathological Union, Phone: +39 0552755863, E-mail: [phymed@unifi.it](mailto:phymed@unifi.it), Web: <http://mpucordoba.mpunion.eu/>

XII Master in Olive Growing and Oil Technology, September 2017, Cordoba, Spain. Info: Mediterranean Agronomic Institute of Zaragoza (IAMZ) – CIHEAM, Avenida de Montañana 1005, 50059 Zaragoza, Spain, Phone: +34 976 716000, Fax: +34 976 716001, E-mail: [iamz@iamz.ciheam.org](mailto:iamz@iamz.ciheam.org), Web: [www.iamz.ciheam.org](http://www.iamz.ciheam.org)

Postharvest Technology Course, 10-13 October 2017, Wageningen, The Netherlands. Info: Monique Tulp MSc, Programme manager Wageningen Academy, Phone: +31 317 48 22 98, E-mail: [monique.tulp@wur.nl](mailto:monique.tulp@wur.nl), Web: <http://bit.ly/21zQXrK>

International Event for Precision Agriculture & Horticulture in Asia/Australasia, 15-18 October 2017, Hamilton, New Zealand. Info: ForumPoint2 Limited, PO Box 1008 WMC, Hamilton 3240, New Zealand, Phone: +64 7 838 1098, E-mail: [conference@fp2.co.nz](mailto:conference@fp2.co.nz), Web: <https://forumpoint2.eventsair.com/QuickEventWebsitePortal/7acpa2017/info>





## › III All Africa Horticultural Congress



The III All Africa Horticultural Congress was successfully organised in Nigeria, jointly by the National Horticultural Research Institute (NIHORT) in Nigeria, the Horticultural Society of Nigeria (HORTSON) and the International Institute of Tropical Agriculture (IITA), under the auspices of the International Society for Horticultural Science (ISHS). It was held from 7-12 August 2016 at the IITA, Ibadan. The aim was to create a platform for building lasting synergies between the various stakeholders in horticulture (business, government, academia and students) in Africa. The expected outcome was to place various perspectives of horticulture in public view and to articulate joint strategies for developing horticulture to improve livelihoods in Africa. Thus, the theme for the congress was 'Horticulture for improved livelihoods'. The broad programme of the congress included an opening ceremony, technical sessions, a horticultural fair, a panel discussion, side events, an excursion, a social evening and the closing ceremony.

The opening ceremony was attended by about 200 people. This included 92 formally registered participants from Benin, Burkina Faso, Cameroon, Côte d'Ivoire, DR Congo, France, Guinea, Italy, Jamaica, Kenya, Liberia, Mali, Malaysia, Namibia, Nigeria, Tanzania, Senegal, South Africa, Taiwan, Germany, United Kingdom, and the United States of America. The Convener, Prof. Dr. Isaac Aiyelaagbe, welcomed the participants by challenging

### › Participants of the congress at the opening ceremony.

Africa to rise to the task of improving the livelihoods of impoverished African people. Goodwill messages were delivered by the Director General of IITA, Dr. Nteranya Saginga, President-in-Council of HORTSON, Dr. Henry Akintoye, and representatives of other agencies. Dr. Rémi Kahane, Chair of ISHS Commission Education, Research Training and Consultancy, addressed the congress participants on the ethos of the ISHS and the antecedents of the All Africa Horticultural Congress, while Prof. Dr. Umezuruike Linus Opara, Chair of ISHS Section Vegetables, Roots, Tubers, Edible Bulbs, Brassica, Asparagus, presented the ISHS medal award and certificate to the Convener.

There were three keynote addresses: Dr. Chiji Ojukwu, Director of Agriculture and Agro-industry Department, African Development Bank, spoke on 'Feed Africa: development of horticultural agribusiness in Africa and the response of the Africa Development Bank'; Dr. Marco Wopereis, Director General of the World Vegetable Centre (AVRDC), spoke on 'Boosting the vegetable sector in Africa'; and Dr. N.K. Krishna Kumar from Bioversity India spoke on 'Livelihood and nutritional security through horticulture in India'. The congress was declared open by the representative of the Hon Minister of Agriculture, Nigeria Chief Audu Ogbe. Thereafter, a panel discussion on 'Horticulture for sustainable development

and improved livelihoods' was hosted by Globalhort. It focused on the state of horticulture in Africa and what needs to be done to reconfigure it and deploy it for sustainable development in Africa. Membership of the panel consisted of both international representation and a range of stakeholders in horticulture. The consensus was that the various sectors of horticulture (science, business and government) must build stronger synergies to develop horticulture. Thereafter, the technical sessions commenced covering seven sub-themes including: Government policy and agribusiness development; Biotechnology, genetic improvement and seed systems; Postharvest handling; Climate change mitigation; Integrated pest management; Urban and organic horticulture; and Education extension and gender. Ninety-one oral and 29 poster presentations were given. Each sub-theme was preceded by a lead paper. The lead speakers included Dr. Abdou Tenkouano (West and Central African Council for Agricultural Research and Development (CORAF/WE CARD), Senegal), Dr. Dyno Keatinge (Tropical Agricultural Development Advisory Services (TADAS), UK), Dr. Rémi Kahane (French Agricultural Research Centre for International Development (CIRAD), France), Prof. Janice Olawoye (University of Ibadan, Nigeria), Dr. Martin Thibaud (CIRAD, France), Dr. David Ladipo (Centre for Environment,





➤ Presentation of keynote address by A) Dr. Chiji Ojukwu, Director of Agriculture and Agro-industry Department, African Development Bank, B) Dr. Marco Wopereis, DG of the World Vegetable Centre.



➤ ISHS representatives, Dr. Rémi Kahane (center) and Prof. Dr. Umezuruike Linus Opara (right), presenting the ISHS medal award to Convener Prof. Dr. Isaac Aiyelaagbe (left).



➤ ISHS student awards presented to A) Mr. Machel A. Emanuel for the best oral presentation, B) Mr. Olaoluwa Omoniyi Olarewaju for the best poster.



➤ Exhibits of A) the National Horticultural Research Institute, B) the Cocoa Research Institute of Nigeria, C) the Global Alliance for Improved Nutrition, D) the World Vegetable Centre.



Renewable Natural Resources Management Research and Development (CENRAD), Nigeria), Dr. Jane Ambuko Lukhachi (University of Nairobi, Kenya), Prof. Umezuruike Linus Opara (Stellenbosch University, South Africa) and Mr. Maximus Okoye (Stanbic IBTC Bank, Nigeria). An excursion was organised to the Federal University of Agriculture Abeokuta, Nigeria, where the delegates were able to visit the oldest Department of Horticulture in the higher education sector in Nigeria. After a courtesy call to the Vice-Chancellor, Prof. Olusola Oyewole, the delegates visited the university's commercial horticulture farm, ornamental nursery, and zoo.

Besides the technical sessions, side events included the GAIN symposium on 'Reducing postharvest losses in fresh fruits and vegetables in Nigeria', coordinated by Dr. Okoruwa, and several training workshops. These included 'Publish and prosper', hosted by Dr. Kahane, Editor-in-chief of the journal *Fruits* – The International Journal of Tropical and Subtropical Horticulture (<http://www.ishs.org/fruits>); 'Urban horticulture', coordinated by the FAO-Africa; and 'Improved presentation skills', coordinated by Dr. Gloria Adejo of the University of Ibadan. A social evening gave participants the opportunity to experience snippets of Nigerian culture including music, cuisine and dance and to further interact. The congress wound down on 12<sup>th</sup> August with a closing ceremony during which the communiqué was read and ISHS student awards were given. The ISHS award for the best oral presentation was received by Mr. Machel A. Emanuel (University of the West Indies, Jamaica), for his work "Apio Inc. Breatheway modified-atmosphere technology of ackee (*Blighia sapida*) arils: effect of temperature on package O<sub>2</sub> and CO<sub>2</sub> during



➤ Visit to parks and gardens of the Federal University of Agriculture Abeokuta.

storage", while the ISHS award for the best poster was received by Mr. Olaoluwa Omoniyi Olarewaju (University of KwaZulu-Natal, South Africa), for his research on "A comparative analysis of postharvest rind colour and antioxidant composition of 'Marsh' grapefruit harvested from different canopy position of the tree". During the ISHS business meeting, Senegal received endorsement to host the IV All Africa Horticultural Congress in 2020. The III All Africa Horticultural Congress was judged a success by participants and exhibitors. A modest financial success was made possible mainly by funding support received from the National Horticultural Research Institute, Horticultural Society of Nigeria, Prem Nath Agricultural Science Foundation (PNSAF) India, World Vegetable Centre (AVRDC), Global Alliance for Improved Nutrition (GAIN), Food and Agriculture Organisation, Inqaba biotech, Syngenta, Xybet Solar, Jubaili Agrotec, British American Tobacco

Nigeria Foundation, the patronage of the exhibitors, logistics support from the International Institute of Tropical Agriculture and Cocoa Research Institute of Nigeria, and contribution in kind from Yale Foods. We acknowledge the enthusiasm and contribution of resource persons, registered participants and the local Organising Committee. Details of the congress can be found on the congress website available through <http://www.ishs.org/symposium/394>.

Isaac Aiyelaagbe

### ➤ Contact

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## ➤ III International Symposium on Horticulture in Europe

The III International Symposium on Horticulture in Europe (SHE2016) was held from 17-21 October in Chania, located on the island of Crete, Greece. It was jointly organised by Dr. Panagiotis Kalaitzis, from the Department of Horticultural Genetics and Biotechnology of Mediterranean Agronomic Institute of Chania (MAICh) and Dr. George Manganaris from the Cyprus University of Technology, Department of Agricultural Sciences, Biotechnology and Food Science.

The meeting was attended by 320 delegates from different countries around the world. The objective of the symposium was to give scien-

tists, who study all aspects of horticulture, an opportunity to exchange knowledge, expertise, information, innovative ideas and techniques. Moreover, during the symposium, a wide array of scientific disciplines, such as genetics and breeding, ecophysiology and stress physiology, genomics and biotechnology, horticultural crop quality and postharvest technology, were merged together and included recent developments in fruit, vegetable and ornamental crops, making this event successful. The central theme of the symposium was "Growing Health and Life", and some of the oral presentations were focused on this.

In addition, the symposium scientific programme was comprised of 84 oral presentations, 256 posters and 16 plenary talks by invited keynote speakers, who are world-renowned experts in their research fields. The titles of the plenary talks were:

- What can plant science do for human health? – **Cathie Martin**, John Innes Centre, UK.
- The one-health concept and organic production of vegetables & fruits – **Beatrix Alsanius**, Swedish University of Agricultural Sciences (SLU), Sweden.
- The regulatory networks underlying developmental shifts in fleshy fruit: from



› Participants of the symposium.



› Convener, Dr. Panagiotis Kalaitzis, during his welcome speech.



› Co-convener, Dr. George Manganaris, during the award ceremony for Greek scientists-members of ISHS.

- fruit setting to fruit ripening – **Mondher Bouzayen**, University of Toulouse, France.
- Temperate fruit crops at new era: from preharvest to postharvest – **Guglielmo Costa**, University of Bologna, Italy.
- Sustainable vegetables by full control of plant production in greenhouse horticulture – **Leo Marcelis**, Wageningen University, The Netherlands.
- Bridging the gap between genomics and fruit breeding – **Francois Laurens**, INRA Angers, France.
- New developments in dynamic controlled atmosphere storage of pome fruit – **Bart Nicolai**, University of Leuven, Belgium.
- The genomic approach to dissect GXE in grapevine – **Mario Pezzoti**, University of Verona, Italy.
- Recent trends in greenhouse design and microclimate control – **Kostas Kittas**, University of Thessaly (UTH), Greece.
- Phenotyping methods for horticultural crops: opportunities and challenge – **Mark Mueller-Linow**, Forschungszentrum Juelich, Germany.
- Regulation of senescence and abscission in ornamentals by plant hormones:

horticultural use and mode of action – **Shimon Meir**, The Volcani Center, Israel.

- Genetic dissection of tomato fruit quality in the genome era: new tools for in depth QTL characterization – **Matilde Causse**, INRA, France.
- Climate change and the potential mitigation role of fruit tree orchards – **Cristos Xylogiannis**, University of Basilicata, Italy.
- Application of functional genomics in glandular trichomes of *Cistus creticus* laid to exploration of labdane-type diterpenes biosynthesis – **Angelos Kanellis**, Aristotle University of Thessaloniki, Greece.
- Strategic research and innovation agenda for the fruit sector: the view of the industry – **Joan Bonany**, Mas Badia (IRTA), Spain.
- Next generation data analysis using flowering plants: case study *Aquilegia* species – **Christos Noutsos**, Cold Spring Harbor Laboratory, USA.

The research highlights of the event were not restricted to the above plenary talks, and interesting and fruitful outcomes were generated during the oral and poster presentations. Many interesting research results, in terms of originality, significance and rigour,

that crossed the boundaries between all the scientific areas of horticulture, were presented. These are some of the highlights:

- Human health, nutritional value and horticulture** (fruit and vegetable crops for healthy lives, conventional and organic production systems for nutritional value).
- Tools, technologies, innovations and applications** (automations, bioinformatics in horticulture, interdisciplinary concepts and novelty in horticulture).
- Quality, authentication, traceability and supply chains** (fruit and vegetable production and physiology for quality, green supply chain management).
- Genetic resources, systems approaches and biodiversity** (phenotype and phenomics in horticulture, breeding, genetics and new cultivars, systems biology and omics in horticulture).

All of these presentations provided a foundation for the establishment of new collaborations that will drive pioneering high-quality research, and fostered an atmosphere of effective communication and cooperation amongst symposium participants.

Two ISHS student awards for the best oral and poster presentations were given by the





► Keynote speakers: Francois Laurens (A), Mondher Bouzayen (B) and Christos Xylogiannis (C).



► A) Johanna Suhl, winner of the ISHS student award for the best oral presentation. B) Dr. Greg Reighard (left) presenting the ISHS student award to Dieter Lohr (right) for the best poster.

ISHS Board members Professor Jens Norbert Wünsche and Professor Silvana Nicola. The recipients were Johanna Suhl from the Humboldt-Universität zu Berlin, Germany, for the best oral presentation entitled “INAPRO - Innovative Aquaponics for Professional Application” and Dieter Lohr from the Weihen-

stephan-Triesdorf University of Applied Sciences, Germany, for the best poster entitled “Multi-species near infrared calibration models for predicting nitrogen status of ornamental cuttings’ strategies for scope extension”. The social program of the symposium included a welcome reception party, a gala dinner

in the premises of MAICH and professional tours, which enabled the participants to discover the horticultural industry in the area of Chania, and enjoy the beautiful scenery on the island of Crete. Further details about SHE2016 can be found at <http://she2016.org>, and the photos from the scientific and social programme of the meeting can be retrieved from the symposium’s official Facebook page <https://www.facebook.com/SHE2016Chania/>.

*Panagiotis Kalaitzis  
and George Manganaris*

## ► Contact

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# ► International Symposia on Tropical and Temperate Horticulture

The International Symposia on Tropical and Temperate Horticulture (ISTTH2016) was the first ISHS meeting convened using the new Symposia 2.0 format, in which several related symposia are grouped together at one venue. This concept provides extra value for delegates and, in offering a broader program, maximizes delegate numbers. This enables new symposia to become established and makes viable smaller symposia that address narrower, more specific research areas. We

assembled several symposia, eight of which were new initiatives, under the theme “Now is the Era for Tropical Horticulture”. It was held from November 20-25 2016, in Cairns, Australia, and was attended by 250 delegates from 27 countries. We received many positive comments both during the week and after the symposia. This meeting was convened by Rod Drew and was jointly hosted by ISHS, AuSHS and AIH (Australian Institute of Horticulture). AIH was very supportive and made a

major contribution to the organization and running of the symposium. The II International Symposium on Tropical Horticulture was very well received and emphasized the importance of horticulture now and in the future. It was convened by Prof. Rod Drew, Prof. Robert Paull (ISHS Fellow), and Dr. Alain Rival (CIRAD) and was attended by some excellent speakers and leading horticulturists from tropical regions including: Prof. Dyno Keatinge (ISHS Fellow),

Dr. Kim Hummer (ISHS Science Editor), Prof. Sisir Kumar Mitra (Chair ISHS Section Tropical and Subtropical Fruits), and Dr. Stefano Padulosi (Bioversity International), as well as representatives from the World Vegetable Centre and the Australian Centre for International Agricultural Research. Melinda Perkins won the ISHS student award for the best oral presentation entitled “Red bayberry - the journey to its commercialisation in Australia”. As the world changes, many challenges face horticultural production in the tropics. Many of world’s poorest people live in tropical regions. More people now live in cities than in rural regions and as the world population moves towards 9 billion by the 2050s, many of the fastest growing cities are located in the tropics. Cities consume both land and water. They are an opportunity for new markets but they also pose challenges for tropical horticulturists. As well as the rapid increase in urbanization, breeding strategies and Best Agricultural Practices are being impacted by climate change. However, there was a strong sense of optimism among the delegates in response to these challenges. It was concluded that horticulturists, research providers, governments, funding bodies and private companies need to work together to realize the potential of tropical horticulture to meet the needs of our world. The First International Symposium on Poverty, Hidden Hunger and Horticulture & VI International Symposium on Improving the Per-

formance of Supply Chains in the Transitional Economies were jointly convened by Dr. Hannah Jaenicke, Prof. Peter Batt, Dr. Detlef Virchow, and Prof. Umezuruike Linus Opara. A three-day program included some excellent speakers and key delegates from many countries. The symposium featured three keynote presentations, 24 oral and three short oral (poster) presentations and attracted a steady audience of around 40 participants, despite the strong competition from parallel symposia. Alisher M. Ergashev received the ISHS student award for the best oral presentation entitled “Determinants and constraints of fruit and vegetable consumption in Uzbekistan” in the First International Symposium on Poverty, Hidden Hunger and Horticulture. Elisha O. Gogo received the ISHS student award for the best oral presentation entitled “Postharvest UV-C treatment improves health promoting plant compounds and prolongs shelf-life of vegetable amaranth (*Amaranthus cruentus* L.)” in the VI International Symposium on Improving the Performance of Supply Chains in the Transitional Economies. An element of the joint symposia was a panel discussion featuring Prof. Dyno Keatinge (Tropical Agriculture Development Advisory Services Ltd.), Dr. Stefano Padulosi (Bioversity International), Prof. Peter Batt (Peter J Batt & Associates) and Dr. Astha Thuladar (Meijo University), moderated by Dr. Hannah Jaenicke (GlobalHort) on the topic of “Horticulture for Sustainable Development – What does it take

for lasting success?” The messages emanating from the discussion included the need to make horticulture more attractive to young people, send clear messages about the benefit of fruits and vegetables for better nutrition, improve on capacity strengthening, and the need for innovative fundraising with new investors. While everyone has a role to play as individual ambassadors, there is a need for better links amongst the players in horticultural research and practice and across to local, regional and global decision makers. An interview with the panelists has been published on the DevEx website (<https://www.devex.com/news/prioritizing-horticulture-in-the-sdgs-why-it-matters-89239>). The First International Symposium on Poverty, Hidden Hunger and Horticulture is a new symposium for ISHS but one that will grow in importance in coming decades. The First International Symposium on Beverage Crops was attended by a small but very enthusiastic group of delegates who presented a wide range of research from “Beverages made from Amazonian fruits” to “Juniper berries for the production of the “Borovička” in the Slovak Republic” and “Recent advances on kava quality control, the traditional beverage of the Pacific Islands”. This symposium was convened by Profs. Renato Pavia, Rod Drew, Yves Desjardins, and Umezuruike Linus Opara. At the business meeting it was unanimously agreed to hold the II International Symposium on Beverage Crops in Xi’An in China.



► Participants of the symposia. Photo by Romy Photography.





► Rod Drew presenting the ISHS medal awards to Conveners A) Robert Paull (II International Symposium on Tropical Horticulture), B, C) Peter Batt and Hannah Jaenicke (I International Symposium on Poverty, Hidden Hunger and Horticulture & VI International Symposium on Improving the Performance of Supply Chains in the Transitional Economies), D) Renato Paiva (I International Symposium on Beverage Crops and I International Symposium on Vegetative Propagation and In Vitro Culture of Tropical Plants), E) Patricia Paiva (First International Symposium on Urban Landscapes in Tropical Cities), F) Sophie Parks (I International Symposium on Protected Cultivation in Tropical and Temperate Climates and X International Symposium on Protected Cultivation in Mild Winter Climates), G) Sisir Kumar Mitra (IV International Symposium on Guava and Other Myrtaceae and I International Symposium on Tropical Plantation Crops), H) Andrew East (IV International Symposium on Guava and Other Myrtaceae), I) Songpol Somsri (I International Symposium on Tropical Plant Breeding), J) Natalie Dillon (I International Symposium on Tropical Plant Genomes). Other conveners are listed in the text of this article. Photos by Romy Photography.

The First International Symposium on Urban Landscapes in Tropical Cities was combined with a two day symposium jointly hosted by the Australian Institute of Horticulture, whose membership includes many of the leading landscape horticulturists in Australia. It was convened by Prof. Patricia Pavia (ISHS Council member, Brazil), Prof. Gert Gröning, and Wayne van Balen and Kim Morris, who are President and Secretary of AIH, respectively. It included some excellent speakers such as Maria Boey (President, Institute of Parks and Recreation, Singapore), Patricia Pavia, Don Burke (Australian Television Presenter on Horticulture) and other leading landscape architects from Australia and Singapore.

The First International Symposium on Protected Cultivation in Tropical and Temper-

ate Climates and X International Symposium on Protected Cultivation in Mild Winter Climates were held on Monday 21<sup>st</sup> November, 2016. The symposia were jointly convened by Drs. Sophie Parks, Gordon Rogers, and Yüksel Tüzel. These symposia were truly international, with representatives from ten countries. Research was presented on a number of horticultural crops including apple, blackberry, capsicum, grape, herbaceous cuttings, medicinal cannabis, mustard greens, strawberry, tomato and turf grass. Research on plant responses to protective covers, greenhouse design, light quality, nutrition, and grower practices to improve crop production were highlighted. Max Edgley received the ISHS student award for the best oral presentation entitled “The effects of nitrogen fertiliser application rates on red drupelet

disorder (reversion) in ‘Ouchita’ thornless blackberries grown under tunnels”. Timothy Kendrick of BW Global, Canada, presented a morning plenary lecture entitled “Protected cultivation innovations and their evolutionary effect on production, distribution and retail food system models”.

The IV International Symposium on Guava and Other Myrtaceae was convened by Assoc. Prof. Andrew East and Prof. Sisir Kumar Mitra. Previously, this symposium had to be cancelled due to insufficient abstracts, however, the 2.0 format allowed us to successfully hold it. This small symposium featured eight oral and two poster presentations. Feijoa was featured as a topic in three talks and posters and is a fruit that is developing commercially. The remaining orals discussed the latest research on guava (3), araza and pitanga.



➤ Wayne Van Balen, President of the Australian Institute of Horticulture. Photo by Romy Photography.

panel comprising of world renowned plant tissue culturists: Drs. Jenny Aitkin, Alain Rival and Rod Drew. The best oral presentation by a student entitled “Temporal profile of juvenility-associated microRNAs during tissue culture of avocado” was awarded to Jayeni Hiti Bandaralage.

Smaller symposia, which each featured one day of oral presentations, were on: Tropical Plant Breeding, Tropical Plant Genomes and Tropical Plantation Crops. Conveners of these three symposia were: Drs. D.M. Dinesh, Songpol Somsri, and Lee Wen-Li (Plant Breeding); Dr. Natalie Dillon (Genomes); and Prof. Sisir Kumar Mitra, Dr. Valerie Tuia, and Dr.

At a general business meeting, it was decided to hold the III International Symposium on Tropical Horticulture in Thailand. The attendees decided not to separate the Symposium on Poverty, Hidden Hunger and Horticulture at this stage but to retain it as a major theme of the third symposium. We must address hidden hunger (deficiency of minerals and vitamins) that now affects more than 2 billion people worldwide. It was recommended that other small symposia be included as separate sessions and that the Symposia 2.0 format be maintained.

Rod Drew



➤ A. Rod Drew presenting the ISHS student awards for the best oral presentations at ISTTH2016 to Usana Nantawan (second from left), Melinda Perkins (second from right) and Elisha Gogo (right). Photo by Romy Photography. Other ISHS student award winners were Alisher Ergashev (B), Jayeni Hiti Bandaralage (C), and Max Edgley (D).



The First International Symposium on Vegetative Propagation and In Vitro Culture of Tropical Plants was convened by Profs. Renato Pavia and Maurizio Lambardi. Two days of oral presentations featured keynote presentations by Profs. Sisir Kumar Mitra and Rod Drew. A well-attended workshop was convened by Dr. Jenny Aitkin and featured a

Luseane Taufa (Plantation Crops). Usana Nantawan was the winner of the ISHS student award for the best oral presentation entitled “Development of polymorphic simple sequence repeat (SSR) markers from genome re-sequencing of *Carica papaya* L. ‘Sunrise Solo’ and ‘RB2’ for marker-assisted breeding” in the Plant Genomes Symposium.

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## ➤ XII International Symposium on Flower Bulbs and Herbaceous Perennials

Section Ornamental Plants

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The XII International Symposium on Flower Bulbs and Herbaceous Perennials was held in Kunming, China, from June 28 to July 2, 2016, under the auspices of the ISHS. This symposium was organized by Convener Prof. Ding Mu from the Institute of Vegetables

& Flowers, Chinese Academy of Agricultural Sciences (CAAS) and Co-Convener Prof. Jihua Wang from the Flower Research Institute (FRI), Yunnan Academy of Agricultural Sciences (YAAS) and was hosted by FRI, YAAS. FRI also provided financial support.

The symposium was divided into five sections, with special emphasis on new crops and findings, including recent research achievements and techniques. The proceedings will include 50 papers. Oral presentations were applicable and valuable to the





> Participants of the symposium.



> A. Prof. W. B. Miller during his oral presentation. B. Prof. Rina Kamenetsky presents information on the development and utilization of ornamental geophytes. C. Prof. Silan Dai during her oral presentation on flowering mechanisms.



> A. Prof. Ding Mu presenting the ISHS student award to A.R. Garfinkel for the best oral presentation. B. Y.Y. Zhang, winner of the ISHS student award for the best poster.

flower industry in both China and the world. Some of the highlights included:

- “Flower bulbs worldwide: perspectives on the production chain and our research”, presented by Prof. William B. Miller (Cornell University, USA);
- “Development and utilization of ornamental geophytes: research challenges and sustainable production”, presented by Prof. Rina Kamenetsky (ARO, Israel);
- “Scheduling flowering in *Clivia miniata* Regel. for different markets”, presented by

Dr. Keith Funnell (Plant & Food Research, New Zealand). This presentation was highly relevant to the Chinese flower market, especially at the time of the Chinese Spring Festival;

- “Comparative analysis of the photosynthetic characteristics for male sterile lines of *Lilium*”, by Wenjie Jia, FRI, YAAS.

Many other oral presentations were also highly appreciated, including those from Prof. Silan Dai (Beijing Forestry University, China), Junping Gao (China Agriculture University),

Gary Chastagner (Washington University, USA), and Hiroshi Okubo (Japan).

Dr. Jihua Wang et al. from FRI, YAAS, investigated more than 40 species of flower bulbs and herbaceous perennials in Yunnan. Many of them were new introductions with good potential for the flower production industry. Dr. Keith Funnell described the genus *Gentianella*. Dr. D. Aros from Chile introduced five genera, including *Pasithea*, which have bright prospects for ornamental use.

Numerous new and potential ornamental crops were introduced in the oral and poster presentations. In addition, modern and novel techniques used in flower bulb research





➤ A. Visit to a flower market in Kunming. B. Visit to a flower company that produces *Cymbidium faberi* Rolfe and other orchids. This company works cooperatively with companies in South Korea and Japan and distributes their products throughout China.

were described, that will facilitate a better understanding of the mechanisms of flowering, dormancy and plant-pathogen interaction in ornamental plants.

During the symposium ISHS student awards were presented. A.R. Garfinkel from Washington State University, USA, received the award for the best oral presentation entitled “Microsatellite marker development for tracking potential routes of *Botrytis paeoniae* migration on rootstock material of paeonia”, and Y.Y. Zhang from Beijing Forestry University, China, received the award for

the best posters, which were entitled “The cross-compatibility of different lily hybrid cultivars” and “The breeding of thirteen new Asiatic lily cultivars for cut flowers”.

During the ISHS business meeting, it was proposed that the XIII International Symposium on Flower Bulbs and Herbaceous Perennials be hosted by South Korea. Prof. Gary Chastagner from Washington State University, USA, was elected as the new Chair of the ISHS Working Group Flower Bulbs and Herbaceous Perennials. On behalf of the ISHS, Prof. W.B. Miller issued symposium awards to the

retired scientists, Prof. Hiroshi Okubo (Japan), Menashe Cohen and Dorit Sandler-Ziv (Israel), and Prof. Ding Mu (P.R. China).

Ding Mu

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## ➤ First International Apple Symposium

Section Pome and Stone Fruit

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The First International Apple Symposium (<http://www.ishs.org/symposium/624>) was held on October 10-16, 2016, in Yangling, Shaanxi, China, with the theme of “Improving Apple Culture Benefits More of the World’s People”. The symposium was supported by the Chinese Ministry of Agriculture and Shaanxi Provincial Government and was held under the aegis of the International Society for Horticultural Science. It was sponsored by the Chinese Society for Horticultural Science and the Chinese Academy of Engineering, and was organized by Northwest A&F University, Agricultural Department of Shaanxi Province (Fruit Industry Bureau), Yan’an Municipal Government, and the Yangling Management Committee. Co-organizers included the Apple Collaborative Innovation Center of Beijing, China Agricultural University, Shandong

Agricultural University, and Yangling Vocational Technical College.

Over 800 scientists and entrepreneurs from 26 countries gathered in Yangling, and shared their understanding of the science underlying progress towards the development of a worldwide sustainable apple industry. The scientists shared current progress and future challenges in apple research, production and the entire marketing chain. After the Opening Ceremony, a plenary session was held, in which 10 keynote speakers gave the following presentations: (1) “Preharvest and postharvest 1-MCP application on apple fruit quality and physiological disorders” by Prof. Christopher Watkins from Cornell University, USA; (2) “Small apple, huge industry and big data” by Mr. Wei Guo from Digital China Group Co. Ltd., China; (3) “Exploring all the options towards engineering an even

### ➤ Participants of the symposium.

healthier apple” by Dr. Andrew C. Allan from the New Zealand Institute for Plant & Food Research Ltd; (4) “Different backgrounds for small apple – the apple industry development in Shaanxi Province” by Mr. Wubin Gao from the Fruit Administrative Bureau of Shaanxi, China; (5) “Genes and genomes: the role of genetic markers in pipfruit breeding” by Dr. Vincent Bus from the New Zealand Institute for Plant & Food Research Ltd; (6) “Current status and technical evolution of apple industry in China” by Prof. Mingyu Han from Northwest A&F University, China; (7) “Transgenic free genome editing for non-sexually propagated crop plants” by Pro. Yi Li from the University of Connecticut, USA; (8) “Apple rootstock breeding in China – advance and challenge” by Prof. Zhenhai Han from





➤ ISHS President Rod Drew (right) and ISHS Board member Dr. Jill Stanley (left) presenting the ISHS medal award to Symposium Conveners Dr. Stuart Tustin (second from left), Prof. Zhenhai Han (center) and Prof. Fengwang Ma (second from right).

China Agricultural University, China; (9) “What have we learned from the apple genome: tools and perspectives” by Dr. Riccardo Velasco from Fondazione Edmund Mach, Italy; and (10) “SERRATE plays important roles in drought stress tolerance of apple” by Prof. Qingmei Guan from Northwest A&F University, China. Over the following two days, six concurrent sessions were held covering the following topic areas: Germplasm and breeding; Orchard environment and cultivation; Molecular biology and biotechnology; Plant protection; Orchard equipment, postharvest technologies and marketing; and the Role of vocational education in the apple industry. In addition to the keynote presentations, the scientific programme contained 102 oral and 98 poster presentations. Posters were displayed throughout the symposium. ISHS President Dr. Rod Drew was invited and enthusiastically attended the symposium. He participated in all activities of the symposium and gave addresses in both the opening and closing ceremonies.

A two-day field tour to the Yan'an apple production area took place, which demonstrated the large scale of apple production in semi-arid agricultural systems and the current status of the apple industry in China.



➤ ISHS President Dr. Rod Drew talking with a Chinese farmer during the orchard tour.

At the closing ceremony, ISHS medals were awarded to Prof. Zhenhai Han, Prof. Fengwang Ma and Prof. Stuart Tustin in recognition of their meritorious service to the Society as Conveners of the symposium. After full evaluation by two professional groups, ISHS student awards were given to Qiulei Zhang for the best student oral presentation entitled “The mechanism of a novel Md-miR12 regulate apple *Alternaria* leaf spot” and to Zhengcao Xiao for the best student poster entitled “Extraction, identification, and antioxidant and anticancer tests of seven dihydrochalcones from *Malus* plant”. At the conclusion of the symposium, the ISHS Board representative, Dr. Jill Stanley, announced that the II International Apple



➤ ISHS Board member Dr. Jill Stanley (center) presenting the ISHS student awards to Qiulei Zhang for the best student oral presentation (right) and to Zhengcao Xiao for the best student poster (left).

Symposium would be held in Italy, organized by the Edmund Mach Foundation and convened by Dr. Riccardo Velasco, according to the selection process held during the ISHS business meeting.

*Zhenhai Han, Fengwang Ma, Stuart Tustin and Ting Wu*

## ➤ Contact

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# ➤ V International Symposium on Lychee, Longan and Other Sapindaceae Fruits

Section Tropical and Subtropical Fruits

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The V International Symposium on Lychee, Longan and Other Sapindaceae Fruits was organized by Bihar Agricultural University (BAU) at Sabour, Bhagalpur, Bihar, India from May 31-June 3, 2016, under the auspices of the International Society for Horticultural Science (ISHS). The symposium was supported

by the Department of Science & Technology, New Delhi; the National Bank for Agriculture and Rural Development (NABARD), Patna; the Bihar Agricultural Management & Extension Training Institute (BAMETI), Patna; the National Horticulture Board (NHB), Gurgaon; and the National Horticulture Mission (NHM),

Patna. A total of eight foreign delegates from various parts of the world (China, Mauritius, South Africa, and United Kingdom) and 137 national researchers from Bihar, Delhi, Gujarat, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Meghalaya, Mizoram, Punjab, Uttar Pradesh, and West Bengal, participated in the

symposium. Padam Shree Dr. K.L. Chadha, President of the Horticultural Society of India, New Delhi; Dr. A.K. Singh, Vice Chancellor, BAU, Sabour; Dr. Regina B. Cronje, Agricultural Research Council-Institute for Tropical and Subtropical Crops (ARC-ITSC), Nelspruit, South Africa; Dr. W.S. Dhillon, Professor (Horticulture), Punjab Agricultural University, Ludhiana and former ADG, Indian Council of Agricultural Research (ICAR), New Delhi; Dr. Vishal Nath, Director, National Research Centre on Litchi, Muzaffarpur; and Dr. B.C. Saha, DRI-cum-Dean PGS, BAU, Sabour, graced the inaugural func-



► **Inaugural session of the symposium.** From left to right: Prof. M. Feza Ahmad, Symposium Convener; Dr. Regina B. Cronje, ISHS representative; Padam Shree Dr. K.L. Chadha, President, The Horticultural Society of India; Dr. A.K. Singh, Vice Chancellor, BAU, Sabour; Dr. Vishal Nath, Director, National Research Centre on Litchi, Muzaffarpur; and Dr. W.S. Dhillon, Professor (Horticulture), Punjab Agricultural University, Ludhiana and former ADG, ICAR, New Delhi.

tion of the symposium. During his welcome address, Prof. M. Feza Ahmad, Convener of the symposium, emphasized various aspects of *Sapindaceae* fruit cultivation, including biodiversity, genetic resources, breeding through conventional and biotechnological approaches, and quality and shelf life improvement using physiological, biochemical and nanotechnological tools to address both the domestic and export markets. The opening keynote speaker of the symposium, Padam Shree Dr. K.L. Chadha, emphasized important aspects, such as germplasm conservation, processing of litchi and other sapindaceous fruit, and promotion of non-conventional sapindaceous fruit like longan and rambutan, as well as their export potential. In the presidential address, Dr. A.K. Singh, Honorable Vice Chancellor, BAU, Sabour, pointed out the impact of climate change on fruit production and quality as well as the improvement of shelf life of litchi and allied crops. Dr. Regina B. Cronje presented the activities of the ISHS throughout the world. Dr. W.S. Dhillon emphasised the importance of fruit crops in promoting nutri-



► **Participants in the hall on the first day of the symposium.**

tional security and their contribution to the national economy. Dr. Vishal Nath explained the role of the National Research Centre on Litchi in the holistic improvement of litchi production and advancements in research, such as canopy management and precision input management interventions in physiological systems. The inaugural session ended with a few words of thanks from Dr. B.C. Saha.

Thereafter, Padam Shree Dr. K.L. Chadha delivered a plenary lecture on “Fruit crop improvement: achievement and future priority”. During his lecture, he pointed out the various constraints and approaches of the fruit crop improvement programme, including biodiversity conservation, survey of areas for suitability of different fruit crops and commercialization of new crops like longan, rambutan, pulasan, kiwifruit, passionfruit, and oil palm.

Subsequently, seven different technical sessions were held during the entire four-day programme. The outcome of technical session I, “World production and trade scenario”, was to place emphasis on mutation and other breeding methods to increase variability in litchi. In this session, it was also recommended that in the near future litchi should be planted in non-traditional areas of India, such as Kerala, Karnataka, Tamil Nadu and Andhra Pradesh to extend the crop availability to include December and January. In technical session II, “Biodiversity, genetic resource and breeding”, it was concluded that diverse germplasms of the *Sapindaceae* family should be used and conserved at all litchi research centres to maximize their use in varietal improvement programmes. In technical session III, “Physiology, biochemistry, biotechnology and nanotechnology”, researchers were advised to recommend specific fertilizer schedules for each cultivar. Patch budding in August at high relative humidity, with more than 70% success rate, was recommended as an alternative to air layering in technical session IV, “Propagation and orchard management”. In technical session V, “Plant growth regulators in litchi production”, researchers were advised to standardize the concentration of different plant growth regulators for a specific problem

at a specific location. Litchi is known to be less susceptible to many pests and diseases than many other fruit crops, however, new diseases, such as blight, wilt and fruit rot, have recently been reported in different parts of India. During technical session VI, “Disorders, disease and insect-pest management”, the conclusion was that in future research work more emphasis should be given to combating serious diseases, in addition to the major problem of pericarp browning. Technical session VII, “Postharvest biology and technology, processing, marketing & export”, was concluded with the suggestion that pre-cooling facilities and cold chain management systems be made compulsory, in order to maintain fruit quality and to increase shelf life of fruit during storage and transportation.

A field visit to the major litchi growing area adjoining BAU, Sabour campus, was organized. During this tour, scientists and experts from different parts of the world interacted with the litchi growers regarding different issues related to litchi cultivation. On the last day of the symposium, a farmer-scientist interaction was organised, to discuss socio-economic and other relevant issues affecting litchi growers in the state. This was followed by the valedictory function of the symposium.

The valedictory programme was inaugurated by the keynote speaker, Shri. Vijay Prakash, Agriculture Production Commissioner, Bihar, in the presence of Guest of Honour, Dr. H.P. Singh, Former Dy. Director General (Horticulture), ICAR, New Delhi; Dr. G. Triwedi, Former Vice Chancellor, Rajendra Agricultural University, Samastipur, Pusa, Bihar; Dr. Regina B. Cronje, ARC-ITSC, Nelspruit, South Africa; Dr. Ajoy Kumar Singh, Honorable Vice Chancellor, BAU, Sabour; and Mr. Edward Grantham, progressive farmer of South Africa. The keynote speaker, Shri. Vijay Prakash, stated that Bihar is very fortunate to produce the greatest volume of litchis in India, and that the crop has great potential to improve the state's economy. He emphasised that cool chain facilities were essential for expanding export opportunities for litchi. He also mentioned that an important challenge for scientists is to increase the





➤ ISHS representative Dr. Regina B. Cronje presenting the ISHS student awards to A) Mr. Sameer Muhamed for the best oral presentation, B) Ms. Pushpa Kumari for the best poster.

shelf life of the fruit because this will have great impact on achieving expansion of export markets. Further, he emphasized the importance of grading and packaging techniques and explained that the Government of Bihar is working on this challenge in collaboration with the Agricultural & Processed Food Products Export Development Authority (APEDA), New Delhi, to increase export potential. In addition, he also suggested that litchi growers should adopt the technology of litchi honey production as it has potential to be a successful new business opportunity. Dr. H.P. Singh's valedictory address covered many important issues related to litchi cultivation around the world.

ISHS student awards were presented to Mr. Sameer Muhamed from Kerala Agricultural University, Thrissur, India, for the best oral presentation entitled "Elite selections of rambutan (*Nephelium lappaceum* L.) for different economic attributes from Kerala", and to Ms. Pushpa Kumari from Bihar Agricultural University, Sabour, Bhagalpur, India, for the best poster entitled "Postharvest salicylic acid and chitosan treatment reduces pericarp browning and preserves fruit quality of litchi". Dr. Regina B. Cronje, ISHS representative, presented the ISHS medal award to the Symposium Convener, Prof. M. Feza Ahmad, and Co-conveners, Dr. Rewati Raman Singh, Assoc. Prof.



➤ Interaction between judges and presenter during the poster presentation session.

Sanjay Sahay and Dr. Ruby Rani, for making this event successful. Finally, the programme ended with a few words of thanks, given by Prof. Feza Ahmad, Symposium Convener.

*M. Feza Ahmad*



➤ Visit to a field of litchi growers at Naugachia, Bihar, India.

### ➤ Contact

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## ➤ VI International Symposium on Persimmon

Section Tropical and Subtropical Fruits

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After five previous successful symposia, organised in Thailand, Australia, Korea, Italy and China, the VI International Symposium on Persimmon of the International Society for Horticultural Science (ISHS) was held in Valencia, Spain, from 16-20 October, 2016. Persimmon is an emerging fruit

crop in Spain, which is now the largest persimmon producing country outside of Asia. The organization of this international symposium offered an outstanding opportunity for international participants to take a closer look at this exciting new Spanish industry.

The persimmon industry in Spain grows an outstanding cultivar, 'Rojo Brillante', which originated as a natural mutation discovered near Valencia. The high quality fruit, along with new technologies developed to eliminate astringency while keeping fruit firmness, has enabled and bolstered a new





#### ► Participants of the symposium.

export industry during the last few years. Today, Valencia ranks first for persimmon exports worldwide. The close and valuable collaboration between local stakeholders (growers, research centres, fruit exporters) has been key in the development of new persimmons with extraordinary quality, that can also be successfully transported to distant international markets.

The Instituto Valenciano de Investigaciones Agrarias (Valencian Institute of Agricultural Research) in collaboration with the Instituto Nacional de Investigación y Tecnología Agraria y Agroalimentaria (National Institute for Agricultural and Food Research and Technology) organised the symposium. During the four day symposium, about 200 participants, including scientists and technicians from twelve different countries, presented the most recent results on persimmon research and experimentation. The six broad session topics included: production and markets, genetic resources, plant breeding and biotechnology, postharvest technology, crop management, and pest and diseases. The two last topics were included for the first time as separate sessions in this symposium.

The keynote address was given by Prof. Edgardo Giordani on the new network of markets and technologies linked to the culture and perception of persimmon fruit. Five plenary lectures by outstanding scientists and experts reviewed the state of the art in breeding and molecular biology, crop management in the context of climate change, new pest and disease challenges, and an overview of the contribution of modern postharvest techniques to fruit industrialization. The scientific contributions covered not only traditional techniques and studies, such as conventional breeding and germplasm studies, but also the implementation of modern biotechnological methods based on genomics and new generation sequencing. These new techniques were applied to describe the whole genome of persimmon and to identi-



► Symposium Convener Maria Luisa Badenes presenting the ISHS student awards to A) Miao Miao Wang for the best student oral presentation, and B) Omar García Martínez for the best student poster.

fy important genes. Furthermore, new challenges in pest control and crop management and the most recent postharvest techniques were presented and discussed. These topics were addressed in 80 scientific presentations that covered the complete persimmon industry. The Spanish industry that is emerging in response to the need for crop management and postharvest technologies was represented by 15 companies.

Attendees shared experiences and results with colleagues from the main persimmon-growing countries, including those in which persimmon has been cultivated for many centuries, such as China, Korea and Japan, as well as those where the crop has been recently introduced, like Australia, Brazil, New Zealand, Israel, Italy, Turkey and Spain. Technical visits were organised to the most important persimmon production areas in Spain, located in Valencia (east) and Huelva (southwest). The tours provided an excellent occasion to become familiar with new varieties and their response to different climatic conditions, and to view crop management

strategies. Participants on the technical tour in Valencia observed two leading 'Rojo Brillante' orchards and cooperative packing-house facilities. The technical trip to Huelva involved a visit to 'Sharon' orchards. In both cases, attendees had informal discussions with the technical managers about persimmon production. The excellent weather conditions in Spain in October, and the convenient location of the orchards allowed the attendees to enjoy an exciting social program with guided tours in Valencia and Seville, two of the most impressive cities in Spain.

After the scientific sessions, the symposium concluded with an ISHS business meeting. Prof. Ryutaro Tao, ISHS Board member, presented information about the Society to all participants, and invited them to become members. Miao Miao Wang, PhD student from Zhejiang University, China, was awarded the best oral presentation, with the paper entitled 'Dual functions of DkERF for persimmon fruit postharvest deastringency and softening'. This study focused on DkERF genes, important regulators of persimmon fruit posthar-





► Technical visit to A) 'Rojo Brillante' persimmon orchard, B) packing house.

vest destringency. The best poster presentation was awarded to Omar García Martínez, PhD student from IVIA, Spain, who presented research entitled 'Composition and dynamics of mealybug communities on Spanish persimmon assessed by DNA markers'. The study provided an accurate identification of mealybug populations using molecular markers, and their dynamics that will be the basis of new biological control methods.

Prof. Zhengrong Luo, Chair of the ISHS Working Group Persimmon, and Prof. María L.

Badenes, Convener, conducted the business meeting. Prof. Badenes from IVIA, Valencia, Spain, was appointed the new Chair of the ISHS Working Group Persimmon, replacing Prof. Luo, who served one term. Prof. Keizo Yonemori presented the support of the Japanese Horticultural Society to organise the VII International Symposium on Persimmon. Dr. Hiroshi Asao and Dr. Shinya Kanzaki from the Nara Prefectural Agricultural Experiment Station and Faculty of Agriculture at Kindai University, respectively, presented their bid

to host the next symposium. The assembly unanimously accepted their kind offer. The VII International Symposium on Persimmon will be held in October 2020, in Nara, Japan.

*Maria Luisa Badenes*

### ► Contact

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## ► Hortimodel2016: V International Symposium on Models for Plant Growth, Environment Control and Farming Management in Protected Cultivation

Commission Horticultural Engineering  
Commission Protected Cultivation

#ishs\_cmen  
#ishs\_cmpc

On 19-22 September 2016, the Hortimodel2016 Symposium, which was the V International Symposium on Models for Plant Growth, Environment Control and Farming Management in Protected Cultivation, was held in Avignon, France, under the auspices of the ISHS. This symposium was organized by Plantes et Systèmes de Culture Horticoles, also known as Plant and Cropping Systems in Horticulture (PSH) of Institut National de la Recherche Agronomique

(INRA), Provence-Alpes-Côte d'Azur (PACA), with the financial and organizational support of the Environment and Agronomy division of INRA, Agropolis Foundation and TERSYS. Three private companies, ARIA Eco-parc de Sologne, CMF Groupe, and Cybele-Tech, significantly supported the meeting. A total of 63 participants from 20 countries were welcomed to the prestigious Pope's Palace and provided with on-site hosting and catering facilities.

### Aims and scope of the symposium

Fruits and vegetables are a main source of health compounds and provide many required components of the human diet. However, in the context of global change, growers are facing increasing environmental and economic constraints. Therefore, to meet consumer demand in terms of quality and to face environmental challenges, innovations are needed to reduce water, nutrient and chemical inputs, while



► Symposium participants in the cloister of the Pope Palace.

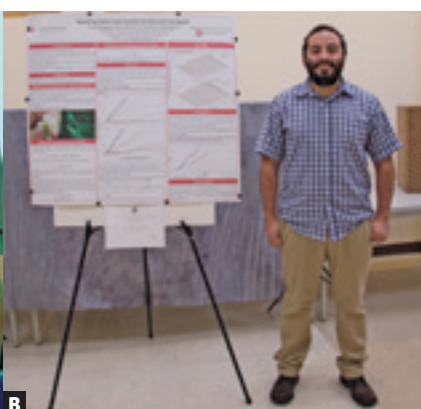
maintaining yield and quality. Plant breeding, innovative cultural practices and climate control are all effective approaches that can be combined in order to improve horticultural crop yield and quality. In this context, dynamic predictive models play a major role. Hortimodel2016 highlighted the need for a renewed modeling effort to provide an integrated understanding of horticultural system functioning. Models of the future must describe the

irrigation management, plant response to abiotic and biotic stresses, integrated approaches to phenotypic trait dissection and more methodological issues related to parameter uncertainty and genotypic differentiation in plant models.

Seventeen students competed for the ISHS student awards, which were evaluated by an international committee of senior participants. Constance Demestihias from INRA, Avi-



► A. Members of the ISHS student awards Selection Committee: Dr. François Lecompte from INRA, Avignon, France (center) and Prof. Kenneth Boote from the University of Florida, USA (right) presenting the award to Constance Demestihias (left) for the best student oral presentation. B. Hector Camargo Alvarez, winner of the ISHS student award for the best poster.



cross-talk between physiological processes at multiple plant scales, and simulate complex greenhouse designs, anticipating the consequences of environmental fluctuations or pest attack on system control and management. In this rapidly changing context, Hortimodel2016 brought together modelers from different fields, promoting exchanges between fundamental and applied plant research.

## Organization and highlights of the symposium

In total 63 oral and poster presentations were given, from more than 200 co-authors. Five invited speakers presented keynote addresses on the topics: greenhouse climate control,

Avignon, France, received the award for the best student oral presentation entitled “A crop simulation model supporting multiple ecosystem services analysis in apple orchards.” Hector Camargo Alvarez from Washington State University, USA, received the award for the best student poster entitled “Modeling the pollen tube growth for ‘Gala’ and ‘Fuji’ apples”. Coffee and lunch breaks facilitated interaction with private companies/sponsors and allowed for poster presentation and discussions. Several social events and a guided tour of the historic city were organized throughout the symposium. The social program promoted interaction among participants, and largely contributed to the warm and friendly



► Oral presentation of Dr. Juan Ignacio Montero (IRTA, Spain).

atmosphere that characterized the meeting. Around thirty papers are currently being considered for publication in *Acta Horticulturae*, and we also maintain an active Hortimodel community by posting photos and oral presentations on line, on the PSH unit website: <https://www6.paca.inra.fr/psh/Zoom-sur/Congres-HORTIMODEL>.

The overall presentation of research was distributed over four sessions as described below.

- Topic 1 described decision-supporting modeling tools for greenhouse climate control and irrigation design and scheduling. A number of computational fluid dynamics (CFD) approaches for simulating climate variability were presented and applied to a large variety of greenhouse configurations and climatic regions. Models and decision tools for water and nutrient supply in protected cultivation were also presented, with particular attention to energy saving issues and resulting plant yield.
- Topic 2 addressed the effects of abiotic and biotic stress factors on plants and crop performance. Since many physiological traits of horticultural crops are shared with other species, we included some presentations dealing with model plants or field crops. As a consequence, a large range of species was addressed, ranging from classical ornamental and crop plants to *Brassicaceae* and orchard trees. Many abiotic factors were explicitly considered in the presented mod-





➤ View of the guided tour of the historic city.

els, including temperature, light spectrum, irrigation and both sulphur and nitrogen fertilization. Two models dealing with plant responses to biotic stress factors were also presented, opening the way to promising dialogue among crop modelers, ecologists and epidemiologists. Issues related to the trade-off between growth and defense, or to the interactions between biotic and abiotic factors, will be tackled by horticultural modelers in the near future.

- Topic 3 addressed the important issue of model calibration, selection and integration. This methodological section was organized for the first time at Hortimodel. Indeed, most crop and plant models are characterized by system non-linearity and a large number of parameters whose values are often unknown and must be estimated by numerical means. The choice among several alternatives for model calibration will clearly improve model prediction and reliability. In this respect,

sensitivity analyses have proved useful to reduce parameter uncertainty and to deal with genetic diversity. Different methods and approaches for data analysis and parameter estimation, including local, global heuristic and Bayesian methods, were presented and compared, providing an overview of the main current strategies for model calibration and evaluation.

- Topic 4 focused on multi-scale and integrative models for plant development and genotype screening. Recent advances in profiling technologies allow the analysis of system-wide responses over a large number of genotypes and contrasted environmental conditions. However, observations at the molecular level are not easily extrapolated in terms of plant functioning. Thus, the integration of processes and mechanisms measured at different scales stands as a main issue to understanding and predicting the complexity of biological systems. A large range of models were presented, which spanned different spatial scales,

from cells to organs and to the whole plant, integrating both genetic and molecular information about main physiological processes. Overall, the need for improved functional-structural approaches combining the description of plant architecture with water and carbon-related processes, emerged as a key direction for both plant and organ models. The complexity of plant-to-plant interactions within a landscape (competition for resources and mutual shading) was also addressed, broadening the discussion towards ecosystem services, biodiversity and innovative cropping systems.

## Conclusions

Hortimodel2016 was a successful meeting from both the scientific and human points of view. In the future, the fusion of Hortimodel with other ISHS symposia, such as Model-IT, or the International Symposium on Modelling in Fruit Research and Orchard Management, could broaden the audience and benefit a larger scientific community. This opportunity was supported unanimously during the closing ceremony.

*Nadia Bertin, Valentina Baldazzi and  
François Lecompte*

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# ➤ International Symposium on Sensing Plant Water Status – Methods and Applications in Horticultural Science

Commission Irrigation and Plant Water Relations  
Section Pome and Stone Fruits

#ishs\_cmir  
#ishs\_sefr

Under the auspices of the ISHS, the first International Symposium on Sensing Plant Water Status – Methods and Applications in Horticultural Science (spws2016) was held in the scenic town of Potsdam, Germany, from Octo-

ber 5 to 7, 2016. It was organized by Dr. Werner B. Herppich and Dr. Manuela Zude-Sasse of the Leibniz Institute for Agricultural Engineering and Bioeconomy (ATB) in close collaboration with Prof. Dr. Sascha Oswald from the Uni-

versity of Potsdam. The event took place at the beautiful, old university campus of Griebnitzsee, in the most recently built building, providing excellent IT facilities and tasty catering. The ISHS Commission Irrigation and



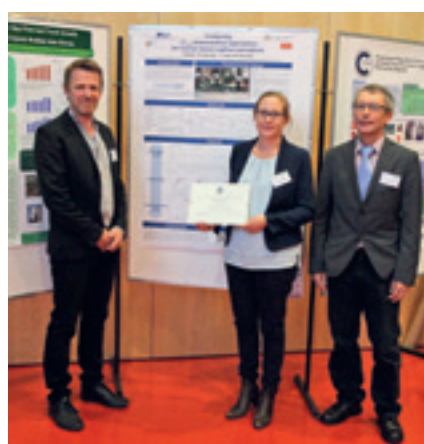
› Participants of the symposium.



› Convener, Dr. rer. nat. Werner B. Herppich.

Plant Water Relations, ISHS Section Pome and Stone Fruits, and ISHS Working Groups Water Supply and Irrigation and Water Relations were involved in supporting this symposium. Water has always been a crucial and, in many cases, rare resource in horticultural production. It is also an important aspect in postharvest chains; excessive water losses may increase waste and hence lead to economic and social problems. Consequently, comprehensive knowledge of plant water relations is essential to optimise plant production, harvest, storage, handling and processing. Bringing together experts from research and practice from the different fields of water status research, this symposium provided a platform to exchange recent findings on established and new methods in sensing plant water status from all fields of relevance for the first time. Fundamentals of methodology as well as helpful hints in application were both considered.

At the opening ceremony, the Convener, Dr. Herppich, welcomed 95 participants from 23 countries and gave a short and very personal introduction to the main topics of the symposium. Dr. Uta Tietz, head administrator, presented the compliments of the ATB management board and gave a short overview of the organization and main scientific tasks of the ATB. Prof. Oswald welcomed the participants on behalf of the University of Potsdam. The scientific program started with the first keynote presentation by Prof. Dr. Ken Shackel from UC Davis (USA), who presented an introduction to the basics of plant and horticultural perspectives of sensing and responding to water limited conditions. On the second



› Pieter Verboven (left) and Werner B. Herppich (right) presenting the ISHS student award to Inken Rabbel (center) from the University of Bonn, Germany, for the best student poster presentation.

symposium day, the program started with a keynote lecture by Prof. Dr. Hamlyn G. Jones, Univ. Dundee (United Kingdom). He discussed “Opportunities and pitfalls in the use of thermal sensing for monitoring water stress and transpiration”. The third main lecture was given by Prof. Dr. ir. Kathy Steppe, Univ. Ghent (Belgium), on “Sap flow-dendrometer interactions as an avenue for plant drought stress detection”.

During the three days of the symposium, a total of 44 oral presentations were given in two parallel sessions, allowing a comfortable 30 minutes for each presentation. Extending lectures to 30 minutes was well accepted by the participants because it allowed time for a thorough discussion of the respective topics. Most recent findings, new developments and also aspects of research necessary in the future, were presented and their bottlenecks and actual practical applications were discussed. Talks covered the topics of irrigation, quality and process control, stress detection, and physiological processes.

Posters were introduced in a designated poster session. Of these posters, that of Inken Rabbel (Univ. Bonn, Germany) entitled “Comparing and evaluating  $\Delta T_{max}$  determination approaches for Granier-based sapflow estimations on different time scales” was selected for the student poster award of ISHS. In a

plenary lecture, Prof. Dr. Zude, Chair of ISHS Commission Irrigation and Plant Water Relations, introduced and discussed general and specific ISHS issues.

Various companies working in different fields within sensing plant water status were included in spws2016. It must be noted that the contribution of attending companies was greatly valued as they presented their specific tools and techniques and, most importantly, shared their knowledge, ideas and questions with researchers by giving lectures on recent technical advances.

On the evening of the first symposium day, participants were welcomed at the ATB to learn more about the institute and about German Bratwürste, Fleischkäse and Laugenbretzeln, and to sample various types of beer and wine. In addition to this evening, many of the participants enjoyed the symposium dinner in the historic atmosphere of the Bornstedt Crown Estate close to Sanssouci Palace, Potsdam, after the second day of the symposium. Overall, the symposium successfully offered a wide range of topics covering many aspects of sensing plant water status including relevant recent and emerging methods and techniques as well as their applications to horticulture and related fields. The symposium was highly valued by all participants from both science and industry as a chance to intensively discuss questions and problems on specific methods and to consider issues beyond the borders of their own specific fields. The proceedings of the symposium will be published as a volume of *Acta Horticulturae*.

**Werner B. Herppich and Manuela Zude-Sasse**

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# ➤ VIII International Postharvest Symposium – Enhancing Supply Chain and Consumer Benefits: Ethical and Technological Issues

Commission Quality and Postharvest Horticulture

#ishs\_cmph



➤ Opening ceremony. From left to right: Carmen Morales Cuenca, Agriculture Director of the Regional Government of Murcia; Alejandro Díaz Morcillo, Chancellor of Universidad Politécnica de Cartagena; Chris Watkins, Chair ISHS Commission Quality and Postharvest Horticulture; and Charles Wilson, Founder of the World Food Preservation Center.

From 21<sup>st</sup> to 24<sup>th</sup> of June 2016, the VIII International Postharvest Symposium was successfully held in Cartagena (Murcia, Spain), with the theme 'Enhancing supply chain and consumer benefits: ethical and technological issues'. The symposium was held under the

banner of the International Society for Horticultural Science (ISHS) and was organized by the staff of the Postharvest and Refrigeration Group and the Institute of Plant Biotechnology of the Universidad Politécnica de Cartagena. Researchers from other Spanish

➤ Most of the symposium participants.

universities and institutes also joined the Organizing Committee. Well-known scientists from about 50 international institutions made up the Scientific Committee. The symposium was sponsored by Productos Citrosol S.A., Janssen PMP, Isolcell S.A., AgroFresh S.A., Fundación Cajamurcia, Decco S.A., Fomesa Fruitech, Bioconservación S.L., Tecnidex S.L., SaniFruit, Felix Instruments, Puerto de Cartagena, Ayuntamiento de Cartagena, Ministerio de Economía y Competitividad, and Consejería de Agricultura y Medio Ambiente and Fundación Séneca of Región de Murcia.

The symposium welcomed the world's leading experts in the postharvest of fruits, vegetables and flowers from 44 countries to discuss the production of healthy food with reduced losses while maintaining quality and safety. Preservation of the environment, taking into account ethical aspects and economic profit, was also particularly emphasized. Today more than ever, sustainable postharvest technology based on just and





› Organizing Committee from UPCT.



› ISHS student awards presented to A) Macarena Farcuh from USA for the best student oral presentation, and B) Sheng Jia from China for the best student e-poster.

responsible values is the greatest challenging issue all around the world. More than 320 scientists, specialized professionals, technicians and producers attended the symposium, presenting a total of 325 'cutting edge' short oral talks, e-posters and industry-ac-

ademia panels, that together included the work of 990 authors. The symposium was opened by the Chancellor of the Universidad Politécnica de Cartagena, the Chair of the ISHS Commission Quality and Postharvest Horticulture and the Convener of the sym-



› Poster session: short oral presentation.



› Researchers retiring in recent or coming months. From left to right: Dr. Charles Wilson (USA), Dr. Inmaculada Recasens (Spain), Dr. Francisco Artés (Spain), Dr. Jean Claude Pech (France) and Dr. Antonio Lizana (Chile).

posium, followed by a keynote address from Dr. Charles Wilson, Founder of the World Food Preservation Center® LLC. Throughout the four days of the symposium, 10 highly recognized scientists analyzed, shared and discussed the latest advances in postharvest in plenary sessions. Together with oral presenters, the different keynote speakers covered the most relevant aspects related to: pre-harvest and harvesting advances; post-harvest plant pathology; the use of omics to study and improve quality and flavour (Bart Nicolaï, Belgium); controlled atmospheres and modified atmosphere packaging for extending shelf-life while maintaining good flavour (Chris Watkins, USA); innovative treatments, especially those related to reducing losses due to chilling injury (Daniel Valero, Spain); affordable pre- and postharvest technologies in developing countries, with participants from Europe, Africa, Asia and Latin America; minimal processing, including innovative approaches to improving quality (Giancarlo Colelli, Italy); latest advances in the knowledge of physiology (Jean Claude Pech, France) and disorders and their relationship with biochemistry; emergent methods for non-destructive quality evaluation; significant aspects related to packaging, transport and distribution, mainly for long-distance markets (Peter Toivonen, Canada); nutritional compounds and their relationship with health issues (Luis Cisneros, USA); modelling; consumers' preferences (Ian Ferguson, New Zealand) and strategies for education in postharvest (Umezuruike Linus Opara, South Africa).

The industry-academia discussion panel stimulated good participation from symposium delegates. There was an interesting



dialogue about the need for better understanding of the goals that drive industry and academic work in order to merge such research activities. Discussions on the main challenges in postharvest focused on producing safe plant foods without affecting the environment, while making products available to new markets in developed and developing countries.

Innovative e-posters were presented on very wide monitors during the poster sessions, in which 5-minute oral summaries were given. Poster presenters appreciated not having to print and carry their posters, while the opportunity of printing useful posters at the symposium venue was also welcomed. The symposium had a company-exhibitor area that was well attended during breaks and lunch periods, where Productos Citrosol S.A., Decco S.A., Bioconservacion S.L., Tecnidex S.L. and Felix Instruments presented their novel products and shared information with attendees.

The social program included a welcome cocktail at the Paraninfo of the University, a very pleasant gala dinner at a Michelin-awarded restaurant located in the Murcia countryside, and a cultural visit to the Ancient Roman Theatre of Cartagena. As well as these activities participants enjoyed their stay in the

3,000-year-old Cartagena city with its historical highlights and interesting tourist venues. On the 4<sup>th</sup> day of the symposium, participants were taken on a tour of several selected post-harvest companies: Frutas Esther S.A. (stone fruits packinghouse), Surinver Soc. Coop. (capsicum and watermelon packinghouse and some fresh-cut products), Fruca SAT (greenhouses, nursery and packinghouse) and Primaflor SAT, one of the three most important large-scale Spanish industries of fresh-cut plant commodities. The trip gave delegates the opportunity to see and experience the significant importance of fruit and vegetable production and specialized industries in the Region of Murcia and the south-east of Spain.

A number of awards were given to prestigious researchers retiring in the recent or coming months, as well as various prizes for the best oral dissertation and the best oral-poster presentation to young researchers, five registration grants to young researchers from developing countries (Brazil, China, India, Israel and Mexico) and eight registration grants to young Spanish students. ISHS student awards were presented to Macarena Farcuh from the Department of Plant Sciences, University of California, Davis, USA for the best student oral presentation entitled 'Use

of bud sports to understand the complexity of fruit ripening behaviour', and to Sheng Jia from the Laboratory of Fruit Quality Biology, Zhejiang University, Hangzhou, China, for the best student e-poster entitled 'Effects of huyou (*Citrus changshanensis*) fruit extract on glucose consumption in human HepG2 cells'. Each of the technical companies that sponsored the symposium was recognized and a medal from the ISHS to the Convener, Prof. Dr. Francisco Artés, was awarded.

The proceedings of the symposium will be published as a volume of *Acta Horticulturae* after current editorial review.

Looking to the future, the elected candidate by the ISHS members at their business meeting has already started working on the next symposium, which will take place in New Zealand in 2020.

**Perla A. Gómez, Francisco Artés-Hernández and Francisco Artés**

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From the  
Secretariat

# > New ISHS members

ISHS is pleased to welcome the following new members:

## New Individual Members

**Argentina:** Dr. Pablo Cavagnaro, Dr. Mariela Curetti, Enrique Alberto Frusso; **Australia:** Mr. Nicholas Anderson, Dr. Mila Bristow, Dr. Tom Buckley, Rick Butler, Prof. Barbara Chambers, Mr. Jurgen Clauss, Mr. Michael Crisera, Mr. Darren Doherty, Mr. Daniel Huxtable, Mr. Anand Koirala, Dr. Cameron McConchie, Mr. Matthew Nicholson, Mr. Omid Rad, Dr. Ali Sarkhosh, Mr. Charlie Scandrett, Ms. Pamela Spencer, Dr. Nigel Swarts, Dr. Eden Tongson, Mr. Robert van Merkestein, Dr. Zhenglin Wang; **Austria:** Prof. Dr. Gabriele Berg, Ms. Karina Eva Hauer; **Belgium:** Hanne Claessen, Agneta Colda, Mr. Bastien Durenne, Dr. Sarieh Ghorbani, Mr. Jens Mincke, Dr. Alejandra Navarro Garcia, Dr. Maria Isabel Pozo Romero, Mr. Jeroen Schreel, Dr. Maja Simpraga, Mr. Tom Smets, Sylvie Weckx; **Bosnia and Herzegovina:** Mr. Predrag Ilic; **Botswana:** Ms. Chidoh Kootole; **Brazil:** Mr. Lermen Acosta, Ms. Judith Alcalde, Prof. Dr. Lilian Amorim, Dr. Paula C. da S. Angelo, Mr. Emílio Carlos Antunes, Moacir Brito Oliveira, Gustavo Brunetto, Prof. Dr. Italo Cavalcante, Prof. Dr. Marlon Cristian Toledo Pereira, Ms. Silvia de Afonseca Lourenço, Dr. Marcos David Ferreira, Dr. Leandro Hahn, Prof. Dr. Ráirys Herrera, Ms. Cibele Mantovani, Prof. Dr. Claudia Mattiuz, Prof. Dr. Louise Larissa May De Mio, Michele Carla Nadal, Mr. Gilberto Nogueira e Silva, Rafael Oliveira, Ms. Rafael Pereira Sales, Ms. Isabela Primiano, Prof. Dr. Juliana Sales; **Bulgaria:** Prof. Dr. Ivan Manolov; **Burkina Faso:** Dr. Albert Nikiema; **Canada:** Mark Brownlee, Mr. Deron Caplan, Ms. Sandra Ducic, Dr. Robert Duncan, Dr. Bao-Luo Ma, Dr. Mehdi Sharifi, Mr. Jared Stoochnoof, Prof. Jayasankar Subramanian, Mr. Steven Szewczyk, Mr. Ron VanHart, Mr. Tristan Watson; **Chile:** Mr. mario alegria, Prof. Dr. Ariel D Aren-cibia, Dr. Cristian Balbontin, Mr. Carlos Cruzat, Dr. Katy Díaz, Dr. José Manuel Donoso, Alvaro Jimenez, Dr. Prat Loreto, Prof. Dr. Andrea Miyasaka Almeida, Dr. Karla Quiroz, Ms. Danae Riquelme Toledo, Mr. Camilo Riveros Burgos, Ms. Evelyn Sánchez, Ms. Mariola Tobar; **China:** Dr. Songling Bai, Prof. Dr. Yuliang Cai, Dr. Feng Ding, Dr. Sheng Du, aiping gao, Mr. Yuxiang Gao, Mr. Zhaoyin Gao, Dr. Deqiang Gong, Assoc. Prof. Zhaobin Jing, Assoc. Prof. X.N. Kang, Dr. Qili Li, Dr. wen li, Dr. Feng Liu, Prof. Dr. Songzhong Liu, Prof. Ruijuan Ma, Xiaowei Ma, Prof. Dr. Jianxin Niu, Assoc. Prof. Sijun Qin, Ms. Hongye QIU, Prof. Yugang Sun, Assoc. Prof. Lichun Wang, Prof. Dr. Lirong Wang, Prof. Dr. Xiaowu Wang, Prof. Yanchang Wang, Dr. Zhongyan Wang, Assoc. Prof. Changbin Wei,

Dr. Guoqin Wei, Xiaopeng Wen, Prof. Dr. Guo Wenzhong, Yanjun Wu, Ms. Wentian Xu, Prof. Dr. Xuzhang Xue, Dr. Xiao-Li Yan, Lili Yang, Prof. Yuxiang Yuan, Mr. Binbin Zhang, Dr. Chunhua Zhang, Faming Zhang, Dr. Shujiang Zhang, Assoc. Prof. Xiaohui Zhang, Prof. Xiaowei Zhang, Prof. Yanhua Zhao, Prof. Dr. Wengang Zheng, Prof. Caihong Zhong, Dr. Qiguo Zhuang; **Chinese Taipei:** Dr. Sean SC Huang; **Colombia:** Prof. Dr. Anibal Herrera; **Costa Rica:** Mr. Cesar Naranjo; **Czech Republic:** Ms. Hana Belikova, Ms. Gabriela Kureová, Ms. Adéla Neuman-nová, Ivana Tomakova; **Denmark:** Dr. Marie Groenbaek; **Ecuador:** Dr. Elena Guerrero; **Estonia:** Dr. Reelika Rätsep; **Finland:** Dr. Anna Lintunen, Mr. Teemu Paljakka, Dr. Yann Salmon; **France:** Mr. Rémi Beauvieux, Dr. Frederic C. Do, Mr. Arnaud Guyader, Dr. Christelle Lacroix, Mr. Erwan Le Bozec, Ms. Séverine Persello, Jose Quero Garcia, Ms. Christiane Raynal-Lacroix, Julien Ruesch, Ms. Noemie Vimont; **Germany:** Dr. Holger Budahn, Dr. Oluwafemi James Caleb, Dr. Corinna Dawid, Hartmut Fischer, Dr. Henryk Flachowsky, Dr. Karl-Heinz Haeberle, Prof. Dr. Steven Jansen, Julian Kofler, Edit Lantos, Mr. Anton Milyaev, Ms. Galini Papadopoulou, Susann Plath, Mr. Holm Voigt; **Ghana:** Ms. Olivia Tetteh; **Greece:** Dr. Sotiris Papakostas; **Hungary:** Ms. Orsolya Papp; **India:** Mr. Raghav Bhalaik, Dr. N. Manikanda Boopathi, Mr. Yashwant Kumar, Mr. Harshpal Madan, Murugan Sankaran, Rita Seet, Mr. Joseph Thomas; **Indonesia:** Dr. Gunawan Budi-yanto, Ms. Sri Juliati, Mr. Chandra Kurnia Seti-awan; **Iran:** Assoc. Prof. Hamid Abdollahi, Assist. Prof. Mahdi Ayyari Noushabadi, Assist. Prof. Mohammad Hosein Azimi, Assist. Prof. Alireza Babaei, Mehrangiz Chehrizi, Mah-boubeh Davoudi Pahnekolayi, Mr. Fardad Didaran, Mohammad Taghi Ebadi, Marzieh Ghanbari Jahromi, Mostafa Ghasemi, Ms. hanieh hadizadeh, Abdolali Hesami, Shahriar Hessami, Maryam Hojati, Seyed Ahmad Hosei-ni, Mehdi Hosseini Mazinani, Ali Imani, Amanollah Javanshah, Parisa Koobaz, Assist. Prof. Mahmoud Koushesh Saba, Assoc. Prof. Seyed Hossein Mirdehghan, Abdol Majid Mir-zaalian Dastjerdi, Ahmad Moieni, Dr. Seyyed Javad Mousavizadeh, Marziye Nasirzadeh, Assist. Prof. Eisa Nazerian, Mohammad Ali Nejatian, Moallemi Noorollah, Saied Noroozi Faradonbeh, Hamed Pakkideh, Leila Pourhos-seini, Mohamad Raghib, Assist. Prof. Mostafa Rahmati Joneidabad, Assoc. Prof. Asghar Ramezani, Mr. Alireza Rasouli, Iman Rohol-lahi, Assist. Prof. Saadat Sarikhani Khorami, Mohammad Reza Shafiei, Assist. Prof. Feryal

Varasteh Akbarpour, Assist. Prof. Mohammad-reza Vazifeshenas, Dr. Hedayatollah Zakiza-deh; **Iraq:** Dr. Majid Alheidary; **Ireland:** Dr. Maria Angelica Sandoval; **Israel:** Mr. Maoz Aviv, Isashar Berman, Amit Dagan, Moti Dagan, Gadi Elasar, Ofir Elasar, David Frihan, Eyal Klein, Eyal Kleinberger, Amnon Koren, Dr. Adolfo Gabriel Levin, Hilel Manor, Alon Peri, Menachem Sachs, Ofer Schor, Ariel Seroussi, Roi Stein, Efraim Weil; **Italy:** Dr. Agnese Aguzoni, Prof. Rinaldo Botondi, Mr. Valerio Cirillo, Dr. Irene Donati, Paolo Ermacora, Mr. Luca Fortunato, Dr. Liliana Gaeta, Ms. Francesca Gianfelici, Dr. Daniela Giovannini, Ms. Silvia Lechthaler, Dr. Mario Licata, Dr. Antonino Pisciotta, Ms. Delia Revelli, Dr. Alessio Scalisi, Dr. Maria Imm. Schiattone, Dr. Sebastian Soppel-sa, Dr. Giovambattista Sorrenti, Dr. Maria Nivea Terzo, Mr. Martin Thalheimer, Dr. Anita Zamboni, Dr. Damiano Zanotelli; **Japan:** Assist. Prof. Takashi Akagi, Ms. Megumi Fukui, Ms. Yu Haihong, Shunichi Hattori, ryota itai, Dr. Na Lu, Ms. Kanae Masuda, Dr. Naoko Miki, Prof. Dr. Kensuke Miyamoto, Mr. Mohammad Tariq Mohtasebzada, Hiroyuki Okada, Shun Okada, Masanori Okamoto, Shoichiro Omori, Kentaro Ono, Ms. Sakalya Rajapakse, Mr. Yutaro Saito, Mr. Abdul Ghafar Sediqli, Katsura Sekiguchi, Mr. Tomoki Shibuya, Dr. Kenta Shirasawa, Mr. Katsuhiko suezawa, Dr. Takayuki Tokairin, Ms. Sumire Tokiwa, Mr. Kazuki Tsuge, Dr. Shan-shan Wang, Takahiro Yamada, Li Zhi; **Jordan:** Assoc. Prof. Nihad Alsmairat; **Kenya:** Dr. Srinivasulu Rajendran; **Korea (Republic of):** Mr. JongHoon Ahn, Dr. Shiva Ram Bhandari, Mr. Jungsu Jo, Mr. Moon Sup Kim, Prof. Dr. Mi Kyeo-ng Lee, Dr. Young-yi Lee, Prof. Man-Ho Oh, Mr. Wonheum Park, Mr. Jana Jeevan Rameneni; **Latvia:** Valentina Pole; **Lebanon:** Mr. Moham-mad S. Al-Zein, Dr. Mariana Yazbek; **Madagascar:** Ms. Sendra Irina Andriamanali-na, Justin Nathanaël Andrianaivoarimanga, Fanja Fawbush, François Rakotobe, Manohi-soa Rakotondrabe, Tamby Misaina Ramanan-konenana, Fanilo Ratalata, Ms. Harizoly Razafimandimby, Dr. Valérie Razafindratovo, Annick Razafintsalama; **Malaysia:** Ms. Izyan Ayuni Mohamad Selamat; **Mexico:** Dr. Maria Teresa Gonzalez-Arnao, Mr. Hugo Arturo Men-dez Oseguera OSEGUERA, Maria Montes; **Mongolia:** Ms. Davaajav Bold; **Namibia:** Mr. Henner Diekmann; **Nepal:** Mr. Shreekrishna Shrestha; **Netherlands:** Dr. Dália Rosa Alves Carvalho, Bert de Vries, Dr. Chandra Prasad Ghimire, Mr. Jan-Leendert Harrewijn, Assoc. Prof. Maciek Lubczynski, Harald Mikkelsen; **New Zealand:** Julia Ansoorge, Mr. Will Barrett,



Ms. Helen Boldingh, Ms. Alison Currie, Dr. Mike Currie, Karyn Froud, Dr. Christina Fullerton, Dr. Steve Green, Ms. Lynda Hawes, Dr. Denise Hunter, Julia Kaplick, Mr. Po-Han Leo Lai, Dr. Sarah Pilkington, Mr. Chris Rawlingson, Dr. Annette Richardson, Ali Saei, Dr. Roswitha Schroeder, Dr. Svetla Sofkova-Bobcheva, Dr. Jibran Tahir, Rongmei Wu; **Nicaragua:** Investigacion Mangosa; **Oman:** Assoc. Prof. Rhonda Janke; **Pakistan:** Mr. Saleem Ahmad; **Peru:** Mr. Rolando Riojas, Maria Ofelia Sarmiento Berrocal, Mr. Rainer Vollmer; **Philippines:** Dr. Ulysses Besas, Ms. Pamela Henares; **Poland:** Dr. Barbara Lata, Dr. Piotr Latocha; **Portugal:** Ms. Catarina Campos, Ms. Catarina Chemetova, Sonia Correia, Dr. Clayton Debiasi, Cristino Dore, Custódia Gago, Eva Garcia, Prof. Berta Gonçalves, Ms. Marta Nunes da Silva, Dr. Joana Santos, Ms. Adriana Vaz; **Reunion:** Dr. Alain Ratnadass; **Romania:** Dr. Petre Marian Brezeanu; **Russian Federation:** Ms. Anastasiia Baidina, Ms. Valentina Brailko, Olga Fedorova, Dr. Iuliia Ivashchenko, Dr. Andrei Kuzin, Ms. Dmitry Maslov, Dr. Sokrat Monakhos, Dr. Dmitry Romanov, Dr. Alexandr Solovyev, Dr. Josef Urban, Olga Zubko; **Saudi Arabia:** Dr. Khaled Alakeel; **Serbia:** Dr. Zdenka Girek, Prof. Dr. Zoran Ilic, Prof. Dr. Maja Manojlovic, Dr. Ana Marjanovic Jeromela, Assist. Prof. Djordje Moravcevic; **Slovak Republic:** Mr. Ladislav Tóth; **Slovenia:** Dr. Rozalija Cvejic, Dr. Peter Dolnicar, Assoc. Prof. Sonja Lojen, Dr. Barbara Pipan, Dr. Lovro Sinkovic, Dr. Kristina Ugri-

novic; **South Africa:** Mr. Kipchumba Cheron, Dr. Miranda Deutschlander, Dr. Wilma du Plooy, Dr. Stephan Ferreira, Dr. Elize Jooste, Mr. David Nndineni Mathobo, Mr. Bongumusa Mbatha, Dr. Duccio Migliorini, Ms. Letlhogonolo R. Moeng, Mr. George Moletsane, Mr. Schalk Reynolds, Ms. Catherine Savage, Dr. Piet Stassen, Ms. Angelique Swarts, Ida Wilson, Dr. Obiro Wokadala, Ms. Asavela Yashe; **Spain:** Assist. Prof. M. Esther Barreal, Mr. Alejandro Calle Calderón, Mr. Rafael Carranza, Mr. Víctor Flo, Dr. Carolina Font i Forcada, Dr. Virginia Hernandez-Santana, Dr. Jorge Lora, Eitan Martin, Dr. Pedro Martinez-Gomez, Dr. Diego A. Moreno-Fernández, Maria Teresa Prats Llinas, Angela Sánchez Prudencio, Dr. Neus Teixidó, Ms. Verónica Tijero, Marta Vilarrasa, Prof. Dr. Josep M Villar; **Sri Lanka:** Dr. Mojith Ariyaratne, Ms. Himali Balasooriya, Ms. Dayani Karunananda, Dr. Shelomi Krishnarajah, Mr. Chandana Wasala, Dr. Nilanthi Wijewardane; **Switzerland:** Dr. Andreas Bühlmann; **Tanzania:** Dr. Ralph Roothaert; **Thailand:** Dr. Anyamanee Auvuchanon, Dr. Sermsiri Chanprame, Dr. Pornprapa Kongtragoul, Ms. Warangkana Makkumrai, Yanisa Sangsotkaew, Dr. Thaveesak Sangudom, Assoc. Prof. Sasiya Siriphanich, Ms. Tanyarat Tarinta, Dr. Pannipa Youryon; **Tunisia:** Ms. Imen Farhat; **Turkey:** Mr. Alpaslan Sevet Acar, Prof. Dr. Ahmet Altindisli, Prof. Dr. Ismet Boz, Assoc. Prof. Feza Can Cengaz, Assist. Prof. Ali Cayli, Dr. Burhanettin imrak, Ms. Senay Murat Dogru, Mr. Ahmet Okumus, Prof.

Dr. Ibrahim Ortas, Dr. Tamer Turgut, Dr. Fatma Uysal Bayar; **United Kingdom:** Keji Ajayi, Dr. Natalia Falagan, Ms. Boroka Kiss, Ms. Bianca Lear, Prof. Dr. Steve M. Newman, Dr. Steven Penfield; **United States of America:** Joseph Argentine, Dr. Heidi Asbjornsen, Assoc. Prof. Diane Beckles, Dr. Carter Berry, Dr. Charles Bethke, Dr. Charles Cannon, Mr. Nathan Carney, Mr. Bruno Casamali, Assist. Prof. Dario Chavez, Dr. Chunxian Chen, Stephen Cockfield, Mr. Robert Curtis, Jessica Davis, Ryan Dickson, Mr. Daniel Donahue, Danielle Dozier, Dr. Arno Erasmus, Dr. Samuel Y.C. Essah, Kathryn Fiedler, Amy Fulcher, Jose Gomez, Mr. Jeff Groce, Jose Gutierrez Lopez, Dr. Iago Hale, Dr. Jeff Hardin, Dr. Katherine Hendricks, Joshua Henry, Ms. Leslie Holland, Ms. Jessica Hossain, Carl Iverson, Grace John, Mr. Roman Killgore, George W. Koch, Dr. Robert Lascano, Kim Lattier, Dr. Noris Ledesma, Leynar Leyton Naranjo, Dr. Danielle Lightle, Ping Lim, Jun Liu, Mr. Victor Loaiza Mejia, Ms. Marlene Long, Mr. Alex McAlvay, Mr. Charles McClung, David Miller, Chelcy F. Miniati, Assoc. Prof. Georgianne Moore, Wayne Myers, Dr. Alexandria Pivovarov, Markus Raab, Ms. Teryl Roper, Dr. Thibaut Scholasch, Dr. Christine Scoffoni, Ms. Holly L. Scoggins, Dr. Robert Skelton, Ms. Kristen Smith, Ms. Megan Tucker, Anna Underhill, Michael vanBavel, Heather Vice, Victoria Woods, Dr. Margaret Worthington, Dr. Yi Zhang; **Uruguay:** Eduardo Barlocco, Dr. Clara Pritsch; **Zambia:** Mukelabai Ndiyo; **Zimbabwe:** Mawira Chitima

## > In memoriam



**Dr. Rod Bielecki  
(1931-2016)**

Dr. Rod Bielecki, plant physiologist and one of New Zealand's leading horticultural scientists, died on 15 November 2016, after a short illness.

Rod was a good scientist, a very good scientist. He was enthusiastic, had a perceptive mind, a real interest in things scientific and an ability to undertake good, unambiguous experiments to provide answers, which he then wrote up meticulously. Science was a very important part of his life – indeed he was passionate about his science.

He excelled as an innovative experimental scientist who used his training in botany and chemistry to develop an understanding of the physiological behaviour of plants in general and important horticultural crops in particular. He was one of the first to use P-32, the radioactive isotope of phosphorus, in plant studies. He also contributed to the development of plant extraction procedures and the development of flat-plate acrylamide gel electrophoresis systems. These techniques have now become standard experimental procedures.

After completing an MSc at Auckland University College and a PhD at the University of Sydney, Rod joined the staff of the then Fruit Research Division of the New Zealand Department of Scientific and Industrial Research (DSIR) in 1958. Apart from periods of leave overseas, he was to spend the rest of his professional life at Mt Albert, Auckland, retiring in 1996. He was one of the outstanding scientists of his generation and he established New Zealand as a location in which major contributions to plant science could be successfully made.

He was appointed to strengthen DSIR's horticultural research. He developed a comprehensive interest in the nutrition of plants, the allocation and redistribution of nutrients, both mineral and carbohydrate, and responses to stress and senescence. Highlights of his research career include the demonstration of active sugar transport in sugarcane, the demonstration that phosphate in the plant cell is apportioned into different cellular compartments or pools, the study of polyol transport and nutrition, and studies on nutrient loading into individual sieve tubes of excised phloem tissue.

His scientific career was interrupted when he became director of DSIR's Division of Horticulture and Processing from 1980-1988, a difficult period during which the administrative structures of New Zealand science underwent many changes. As a director, Rod saw his role not so much to manage or direct scientists but to provide facilities and encouragement that would allow good research to be undertaken, work that was relevant to the main

horticultural industries of New Zealand. He therefore fostered the personal development of many individual staff members. He placed great emphasis on the communication of scientific results, both to fellow scientists and commercial horticulturists.

Rod's scientific research met with recognition both in New Zealand and internationally. He was awarded the Research Medal of

the New Zealand Association of Scientists in 1966 and at a relatively early age he was elected a Fellow of the Royal Society of New Zealand in 1973. In 1984 he received the Society's then premier award, the Hector Medal. He was awarded a Doctorate of Science from Sydney University in 1992 and in 2010 he was appointed a Member of the New Zealand Order of Merit.

In retirement Rod was very active in voluntary horticultural societies including the New Zealand Camellia Society (for whom he was the registrar of cultivars), the South Auckland Orchid Society, the Auckland Begonia Circle and the Friends of the Auckland Botanic Gardens.

*Ross Ferguson, Plant & Food Research,  
New Zealand*



**Eli Tomer  
(1940 (Iraq) -  
2016 (Israel))**

It is with great sorrow that I inform you that Dr. Eli Tomer passed away on the 19<sup>th</sup> November 2016. Living in Israel from 1950 onwards, Eli developed his research and field work at the Agriculture Research Organization (ARO), devoting his career to the study of fruits and contributing greatly to the improvement of tropical fruit crops. His 1977 doctoral thesis, "The impact of girdling on flowering, fruit setting and fertility of avocado trees", supervised by Professors Hanan Oppenheimer and Shmuel Gazit at the Hebrew University of Jerusalem, was of crucial importance to the emerging Israeli avocado industry. So too was his following research on cultivars, and his continued work on cultivars and water quality (particularly salinity levels). From the later 1970s onwards, Eli led the Israeli mango improvement project, which resulted in cultivars of economic importance not only in Israel – a third of the nation's mango industry uses them – but in other countries as well. Eli was particularly active in the ISHS International Mango Symposia (IMS), and was, quite logically, on both the Organizing

and the Program Committees of the 5<sup>th</sup> IMS held in Israel in 1996. In the early 1990s Eli led a project on the improvement of guava as a commercial fruit crop, developing new cultivars with pleasant but milder aromas (as well as cultivars yielding completely odorless fruit) and cultivars producing more colorful fruit, many of which were patented and have proved highly successful in both export and local markets. He also introduced lychee and longan to Gilat and the Negev. During his professional career at the AGO, Eli was Head of the "Gilat" and "Bsor" regional research stations, Head of the Department of Fruit Trees of the Institute of Horticulture, and Head of the Institute of Horticulture of the Volcani Center, and an active and dedicated member of the National Steering Committee of the "Fruit Board" for Mango, of the Steering and Evaluation Committee for R&D in Horticulture of the Chief Scientist, Ministry of Agriculture, and of BARD (the U.S.-Israel Binational Agricultural Research and Development Fund in Horticulture). Officially retired in 2006, he remained scientifically active at the ARO, voluntarily playing important roles at the Volcani Center and as a member of the Association of Friends of Volcani, and curating the "Hanan Garden" genetic collection of subtropical fruit trees. One of his last contributions to the world of tropical fruits is the book "Mango Cultivars in Israel", soon to be published (initially in Hebrew), that describes the acclimation of mangoes in that country as well as detailing the cultivars he brought to Israel and those subsequently developed by the Israeli breed-

ing project. Eli Tomer had good and enduring relationships with subtropical fruit experts throughout the world, and, over the years, many of us – notably so in South Africa, the US, Australia, and Spain – had the good fortune to share his expertise while hosting Eli at our research centers. My friendship with Eli became greater during his last sabbatical in Spain, in 2004, where, accompanied by his wife Zehava, he spent several months at the La Mayora Research Station in Malaga and in the Canary Islands, at the Instituto Canario de Investigaciones Agrarias (ICIA) where I was at the time Head of the Department of Tropical Fruits. During his stay in Spain, we partnered to give several lectures and short courses on tropical fruits, and later traveled together, at his request, across mainland Spain to visit the places mentioned in the novel *Don Quixote* (Eli was much moved by the story, most particularly by the profound friendship between the Don and his squire, Sancho Panza). My wife, Ana Luisa, and I were lucky enough to enjoy the hospitality of his home in a subsequent visit to Israel, where Zehava and Eli gave us a spectacular tour of that beautiful country. In short, Eli was not only a great scientist who will be sorely missed, but a good and straightforward man who knew "the right way of walking in life", as he put it. I hope I speak for all who knew him, friends and colleagues, as I express our most sincere condolences to Zehava and his extended family. Eli will be sorely missed.

*Víctor Galán Saúco, ISHS Council member*



**James  
Norman  
Moore  
(1931-2017)**

James "Jim" Moore passed away on January 22, 2017, following a short hospitalization, aged 85. Moore founded the University of Arkansas fruit breeding effort in 1964 and made major impacts in cultivar improvement of numerous fruit crops, particularly blackberry.

"Jim had a passion for horticulture and was a gifted teacher," said Mark Cochran, Vice President-Agriculture and Head of the University of Arkansas's System Division of Agriculture. "He leaves a tremendous legacy, not only on farms, orchards and vineyards around the

world, but also in the students he taught, who will carry on his work for decades to come."

Moore earned his PhD from Rutgers University in 1961. There he worked with Fred Hough, leader of Rutgers' fruit breeding program, who had already achieved national recognition for his breeding with apples, peaches and strawberries. It was in working at Rutgers that he met Jules Janick, now the James Troop Distinguished Professor of Horticulture at Purdue. "Jim was a great horticulturist and a great man and will be sorely missed," Janick said.



"I will say that the work he started, and is being continued by John Clark, will continue to have a tremendous impact on American fruit production."

From 1961-63, Moore worked for the U.S. Agriculture Department at Beltsville, Maryland, as a small fruit breeder. He returned to his native Arkansas in 1964.

Moore developed a very broad breeding program that encompassed blackberries, strawberries, peaches, and grapes, and added blueberries later in his career. His achievements in fruit breeding were monumental, with more than 50 varieties released from his efforts.

A prolific writer, Moore had more than 300 professional publications in his career. He was internationally known for his contribu-

tion as co-editor with Janick of a series of reference books on fruit breeding, including "Advances in Fruit Breeding" in 1975 and the trilogy series "Fruit Breeding" in 1996.

Moore received many awards in his career. He was recognized as a distinguished professor at the University of Arkansas, its highest academic appointment. He was a Fellow of the American Society for Horticultural Science and received the Wilder Medal from the American Pomological Society. He was inducted into the Arkansas Agriculture Hall of Fame as well as the Hall of Fame of the American Society for Horticultural Science. Moore taught at both the undergraduate and graduate levels, and advised 31 graduate students in his career. He received high ratings from students, to whom he was both

approachable and unassuming. As one outstanding student remarked, "We were being taught by a great man, yet you would never know it from his manner."

Jim loved to work with students on their various research projects and inspired them to make a difference in their careers. This inspiration continues today as many of these past students are involved in fruit research and expand on the ideas he shared as an adviser. Memorials may be made to the University of Arkansas Foundation for the James N. Moore Fellowship, c/o Department of Horticulture, 316 Plant Sciences Bldg., Fayetteville, AR 72701.

*John R. Clark, University of Arkansas,  
Fayetteville, USA*

## > Calendar of ISHS events

For updates and extra information go to [www.ishs.org](http://www.ishs.org) and check out the calendar of events. Alternatively use the "science" option from the website navigation menu for a comprehensive list of meetings for each Section, Commission or Working Group.

To claim reduced registration for ISHS members your personal membership number is required when registering - ensure your ISHS membership is current before registering. When in doubt sign in to your membership account and check/renew your membership status first: [www.actahort.org](http://www.actahort.org) or [www.ishs.org](http://www.ishs.org)

### Year 2017

■ April 6-8, 2017, Kandy (Sri Lanka): **IV International Conference on Postharvest and Quality Management of Horticultural Products of Interest for Tropical Regions**. Info: Dr. Chalinda Beneragama, Department of Crop Science, Faculty of Agriculture, University of Peradeniya, 20400 Sri Lanka Peradeniya, Sri Lanka. Phone: (94)812-395127, E-mail: [chalindab@gmail.com](mailto:chalindab@gmail.com) E-mail symposium: [pqmhp2017@gmail.com](mailto:pqmhp2017@gmail.com) Web: <http://pqmhp2017.org/>

■ April 24-28, 2017, Lavras, Minas Gerais (Brazil): **VII International Symposium on Production and Establishment of Micropropagated Plants**. Info: Prof. Dr. Renato Paiva, Alameda dos Flamboyants 103, Condomínio Jardim das Palmeiras, 372000-000 Lavras-Minas Gerais, Brazil. Phone: (55)3538291359, Fax: (55)3538291100, E-mail: [renpaiva@dbi.ufba.br](mailto:renpaiva@dbi.ufba.br) or Dr. Diogo Pedrosa Corrêa da Silva, Rua América de Moura Maia, 57, apto 02, Lavras, Brazil. E-mail: [pedrosacorrea@yahoo.com.br](mailto:pedrosacorrea@yahoo.com.br) or Dr. Michele Reis, Federal University of Lavras, Biology Department, Plant Physiology, Campus Universitário, 37200-000 Lavras-Minas Gerais, Brazil. Phone: (55)035 38291619, E-mail: [mvreis@yahoo.com.br](mailto:mvreis@yahoo.com.br) Web: <http://www.pempbrazil.com>

■ May 1-4, 2017, Ramsar (Iran): **International Symposium on Wild Flowers and Native Ornamental Plants**. Info: Dr. Pejman Azadi, Agricultural Biotechnology Research Inst., P.O Box: 31535-1897, 31535-1897, Karaj, Alborz, Iran. Fax: (98)9199230060, E-mail: [azadip22@gmail.com](mailto:azadip22@gmail.com) E-mail symposium: [info@wildflowers2017.com](mailto:info@wildflowers2017.com) Web: <http://wildflowers2017.com/>

■ May 22-25, 2017, Pontevedra (Spain): **VII International Symposium on Brassicas**. Info: Elena Cartea, CSIC, PO BOX 28,

36080 Pontevedra, Spain. Phone: (34)986854800, E-mail: [ecarte@mbg.csic.es](mailto:ecarte@mbg.csic.es) or Pablo Velasco, Misión Biológica de Galicia (CSIC), Apartado 28, 36080 Pontevedra, Spain. Phone: (34)986854800, E-mail: [pvelasco@mbg.csic.es](mailto:pvelasco@mbg.csic.es) or Pilar Soengas, Misión Biológica de Galicia (CSIC), Apartado 28, 36080 Pontevedra, Spain. Phone: (34)986854800, E-mail: [psoengas@mbg.csic.es](mailto:psoengas@mbg.csic.es) or Dr. Victor Rodriguez, Misión Biológica de Galicia, Palacio de Salcedo, Carballeira, 8 (Salcedo), 36143 Pontevedra, Spain. Phone: (34)986854800, E-mail: [vmrodriguez@mbg.csic.es](mailto:vmrodriguez@mbg.csic.es) E-mail symposium: [brassica2017@csic.es](mailto:brassica2017@csic.es) Web: <http://brassica2017.com>

■ May 22-26, 2017, Fullerton, CA (United States of America): **X International Workshop on Sap Flow**. Info: Prof. Dr. H. Jochen Schenk, Department of Biological Science, California State University Fullerton, PO Box 6850, Fullerton, CA 92834-6850, United States of America. Phone: (1)6572783678, E-mail: [jschenk@fullerton.edu](mailto:jschenk@fullerton.edu) E-mail symposium: [info@rivertotheshy.org](mailto:info@rivertotheshy.org) Web: <http://www.rivertotheshy.org/>

■ May 28 - June 3, 2017, Skukuza (South Africa): **IV International Symposium on Postharvest Pathology**. Info: Prof. Lise Korsten, University of Pretoria, School of Plant and Crop Science, Pretoria 0002, South Africa. Phone: (27)124203295, Fax: (27)124204588, E-mail: [lise.korsten@up.ac.za](mailto:lise.korsten@up.ac.za) Web: <http://www.postharvest2017.co.za/>

■ June 5-9, 2017, Yamagata (Japan): **VIII International Cherry Symposium**. Info: Prof. Dr. Satoshi Taira, Lab. of Pomology, Fac. of Agr., Yamagata University, Tsuruoka, Yamagata 997-8555, Japan. Phone: (81)235-282829, Fax: (81)235-282832, E-mail: [staira@tds1.tr.yamagata-u.ac.jp](mailto:staira@tds1.tr.yamagata-u.ac.jp) or Prof. Dr. Ryutaro Tao, Lab. Pomology, Fac. Agric., Kyoto University, Kitashirakawa Oiwake-cho, Sakyo-ku Kyoto 606-8502, Japan. Phone: (81)757536053, Fax: (81)757536497, E-mail: [rtao@kais.kyoto-u.ac.jp](mailto:rtao@kais.kyoto-u.ac.jp) or Hideki Murayama, Faculty of Agriculture, Yamagata University, 1-23 Wakabamachi Tsuruoka, Yamagata 997-8555, Japan. Phone: (81)235282887, Fax: (81)235282812, E-mail: [mhideki@tds1.tr.yamagata-u.ac.jp](mailto:mhideki@tds1.tr.yamagata-u.ac.jp) Web: <http://cherry2017.jsbs.jp>

■ June 18-22, 2017, Warsaw (Poland): **XII International Controlled and Modified Atmosphere Research Conference - CaMa2017**. Info: Dr. Krzysztof Rutkowski, Research Institute of Horticulture, Konstytucji 3 Maja 1/3, 96-100 Skierniewice, Poland. Phone: (48) 468345363, E-mail: [krzysztof.rutkowski@inhort.pl](mailto:krzysztof.rutkowski@inhort.pl) E-mail symposium: [cama2017@inhort.pl](mailto:cama2017@inhort.pl) Web: <http://www.cama2017.inhort.pl>

NEW

- June 19-23, 2017, Palermo (Italy): **International Symposium on Flowering, Fruit Set and Alternate Bearing**. Info: Prof. Francesco Marra, Department of Agricultural & Forest Science, Viale delle Scienze, Edificio 4 ingresso H, 90128 Palermo, Italy. Phone: (39)09123861236, Fax: (39)09123861211, E-mail: francescopaolo.marra@unipa.it or Prof. Dr. Tiziano Caruso, Department of Agricultural & Forest Science, University of Palermo, Viale delle Scienze, Edificio 4 ingresso H, 90128 Palermo, Italy. Phone: (39) 09123861207, E-mail: tiziano.caruso@unipa.it or Prof. Dr. Sisir Kumar Mitra, B-12/48, Kalyani, Nadia, West Bengal 741235, India. Phone: (91)9432174249, Fax: (91)3325828460, E-mail: sisirm55@gmail.com E-mail symposium: info@fsab2017.it Web: <http://www.fsab2017.it>
- June 20-23, 2017, Maribor (Pivola) (Slovenia): **VII South-Eastern Europe Symposium on Vegetables and Potatoes**. Info: Prof. Dr. Martina Bavec, Univerza v Mariboru, Slomskov trg 15, 2000 Maribor, Slovenia. E-mail: martina.bavec@um.si E-mail symposium: ishs2017@galileo3000.si Web: <http://vp2017.um.si/>
- June 27-30, 2017, Bozen-Bolzano (Italy): **VIII International Symposium on Mineral Nutrition of Fruit Crops**. Info: Prof. Dr. Massimo Tagliavini, Faculty of Sciences and Technology, Free University of Bolzano/Bozen, Via Sernesi 1, 39100 Bolzano/Bozen, Italy. Phone: (39)0471 017120, Fax: (39)0471 017009, E-mail: massimo.tagliavini@unibz.it or Prof. Dr. Stefano Cesco, Faculty of Science and Technology, University of Bolzano/Bozen, Piazza Università 1, 39100 Bolzano, Italy. Phone: (39)0471 017160, Fax: (39)0471 017009, E-mail: stefano.cesco@unibz.it E-mail symposium: mnutrition2017@unibz.it Web: <http://mnutrition2017.events.unibz.it/>
- July 2-7, 2017, Angers (France): **VII International Symposium on Rose Research and Cultivation**. Info: Dr. Fabrice Foucher, UMR IRHS, Centre INRA, BP 60057, 49071 Beaucouze, France. E-mail: fabrice.foucher@inra.fr E-mail symposium: secretariat.irhs@angers.inra.fr Web: <https://symposium.inra.fr/ishs-rose2017>
- July 2-6, 2017, Bucharest (Romania): **IX International Peach Symposium**. Info: Prof. Dr. Florin Stanica, University of Agronomic Sciences, Faculty of Horticulture, B-dul Marasti, 59, Sector 1, 011464, Bucuresti, Romania. Phone: (40)722641795, Fax: (40)213182888, E-mail: flstanica@yahoo.co.uk E-mail symposium: contact@peach2017.com Web: <https://peach2017.com/>
- July 10-16, 2017, Baise City, Guangxi (China): **XII International Mango Symposium**. Info: Wen-ming Huang, Tiandong County People's Government, Baise City, China. Phone: (86)776-5232669, Fax: (86)776-5232669, E-mail: tdxfb37@163.com or Prof. Dr. Xinhua He, 100 Daxue Rd, College of Agriculture, Guangxi University, Nanning, Guangxi, 530004, China. Phone: (86)771-3270184, Fax: (86)771-3235612, E-mail: honest66222@163.com or Prof. Cheng-xin He, Guangxi Institute of Botany, Chinese Academy of Sciences, Yanshan Town, Guilin city, China. Fax: (86)773-3550067, E-mail: 228268892@qq.com E-mail symposium: mango2017\_china@163.com Web: <http://www.mango2017.com.cn>
- August 15-19, 2017, Atakum, Samsun (Turkey): **IX International Congress on Hazelnut**. Info: Prof. Dr. Celal Tuncer, Ondokuz Mayıs University, Faculty of Agriculture, Department of Plant Protection, 55139 Atakum, Samsun, Turkey. Phone: (90)3623121919, Fax: (90)3624576034, E-mail: celalt@omu.edu.tr Web: <http://www.hazelnut2017.org>
- August 20-24, 2017, Beijing (China): **Greensys 2017 - International Symposium on New Technologies for Environment Control, Energy-Saving and Crop Production in Greenhouse and Plant Factory**. Info: Prof. Dr. Qichang Yang, 211, IEDA, CAAS, 12#, Zhongguancun South Street, Haidian District, Beijing City, 100081, China. Phone: (86)010-82105983, Fax: (86)010-82106021, E-mail: yangqichang@caas.cn or Prof. Dr. Weihong Luo, College of Agriculture, Nanjing Agricultural University, No 1 Rd Weigang, Nanjing, Jiangsu, 210095, China. Phone: (86)25-84399100, Fax: (86)25-84399100, E-mail: lwh@njau.edu.cn E-mail symposium: greensys2017@chinastargroup.com Web: <http://www.greensys2017.org>
- NEW** ■ August 20-25, 2017, Portland, Oregon (United States of America): **International Symposium on Growing Media, Soilless Cultivation, and Compost Utilization in Horticulture**. Info: Brian Jackson, NC State University, Horticulture, 114 Kilgore Hall - Campus Box 7609, Raleigh, NC 27695-7809, United States of America. Phone: (1)9195133187, Fax: (1)9195133191, E-mail: brian\_jackson@ncsu.edu Web: <http://newbeginningsmanagement.com/compsubsci2017/>
- August 27-31, 2017, Chiba (Japan): **XIII International Symposium on Plant Bioregulators in Fruit Production**. Info: Prof. Dr. Satoru Kondo, Graduate School of Horticulture, Chiba University, Matsudo, Chiba, 271-8510, Japan. Phone: (81)-47-308-8800, Fax: (81)-47-308-8800, E-mail: s-kondo@faculty.chiba-u.jp E-mail symposium: pgr-fruit2017@ics-inc.co.jp Web: <http://www.pgr-fruit2017.org/>
- September 3-6, 2017, Potsdam (Germany): **XIV International Asparagus Symposium**. Info: Dr. Jan Graefe, Institute of Veg. & Ornament Crops, Theodor-Echtermeyer-Weg, 14979 Grossbeeren, Germany. Phone: (49) 033701 78 353, E-mail: graefe@igzev.de or Carmen Feller, Inst. of Vegetable and Ornamental Crops, Theodor Echtermeyer Weg 1, 14979 Grossbeeren, Germany. Phone: (49)3370178368, E-mail: feller@igzev.de or Dr. Bernhard Brueckner, Leibniz-Institute of Veg and Ornamentals, Theodor-Echtermeyer-Weg 1, 14979 Grossbeeren, Germany. Phone: (49)33701 78252, Fax: (49)33701 55391, E-mail: brueckner@igzev.de E-mail symposium: ias2017@igzev.de Web: <http://www.ias2017potsdam.org/>
- September 4-7, 2017, Tehran (Iran): **I International Conference & X National Horticultural Science Congress of Iran (IrHC2017) - Theme: Productivity of horticultural crops in Iran: potentials, production limitations, possible solutions and international collaborations**. Info: Prof. Kazem Arzani, Department of Horticultural Science, Tarbiat Modares University (TMU), P.O.Box 14115-336, Tehran, Iran. Phone: (98)2148292094, Fax: (98)2148292200, E-mail: arzani\_k@modares.ac.ir E-mail symposium: IrHC2017@gmail.com Web: <http://www.IrHC2017.org>
- NEW** ■ September 4-7, 2017, Stellenbosch (South Africa): **VII International Conference on Managing Quality in Chains (MQUC2017) and II International Symposium on Ornamentals in association with XIII International Protea Research Symposium**. Info: Prof. Dr. Umezurike Linus Opara, University of Stellenbosch, Faculty of AgriSciences, Private Bag X1, Stellenbosch 7602, South Africa. Phone: (27) 21 808 4064, Fax: (27) 21 808 2121, E-mail: opara@sun.ac.za or Dr. Lynn Hoffman, PO Box 3318, Matieland, 7602, Stellenbosch, South Africa. Phone: (27)218082383, Fax: (27)218082121, E-mail: ewh@sun.ac.za or Ms. Emily Rigby, PO Box 418, Mapleton, Queensland 4560, Australia. Phone: (61)754423055, Fax: (61)754423044, E-mail: emilyr@cedarhill.com.au E-mail symposium: reventer@netactive.co.za Web: <http://www.ishs2017 Stellenbosch.co.za>
- September 5-8, 2017, Bengaluru (India): **International Symposium on Horticulture: Priorities and Emerging Trends**. Info: Dr. M.R. Dinesh, Principal Scientist - President SPH, Division of Fruit Crops - ICAR, Sadashivanagar - IIHR, Bangalore, Karnataka, 560089, India. Phone: (91)80-228466471, Fax: (91)80-28466291, E-mail: drmdinesh@gmail.com or Dr. C. Aswath, Principle Scientist & Head, Division, Ornamental Crops, Vice-President, SPH, ICAR-Indian Institute of Hort. Research, Hessaraghatta Lake Post, Bengaluru, 560089, India. Phone: (91)8028466420, Fax: (90)8028466291, E-mail: aswath@iihr.res.in or Dr. P.C. Tripathi, Principle Scientist & Head (I/C), Division of Plant Genetic Resources, ICAR-Indian Institute of Hort. Research, Hessaraghatta Lake Post, Bengaluru 560089, India. Phone: (91)8028466420, Fax: (91)8028466291, E-mail: prakaashtripathi2000@yahoo.co.in E-mail symposium: goldjubiihrs@gmail.com Web: <http://www.intsym.com>
- September 6-9, 2017, Porto (Portugal): **IX International Symposium on Kiwifruit**. Info: Prof. Dr. Maria Dulce Antunes, Universidade Do Algarve, FCT, Campus de Gambelas, 8005-139 Faro, Portugal.



E-mail: mantunes@ualg.pt or Prof. Dr. Pedro Pablo Gallego, Faculty of Biology, University of Vigo, Campus Universitario, 36310 Pontevedra Vigo, Spain. Phone: (34) 986812995, Fax: (34) 986812556, E-mail: pgallego@uvigo.es E-mail symposium: IXISK@aphorticultura.pt Web: <http://www.aphorticultura.pt/ixisk.html>

■ September 12-14, 2017, Jeonju (Korea (Republic of)): **IV Asia Symposium on Quality Management in Postharvest Systems.** Info: Dr. Ji Gang Kim, Nat. Institute of Hort. and Herbal Science, Nongsaengmyung Ro 100, 55364 Wanju, Korea (Republic of). Phone: (82) 63-238-6500, E-mail: kjg3@korea.kr E-mail symposium: info@asiapostharvest2017.kr Web: <http://asiapostharvest2017.kr/>

■ September 12-15, 2017, Bologna (Italy): **International Symposium on Greener Cities for More Efficient Ecosystem Services in a Climate Changing World.** Info: Dr. Francesco Orsini, University of Bologna, Viale fanin, 44, Bologna 40127, Italy. Phone: (39)0512096677, Fax: (39)0512096241, E-mail: f.orsini@unibo.it or Teodoro Georgiadis, National Research Council, via P.Gobetti 101, 40129 Bologna, Italy.

E-mail: t.georgiadis@ibimet.cnr.it or Prof. Dr. Giorgio Prosdociimi Gianquinto, Dip. Scienze Agrarie, DiPSA, Università degli Studi di Bologna, Viale Fanin, 44 - 40127 Bologna, Italy. Phone: (39) 0512096663, Fax: (39) 0512096245, E-mail: giorgio.gianquinto@unibo.it E-mail symposium: greencities2017@sistemacongressi.com Web: <http://www.greencities2017.org/>

■ September 18-22, 2017, Elche, Valencia (Spain): **IV International Symposium on Pomegranate and Minor Mediterranean Fruits.** Info: Dr. Julian Bartual, Estación Experimental Agraria, Ctra Dolores Km.1, 03290 Elche, Alicante, Spain. Phone: (34)965455952, E-mail: bartual\_jul@gva.es or Dr. Maria Luisa Badenes, Secretary General EUCARPIA, IVIA, 4 Apartado Oficial, 46113 Moncada (Valencia), Spain. Phone: (34)9634 24049, Fax: (34)9634 24106, E-mail: badenes\_mlu@gva.es E-mail symposium: science@pomegranate2017.org Web: <http://pomegranate2017.org>

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## ➤ *Chronica Horticulturae* author information

*Chronica Horticulturae* is the quarterly publication of the International Society for Horticultural Science (ISHS) and is received by all members of the Society and numerous libraries throughout the world. Members and non-members are urged to contribute articles for consideration. However, it needs to be understood that *Chronica* is not to be construed as a scientific journal that publishes original research. Research articles appropriate for *eJHS* or *Acta Horticulturae* are usually inappropriate for *Chronica*. We seek horticultural articles of interest to a broad audience composed of ISHS members and the horticultural, scientific, and academic communities.

*Chronica Horticulturae* is currently made up of as many as nine sections as follows:

**News & Views from the Board.** This section is usually confined to editorials from Board Members as well as general announcements of the Society.

**Issues.** Articles of a broad focus that often involve controversial topics related to horticulture, including broad social issues and economic development, are appropriate for this section. These articles are intended to stimulate discussion. Often, guest writers are invited to contribute articles.

**Spotlight on Honoured ISHS Members.** ISHS Fellows and Honorary Members complete an interview on how they started and progressed in their careers, what affected their decisions and attitudes and how their involvement with ISHS assisted them. In addition, they are invited to comment on how they see the future of horticultural science for young people. Articles in this section are by invitation only.

**Horticultural Science Focus.** This section is intended for in-depth articles on a topic of horticulture that is generally, but not always, scientific in nature. Many articles are mini-reviews and will provide up-to-date information on current topics of interest to the horticultural community. We encourage these articles to be illustrated.

**Horticultural Science News.** Shorter articles about current topics including horticultural commodities and disciplines are welcome.

**History.** This section includes articles on the history of horticulture, horticultural crops, and ISHS.

**The World of Horticulture.** Articles in this section highlight horticultural industries and research institutions of particular countries or geographic regions throughout the world. Illustration with figures and tables is extremely helpful and highly advised. This section also includes book reviews that are requested by the Editor. Members who wish to recommend a book review should arrange for a copy of the book to reach the Secretariat.

**Symposia and Workshops.** Meetings under the auspices of ISHS are summarized, usually by a participant of the meeting. These articles are arranged by the symposium organizers.

**News from the ISHS Secretariat.** This section contains information on membership, memorials of deceased ISHS members, and a calendar of ISHS events. Brief memorials (up to 500 words) should be sent to the Secretariat.

Authors who wish to submit articles for publication in *Chronica* should contact ISHS headquarters and their request will be transmitted to the Editor. Authors should be aware that most articles should have a broad international focus. Thus, articles of strictly local interest are generally unsuited to *Chronica*. Illustrated articles are usually 1500 to 5000 words long. There are no page charges for *Chronica Horticulturae*. Photographs submitted should be of high resolution (≥ 300 pixels per inch). Send articles or ideas for articles to:

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