A publication of the International Society for Horticultural Science

Chronica Horticulturae

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Symposia and workshops

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eJHS
The *European Journal of Horticultural Science* (eJHS) accepts original research articles and reviews on significant plant science discoveries and new or modified methodologies and technologies with a broad international and cross-disciplinary interest in the scope of global horticulture. The Journal focuses on applied and fundamental aspects of the entire food value chain, ranging from breeding, production, processing, trading to retailing of horticultural crops and commodities. ISHS members benefit from a discounted publishing charge. eJHS is available in print + online Open Access. Additional information can be viewed on **www.ishs.org/ejhs**.

Fruits – International Journal of Tropical and Subtropical Horticulture
Fruits – International Journal of Tropical and Subtropical Horticulture accepts original research articles and reviews on tropical and subtropical horticultural crops. The Journal is available in print + online. Additional information can be viewed on **www.ishs.org/fruits**.

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Scripta Horticulturae is a series from ISHS devoted to specific horticultural issues such as position papers, crop or technology monographs and special workshops or conferences.

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Pubhort is a service of ISHS as part of its mission to promote and to encourage research in all branches of horticulture, and to efficiently transfer knowledge on a global scale. The PubHort platform aims to provide opportunities not only to ISHS publications but also to other important series of related societies and organizations. The ISHS and its partners welcome their members to use this valuable tool and invite others to share their commitment to our profession. The PubHort eLibrary portal contains over 78,000 downloadable full text scientific articles in pdf format, and includes The Horticulture Journal, Journal of the American Pomological Society, Journal of the International Society for Mushroom Science, Proceedings of the International Plant Propagators' Society, Journal of the Interamerican Society for Tropical Horticulture, etc.
Additional information can be viewed on the PubHort website **www.pubhort.org**.

Cover photograph: Ripe red peppers growing in soilless cultivation in a greenhouse (Copyright: StockPhotosLV/Shutterstock). See article p. 23 .

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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Recognising and supporting our colleagues

Jill Stanley

Jill Stanley, Secretary of the ISHS Board

One of the pleasures of belonging to a scientific society is being able to acknowledge publically our colleagues who have made outstanding scientific contributions or who have unselfishly served the society. An ISHS Fellow is a member who has made an outstanding contribution to horticultural science worldwide and an ISHS Honorary Member has given exceptional service to the Society over many years and by undertaking many different roles. Examples of service to ISHS include being a symposium convener, being involved in organising symposia and congresses, editing *Acta Horticulturae*, and serving on the ISHS Council, Executive Committee and/or Board. Many of these activities involve significant time commitments, which impose on their personal life, yet some people carry out these functions voluntarily over a long career. ISHS members who you consider meet either of these criteria can be nominated for one of these awards, and the Awards Committee will evaluate each individual nominee independently on whether he/she meets the required standard.

Current Honorary Members and Fellows

The first honorary memberships were awarded in 1970 and the first Fellows in 2002, so this is a relatively young tradition. In fact, the list is surprisingly small. Up to 1% of the membership can be Fellows, which would currently be around 65 people, yet there are only 21 Fellows. There are a few more Honorary Members, currently 46 of them. You can find the list, and the description of the awards at **www.ishs.org/ishs-awards**.

There is currently a low percentage of women who are Fellows and Honorary Members, 10% and 2%, respectively. Members who are nominated for these awards are typically a long way through their careers and males have dominated the scientific arena in the past. But more women are performing in top scientific roles now and are also serving ISHS in many different roles, so this ratio is likely to change rapidly in the future as more women are successfully nominated.

There are horticultural scientists doing very impressive science all around the world and/or working voluntarily for ISHS, yet there are currently no Fellows or Honorary Members from South/Central America or Africa, and only a few from Asia.

The low numbers of Fellows and Honorary Members in total suggests that the main problem is that very few people have found the time to nominate their colleagues. If more members were nominated now, we would naturally expect that they would be of both genders and would originate from all around the world. However, this result requires action from all of you.

Action needed by you!

Now is the time to start thinking about dedicated colleagues who should be nominated for Fellow or Honorary Member of ISHS. I challenge you to think about worthy people from all around the world, and get together with some colleagues to prepare a nomination. Nominations should be accompanied by five letters of support, giving reasons why a nominee is considered worthy of an honour; these letters must come from members in no less than three different countries.

Regardless of who they are and where they are from, the Awards Committee will consider each person solely on the criteria of the award, so ensure you highlight your nominee's best points. To enable the decision to be made by the Awards Committee and be endorsed by the ISHS Council next year, we recommend you **get your nomination in by the end of December 2017**. Any successful awards can then be presented at the International Horticultural Congress in Turkey in August 2018.

Getting to know our honoured colleagues

Our reasonably new section in *Chronica Horticulturae* on "Spotlight on honoured ISHS members" has been running for seven issues now, so you will have had the opportunity to read about the beginnings of the careers of several of our Fellows and Honorary Members, their challenges, their successes and their thoughts on ISHS and horticultural science into the future. We hope you have been enjoying these more personal pieces, being a change from purely factual accounts, and that their stories resonate with you and inspire you. In this issue, Professor Koki Kanahama from Japan tells us of his horticultural beginnings in childhood, the challenges he faced when activists restricted his start at university and the impact of the tsunami in 2011. We also get a glimpse of the fascinating research he has conducted.

ISHS Horticulture Innovation Award

The Horticulture Innovation Award is the highest recognition granted by ISHS Council to a person or institution for an exceptional contribution to horticulture innovation. This award is especially addressed to those with innovative ideas to create new products and services that are seen as important landmarks in the progress of horticulture at an international level. This is a very new award and so far only two awards have been made. The first one was to Compac Sorting Equipment Ltd., New Zealand, in 2014, and the second was to Suntory Flowers Ltd., Japan, 2016. We suggest you should also submit any nominations for this award by 31 December 2017.

Awards for younger members

You might be reading this and thinking that, while it is essential to acknowledge and honour those who spend decades in commitment and service to horticulture, what can be done to encourage and enhance the careers of young scientists? About 18 months ago we initiated awards that we hope will help our younger members in their careers. At each ISHS symposium, awards are presented for the best student oral presentation and the best student poster. The student receives a certificate, one year's ISHS membership, the opportunity to include this award on their CV and the chance to have their research highlighted in *Chronica Horticulturae*. We publish a short description of some of the winner's research in each issue. Unfortunately, we cannot publish these for all winners, but the remainder are shown on the website. Go to **www.ishs.org/student-awards** to find out about the awards, and follow the link to student summaries from there. Let's support

our young horticultural scientists, so visit the web link, check out what they are doing, and encourage your young colleagues to take part in symposia.

Supporting our younger colleagues

As we have read in "Spotlight on honoured ISHS members" interviews, life as a young horticultural scientist can be challenging, and we have to make decisions about our careers. It would be great to see some of our more senior members encouraging and mentoring our younger members. This could be as small as being willing to listen to their issues and the decisions they are trying to make, reviewing a scientific paper before it is submitted, or encouraging them to present an oral paper at a symposium. Next time you are attending a symposium, take the time to meet and chat with a younger delegate, and keep in touch with them afterwards if they are interested. It could be useful to have someone completely outside their normal circles to ask for an independent opinion.

Let's honour our high performing members for their scientific achievement or for their service to ISHS. But let's also stand up for our young members, for they are the future of our society!

Call for nominations: ISHS Honorary Membership and Fellowship

Nominations for new Honorary Members and Fellows of the ISHS will be considered by the Council at its meeting in Turkey next year. All nominations for these awards should be received at the Secretariat **no later than 31 December 2017**, to be considered by the ISHS Awards Committee prior to the meeting of the Council.

ISHS Honorary Membership

Honorary Membership of the ISHS will be presented by the Council to a person who is a member of the ISHS, in recognition of his/her exceptional service to the Society. A certificate will be given to the recipients of this ISHS award. Currently, 46 ISHS Honorary Memberships have been awarded. Honorary Members are appointed for life by the General Assembly.

ISHS Fellow Award

The ISHS Fellow Award will be presented to a person who is a member of ISHS, in recognition of his/her outstanding contribution to horticultural science worldwide. A precious medal pin and a certificate will be given to the recipients of this ISHS award. Awarded by Council, the total number of living ISHS Fellows should not exceed 1% of the total membership, averaged over the previous 5-year period. Currently there are only 21 ISHS Fellows; that is less than 1% of total membership.

Horticulture Innovation Award

The Horticulture Innovation Award is the highest recognition granted by ISHS Council to a person or institution for an exceptional contribution to horticulture innovation. This award is especially addressed to those with innovative ideas to create new products and services that are seen as important landmarks in the progress of horticulture at an international level. A plaque and a certificate will be given to the recipients of this award.

Procedure

The ISHS Awards Committee (hereafter AC) invites the members of the Society, through the announcement in *Chronica Horticulturae*, to bring possible candidates for an ISHS Honorary Membership and Fellow Award to the attention of the Society. **Nominations must be received by the Executive Director (jozef@ishs.org) no later than 31 December 2017**. They should be accompanied by five letters of support, giving reasons why a nominee is considered worthy of the honour. These letters must come from members in no less than three different countries/regions.

The Executive Director must receive nominations at least 3 months prior to the next Council meeting. The Executive Director will collect the nominations and send them, together with letters of support, to the AC. The AC Chair will submit the AC recommendations for awards to Council. AC recommendations must be balloted by Council members, either by electronic voting (one vote per country/region as for other Council matters) prior to a Council meeting, or by a secret ballot at a Council meeting. Two-thirds of Council votes present at the meeting, or electronically voting, must be in favour of a nominee for the award to be granted.

› The back office of the ISHS

Jozef Van Assche, ISHS Executive Director

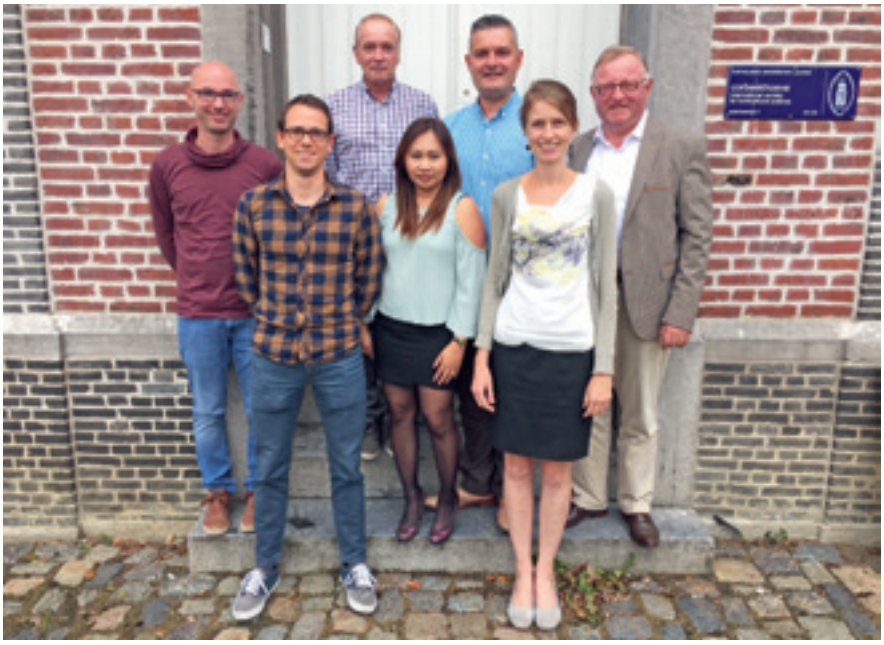
A changing world

In today's technology-driven world, where information technology, online and social media reign and continue to rapidly evolve, even a small learned society such as the International Society for Horticultural Science (ISHS) has no alternative but to rapidly adopt such tools and applications if it is to survive. Integrating modern technology into our day-to-day business has become a top priority for our society. When contacting the ISHS online, our members and other stakeholders need to be able to find the information they are looking for at the click of their mouse, and this within fractions of a second. With the publication of an average 45 *Acta Horticulturae* volumes per year, representing roughly 2,200 articles and 14,300 pages, our *Acta* content database continues to grow and today includes over 63,000 full-text articles, the fruit of your research efforts. The ISHS *Acta Horticulturae* website **www.actahort.org** daily welcomes 28,500 visitors looking for information to help them continue their research. Apart from that, our Secretariat is providing similar services for our own journals, *eJHS* and *Fruits* (The International Journal of Tropical and Subtropical Horticulture) and for publications of other organizations that are grouped in the **www.pubhort.org** online portal.

The conveners of our 45+ symposia held each year are doing a marvelous job. Without their voluntary work organizing the symposia and conferences, and overseeing the editorial activities leading up to the proceedings, there simply would not be a society. The adoption of submission platforms such as ROSA (Responsive Online System for *Acta Horticulturae* submission and review) and Editorial Manager has facilitated efficiencies and streamlining that make the life of our conveners and editors much easier. The use of other tools such as eXtyles has lifted our production and pre-publication workflow capacity to a higher level, and allows us to align the publication procedures of our journals and proceedings with science and industry standards and ensure that the content we output is future-proof. We wish to compliment the efforts of our Section, Commission and Working Group Chairs in coordinating all of these symposia, setting the science structure of the ISHS. Indeed, all on a voluntary basis.

History

When the members of the International Committee for Horticultural Congresses at the 15th International Horticultural Congress in Nice 1958 voted to establish the International Society for Horticultural Science, they laid down the foundations of what today has become your global network of Horticultural Science. On 27 April 1959, the Society was officially registered, a Secretary General appointed and a Secretariat established. The main arguments that the International Committee saw were the need to provide continuity in its activities and to make the network grow, offering services to the members and promoting horticultural science worldwide. Today, almost 60 years later, your ISHS Secretariat employs seven people full time, most of whom have been 'in service' for many years. We form a smooth and highly dedicated team of colleagues working and interacting harmoniously with each other and the members of ISHS.



› Staff of the ISHS Secretariat on the office steps. From left to right: Steven Franssens, Jelle Ollivier, Dirk Van Holderbeke, Maria Testor, Peter Vanderborght, Kelly Van Dijck and Jozef Van Assche.

Day-to-day activities

Practically speaking, the activities of the ISHS Secretariat could be divided in two parts: issues related to the Society's life, and issues related to publications.

An association or a society exists thanks to its members: members register, members develop activities and members interact, through our discussion platforms, and our magazine *Chronica Horticulturae*, etc. At the Secretariat level, this means managing the membership database, receiving membership dues and keeping accounts, and together with Board member Dr. Jill Stanley, soliciting contributions for *Chronica* and editing the magazine. Our colleagues Peter Vanderborght, Dirk Van Holderbeke, Kelly Van Dijck and Maria Testor perform these services as part of their duties. They are available on a daily basis to answer your questions, and learn where and how we can improve our services and support. We take this opportunity to compliment the Board member from Asia, Prof. Dr. Ryutaro Tao, for actively expanding the membership of ISHS in Asia.

The ISHS relies for its funding on revenue from membership dues (33%), publications (60%) and partnerships and miscellaneous (7%). *Acta Horticulturae*, the journals *eJHS* and *Fruits*, *Scripta Horticulturae* and *Chronica Horticulturae* are indeed the Society's bread and butter, and we consequently give the publication department our utmost attention. Our colleagues Steven Franssens, Maria, and to some extent Jelle Ollivier, are in daily contact with Editors of *Acta*, they interact with authors of articles, technically review articles, remain in contact with printers and ensure that each symposium participant receives a copy of the proceedings in due course. All of this is in the caring hands of Kelly, who negotiates agreements with conveners and reports to the Vice-President of ISHS, Prof. Dr. Silvana Nicola, and the Executive Committee. She also takes final responsibility in the technical process of producing the proceedings when they are ready for publication and printing. In the last few

› Hard at work in the back office: A. Jelle and Peter discussing the cover options for the upcoming issues of *Fruits* and *eJHS* with Prof. Yves Desjardins, ISHS Board member Responsible for Publications (front) and Maria technical editing *Acta Horticulturae* papers (back). B. Dirk and Kelly examining a new volume of *Acta Horticulturae* (front) and Steven searching the *Acta Horticulturae* archives (back).

years, the ISHS has become the proud owner of *eJHS* and *Fruits*, and our colleague Jelle, in collaboration with the Editors-in-Chief of these journals, Prof. Dr. Jens Wünsche and Dr. Rémi Kahane, has the exciting duty of ensuring that the issues of these journals are on the shelves and in the database every second month. Publications mean subscriptions and online services. Dirk ensures that invoices go out to libraries and subscribers, and he oversees the accounting related to these, while Peter ensures that all publications are available online. One Board member takes particular responsibility for Publications, and for the last seven years, Prof. Dr. Yves Desjardins has been instrumental in guiding the Council and the Secretariat in the renovation process of IT challenges and online activities that our members and other users are now enjoying.

The interaction with the Board

As a reader you certainly will have noticed that interaction between the ISHS Secretariat and the Board of the ISHS is key to our success. The ISHS Secretariat, and in particular the Executive Director, Jozef, together with Peter, ensures the regular and smooth contact between the team at headquarters in Leuven and the ISHS Board. The ISHS President, Prof. Rod Drew, and Jozef meet each other regularly on the road or communicate almost daily by phone, skype or e-mail. All other Board members frequently pass by our office in Leuven and bounce numerous emails and phonecalls back and forth with their back office colleagues in Leuven.

Come and meet us

Last but not least, if you want to meet us in person, you are welcome at the Secretariat. We will also be present at our 'mobile' back office, the ISHS booth, at the International Horticultural Congress, next time in Istanbul for IHC2018 (**www.ihc2018.org**). Board member Prof. Dr. Yüksel Tüzel, Chair of the IHC Organizing Committee, is ensuring that we will have, yet again, a great Congress. See you in Istanbul!

Spotlight on Honoured ISHS Members

› Koki Kanahama

Position or previous position

Emeritus Professor of Tohoku University, Japan since 1st April 2015 (retired Faculty of Agriculture, Tohoku University in March 2015)

ISHS honour

ISHS Honorary Member

Figure 1. A view of Sendai city. In the back you can see the Pacific Ocean and in the front the campus of Tohoku University.

Figure 2. The star festival in Sendai city.

Figure 3. Prof. Koki Kanahama at a campus of Faculty of Agriculture, Tohoku University.

Figure 4. Curvature of cucumber fruit.

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

I was born in 1949 in a small village located on the northeastern coast of Japan, where I lived until I entered Tohoku University at the age of 19. Tohoku University is located in Sendai city and faces the Pacific Ocean (Figure 1). This city is 400 km to the north of Tokyo, the capital of Japan, and has a population of almost one million. Sendai city is famous for tourist attractions such as the star festival in summer (Figure 2). When I was a young researcher, I lived in Thailand for six months as a member of an expert group in horticultural science, supported by the Japan International Cooperation Agency (JICA). This experience gave me an understanding of the importance of international cooperation.

I was a professor at the Laboratory of Horticultural Science for 20 years (Figure 3). The primary scientific theme of the work done in this laboratory was research on the morphological and physiological mechanisms of flower initiation and fruit growth in horticultural plants.

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

I suppose there are two reasons that I started in a career in horticultural science. One reason is the number of my siblings. I was born as the fifth son out of eight siblings. My father was a teacher at an elementary school. When I was a child, I was brought up to grow flowers in a garden together with my siblings, so we could learn to live in friendship. I believe that my father intended to instruct his children in gardening, following the educational philosophy of Friedrich Fröbell, who founded the first kindergarten in 1837. In this case, the kindergarten did not mean a house for teaching children but a garden where children could practise gardening with self-discipline.

The other reason for my attraction to horticulture was the activities of my father. He possessed small paddy fields for growing rice and gardens for growing vegetables and fruit trees. When I was a student at elementary school and high school, I had to help him work in these fields and gardens on weekends and summer holidays. This experience made me familiar with horticultural crops and made me realize the importance of horticultural crops for farm management. As a result, I aimed to become a horticultural scientist.

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

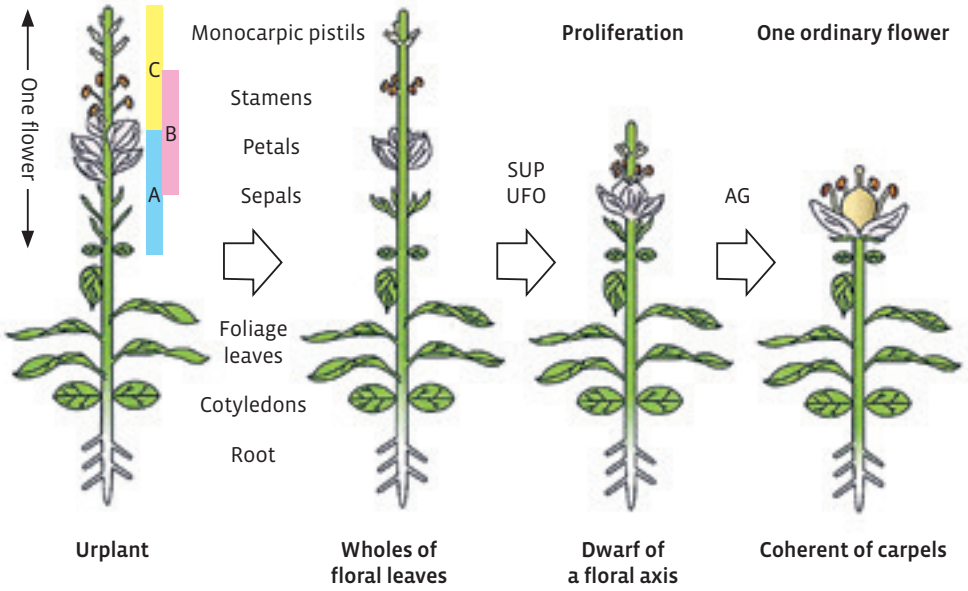
As a graduate student, I began my research on the reason cucumbers bend or curve during the early growth stage. In Japanese markets, only young and straight fruit are sold as fresh vegetables at high prices, while bent or curved fruit (Figure 4) have no sale value. Cucumber growers therefore need to harvest as many straight fruit as possible. Cucumber fruit for use as fresh vegetables are harvested at an early growth stage, between 7 and 10 days after flowering,

and the maximum curvature of the fruit is observed at this growth stage.

I first investigated the effects on fruit growth of environmental conditions such as sunlight intensity, the leaf to fruit ratio on a cucumber plant, fertilizer and water conditions in the soil, and concentrations of sugars and plant growth regulators in the fruit. Based on these results, the cause of fruit curvature was revealed to be a lack of photosynthates for the growth of each fruit. In general, when the amount of photosynthates is reduced in the plants or fruit, growth decreases. However, I then began to wonder why the cucumber fruit showed not only a reduction in fruit growth, but also an increase in fruit curvature. The reason behind this was not revealed for more than ten years.

When I was studying fruit morphology from textbooks, I noticed that one cucumber fruit generally consisted of three carpels, which corresponded to three leaves. The textbook explained the metamorphosis theory proposed in 1790 by Johann Wolfgang von Goethe, a famous German writer. This theory explained the curvature mechanism of a cucumber fruit as follows: when three carpels in a cucumber fruit initiate in a flower, each carpel develops in turn, as do the three leaves that develop on a stem (Figure 5). In the early growth stage of a cucumber fruit, a carpel situated at the outer position of a fruit grows prior to that of the inner position. As a result, the degree of curvature increases. After the growth of the carpel at the outer position of curvature is saturated, another carpel at the inner position of curvature in the same fruit grows to a greater extent than does the carpel at the outer position of curvature. Eventually, fruit curvature is reduced, and the fruit shows a straight morphology. Adopting the metamorphosis theory, I completed my doctoral dissertation and obtained my PhD in 1987, when I was 38 years old.

The metamorphosis theory enabled me to explain many morphological and physiological phenomena in horticultural plants. For example, the cause of irregularly shaped fruit in tomato (Figure 6) and cockscomb berries of strawberry fruit are the result of excessive growth of a number of carpels in a fruit. More than 200 years after it was first proposed, Goethe's metamorphosis theory has been elucidated and accepted, not only by Japanese horticultural scientists, but also by plant morphologists. Nowadays, it is introduced in many famous books such as "Arabidopsis – An Atlas of Morphology and Development" (edited by Bowman, J. 1993. Springer-Verlag) and "Understanding Flowers and Flowering" (edited by Glover, B.J. 2007. Oxford Univ. Press). In Japan, Goethe's metamorphosis theory was introduced for the first time in 2015 in an authorized biology textbook for senior high school students.



(A, B, C, SUP, UFO, AG; typical genes controlling flower development in plants)

Figure 5. Metamorphosis in a flower (original figure illustrated by K. Kanahama in a textbook entitled "Vegetable Crop Science", 2007, published by Bun-eido Shuppan, Tokyo).

After completing my doctoral thesis, I extended my research to a new field – the morphological and physiological mechanism of flower initiation and fruit growth of horticultural plants, including vegetables, ornamental plants, and fruit crops, such as ever-bearing strawberries, tomatoes, baby's breath, prairie gentians, and deciduous fruit. From these results, I showed that we can regulate the flowering of ever-bearing strawberry plants, a long-day plant for flowering, using LED lamps emitting light with a far-red wavelength. This enables fruit to be produced not only in summer but also in winter in Japan. By the same method, I induced the flowering of baby's breath and prairie gentian in winter using far-red LED lamps that I developed. This technique enables growers to produce these flowers in time for Christmas and New Year, which meant selling them at a higher price.

In other vegetables, I studied the mechanism of flower spike development and new tuber growth of Chinese yam by changing day-length and by application of plant growth regulators, and revealed the translocation pathways of ^{14}C-assimilates in cucumber and tomato plants. Further, with the help of my colleagues, I analysed a flowering gene in baby's breath whose expression was mediated by the far-red LED lamps.

4. What do you consider were your greatest achievements?

I have published textbooks in Japanese – "Introduction to Horticultural Science", "Vegetable Crop Science", "Fruit Science", and "Ornamental Horticultural Science". To my great pleasure, I was able to finish the publication of these textbooks before my retirement from Tohoku University. I now study the horticultural philosophy of education, supported by a Grant-in-Aid for Scientific Research of Japan. The aim of this research is to develop teaching methods to nurture excellent students as horticultural researchers.

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

A major difficulty in moving along my career path was caused by my birthday. I was born as part of the baby-boom generation of Japan. When I was a student at school, one class consisted of more than forty students, and we were in keen competition with others for entrance examinations to senior high school and universities. When I applied for the entrance examination for Tohoku University, it was made even harder because Tokyo University, the top university in Japan, cancelled their entrance examination, planned for early spring of 1969, because of campus activism. As a result, the competition rate of the entrance examination for other universities was even higher than before. After being admitted to Tohoku University, we were not able to attend any lectures for two years because of campus activitists. During these days, I made many friends with whom I discussed our future at the university, and we worked together to overcome the damage caused by activism

Figure 6. Metamorphosis of tomato fruit.

Figure 7. A 330-ton fishing boat in a residential zone (two years after the tsunami).

on campus. This experience made me realise that close friends were essential for overcoming difficulties at any time.

6. Tell us about a sad experience that happened to you during your career.

I invested considerable effort in organising the Asian Horticultural Congress (AHC), which was founded in cooperation with the Korean Society for Horticultural Science (KSHS) and the Chinese Society for Horticultural Science (CSHS) and run under the auspices of the International Society for Horticultural Science (ISHS). For example, I visited KSHS in December 2010 and CSHS in February 2012, as a Vice-President and President of the Japanese Society for Horticultural Science (JSHS), respectively. I planned the 2nd AHC, which was to be held in March 2012 (AHC2012) in Tsukuba, Japan. Unfortunately, Japan was subject to a natural disaster on 11th March, 2011 (Figure 7).

I have experienced two major natural disasters in my lifetime. The first experience occurred on 24th May 1960 when I was eleven years old: my hometown was struck by a tsunami over six meters in height, caused by an earthquake in Chile. The second experience occurred in 2011 and caused much more damage than that in 1960: my hometown was struck by a tsunami more than twelve meters in height, which caused extensive damage. During this second experience a student in my laboratory, my older sister, and many relatives and acquaintances were killed.

Owing not only to the damage to the Congress Centre building but also to the accident at the Fukushima Power Plant, I cancelled AHC2012 and announced this cancellation to the President of ISHS and all horticultural societies worldwide. After the natural disaster, as the President of the JSHS, I communicated closely with the President of the ISHS and discussed the future of the AHC. With the help of ISHS and CSHS, we were able to hold the second AHC in September 2016 at Chengdu, China. I would like to take this opportunity to convey my heartfelt thanks for the sympathy and help we received from across the globe. JSHS is making every possible effort to mitigate the damage caused by this natural calamity.

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 was the Editor-in-Chief for three years of the Journal of the Japanese Society for Horticultural Science (JJSHS), an official journal of the JSHS that is an important source of information not only for Japanese scientists but also for researchers worldwide. In 2008 and 2012, I became the Vice-President and President, respectively, of the JSHS.

I attended my first International Horticultural Congress (IHC) when it was held in 1990 in Firenze, Italy. At IHC1990, I enjoyed many enriching experiences as I met with researchers from all over the world who participated in the congress.

In 1994, the JSHS hosted the 24th International Horticultural Congress (IHC1994) in Kyoto, Japan. As a member of the organizing committee, I worked to publish the newsletter and published a review entitled "Studies on fruit vegetables in Japan" in Horticultural Abstracts (*64*, 1–15. 1994).

In 1998, I attended IHC1998, held in Brussels, Belgium, and made many friends among those who participated in the congress from all over the world. This experience accustomed me to new surroundings such as the IHC.

When IHC2006 was held in Korea, I was the Editor-in-Chief of a book entitled "Horticulture in Japan 2006", which the JSHS published and distributed to international participants.

I attended the Board meeting of the ISHS held at Lisbon, Portugal, in August 2010 and the Council Meeting held at Brisbane, Australia in September 2011. During these meetings, I became acquainted with many ISHS Board members.

At IHC2014, held at Brisbane, Australia, I presented a plenary lecture entitled "Impact of the 2011 earthquake and tsunami on Japan's horticultural industry" as a victim of the natural disaster (Figure 8). This was the greatest pleasure I have experienced as a member of the ISHS.

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

In general, when we commence horticultural research, we select a few specific horticultural crops for study, such as vegetable crops, ornamental plants, or fruit trees. However, if we select more diverse horticultural crops, we can obtain more information from these crops. In any kind of research, the creation of an excellent research paper takes many years. It is therefore necessary to constantly further the progress of our research by systematically increasing the number of experimental crops and techniques.

If you present your research at an IHC, you will have the opportunity to meet many famous researchers. For example, I met the previous ISHS President Norman Looney (Figure 9), who was president from 2002 to 2010. We met for the first time at the end of November, 2009, at Tokyo, when he had business at the Japanese Ministry of Foreign Affairs in his capacity as the President of the ISHS. The President of the JSHS, K. Kanahama, and Professor R. Tao, the Secretary of the JSHS and a present ISHS Board member, accompanied him to the Ministry. After his business was concluded, we formed what would become a close friendship in a

Figure 8. Plenary lecture at IHC2014 (Brisbane, Australia).

Figure 9. Reunion with the previous ISHS President (2002-2010) Dr. Norman Looney at IHC2014 (Brisbane, Australia).

restaurant in Tokyo. We have subsequently had many opportunities to meet at international congresses such as IHC2010, held at Lisbon, Portugal; the VII International Strawberry Symposium held at Beijing, China in 2012; and IHC2014, held at Brisbane, Australia. When Dr. Norman Looney was one of six ISHS members to be given the ISHS honorary membership award at the IHC2014 general assembly, I was present to share this pleasure with him. The sad news that he had passed away, which was reported on the homepage of the ISHS and in *Chronica Horticulturae*, broke my heart. I express my sincere condolences to his family.

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

The modern Japanese horticulture industry and horticultural science began 150 years ago, a period that is called the Meiji Restoration. Although the JSHS was established in 1923, the details of the events that led to its establishment have not been identified and summarized. Because the history of JSHS is not taught in the liberal arts, both students and scientific researchers are unaware of it. As my final work, therefore, I am serializing this history in a 20-part publication in a Japanese journal. As a result of this, we Japanese horticultural scientists will be able to discern the future of our horticultural industry and science.

The UC Davis Chimney Dryer and DryCard™ – tools for implementing the dry chain

Michael S. Reid and James F. Thompson

Figure 1. UC Davis Chimney Dryer at the World Vegetable Center in Arusha, Tanzania.

Figure 2. Drying rice in Cambodia by spreading it out on large mats in the sun. Decisions on when the rice is dry are based on the feel of the grains underfoot.

In 2005, the Global Horticulture Assessment, funded by the U.S. Agency for International Development, and incorporating insights from more than 750 horticulturists worldwide, recommended that USAID should fund a Collaborative Research Support Program in Horticulture (HortCRSP) designed to "*provide the research, capacity building and knowledge extension support essential for the development of the global horticulture sector*". The HortCRSP, now the Horticulture Innovation Lab, was established in 2009 at the University of California, Davis, with funding from USAID. Now in its 8th year, the program supports research collaborations between U.S. universities and research and educational institutions in the developing world, as part of the U.S. government's "Feed the Future" global hunger and food security initiative.

The Assessment recognized the importance of postharvest systems and food safety, and recommended that a high priority be given to research and development of appropriate postharvest technologies. The Assessment noted "*for small and medium-sized producers, value-added processing techniques, food safety protocols and quality standards for horticultural commodities can help to reduce postharvest losses, improve food safety, and contribute to increased producer incomes and the subsequent development of rural economies*".

Among value-added processing techniques, drying holds an important position. Drying is the oldest technology for preservation of agricultural products and dried fruits, vegetables, meat, fish, and particularly grains and pulses, which are important components of most diets. Staples such as wheat, rice, maize and chickpeas are dried, but so are high-end horticultural products such as walnuts, almonds, raisins, tomatoes, chillies, and mangos. Drying is also important in the specialty herb and spice market.

In response to inadequacies in drying technologies used by smallholder farmers in the developing world, we developed the UC Davis Chimney Dryer (Deltsidis et al., in press). This dryer (Figure 1), which can be inexpensively constructed from materials that are locally available, dries two to three times faster, and is considerably less expensive on a per kg of dried product basis, than the typical cabinet dryers that have been widely recommended for solar drying of horticultural products (Deltsidis et al., in press). The efficiency of drying is achieved by inducing airflow past the drying product. This is accomplished by reducing the cross-sectional area of the drying tunnel, placing product close to the top of the tunnel (where the air is warmest), and using a chimney to draw air through the drier. In practice, the dryer has proved to be very effective, even under partly cloudy conditions, and the design is flexible enough to allow variations, responding to local requirements.

A key challenge in operating any drier is to determine when products have reached a safe moisture content. Growth of fungi in improperly-dried foods can result in contamination with mycotoxins, particularly aflatoxin, a potent carcinogen and anti-nutrient. Aflatoxin contamination of dried foods, especially grains and pulses, but also dried fruits, vegetables and nuts, is a major problem in sub-Saharan Africa and other humid equatorial regions. Aflatoxin contamination leads to loss of access to high-end markets and, more importantly, widespread dietary exposure to the toxin, a Class 3 carcinogen and anti-nutrient. At high concentrations, aflatoxin causes acute poisoning and liver cancer. Chronic exposure to even minute concentrations of aflatoxin in the diet is associated with stunting and suppression of the immune system. Aflatoxin is estimated to cause about 100,000 cases of liver cancer per year and world-wide a loss of 1-2 million daily-adjusted-life-years per year (Grace, 2015). The anti-nutrient impact of aflatoxin contamination of food is even more

Figure 3. The DryCard (front).

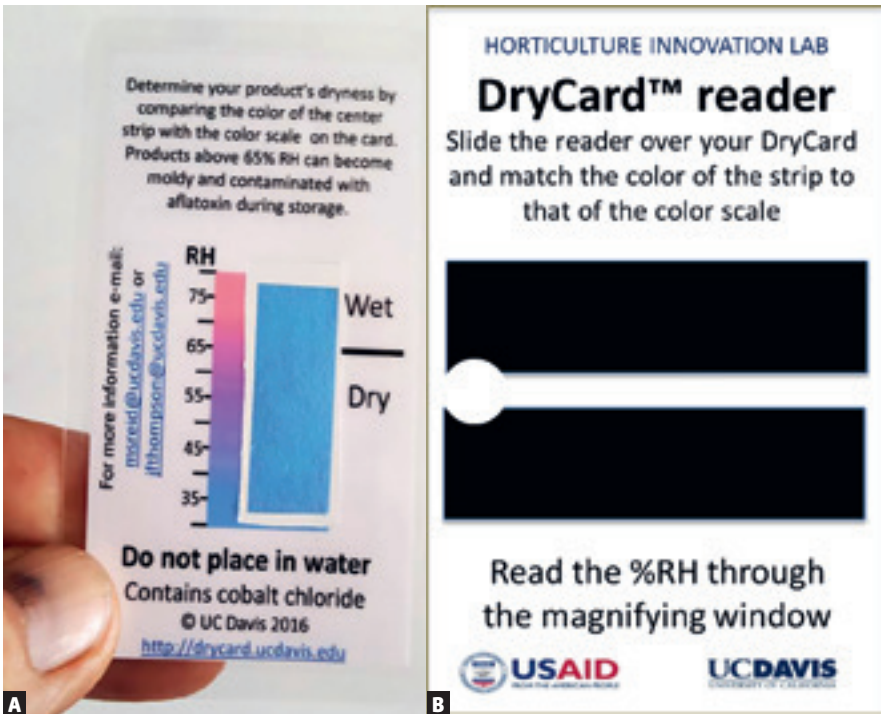


Figure 4. A. The back of the DryCard provides a continuous reference color scale. B. The separate DryCard reader makes it possible to make quite accurate determinations of relative humidity.

tragic. Aflatoxin contamination prevents uptake of essential vitamins and minerals and has been shown to be highly correlated with stunting (Leroy, 2013), causing not only a reduction in height but also in cognitive abilities (Dewey and Begum, 2011). As just one example, it is estimated that 40% of children in Tanzania are stunted, with incalculable personal, social and economic impacts.

Growth of the fungi that produce aflatoxin cannot occur if food is sufficiently dry. The 'dry chain' concept proposed by Bradford et al. (2016) focuses attention on the importance of maintaining low water content in dried products, in an analogy to the well-known concept of the cold-chain, which is key to maintaining quality of perishable horticultural products. A range of devices is available for monitoring the cold chain (digital and analog thermometers, etc.), but the dry chain is rarely monitored because moisture meters for direct and accurate determination of the water content of food are expensive and cumbersome. In the dry tropics and temperate regions, open air drying usually ensures that foods are dry enough to be stored safely. In the humid tropics, this is not certain, and although farmers and processors know that the food needs to be adequately dried, the techniques used to ensure this are subjective, like cracking maize grains between teeth or the 'feel' of rice grains underfoot (Figure 2). Such techniques can be adequate, but only if they can be 'calibrated' by reference to a standard for dryness.

An alternative to direct measurement of food water content is to measure the relative humidity of air above a sample of the food in a sealed container, termed Equilibrium Relative Humidity (ERH). The water content of the food can be determined from the ERH and temperature (Bradford et al., 2016), but the growth of fungi is a direct function of the water activity (Aw) of the food, which is the decimal of the ERH and is unaffected by product temperature. Toxigenic fungi will not grow in food with a water activity below 0.65, equivalent to an ERH of 65% (Beuchat, 1981).

A wide range of devices is available for measuring relative humidity (RH), but those that are accurate (dew-point and wet and dry bulb psychrometers) are expensive or cumbersome. Digital devices using capacitive or resistance sensors to measure RH are now readily available, but those that are reliable and accurate are expensive. More than 70 years ago, Solomon (1945), recognizing the need for a simple and inexpensive method for measuring ERH in dried foods, described the use of paper impregnated with cobalt chloride ($CoCl_2$) for determining humidity. Cobalt chloride changes color from sky blue in its anhydrous form, to mauve in partial hydration and pink when completely hydrated as a hexahydrate. Solomon's data showed that there was a reliable relationship between relative humidity and color of the paper strips. RH-indicating paper based on his findings has been sold commercially for decades and is currently available from several sources (see for example http://www.microessentiallab.com/ProductInfo/F30-SPLTY-HUMIDI-SRD.aspx). Curiously, although this technology is so widely known and available, it has not been applied to the dried food systems for which Solomon invented it.

We recently developed the DryCard™ (Figure 3) as a convenient tool for measuring ERH using commercially available $CoCl_2$ humidity strips (Thompson et al., 2017). A short strip of the humidity paper and instructions for using the card are laminated in a business card PET-EVA plastic pouch. A window is cut in one side of the lamination to allow the humidity paper to have direct access to its surrounding environment. The card is reusable and can be manufactured in quantity for less than USD 0.05 in materials cost, using inexpensive (<USD 20.00) laminating machines. The advantages of the card include its low cost, convenient size, visual indicator system, and the laminated protection that allows it to be reused many times.

The DryCard is being tested in Tanzania, Zambia, Kenya, Uganda, Guinea, Honduras and Bangladesh and has already been translated into a number of languages. Its potential uses are numerous; in addition to providing farmers with an inexpensive tool to check the moisture content of their dried products before storage, it provides a reference for trading in these commodities, allowing certainty on one of the most important aspects of quality for dried products.

In initial versions of the DryCard, we used a continuous color scale for comparison with the color of the $CoCl_2$ strip. Evaluations conducted in conjunction with researchers from Purdue University indicated that for some Kenyan farmers this was confusing, so the face of the current version of the card has discrete color patches as reference, and

this has proved easier for users to interpret. The back of the card (Figure 4A) still has a graded color reference, for those interested in more accurate readings. Colorimeter readings of DryCards held at different RH over saturated salts demonstrated that the hue of the $CoCl_2$ strip changes linearly over most of the RH range (Thompson et al., 2017). We have also developed a card reader (Figure 4B) that allows the user to focus on a narrow range of the color reference, and permits accurate determination of RH within 5%.

The linear relationship between hue and RH makes it possible to envisage a cell-phone 'app' that will allow users with smartphones to obtain even more precise measurements of ERH using the phone's built-in camera and a colorimeter function. Future iterations of the DryCard may use a humidity indicator, with chemistry that changes color at a specified ERH (65% for dried foods, 25% for stored seeds, etc.).

Interest in the DryCard in sub-Saharan Africa has been very high; cards are now being manufactured in Tanzania, and we have identified potential manufacturers in several other countries. Our goal is to make the DryCard locally relevant, in local languages, and with manufacturing and support from local entrepreneurs. The DryCard won the grand prize in the All-Africa Postharvest Technologies and Innovation Challenge that was part of the recent 1st All-Africa Postharvest Congress and Exhibition, and that has generated additional interest. As the card becomes more widely utilized we hope to study the effects of its use on the quality of dried foods and to see a reduction in aflatoxin contamination and a subsequent reduction in its negative effects on human health and development. More information about the DryCard, including how to request samples for testing and research, is available at http://drycard.ucdavis.edu.

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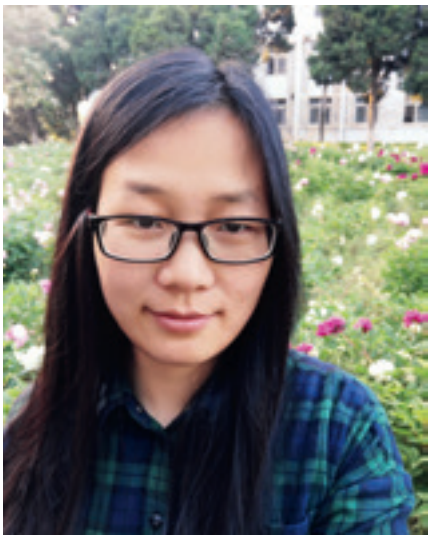
Horticultural Science Focus

› 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.

Effect of chloride-containing fertilizer application on kiwifruit yield, quality, and soil chloride concentration



› Lili Yang

Lili Yang is a doctoral student at the Northwest A & F University in China. Her major is plant nutrition and her research is focused mainly on fruit nutrition management, especially of kiwifruit.

In recent years, the area in China planted with kiwifruit and the total production have ranked first in the world. As the planting area has expanded, there have been many problems with nutrient management in kiwifruit orchards, especially relating to which types of fertilizer can be used. The application of chloride fertilizers may cause salt damage. With misunderstanding about the need to "avoid chlorine crops", and the harmful effects of chlorine on tobacco, the chloride-containing fertilizers have rarely been used by fruit growers. However, kiwifruit vines have a large demand for chlorine. Irrigation is extensively used in kiwifruit orchards in China, so different application rates of chloride-containing fertilizer were tested. The objective was to determine whether chloride-containing fertilizer applied to kiwifruit vines was feasible and to monitor the accumulation of chloride ions in kiwifruit orchard soils. The experimental design involved applying chloride (Cl) at rates of 0, 170, 340, 910, or 1480 kg ha^{-1}, respectively. The results indicated that applying a moderate rate (170-910 kg Cl ha^{-1}) of chloride-containing fertilizer increased kiwifruit yield, improved its quality, and did not have significantly detrimental effects on soil in the short term. A high rate (1480 kg Cl ha^{-1}) was detrimental to the quality of the fruit, reducing the fruit vitamin C and soluble sugar content. Also, the soil Cl concentration (the highest Cl concentration was 262 mg kg^{-1} in 80-100 cm soil layer) was relatively high. These results are contrary to the commonly-held prejudice against chloride-containing fertilizers.

Lili Yang won an ISHS student award for the best poster at the VIII International Symposium on Mineral Nutrition of Fruit Crops in Italy in June 2017.

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Association mapping of nut and kernel traits in the Turkish hazelnut (*Corylus avellana L.*) germplasm

› Süleyman Can Öztürk

European hazelnut (*Corylus avellana* L.) is an economically and nutritionally important nut crop with wild and cultivated populations found throughout Europe and in parts of Asia. Turkey is the world's main hazelnut producer with 450,000 tons grown on 701,141 ha, accounting for 65% of world production.

In this study, 390 accessions from the Turkish national collection were analyzed for their genetic potential, and for their kernel and nut traits. Analyses yielded 407 polymorphic fragments from 30 SSR markers. Association mapping was performed with TASSEL software according to molecular and morphological data for 13 nut and 12 kernel traits which were observed for two consecutive years using 30 samples per accession. GLM (Q) analysis produced the most significant results and was chosen for further analysis. As a result, we found that 78 marker-trait associations were significant between the SSR markers and kernel/nut traits ($p<0.01$, $r^2>0.03$). No SSR markers were identified for nut color, shape of the top, size of the basal scar, kernel shape, and kernel percentage. Cultivars, landraces and wild material were compared separately in terms of their performance and breeding potential. The nut and kernel trait analyses of hazelnut accessions have revealed some of the impacts that human selection and breeding have had on these attributes in hazelnut. Moreover, correlations of traits were analysed and many significant correlations were found between kernel and nut traits.

This study provides molecular information for marker-assisted selection in hazelnut and gives new insights to discover the genetic potential of Turkish hazelnut germplasm.

Süleyman Can Öztürk won an ISHS student award for the best oral presentation at the IX International Congress on Hazelnut in Turkey in August 2017.

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Orchid production and research in South Korea

Yoon Jin Kim, So-Young Park and Ki Sun Kim

Figure 1. Cultivation of *Cymbidium* (left) and *Phalaenopsis* (right) orchids in Korea.

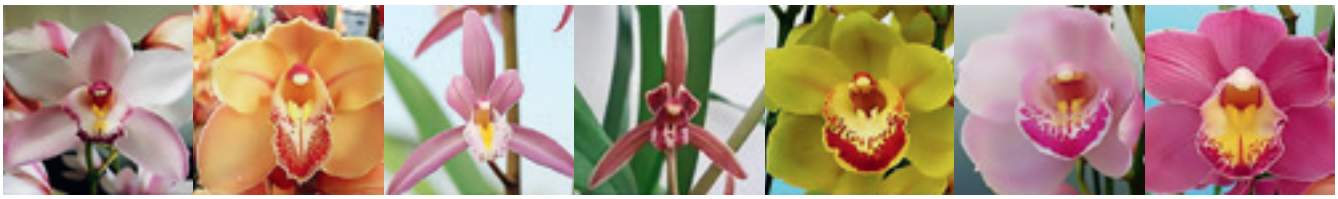
Orchid cultivation has come a long way. Over the years it has evolved from a hobbyist's market into a highly commercial market. Large-scale cultivation of orchid cut flowers and potted orchids is now the trend internationally (Hew and Yong, 2004). Since orchids take a few years from propagation to sale, research on orchid production has recently focused on how to reduce energy consumption in greenhouse cultivation. Environmental conditions, including carbon dioxide, temperature, light and nutrient, are controlled with gas engine driven heat pumps (GHP), which provide heating, cooling and carbon dioxide to greenhouses. Orchid research programmes in Korea have been developed at the National Institute of Horticultural and Herbal Science and the Korea Institute of Machinery & Materials. Today, orchids such as *Cymbidium*, *Dendrobium*, *Phalaenopsis* and *Oncidium* are marketed globally and the orchid industry has contributed substantially to the economy of many ASEAN (Association of the South East Asian Nations) countries (Hew, 1994; Laws, 1995). In Korea, orchids account for 28.5% of the total potted plant industry. *Cymbidium* and *Phalaenopsis* are the main orchid species grown commercially in Korea (Figure 1). The total cultivation area of orchid is 153.5 ha and the production value of orchids in 2015 was approx. $US 52 M (Table 1). This includes 63.7 ha of *Cymbidium* and 43.4 ha of *Phalaenopsis* orchids, respectively, with production values of $US 15 M and $US 19.6 M, respectively. The cultivation area and production value increased significantly until 2010 and then decreased significantly due to stagnation in the total floricultural industry and market. Orchid exports increased until year 2010, mainly to China and Japan. The value of exported orchid cut flowers increased more than three-fold from 2008 to 2015 (Table 1).

Until recently, the main cultivars of *Cymbidium* and *Phalaenopsis* in commercial production in Korea were imported from Taiwan. However, plant breeders working for The Ministry of Agriculture, Food and Rural Affairs of Korea are developing new *Cymbidium* and *Phalaenopsis* cultivars. Fifty-four Korean cultivars of *Cymbidium* and several *Phalaenopsis* cultivars have been developed by plant breeders at the National Institute of Horticultural and Herbal Science (Figures 2 and 3).

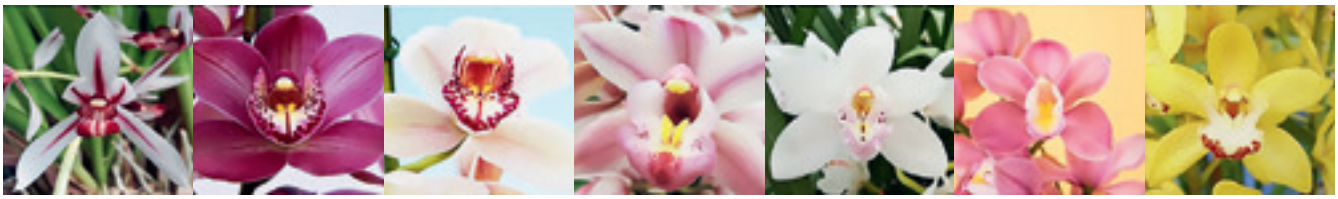
In Korea, 101 species, 14 strains, and 7 cultivars, totaling 122 kinds of orchid plants, have been identified growing in the wild in Korea. Evergreen orchids represent 32.8% of all native orchids in Korea, including *Cymbidium kanran*, *Cymbidium goeringii*, *Calanthe discolor*, *Goodyera schlechtendaliana* and 40 more species. *Cymbidium goeringii* is considered a symbol of Korea and is high-

Table 1. Cultivation areas, production and export values of orchids in Korea from 2000 to 2015 (Anon., 2015a).

	2000	2005	2008	2010	2012	2014	2015
Cultivation area (ha)	307.9	331.6	268.0	227.0	202.0	162.7	153.5
Production value ($US M)	95	108	92	75	71	57	52
Total export value (1000 $ US)	4,422	18,774	25,976	20,264	11,224	7,459	6,648
Orchid cut flower export value (1000 $ US)	-	-	409	937	1,308	1,000	1,300



Sweet Wedding (2013) | Dimple Orange (2013) | Sunny Bell (2013) | Midan (2013) | Yellow Smile (2014) | Wedding Party (2014) | Sunny Luby (2014)



KKogaram (2014) | Ruby Ball (2015) | Cristal (2015) | Sodam (2015) | Wedding March (2016) | Lovely King (2016) | Gold perfume (2016)

Figure 2. *Cymbidium* cultivars bred in Korea. The year of cultivar release is shown in brackets.

ly sought after. In addition to commercial orchid production (Figure 4), there are hundreds of thousands of hobbyists involved in over 700 orchid societies, and around 1,000 stores nationwide sell *Cymbidium goeringii* to hobbyists.

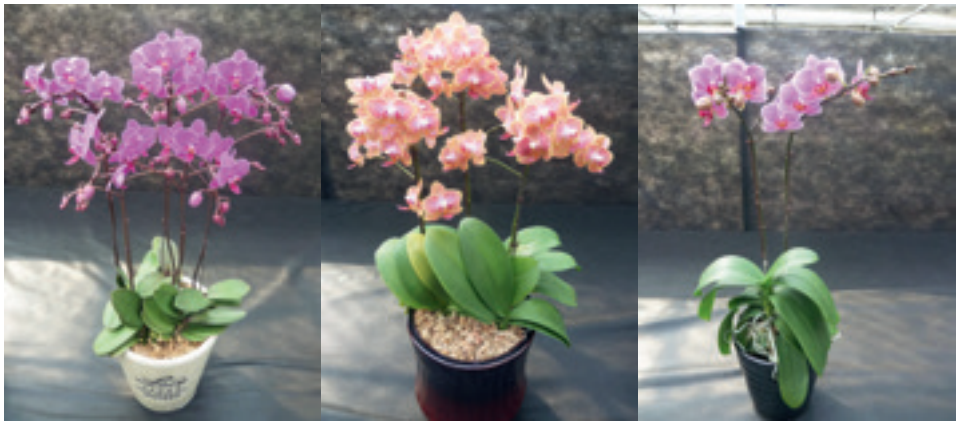
Cymbidium goeringii has various flower forms and colors among the temperate orchids (Figure 5). They are valued highly for their scent, color, and the form of their flowers and leaves, which all determine their price. Leaf variations have high ornamental value (Figure 6).

This orchid has been loved and valued by Koreans for centuries. Poets praised it as an image of chastity and purity. Artists drew it in black and white, praised it as one of the four gracious plants and often used it as the central image on pottery (Lee, 2011). The first literature about this orchid was by Choi Chi Won, who was a scholar during the Shilla Dynasty (890 A.D.). A very old horticultural book written in 1449 A.D., 'Yanghwasorok', records the distribution and transplanting of *Cymbidium goeringii*. The cultivation areas and main facilities of today's commercial producers of *Cymbidium goeringii* are generally quite small, the majority being less than 20 m^2 (Figures 7 and 8).

An auction market for *Cymbidium goeringii* was established in 2014, and there has been increasing interest in new high value markets. Some of the rare cultivars have been sold for as much as $US 1.8 M. The average sale price at auction is about $US 900 and auctioning of *Cymbidium goeringii* is expected to contribute to the national economy in the near future (Figure 9).

Yellow Star (2002) | Orange Dream (2003) | White Angel (2004) | Yellow Dream (2005) | Pink Marvel (2005)

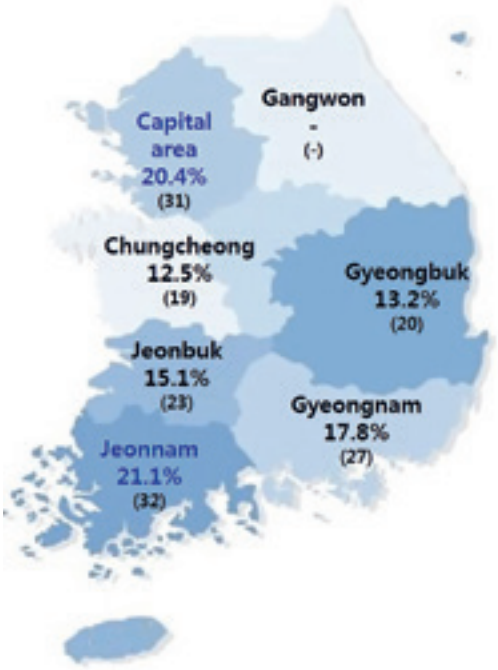
Yellow Marvel (2006) | White Pearl (2007) | Snow Angel (2008) | Sweet Pinky (2008) | Sweet Orange (2009)



Red Vivien (2016) | Beauty (2016) | Little Gem (2016)

Figure 3. *Phalaenopsis* cultivars bred in Korea.
Above: cultivars bred in National Institute of Horticultural and Herbal Science;
Below: cultivars bred in Kang-San Orchid Farm. The year of cultivar release is shown in brackets.

The orchid is the biggest family of the monocots among angiosperms, and its natural distribution is mostly in the tropics and subtropics, yet a small number are found growing in temperate and subarctic regions. Some orchid species are in danger of extinction, due to anthropogenic habitat destruc-



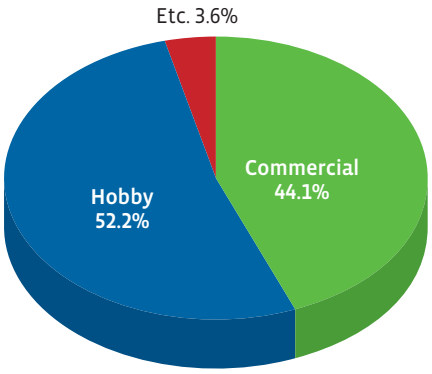
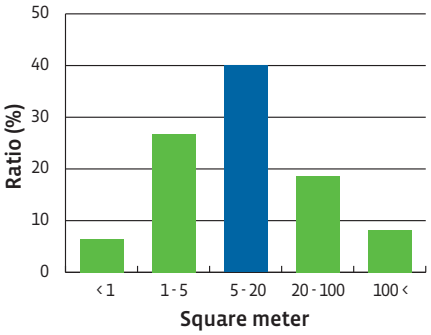


Figure 4. Proportion of *Cymbidium goeringii* grown in different regions (the number of farms) in Korea and the proportion grown for commercial production and hobby.



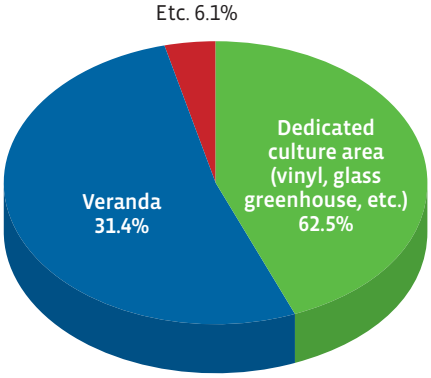
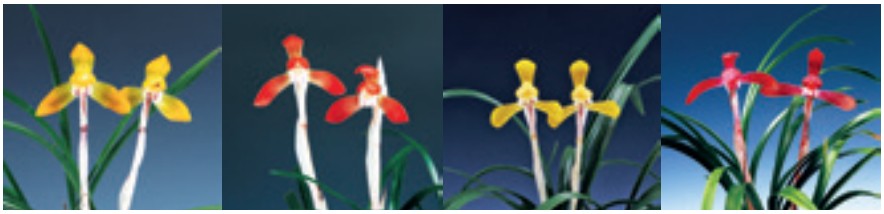
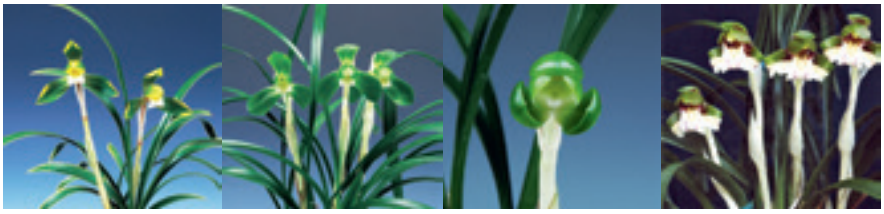


Figure 7. The size of farms for commercial production of *Cymbidium goeringii* and the proportion dedicated to greenhouse and to other facilities (Anon., 2015c).



Joogeumhwa '1457st Hongjugwan' | Honghwa '1491st Seohong' | Hwanghwa '1487st Myeonghwang' | Jahwa '1433st Jahongsung'



Bokrunhwa '1431st Hwang-gung' | Sosim '1510st Husimjung' | Duhwasosim '1512st Chunghaeso' | Gihwa '1340st Jokduri'

Figure 5. Different colors within *Cymbidium goeringii*.

Bokrunban '1465st Geumru' | Sapivan '1260st Chungoksan' | Sanvan '1429st Myeonggeum' | Danyeopjong '1430st Geon-a'

Figure 6. Leaf variation within *Cymbidium goeringii*.

Figure 8. Cultivation of *Cymbidium goeringii* in a greenhouse in Korea.

tion and over-harvesting for enjoyment and medicinal use. Thanks to heightened interest in biodiversity conservation, the *Orchidaceae* family gained formal legal protection when it was listed on CITES (Convention on International Trade in Endangered Species of Wild Flora and Fauna), an international agreement for the conservation of endangered species. In Korea, a total of 10 orchid species are listed as endangered by the Ministry of Environment. There are some native orchids commercially available in the market (Figure 10).

Tissue culture and the flowering physiology of *Cymbidium goeringii*, *Cymbidium kanran*, *Cymbidium nagifolium*, *Calanthe discolor*, and *Calanthe sieboldii* have been extensively

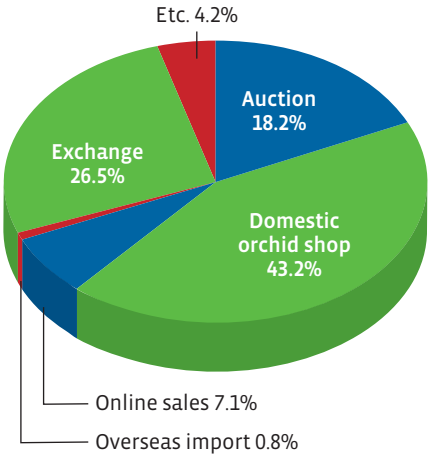


Figure 9. *Cymbidium goeringii* auction (left) and marketing channels (right) of *Cymbidium goeringii* in Korea (Anon., 2015b, c).

Figure 10. Native orchids in Korea (A: *Neofinetia falcata*, B: *Aerides japonicum*, C: *Habenaria radiata*, D: *Bletilla straiata*).

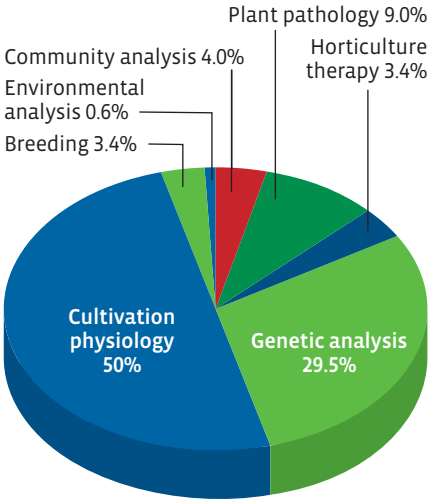


Figure 11. Proportion of effort in research areas on temperate oriental orchids in Korea.

Figure 12. Logo of IOS 2018 (III International Orchid Symposium).

researched (Lee, 2006; Paek and Yeung, 1991). The proportion of effort in each of the major research areas is shown in Figure 11.

We are pleased to invite anyone with an interest in orchid research to participate in the III International Orchid Symposium (IOS 2018) from March 7-9, 2018, in Seoul, Republic of Korea (Figure 12).

IOS 2018 will bring together researchers who are at the forefront of their field, and will provide opportunities for junior scientists and graduate students to interactively present their work and exchange ideas with established senior scientists. This program will include oral presentations, poster sessions and special discussions covering a wide range of session themes on orchid sciences.

This will be an opportunity to exchange information, engage in stimulating discussions and collaborate with your fellow members from around the world. We are sure that our expert speakers will provide you with the most relevant and up-to-date information.

IOS 2018 is organized by the Korean Society for Horticultural Science (KSHS) under the scientific sponsorship of the International Society for Horticultural Science (ISHS). The event is endorsed by ISHS Section Ornamental Plants and Working Group 'Orchids'.

The main theme of this symposium is 'From Conservation to Biotechnology in Orchids'. Topics, ranging from native to commercial orchid species, from conventional to advanced technology, classification and evolution, propagation, cultivation, and from postharvest research to marketing of orchids, will be presented and discussed. The symposium consists of sessions over three days. The first and third days include invited lectures by world renowned orchid scientists and voluntary oral/poster presentations, and the second day is designated for a technical tour. During the technical tour, delegates will visit a research station, flower market, and commercial orchid growers in the western part of Korea. Manuscripts submitted to this symposium will have the potential to be published in *Acta Horticulturae*. We hope all of you will participate in IOS 2018 and enjoy the beautiful orchids, flowers, scenery, and taste of dynamic KOREA.

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Processing tomato production in Turkey

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Introduction

Tomato is among the most important vegetable crops in both the northern and southern hemispheres. China, the leading tomato producing country with over 50 million tons per year, is followed by USA, India, Turkey, Egypt, Italy, Iran, Spain, and Brazil (Table 1). With respect to processing tomatoes, countries have a different ranking, with USA producing the most, followed by China, Italy, Spain, Turkey, Portugal, and Brazil (Table 2).

Turkey is one of the most important fresh and processing tomato producing countries (Tables 1 and 2). Annual production is nearly 12 million tons, of which more than 2 million tons are processing cultivars (Anonymous, 2016a, b). Processing tomato production in Turkey was started in the 1960s in the Aegean Region of Turkey with the open pollinated cultivars 'Rio Grande', 'Rio Fuego', 'VF-6203', 'Campel-37', 'Interpeel', and 'T_2 Improved'. Some of these, after more than 50 years, remain the preferred cultivars for resource-poor low-input agriculture (Düzyaman et al., 2006; Duman, 2016).

■ Table 1. Top tomato producing countries in 2014 (× 1000 t). Source: Anonymous (2015, 2016b).

Country	2006	2007	2008	2009	2010	2012	2013	2014
China	32,519	36,097	39,939	45,366	47,116	50,000	50,552	52,723
USA	12,257	14,185	12,735	14,181	12,859	13,207	12,575	14,516
India	9,821	10,055	10,303	11,149	12,433	17,500	18,227	18,736
Turkey	9,855	9,945	10,986	10,746	10,052	11,350	11,820	11,850
Egypt	0	0	0	0	0	8,626	8,534	8,288
Italy	6,351	6,530	5,977	6,878	6,025	5,132	4,932	5,625
Iran	5,065	5,534	4,827	5,888	5,256	6,000	6,174	5,973
Spain	3,801	4,082	4,050	4,604	4,313	4,000	3,684	4,889
Brazil	3,363	3,431	3,868	4,311	4,114	3,874	4,188	4,303
World	**130,012**	**137,056**	**140,942**	**153,977**	**151,700**	**161,794**	**164,493**	**162,000**

■ Table 2. Top processing tomato producing countries in 2016 (× 1000 t). Source: Anonymous (2016a).

Country	2011	2012	2013	2014	2015	2016
USA	11,800	11,500	11,000	12,700	13,018	11,430
China	6,000	4,700	4,300	6,300	5,600	5,150
Italy	4,950	4,500	4,100	4,900	5,300	5,180
Spain	1,985	1,935	1,650	2,700	3,050	2,950
Turkey	2,100	2,150	2,400	1,800	2,700	2,100
Portugal	1,065	1,190	1,100	1,200	1,660	1,500
Brazil	1,450	1,500	1,700	1,400	1,300	1,450
Iran	2,200	2,700	2,000	2,200	1,350	1,150
Tunisia	850	780	770	800	920	650
Ukraine	440	385	400	470	550	550
World	**37,700**	**33,400**	**33,050**	**39,160**	**41,254**	**38,008**

A brief history

In the early 1980s, when the seed industry opened to the importation of new cultivars, F_1 hybrids of many cultivated plant species, including tomato, were planted in Turkish growing areas. The activities of foreign seed companies in Turkey also started at that time, and accelerated the development of processing tomato production (Vural et al., 2000; Duman and Damar, 2016).

Now, after more than 50 years of production experience, both the Aegean Region and the Marmara Region have become important production areas of processing tomatoes (Figure 1). The next regions of production importance are Central Anatolia, the coastal region of the Black Sea, and more recently, Southeast Anatolia. Modern F_1 hybrids have much better yield performance, disease resistance, and higher brix values than the open pollinated cultivars (Duman and Düzyaman, 2014). These qualities have led to enhanced tomato paste production and to diversified products derived from tomato paste (Duman et al., 2005; Duman and Düzyaman, 2006).

Until 2009, most of the processing tomatoes were used for tomato paste, however, since 2009, alternative products have been developed, including frozen tomatoes and tomato powder (Keskin, 2010). Today, besides paste, products such as tomato sauce, diced tomatoes, peeled tomatoes, tomato puree, ketchup, and tomato juice are produced for domestic markets and are exported to various countries (Figure 2).

In recent years, processing tomato cultivars have also been preferred for production of tomatoes for fresh consumption, because of high dry matter content, color, flavor, and aroma of their fruit. About 83-85% of processing tomatoes are canned as tomato paste and as derivative products such as tomato sauces, tomato puree, ketchup, tomato juices and diced and peeled tomatoes. The remaining 10-12% are used in dried tomato production, with 4-5% used for fresh consumption (Figure 3).

A success story

When reflecting on research into processing tomato production carried out in Turkey between 1989 and 1996, one project among many others stands out; 'Developing the Processing Tomato Production in Turkey' (SANDOM), implemented by the Paste Producers and Exporters Association of Turkey and the Ege University, Faculty of Agriculture. Several

Figure 1. Processing tomato production field with hybrid cultivars in the Aegean Region (Torbalı, İzmir, Turkey).

Figure 2. Sun drying tomatoes in the Aegean region conditions (Torbalı, İzmir, Turkey).

studies were performed under the framework of this project especially on cultivar adaptation, pest and disease control, weed control, seed quality, plant nutrition, irrigation, and soil preparation in the most important growing areas of processing tomatoes of the Marmara and Aegean Regions. Findings were presented at meetings after each growing season, with the participation of paste and seed companies.

As a result of many individual studies, the major outcome of the SANDOM project was that the yield of the processing tomato increased from 50-60 to 80-90 t ha^{-1} within a period of 8 years. Activities of this project included the testing of imported tomato cultivars under various ecological conditions in the most important growing areas. Protocols for appropriate pest and disease control and weed management were developed. Pesticide residue problems in exported products were minimized by improving protocols for timing of application, and chemical quantity and type. Similarly, protocols for fertilization were developed according to soil analyses. Cultivars suitable for drying, peeling, and dicing were identified. Hence, problems encountered in seed and seedling production were resolved. The use of seed-borne pathogen-infected seeds decreased from 66 to 6%. Growing techniques were improved, and mechanical harvest facilities investigated (Vural et al., 1994).

Future perspectives

Successful projects like SANDOM need to be supported and sustained. Today, 20 years after the completion of this major research programme, the Turkish processing tomato industry still has issues. Breeding superior processing tomato cultivars with high yields, good technological properties and resistance to pests and diseases should be the major goals of domestic seed companies. Developing cultivars suitable for new growing areas should also be considered (Figures 4 and 5). Research on seed and seedling quality should be continued and intensified. Seed problems such as germination and vigor should be solved, and quality of produced seedlings improved.

Figure 3. Cultivars developed for processing tomatoes are also popular cultivars for fresh consumption in Turkey.

Figure 4. Full bloom stage in processing tomato production with F_1 hybrid cultivars in Marmara region (Mustafakemalpaşa, Bursa, Turkey).

Figure 5. Seedlings are being mechanically planted in large production areas in Turkey (Torbalı, İzmir, Turkey).

The demand for certified and organic products is increasing throughout the world. Developing processing tomato cultivars suitable for organic conditions is necessary. Good agricultural practices are currently applied in the production and processing of dried tomatoes, and should be supported with innovative growing techniques. Minimizing chemical use should also be another goal. Last but not least, the development of a Turkish trademark for innovative processing tomato products should be a major effort in the near future. This will increase consumer confidence in Turkish products, enhance market diversification, and increase exports of processed tomato products rather than the raw material (Düzyaman and Duman, 2003).

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Soilless cultivation in Turkey

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Figure 1. The largest company in Turkey utilising soilless cultivation, Agrobay Seracılık, has a greenhouse area that covers 54.2 ha. The greenhouses are heated by geothermal energy. Besides vegetable production, the company also produces seedlings and bumble bees at the same location (Photo courtesy of Mr. Mehmet Karatay, production manager of Agrobay Seracılık).

Introduction

Interest in applying soilless cultivation on a commercial scale has increased since the 1980s, and this technique has become a reality for greenhouse growers throughout the world. In Turkey it has been used on a commercial scale since 1995. The main advantages of this technique are: higher production, better control of growth and quality, prevention of the dispersal of soil-borne pathogens, and more efficient use of water and fertilizer (Van Os et al., 2002; Savvas, 2002; Pardossi et al., 2004; Savvas et al., 2013). However, soilless cultivation incurs greater initial investment costs and requires technical knowledge. Therefore, there are differences among countries in the rate of adoption of soilless cultivation. Countries with a larger average greenhouse size per enterprise are showing faster adoption rates. Soilless cultivation is progressing more slowly in low technology greenhouses based on favourable natural conditions in most of the Mediterranean countries (Savvas, 2002). This paper aims to describe the development of the soilless cultivation sector in Turkey.

Current status of soilless cultivation in Turkey

Growing area and greenhouse technology

Turkey is among the top 5-6 countries in the world for greenhouse production, and has the third largest protected cultivation area in the Mediterranean region (Tüzel and Öztekin, 2015). The total greenhouse area

Table 1. Area covered by greenhouses that utilise soilless cultivation in Turkey from 1995 to 2016.

Year	Production area (ha)
1995	10
2000	20
2004	75
2007	185
2010	400
2011	500
2012	700
2013	850
2014	1,000
2015	1,150
2016	1,200

Figure 2. Soilless cultivation is common in high technology greenhouses (A and B) and the number of growers with low technology greenhouses using soilless cultivation techniques (C) is limited.

Figure 3. California wonder pepper growing in soilless cultivation in a high technology greenhouse in Turkey.

Figure 4. Tomato is the main crop grown in soilless cultivation in Turkey (Photo courtesy of Mr. Mehmet Karatay, production manager of Agrobay Seracılık).

in Turkey exceeded 52,000 ha in 2016 (TUIK, 2016). As seen in most other Mediterranean basin countries, low technology greenhouses (LTG) predominate. LTG have simple structures with a 0.1-0.2 ha average surface area. They have poor climate control; heating is generally applied only to protect the plants from frost. High technology greenhouses (HTG) have an average 2-4 ha surface area and are taller (up to 4.5 m at the eaves and 6.5 m at the ridge). They have a central heating system; coal and geothermal energy are the most common energy sources for heating. Fogging systems are commonly used, and carbon dioxide enrichment is increasing (Gül, 2013). Soilless cultivation is common in HTG.

The first companies utilising soilless cultivation began in 1995 with a total area of only 10 ha. Soilless cultivation increased slowly during the first decade, and by 2000 the area had reached only 20 ha. However, much greater increases have been recorded since 2005. Nowadays, the area of soilless cultivation is around 1,200 ha (Table 1). Although good results have been obtained from production in soilless culture (Engindeniz and Gül, 2002; Gül et al., 2004, 2007a, b), the number of growers with LTG using this technique remains limited. Soilless culture techniques have expanded almost exclusively in HTG (Figures 1 and 2), with a 2007 survey showing that 99% of the total soilless cultivation area in Turkey was in HTG, while only 1% was in LTG (Gül Aydoğan et al., 2009).

The first companies utilising soilless culture were established in Antalya, the capital of the greenhouse sector in the country. However, subsequent uptake in the 2000s has predominantly been in regions that can utilize geothermal energy for heating. Most of these greenhouses are located in the Aegean region, i.e. the western part of Turkey. In addition to the Aegean region, greenhouses heated by geothermal energy are also located in the eastern and southeastern Anatolia regions of the country. There are some soilless greenhouses heated by industrial waste energy in different cities, but their area is limited (Gül, 2013).

Initial investment costs

The initial investment cost, excluding land price, is around 55 and 70 € m^{-2} for plastic and glass covered HTG, respectively (Bayar, 2012). In contrast, the initial investment

Figure 5. Strawberry production is increasing in soilless media in Turkey. Cocopeat is the most common substrate used.

Figure 6. Orchid production in soilless media in Turkey (Photo courtesy of Dr. Adnan Özçelik, the owner of Patara Çiçekçilik Tarım).

Figure 7. Growers in Turkey prefer to use substrate culture, and the common substrates are perlite (A), cocopeat (B) and rockwool (C).

cost, excluding land price, was only $US 7.8 m^{-2} (less than 7 € m^{-2} in July 2017) for LTG with a simple soilless cultivation and no automatic fertigation system (Gül et al., 2004). Initial investment costs depend on the characteristics of the greenhouse. Castilla and Hernandez (2007) reported that the initial investment cost was 17.3 € m^{-2} for an arched multispan (no roof vents) greenhouse (with windbreaks, drip irrigation system and soilless system) in Morocco; 96.0 € m^{-2} for standard and 118.2 € m^{-2} for a high level Venlo type glasshouse and equipment in the Netherlands.

Crops grown

Vegetable production is the dominant use of soilless cultivation in Turkey. Among the vegetables, tomato is the major crop and blocky type peppers are second (Figure 3). Although different types of tomatoes (truss, cherry, beef, etc.) are grown in soilless greenhouses, the majority are truss tomatoes (Figure 4). Tomato yields range from 300 to 600 t ha^{-1}, depending on location and timing of harvest. Higher yields are possible in greenhouses located in the continental climate areas like Afyon province, because production can continue during the summer. Geothermal energy makes protected cultivation possible in those areas where the temperature is low in winter.

Although cucumbers are grown on the second largest area of protected cultivation in Turkey (Tüzel and Öztekin, 2015), their production using soilless cultivation is very limited and is carried out mainly by growers who have small unheated greenhouses. In recent years, there has been increasing interest in growing strawberries in soilless media (Figure 5). Besides these crops, lettuce and other leafy vegetables, as well as cut flowers like anthurium, roses, and orchids (Figure 6), are grown in a limited area using soilless cultivation techniques.

Soilless cultivation techniques

Substrate culture is the main technique implemented in soilless cultivation in Turkey. The common substrates are perlite, rockwool and cocopeat (coir). Perlite is available locally, whereas rockwool and cocopeat are imported. It is possible to find ready-to-use bags filled with these substrates (Figure 7). The open soilless culture system has been dominant in the past, however, recently there has been an increasing trend to switch over to closed-loop systems in which the drained nutrient solution is recovered, replenished and recycled. Water culture is applied to

Figure 8. Lettuce production in Turkey using floating hydroponics.

Figure 9. Aquaponic research in Bergama Vocational School, Turkey, for raising fish and plants.

limited areas for producing leafy vegetables. Among water culture techniques, nutrient film technique (NFT) and floating hydroponics have been used (Figure 8). Aquaponics is also being investigated in scientific trials (Eltez and Taşkavak, 2016) (Figure 9).

Marketing

Vegetables produced using soilless cultivation techniques in Turkey are exported, and also consumed locally (Figure 10). Large-scale soilless cultivation companies (>3 ha) are generally GLOBALGAP certified and export most of their production. Crops from medium-sized companies (1-3 ha) are generally marketed through supermarkets within Turkey. Growers with small production sell their products through middlemen (Gül Aydoğan et al., 2009).

Figure 10. Packaging section of a soilless culture company in Turkey (Photo courtesy of Mr. Mehmet Karatay, production manager of Agrobay Seracılık).

Conclusion

In Turkey, soilless cultivation on a commercial basis dates back to 1995. In this relatively short period, it has developed steadily for the following reasons: (1) Producing certified high-quality products to meet consumer demand, especially for export, is easier using soilless systems than conventional systems; (2) Soil structure is poor in geothermal areas that are becoming promising places to develop protected cultivation in Turkey; (3) In rocky areas of Turkey, excavation is required before greenhouses can be constructed. If production is to be undertaken in soil, then this work is difficult and costly; (4) The government subsidizes the establishment of soilless cultivation.

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› Ayşe Gül

About the author

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New Books
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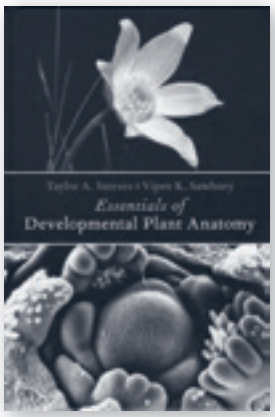
Book reviews

The books listed below are non-ISHS-publications. For ISHS publications covering these or other subjects, visit the ISHS website www.ishs.org or the *Acta Horticulturae* website www.actahort.org



Steeves, T.A., and Sawhney, V.K. (2017). Essentials of Developmental Plant Anatomy (Oxford, UK: Oxford University Press), pp.168. ISBN 9780190657055 (hardback). $69.95 / £45.99. global.oup.com

As a first year horticultural science student, one of the compulsory papers in our four-year degree program was botany and, within that paper, considerable attention was given to plant anatomy. Access to *Essentials of Developmental Plant Anatomy* may well have resulted in me getting a much higher grade than the one allocated!

This book "provides a developmental perspective to plant anatomy. The intent of the book is to provide fundamental information on plant structure and development to students at the introductory level, and as a resource material to researchers working in nearly all areas of plant biology i.e., plant physiology, anatomy and development, systematics, ecology, developmental genetics and molecular biology. The book is focussed on angiosperm species with some examples from different groups of plants."

There is no doubt that the text simplifies many aspects of plant anatomy, clearly explains highly specialised terms and presents a logical flow to the subject matter that is covered. It is indeed very suitable as an introductory text, not just for those areas stipulated above but also for students in the more applied professions such as agriculture, horticulture, viticulture, and forestry.

The book starts with "an introductory chapter and a brief introduction to plant cell structure, which is followed by the structure of the flower, plant reproduction (sexual and asexual) and the development and structure of the embryo – the precursor of the plant body. Each chapter then deals with essential information on the shoot system, diversity of plant cells and tissues, the structure and development of the stem, leaf, root, and the secondary body."

The text is very well written and the logical flow that is used through the different chapters enhances understanding of the various processes and structures being described. The authors are to be congratulated for their clarity of presentation and for their approach. There is extensive use of appropriate technical terms and names throughout, which is essential in covering such a topic, and an excellent glossary is included. While any of the sections could have been expanded, the authors have achieved a good balance across the different topics and have provided the basic knowledge needed to understand each section. One of its strengths is that the book is concise (only 168 pages) and it does not take too much effort to read through all of the content. Students using this book should readily be able to come to terms with this important area of plant science and develop an appropriate level of understanding of plant anatomy.

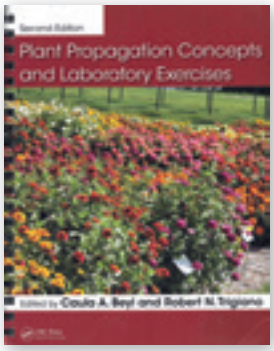
While the intention of the authors is to have the book used "as a resource material to researchers working in nearly all areas of plant biology", I suspect that most researchers will use more extensive texts (of which there are several) to develop their understanding.

The book has a very nice layout, it is printed in black and white and is well illustrated with a range of line drawings, photographs and electron micrographs. However, many of these images are reproduced from more detailed texts such as *Botany: An Introduction to Plant Biology* by T.E Weier, C.R. Stocking, and M.G. Barbour (1974) or *Plant Anatomy* by K. Esau (1967), which I found disappointing given that this text is attempting to present a refreshing new approach to the topic (and given that those reference texts were published over 40 years ago). For example, Figure 2.3 reproduces line drawings from Esau of ergastic substances found in the protoplast such as starch grains, crystals, druses and raphides. These images are low in impact and would be seen as "old fashioned" by many. Modern electron micrographs are available that show such substances in a very impressive way, which would have greater impact on highly impressionable, young, enquiring minds. The same comment might be made about the range of excellent modern images that are available, for example, to illustrate tissues in the xylem.

A further enhancement of this particular text would have been through the use of colour in many of the images, such as those showing the cross sections of stem (e.g., Figure 8.1) and root (e.g., Figure 10.11). Notwithstanding the desirability of keeping publishing costs down, the use of colour would have enhanced the learning experience (differential staining clearly distinguishes the various tissue types), and the text would then have been a major advance over those published 40-50 years ago. The use of colour would have provided details that are readily available from competing web-based sources.

Aside from these shortcomings, the authors have achieved their objectives and the book is indeed a very good introductory text to plant anatomy.

Reviewed by Ian J. Warrington,
Emeritus Professor, Massey University,
Palmerston North, New Zealand



Beyl, C., and Trigiano, R., eds. (2017). Plant Propagation Concepts and Laboratory Exercises, 2nd edn (Boca Raton, FL, USA: CRC Press Taylor & Francis Group), pp.498. ISBN 978-1-4665-0387-8 (paperback). $108.00. www.crcpress.com

For the last six years I have been searching for a laboratory exercise book to complement my class textbook in my course on plant propagation. The laboratory practicals in the course have been designed to help students develop a wide range of propagation techniques and understand the underlying principles. However, I was often asked by my students how to set up a small propagation research trial independently. This new revision of propagation exercises edited by Caula Beyl and Robert Trigiano fits my needs.

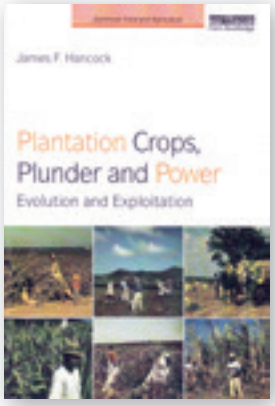
The 40 chapters, written by 47 contributing authors, evolved from the first edition published in 2008, but have been extensively restructured and revised. The chapters are divided into 13 Parts: Part I Introduction to Plant Propagation; Part II Botanical Basics; Part III Plant Propagation Structures, Media, and Container; Part IV Plant Propagation Diseases and the Importance

of Sanitation; Part V Evaluation of Propagated Plants; Part VI Propagation by Stem Cuttings; Part VII Part Propagation by Leaf and Root Cuttings; Part VIII Layering; Part IX Grafting and Budding; Part X Bulbs and Plants with Special Structures; Part XI Micropropagation; Part XII Seed Production and Propagation; and Part XIII In Conclusion: Special Topics.

With the first two parts of the book, the authors provide a brief background and history of plant propagation, information on the organization of the book, and essential information to help build foundation on plant science including botany, plant physiology, plant growth regulators, sexual reproduction, and plant breeding and genetics. Parts III to IV deliver information on propagation environmental management and deal with various pathogens commonly present during propagation. Part V, the core of this book, provides critical information required for propagation experiments: experimental design, evaluation methods, and data collection, analysis, and interpretation. Parts VI to XII take a straightforward approach, exploring each propagation type and principles. Part VI introduces recent propagation techniques using long cuttings of woody plants, and cuttings of various tropical plants. Part IX incorporates not only the traditional grafting and budding techniques for woody plants but also the art of grafting vegetables. Part XIII unscrambles the myths of plant propagation through experimentation, and addresses important issues in the horticultural industry, including intellectual property protection for plants. It also speculates about the future direction of plant propagation research and highlights how recent discoveries derived from molecular genetics research may affect plant propagation practices. In each chapter, the editors use the concept box to effectively deliver primary concepts and summaries. I found this organization effective, not only for instructors, but also for students.

There are unique features that distinguish this book from other plant propagation books. It includes a wide range of vital information related to plant propagation, on topics from the foundation of plant science, theory and concept through to laboratory exercises. This book provides not only in-depth details of its subject, but also lab exercises, which align well with the topic of each chapter. While encompassing all necessary topics relating to plant propagation, the lab exercises provide in-depth supplementary information and hands-on practices that represent the principles found in the chapters. In particular, it has a list of materials necessary to complete the experiments, step-by-step guidelines that are easy to follow for beginners, examples of data collection, anticipated results of the lab exercises, and a list of critical questions. This book contributes to plant propagation learning and education by providing essential information in a clear, concise, and attentive manner by cultivating a self-directed learning environment, by including plant materials from temperate to tropical regions, and by introducing past, current, and future techniques. Overall, this book is an excellent resource for college plant propagation courses, either as a supportive reading material for a higher level propagation course or as a single textbook for a lower level course. It will be invaluable for students to enhance their skills and develop confidence in themselves as independent learners.

Reviewed by Hye-Ji Kim, Purdue University, USA



Hancock, J.F. (2017). Plantation Crops: Plunder and Power: Evolution and Exploitation (Abingdon, Oxon, UK and New York, NY, USA: Routledge), pp.196. ISBN 978-1-138-28575-0 (hardback), 978-1-138-28576-7 (paperback), 978-1-315-26878-1 (e-book). $145.00/£95.00 (hardback), $49.95/£31.99 (paperback), $49.95/£31.99 (e-book). www.routledge.com

Plantation crops are high-value crops that involve a fusion of intensive agriculture practices and industrial processing. The system was attuned to tropical or subtropical crops that demanded an extensive amount of land and labor for cultivation and harvest, and required large amounts of capital for industrial processing, requirements that made them unsuitable for small individual farmers. The system was initiated by entrepreneurs from temperate colonial powers (e.g. Portugal, Spain, England) starting with sugar in the 16th century in newly-discovered Brazil but expanded quickly to the Caribbean islands and then Asia and Africa. Land was expropriated from indigenous populations in the New World, who were ruthlessly and tragically eliminated or reduced in size significantly by a combination of warfare, disease, or dispersion.

The high demand for labor in the New World for these crops was solved by the introduction of slaves purchased from Africa when the local indigenous populations proved unsuited. The slave system in plantation systems continued until the end of the 19th century: ending in 1838 in the British Caribbean, 1865 in the United States, and 1888 in Brazil. The plantation system at one time was the source of enormous profits to the colonial powers, especially England, and the system supported the growth of manufacturing and the maritime industry that profited from transporting, not only plantation products (e.g. sugar, molasses, and rum) from the colonies, but also manufactured goods from England to the colonies, and slaves from Africa. Powerful forces supporting the plantation system overlooked the inhumanity of the slave system, the immorality of fostering opium addition in China, the exploitation of indigenous populations including children, and the despoiling of the environment. Economic development came at a great price.

James Hancock's book covers seven crops: sugar, banana, cotton, tea, tobacco, coffee and rubber, briefly mentions oilpalm, and should have included cacao. The chapters are divided on the historical development of each crop including product development (very well done), and on the dark side of plantation agriculture that involved slavery and human exploitation. The book is an indictment of unfettered, unregulated capitalism, which, while responsible for economic development, has often led to social injustice and environmental damage, and fostered unhealthy products such as tobacco and opium. The system continued in the form of indentured workers, tenant farmers, and sweatshops. Attempts have been made to humanize the plantation system by encouraging small holders for crop production, cooperatives for crop processing, and unions and regulations to promote worker's rights. The struggle continues. In the United States the supreme court declared laws to declare child labor unconstitutional in 1918 and 1922; child labor laws were only passed in 1938 and agriculture was largely exempted. This book covers these issues splendidly and will be a valuable resource for crop historians, agricultural development, and environmental advocates.

Reviewed by Jules Janick, Purdue University, USA

› New titles

Martin, R.R., Ellis, M.A., Williamson, B., and Williams, R.N., eds. (2017). Compendium of Raspberry and Blackberry Diseases and Pests, 2nd edn (St. Paul, MN, USA: APS Press), pp.175. ISBN 978-0-89054-569-0 (soft cover). $ 189.00. www.apsnet.org

Pasternak, D. (2016). Agricultural Prosperity in Dry Africa (Tel Aviv, Israel: ContentoNow), pp.175. ISBN 978-965-550-490-3 (paperback). $ 42.78.

Symposia and Workshops

International Symposium on Wild Flowers and Native Ornamental Plants

Section Ornamental Plants #ishs_seop
Commission Protected Cultivation #ishs_cmpc

› Participants of the symposium. Photo: Sina Motamed Rad.

From 1-4 May, 2017, research scientists, industry representatives and professionals involved in the field of indigenous flowers and ornamental plants met in Ramsar City, Iran, for the International Symposium on Wild Flowers and Native Ornamental Plants. This symposium was organized by the Iranian Society for Ornamental Plants (ISOP) and the Ornamental Plants Research Center (OPRC) under the auspices of the International Society for Horticultural Science (ISHS).

The first plenary lecture was presented by Dr. Pejman Azadi, Symposium Convener, who gave a broad overview of the general trends in the production of wild flowers and ornamental plants and outlined the important role that identifying, introducing and breeding wild plants plays in the improvement of the floriculture industry. He was followed by Dr. Stefania De Pascale, Italy, ISHS representative, who detailed recent advances in the flower industry. Dr. Rodrigo Gonzalez from Mexico delivered a comprehensive talk on the mechanisms and tools available in wild flower breeding. This was followed by presentations by M.Sc. Mohammad Reza Shafiee, President of OPRC, and Dr. Hasani, Head of the Horticultural Science Research Institute.

The symposium was attended by 60 researchers and students from Iran and 20 prominent scientists and researchers from other countries (Italy, Belgium, Japan, Mexico, Chile, China, Thailand, Indonesia, Russia, Botswana, Lebanon and Iraq), all of whom are working on native flowers and ornamental plants. The symposium included both oral and poster presentations, which gave delegates an opportunity to learn about the latest details of research, development and commercialization of native flowers and ornamental plants. One of the main goals of the symposium was to enable delegates to interact with pioneer scholars and experts, and to promote scientific exchange and collaboration based on the most recent knowledge. The oral presentations were divided into six sessions of lectures on various topics over two days.

Keynote speeches

Dr. Valiolah Mozafarian from Iran delivered a speech introducing Iranian native ornamental plants and discussing their potential for commercial production. Dr. Rodrigo Gonzalez spoke on endangered native ornamental flowers and plants. He continued his lecture by describing the use of molecular genetics, chromosomal studies and new scientific processes to produce new hybrids of ornamental plants.

Another keynote speaker, Dr. Johan Van Huylenbroek, a faculty member of the Scientific Research Institute of Agriculture and Fisheries in Belgium (ILVO), has been working

in the field of ornamental plant breeding through traditional and modern methods and has published many valuable papers on ornamental plant biotechnology in leading journals. His experiences at ILVO interacting with private sector flower and plant producers was very valuable. He explained that the research institute ILVO has been able to introduce new cultivars of ornamental plants and receive royalties to cover research costs. In addition to his valuable scientific experiences, he is highly experienced in the commercialization of scientific research.

Dr. Stefania De Pascale presented her extensive research on breeding programs and commercialization of ornamental plant cultivars. Professor Mii, one of the outstanding researchers on ornamental plant breeding from Chiba University in Japan, spoke about commercialization of many new cultivars in cooperation with the private sector. His speech also covered their latest achievements in ornamental plant breeding.

Dr. Tanaka from Suntory Ltd, Japan, delivered his lecture on molecular breeding of ornamental plants. His company was the first and only manufacturer of new cultivars of blue roses on a global scale.

During the lectures, results of valuable research by national and international scientists were presented. Posters were also presented during four sessions over the two-day symposium. Oral and poster presentations by students were judged by ten referees in each session and, at the closing session, the top-ranking presentations were introduced and honored. ISHS student awards were presented to Mr. Pablo Morales Taipa from the Pontificia Universidad Católica de Chile for the best student oral presentation entitled "*Argylia radiata* micropropagation, a biotechnological tool to domesticate a new ornamental crop", and to Ms. Behnaz Akbarian from the University of Tabriz, Iran, for the best student poster entitled "Effect of light quality on seedling quality characteristics of *Petunia hybrida*".

After the lecture sessions, there was a meeting of national and international scholars to discuss commercialization and applicable breeding methods of native ornamental plants in the production of commercial cultivars. Various aspects of this issue were discussed, including the challenges, problems and solutions.

› ISHS representative Prof. Stefania De Pascale (left) presenting the ISHS medal award to Symposium Convener Dr. Pejman Azadi (right). Photo: Ernest To.

› Prof. Stefania De Pascale, ISHS representative (left), and Dr. Pejman Azadi, Convener (right), presenting ISHS student awards to Mr. Pablo Morales Taipa (second from right) for the best student oral presentation and to Ms. Behnaz Akbarian (second from left) for the best student poster. Photo: Ernest To.

Technical tour

On May 4, a technical tour was held in the highland city of Ramsar to view native ornamental plants in their original location. During this tour, participants had the privilege of experiencing breakfast in a local resident's home, which provided them with a taste of traditional Iranian culture.

Pejman Azadi

› Technical tour: Janat Rodbar, Ramsar. Taking photos of wild ornamental plants. Photo: Sina Motamed Rad.

Closing ceremony

In the evening of May 3, the closing of the International Symposium on Wild Flowers and Native Ornamental Plants was officially announced in the presence of participants, guests, the Governor, Mayor and Imam of Ramsar city. Traditional local music was part of the program in the closing ceremony.

› Contact

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› XI International Symposium on Plum and Prune Genetics, Breeding and Pomology

Section Pome and Stone Fruits **#ishs_sefr**
Commission Molecular Biology and In Vitro Culture **#ishs_cmmv**

› Symposium participants at the Technical University of Munich.

From 17-21 July 2016 the XI International Symposium on Plum and Prune Genetics, Breeding and Pomology was held in Freising-Weihenstephan and Hallbergmoos, Germany. More than 80 researchers, fruit advisers and growers from 24 nations attended the symposium, which is held at four-year intervals. Current knowledge on plums and prunes was imparted and discussed in 24 oral and 33 poster presentations.

Prunus domestica (European plum) and *Prunus salicina* (Japanese plum) are the two main species used for plum production worldwide. Germany is one of the most important European plum producing countries.

During the opening ceremony on Sunday evening, representatives of the Technical University of Munich and of the Bavarian Centre of Pomology and Fruit Breeding welcomed the scientists and highlighted the importance of research in fruit science for economic reasons and for social welfare. Michael Neumüller gave an introduction to fruit (especially plum) production in Germany, the role of plum production for German growers, and state-of-the-art training and production systems and breeding activities in Germany. During an hors d'oeuvres reception and a dinner, the participants had the opportunity to meet each other.

› Selection field with plum seedlings at the Bavarian Centre of Pomology and Fruit Breeding.

During the following four days scientists discussed a broad range of issues related to plum research that fell under the following six topics: breeding and breeding techniques, canopy management, *Plum pox virus*, physiology, variety evaluation and rootstocks. Following a long tradition, plum breeders presented the first results of pomological traits of upcoming potential cultivars and rootstocks. To speed up the release of new cultivars, the development of QTL based selection tools for Japanese plum was shown. A point of discussion was the future role of protected cultivation systems (foliage tunnel or insect proof nets) for protection against rain, fungal infections and insect pests such as *Drosophila suzukii*. The non-destructive measurement of fruit quality and the chemical

composition of plum fruit skin and fruit flesh were additional major foci of discussion.
During the whole-day technical excursion, participants were given a view of fruit production in southwestern Germany. In the Lake Constance region, a farm where 20 ha of European plum are cultivated under plastic coverage was visited. The farmer indicated his desire for the development of new productive cultivars with excellent taste. In the Badonia Region, Erich Kiefer, a nurseryman and fruit farmer, showed the production of plum trees. He takes care of an experimental field where promising selections from the German plum breeding programs are evaluated. Participants were introduced to the fruit quality and yield potential of upcoming cultivars from the Hohenheim and Bavarian plum breeding programs. As Sharka disease is widespread in important growing regions in Germany and restricts plum production, the plum breeding programs in Hohenheim and Weihenstephan focus on Sharka resistance, fruit quality and extended ripening time.
During a half-day excursion, facilities at the Technical University of Munich as well as those at the Bavarian Centre of Pomology and Fruit Breeding were visited. In the late afternoon, participants visited the Botanical Garden in Munich, the capital city of Bavaria, and enjoyed a guided tour learning about the physiology and anatomy of plants. The symposium dinner was held within the rose garden of the Botanical Garden.
The ISHS student awards were given to Sofia Vio Michaelis from the Technical University of Munich, Germany, for the best oral presentation entitled "The conundrum of yellow skinned plum fruits", and to Macarena Farcuh from the University of California, Davis, USA, for the best poster entitled "Sugar homeostasis in Japanese plum fruits with contrasting ripening behaviour".

Michael Neumüller and Johannes Hadersdorfer

› A) Prof. Ted DeJong (left), Chair of ISHS Section Pome and Stone Fruits, and Dr. Michael Neumüller (second from right) and Dr. Johannes Hadersdorfer (right), Symposium Conveners, presenting the ISHS student award for the best oral presentation to Sofia Vio Michaelis. B) Prof. Ted DeJong presenting the ISHS student award for the best poster to Macarena Farcuh.

› Contact

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› VIII International Symposium on Mineral Nutrition of Fruit Crops

Section Pome and Stone Fruits #ishs_sefr
Section Nuts and Mediterranean Climate Fruits #ishs_senu
Section Tropical and Subtropical Fruits #ishs_sets

On June 27-30, 2017, around 130 participants from 36 countries attended the VIII International Symposium of the ISHS Working Group Mineral Nutrition of Fruit Crops in Bolzano (South Tyrol, Italy). The symposium was organised by the Free University of Bolzano-Bozen with the support of the Italian Society of Horticultural Science (SOI) under the auspices of ISHS. In total, there were 7 invited lectures, 23 oral and 63 poster presentations. Posters were briefly presented and summarized by two chairpersons in the main hall before their presentation during the two poster sessions. The book of abstracts can be downloaded at http://mnutrition2017.events.unibz.it/program/.

› Participants of the symposium.

The opening ceremony included welcome addresses by the Rector of the Free University of Bolzano, Prof. P. Lugli, by the Vice-President of ISHS, Prof. S. Nicola, and by the organizers. The program started with an opening lecture by D. Neilsen (Canada) who addressed the challenges in mineral nutrition of plants as a result of climate change and the issue of how to build resilience in woody perennial crops. Other keynote addresses covered a wide range of topics. The problem of nutrient availability in the rhizosphere and nutrient acquisition by roots was covered by T. Mimmo (Italy), who stressed the role of root exudates and plant-microorganism interactions in enhancing phosphorus and micronutrient availability. L. Kalcsits (USA) discussed calcium uptake and distribution in apple and identified alternative ways to study bitter pit and other Ca-related disorders in fruits. I. Ortas (Turkey) addressed taking advantage of the symbiosis between mycorrhizae and roots to develop more sustainable fruit tree management systems. E. Fallahi (USA) and A. Dag (Israel) presented two keynote lectures that tackled the topic of optimizing nutrient supply by fertigation to enhance yields and fruit quality in apple and olive, respectively.

The first session of the symposium dealt with the **physiological aspects of plant nutrition**. Several orals and posters concentrated on root and foliar nutrient uptake and nutrient allocation mechanisms as affected by management strategies, as well as the effects of nutrient deficiencies (e.g. N, Mg, B, Fe) on growth and photosynthesis. Some contributions presented a genetic approach to mineral nutrition, e.g. breeding rootstocks for modulation of mineral nutrient composition in scions – a promising way to enhance nutrient uptake efficiency in the future, the role of potassium in the expression of key genes involved in sugar metabolism in leaves and fruits, and the role of genes involved in magnesium uptake.

The **mineral nutrition and environmental stress** session encompassed tree responses to toxicity levels of some elements (e.g. Al, Cu and Zn) in the soil, the effects of extreme soil pH, the role of B and Ca foliar sprays to reduce sunburn and the effects of enhanced N deposition on above and below ground tree growth.

› ISHS Vice-President Prof. Silvana Nicola (center) presenting the ISHS medal award to Symposium Conveners Prof. Massimo Tagliavini (left) and Prof. Stefano Cesco (right).

A number of contributions concentrated on how to best approach the diagnosis of the mineral status of trees through leaf and soil analyses. The effects of **nutrient status on fruit quality** and postharvest storage potential of several fruit crops received significant attention. In this respect, some contributions presented results from studies on the effects of K supply in citrus and in pear, while in olive, the adverse effects of N and the positive effect of P supply on oil quality were presented. New ways to improve overall fruit quality by fortification of fruit with additional Si supply were discussed.

Over two sessions, studies on recent advancements in the **sustainable management of mineral nutrition** under conventional and organic farming were presented. Topics included the effectiveness of rootstocks in taking up nutrients, the benefit of cover crops to reduce nitrate leaching, the effects of nutrient recycling through plant residues (e.g. abscised leaves and pruning material), and the beneficial role of legume trees in intercropping systems in tropical countries. The pivotal role of soil organic matter was central in several presentations and some presenters reported the effects of biochar and other amendments on soil properties and plant nutrition. The importance of fine-tuning nutrient supply to tree needs, correct timing of nutrient supply as a function of tree phenology and type of fertiliser were stressed. The nutrient use efficiency of fertilisers when applied to the soil or to the canopy received some attention as well. The importance of correct irrigation management to avoid leaching and mineral nutrient depletion in the root zone, and the possibility of reducing fertiliser-dependent GHG emissions were widely discussed.

The one-day **field trip**, organized under the supervision of D. Zanotelli and W. Drahorad, with the contribution of the Laimburg Research Center (W. Guerra and M.

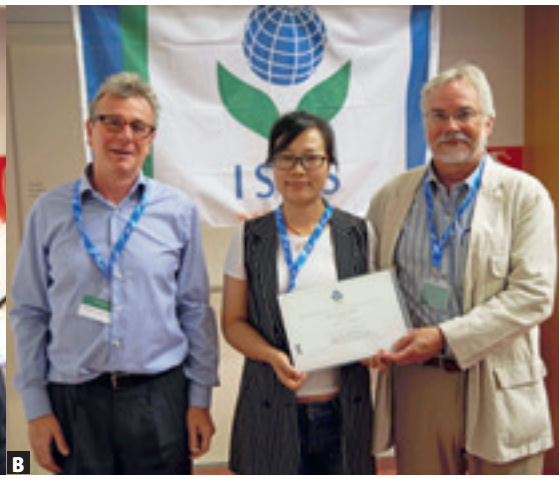
Thalheimer) and the South Tirolean Advisory Service for Fruit and Wine Growing (M. Ladurner), aimed at briefly presenting the apple and grape/wine industry of South Tyrol. It included visits to the packinghouse "Frubona", fruit processing plants of "VOG Products", a company that produces natural ingredients for the food and beverage industry, the experimental fields of the Laimburg Research Center for Agriculture and Forestry and private apple orchards and vineyards, where soil management, irrigation scheduling and mineral nutrient supply were presented and discussed. The field trip ended with a visit to the beautiful botanical gardens of Trauttmansdorff Castle in Meran.

› During the field trip, Dr. Martin Thalheimer explained to the participants the use of simple homemade sensors to guide the water and nutrient supply at the experimental fields of the Laimburg Research Station.

During the **business meeting**, attendees decided on the venue of the next (IX) edition of the symposium. It will be held in approximately three years time in Israel, and will be organized by Dr. Arnon Dag of the Gilat Research Center. Dr. Elmi Lotze (Stellenbosch, South Africa) was elected as the new Chair of ISHS Working Group Mineral Nutrition of Fruit Crops. She received from the former Working Group Chair, Prof. M. Tagliavini, the ceramic bell that since the foundation of the Working Group has been passed as a baton from one Chair to the next. Dr. F. Scandellari, Dr. Y. Pii and Prof. T. Mimmo will be the Editors of the Symposium Proceedings that will be published in a dedicated volume of *Acta Horticulturae*.

The award for the best oral presentation by a student was given to James Suetra Kaba (Ghana, PhD at University of Bolzano-Bozen, Italy) for his contribution "Cocoa (*Theobroma cacao* L.) trees benefit from N derived from the atmosphere when intercropped with the legume tree *Gliricidia sepium* (Jacq., Kunth ex Walp.)". Lili Yang (Northwest Agriculture and Forestry University, China) received the award for the best student poster entitled "Effect of chloride–containing fertilizer application on kiwifruit yield, quality, and soil chloride concentration".

The closing **memorial lecture**, presented by G. Neilsen (Canada), together with co-authors D. Wrona (Poland) and D. Atkinson (UK), honored the career and the long term engagement in the mineral nutrition of fruit crops of the Working Group founder, Prof. Andrzej Sadowski. After summarizing the main research topics of Prof. Sadowski, the authors analyzed the research trend of the Working Group over time and listed a number of priorities in mineral nutrition studies for the future. The control of the mineral status of horticultural crops remains both a challenge and a prerequisite for successful horticultural production in both developing and developed countries. Sustainable intensification in the food production chain calls for a more efficient use of mineral nutrient resources,



› A) Prof. Massimo Tagliavini (right) presenting the ISHS student award for the best oral presentation to James Suetra Kaba (left). B) Prof. Massimo Tagliavini (left) and Prof. Francis J. Peryea (right) presenting the ISHS student award for the best poster to Lili Yang (center).

a task that needs multidisciplinary competences (horticulture, plant physiology and biochemistry, genetics, soil chemistry and microbiology, agricultural engineering, ecology, etc.) and efficient coordination among scientists, extension services, fertilizer companies, grower associations and public administrators. In this respect, we were pleased that our audience included a significant number of representatives (around 40) from fertilizer companies, extension services and field consultants from all over the world. Facing these challenges is even more relevant as we consider that meeting the food demand for an increasing world population must occur by sustainable exploitation of the natural fertility of soils, preserving them for future generations through novel resilient solutions.

The organizers are grateful to the official media partner "New Ag International" and to a number of sponsors that supported the organization of the symposium: "Marlene©" apples South Tyrol, VOG Products, the Italian Association of apple producers "Assomela", the Consortium of South Tyrolean tree nurseries "KSB", the fertilizer companies "Grena, Italy" and "Adob, Poland", and the "Gardens of Trauttmansdorff Castle".

Massimo Tagliavini and Stefano Cesco

› Contact

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I International Symposium on Flowering, Fruit Set and Alternate Bearing

Section Tropical and Subtropical Fruits #ishs_sets
Section Nuts and Mediterranean Climate Fruits #ishs_senu
Commission Molecular Biology and In Vitro Culture #ishs_cmmv

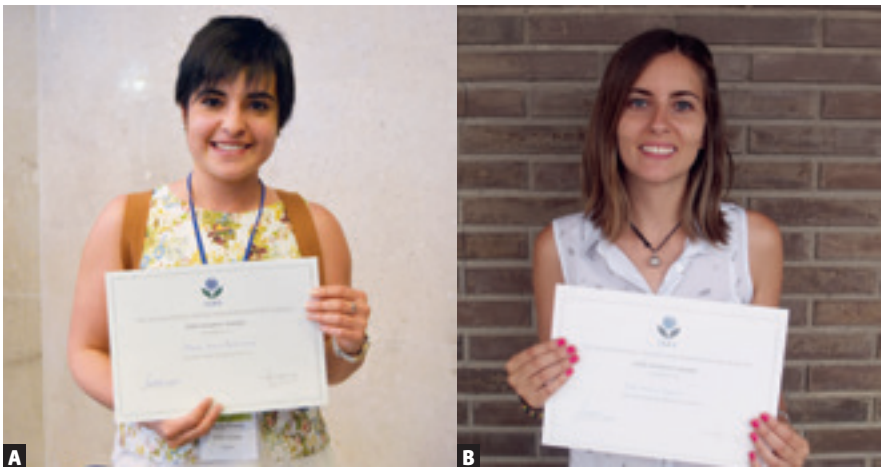
The First International Symposium on Flowering, Fruit Set and Alternate Bearing (FSAB), was held in Palermo, Italy, from June 19-23, 2017, and took place at the headquarters of the University of Palermo, Palazzo Chiaramonte Steri, and at the Department of Agricultural, Food and Forest Sciences. The meeting was organized by three conveners, Prof. Francesco P. Marra, Prof. Tiziano Caruso and Prof. Sisir K. Mitra, under the auspices of the Department of Agricultural, Food and Forest Sciences (University of Palermo), the International Society for Horticultural Science (ISHS) and with the support of the Italian Society for Horticultural Science (SOI), and the Italian Ministry of Agricultural, Food and Forestry Policies. The symposium was sponsored by the Municipality of Palermo, the Sicilian Region, the Agriculture Development Agency of the Sicilian Region (ESA), the "La Palmara" nursery, the "Cupitur" tropical fruit farm, the "Donnafugata" winery, the "Rapitalà" winery, the "Villa Scaminaci" grape and wine cooperative, and the "Regno degli Ulivi" olive mill.

› Opening ceremony of the FSAB symposium. From left to right: Prof. Luciano Gristina (Vice-Director of the Department of Agricultural, Food and Forest Sciences), Prof. Tiziano Caruso (Convener), Prof. Fabrizio Micari (Rector of the University of Palermo), Prof. Francesco P. Marra (Convener) and Prof. Sisir K. Mitra (Convener).

› FSAB participants at the Botanical Garden of Palermo.

The symposium attracted 110 participants from 19 different countries (Australia, Belgium, Brazil, China, Croatia, France, Germany, India, Israel, Italy, Japan, New Zealand, Norway, Serbia, South Africa, South Korea, Spain, The Netherlands, and the United States of America), who contributed one plenary lecture, four keynote lectures, and 44 oral and 40 poster presentations. A total number of 89 abstracts were reviewed by the scientific committee. The most important topics of the symposium were grouped into four sessions: (1) genetics and genomics, (2) environmental factors, endogenous interactions and phenoclimatic models, (3) biology and environmental physiology, and (4) horticultural management for the control of flowering, fruit set and alternate bearing. The program started with a welcome cocktail on Sunday June 18. Oral presentations were allocated over three different days: June 19 (Session I), June 20 (Sessions II and III) and June 22 (Sessions III

› A) Citrus fruit exhibition at the La Palmara nursery during the technical tour. B) Litchi orchard at the Cupitur tropical fruit farm.



› Winners of the ISHS student awards: A) Maria Teresa Prats-Llinas, for the best oral presentation; B) Sara Herrera Lagranja, for the best poster.

and IV). Two poster sessions were scheduled on June 19 and 20. A technical tour (June 21) took the participants to north-eastern Sicily, where they had the opportunity to visit the citrus nursery "La Palmara" and the tropical fruit farm "Cupitur". Moreover, a post-symposium tour to south-western Sicily was carried out on June 23. The tour included a visit to an experimental peach and olive research unit, a high-density olive experimental farm, and a guided tour of the Valley of the Temples in Agrigento.

The FSAB symposium aimed to promote the latest advances in all disciplines related to flowering, fruit set and alternate bearing in temperate, tropical and subtropical tree crop species. In the context of global climate change, plants are facing mutating abiotic and biotic constraints that can significantly alter plant phenology, biology and productivity, as well as unbalance alternate bearing phenomena. Alternate bearing, poor flowering and low fruit set are significant economic problems for a number of fruit and nut industries worldwide, and are often triggered by external factors such as unfavourable weather or poor crop management. A renewed modelling effort is needed to provide an integrated understanding of horticultural system functioning.

In contrast to other symposia in similar fields, the FSAB symposium brought together different disciplines that are interconnected by a common theme. This was a key reason for the success of the symposium. Indeed, colleagues who typically work on different disciplines and different crops related to flowering and alternate bearing of temperate and tropical fruit crops had the chance to share their own research progress. Therefore, international experts were able to transfer their knowledge to the audience and identify future research that will contribute towards innovative and sustainable practices.

During the business meeting, the possibility of a second FSAB symposium was discussed with the participants. European, Chinese and Australian groups indicated their willingness to host the next FSAB symposium in three or four years' time. Ms. Maria Teresa Prats-Llinas from IRTA, Spain, was presented with the best student oral presentation award for her original work entitled "Modelling bud break phenology in Chardonnay grapevine using the chill overlap model framework". In addition, the best student poster presentation was awarded to Ms. Sara Herrera Lagranja, from CITA, Universidad de Zaragoza, Spain, for her interesting poster entitled "S-RNase allele identification and incompatibility group assignment in apricot cultivars".

All participants contributed to the success of the event and emphasized the importance of exchanging information on the topics discussed and establishing new collaborations at an international level to implement strategies to cope with alternate bearing effects on horticulture.

Alessio Scalisi

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› VII International Symposium on Brassicas

Section Vegetables, Roots, Tubers, Edible Bulbs, Brassica, Asparagus **#ishs_sevr**
Commission Fruits and Vegetables and Health **#ishs_cmfv**

› Participants of the symposium.

The VII International Symposium on Brassicas was held in Pontevedra (Galicia, Spain), from 22-25 May, 2017. The symposium was organized by the Group of Genetics, Breeding and Biochemistry of Brassicas (MBG-CSIC) on behalf of the International Society for Horticultural Science (ISHS). During these four days, scientists from all over the world exchanged ideas and knowledge on the economically important *Brassica* species in an amiable environment.

'Brassicas' is the common name employed for crops of the genus *Brassica*, including the economically relevant broccoli, cauliflower, cabbage, kale, rapeseed, and mustards. The symposium covered studies on crops used as vegetables, edible oils, forage and as raw material for obtaining bioactive compounds.

The symposium was aimed at scientists working on a wide range of topics within the 'Brassica world', including diversity studies, resistance to stresses, and food technology. Over the last few years, advances in plant biochemistry, genetics, and molecular biology have greatly improved our understanding

› The Group of Genetics, Breeding and Biochemistry of Brassicas: organizers of the VII International Symposium on Brassicas. From left to right: Victor Rodríguez (Convener), Marta Francisco, Francisco Cores, Elena Cartea (Convener), Pablo Velasco (Convener), Pari Madloo, María Ramos, Juan Carlos Fernández, Rosaura Abilleira, María Tortosa and Pilar Soengas (Convener).

› Keynote speakers. From left to right: Anna Artemeva, Ferdinando Branca, Chris Pires, Guusje Bonnema, Nicole Van Dam, Christian Möllers and Antonio de Haro.

› Prof. Ferdinanco Branca, Chair ISHS Section Vegetables, Roots, Tubers, Edible Bulbs, Brassica, Asparagus, presenting ISHS student awards to A) Pari Madloo for the best oral presentation and B) Galini Papadopoulou for the best poster.

of plant physiology. In this regard, various 'omics' technologies have enabled qualitative and quantitative monitoring of the abundance of various biological molecules in a high-throughput manner, and thus allowed the determination of variation between different biological states on a global scale. For this reason, 'omics' was a section of special relevance.

We succeeded in attracting over 100 participants from 24 countries in Europe, Asia, America and Africa. To highlight the importance of genetic resources in the genomic era, the opening lecture was presented by Dr. Anna Artemeva from the N.I. Vavilov Institute of Plant Genetic Resources, Russia, and she spoke about the Vavilov Institute and the brassica collection kept there. To stimulate exchange between the disciplines already cited, the symposium was organized into seven plenary sessions. Keynote speakers were invited to introduce the sessions on their respective disciplines. To facilitate the communication among scientists in a friendly environment, posters were introduced during a poster "flash session". To introduce scientists to the local views, tastes and flavors, guided tours around Pontevedra and the small town of Combarro were conducted. Pontevedra lies on the route of Camino de Santiago and in recent years it has become one of the most accessible cities in the world. It has also been awarded international prizes for its urban quality.

Apart from the work carried out by the organizing committee, the symposium benefited from the advice of the scientific committee. We are also grateful to several sponsors who provided financial support, including local institutions (Concello y Diputación de Pontevedra) and companies (Iribov SBW, Rijk Zwaan, Sakata, Bruker, A Rosaleira, Biovegen).

ISHS student awards were given to Pari Madloo from Misión Biológica de Galicia, Pontevedra, Spain, for the best oral presentation entitled "Changes in glucosinolates content in *Brassica oleracea* modulate disease severity caused by *Xanthomonas campestris* pv. *campestris*" and to Galini Papadopoulou from the German Centre for Integrative Biodiversity Research (iDiv), Friedrich Schiller University Jena (FSU), Germany, for the best poster entitled "Aboveground-belowground plant-insect interactions: from genes to compounds".

Pilar Soengas Fernández

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› XIII International People Plant Symposium: Plants, Cultures and Healthy Communities

Commission Landscape and Urban Horticulture **#ishs_cmuh**
Commission Fruits and Vegetables and Health **#ishs_cmfv**

The XIII International People Plant Symposium was held in Montevideo, Uruguay on November 10-12, 2016. The symposium was co-organized by the Faculty of Agronomy, Universidad de la República (UdelaR), Uruguay and the Memorial University of Newfoundland and Labrador (MUN) Botanical Garden, Canada, on the initiative of the People Plant Council (PPC) and under the auspices of the International Society for Horticultural Science (ISHS). The mission of the PPC is to document and communicate the positive effects, both psychological and physical, that plants and being in nature have on the well-being of people. This symposium is one of the activities carried out by the PPC to further its mission. The symposia are held every two years in various locations, and this was the first time it was held in Latin America.

The opening was attended by the Dean of the Faculty of Agronomy, UdelaR, Ing. Agr. PhD Jorge Urioste, who delivered greetings on behalf of the faculty and the university. Dr. Candice Shoemaker welcomed all participants on behalf of the PPC and the ISHS. Drs. Norman Goodyear and Marta Chiappe were the conveners of the symposium. Attendees represented professionals from Germany, Brazil, Canada, USA, South Korea, the Czech Republic and Uruguay. Of the participants, those who work in the field of horticultural therapy conduct their activities from universities and workplaces in different educational centres, local communities, nursing homes, hospitals, and psychiatric centres. Their clients range from those who, for whatever reason, have lost or have limited freedom, to those working to maintain or recover health in the most integral ways, through working with plants.

The keynote speaker was Dr. P. Diane Relf, Professor Emerita Professor of Horticulture, Virginia Tech. The title of her talk was

› Dr. Candice Shoemaker, ISHS representative, welcoming the participants.

› Participants of the symposium.

› Participants at Germán Britos' organic farm in Puntas de Manga, Montevideo.

"Moving into the future: horticultural therapy and evidence-based practice", in keeping with her tireless work and promotion of an evidence-based practice. Dr. Relf is one of the earliest academics to promote research in Horticultural Therapy, and continues to be a strong proponent of evidence-based approaches to Horticultural Therapy.

The plenary presenters were Drs. Relf and Shoemaker. Dr. Relf presented an introduction to design for gardens for application in healthcare settings. Dr. Shoemaker presented on the fit of horticultural therapy in integrative medicine. Both talks highlighted the important role that horticulture and nature are playing generally, ranging from therapeutic intervention to maintaining general wellness.

The majority of the presenters shared their research on the application of horticultural-based therapies in the broader concept of the subject involving recreation, gardening, and vegetable, fruit, flower, and plant production. There were also presentations on ethnobotanical research with emphasis on traditional cultures and the historical use of plants in the preparation of foods and herbal teas. They showed that there are compounds in traditional plants that are of high nutritional and photochemical quality, demonstrating their value in both food and medicine. Within the context of traditional cultures there is a revaluing of fruits and vegetables for their positive effect on local biodiversity. The final grouping of presentations was on the development and conservation of species, indicators, and production systems at ecologically vulnerable sites.

Among other things, the research presented revealed psychological and physical changes in people, that reduced the risk of cardiovascular disease and obesity linked to poor eating habits and sedentary lifestyle, and improved the quality of life of individuals in relation to cognitive aspects, interpersonal relationships and social behaviours that determine positive changes in the individual and their interaction within the community.

The event also included a co-organized tour with CEUTA (Uruguayan Centre for Appropriate Technologies), which included a tour of the protected area of the Santa Lucía Wetlands and a visit to the agro-ecological site of Mr. Germán Britos in Puntas de Manga, Rural Montevideo.

The symposium included a poster session where participants were able to network and have deeper discussions on their research and professional practice. Workshops also provided the opportunity to engage with novel approaches to working with various client groups.

The work of the symposium will be published next year in *Acta Horticulturae*.

S. Norman Goodyear, Marta Chiappe and Fernanda Zaccari

› Contact

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› IV International Conference on Postharvest and Quality Management of Horticultural Products of Interest for Tropical Regions

Commission Quality and Postharvest Horticulture Section Ornamental Plants

#ishs_cmph #ishs_seop

› Oral presenters of the conference.

› Traditional lighting of the oil lamp by Dr. Chalinda Beneragama, Convener, at the inaugural session.

The IV International Conference on Postharvest and Quality Management of Horticultural Products of Interest for Tropical Regions (PQMHP 2017) was successfully organized and conducted on 6-8 April 2017 in Kandy, Sri Lanka. The conference was convened by Dr. Chalinda Beneragama, Director of the Agriculture Education Unit of Faculty of Agriculture, University of Peradeniya, Sri Lanka. The University of Peradeniya hosted the conference under the auspices of the International Society for Horticultural Science (ISHS), in collaboration with the Department of National Botanic Gardens (DNBG), the Institute of Postharvest Technology (IPHT), CIC Agribusinesses, Heyleys Agriculture, the International Development Research Center (IDRC), the Sri Lanka Convention Bureau and the Fruit and Vegetable Exporters Association of Sri Lanka.

The conference was a platform to report on all work done by researchers and an opportunity to share their knowledge for a better understanding of postharvest and quality management of horticultural products of interest for tropical regions. Horticulture plays a key role in world agriculture. It not only provides fruits and vegetables to nourish people, but also provides plants and flowers to heal the minds of people. The range of tropical horticultural products that serve the international horticulture trade is countless. However, the capacity for horticultural products to reach target markets in the quality condition that is demanded, is limited because of poor postharvest management and lack of knowledge about required technologies, quality standards and food safety guidelines. Poor quality management during cultivation and postharvest procedures in developing countries results in more than 50% losses of perishable horticultural products. Therefore, to address these issues, this conference was conducted with the theme "Quality of horticultural products for healthy-wealthy-wise living".

A total of about 100 participants, including 24 foreign delegates from 15 different countries (USA, Germany, Canada, Japan, China, India, Taiwan, Malaysia, Thailand, Colombia, Mexico, Australia, Italy, Costa Rica, and Indonesia) attended the conference. Prof. Upul Dissanayake, Vice Chancellor of the University of

› Prof. Margrethe Serek, ISHS representative, presenting the ISHS student awards to A) Ms. Himali Balasooriya for the best oral presentation and B) Ms. R. Shanmugapriya for the best poster.

› Visiting Mike Flora Pvt Ltd, a leading cut-foliage and rooted cuttings export company in Sri Lanka.

Peradeniya, was the chief guest at the inaugural ceremony, and Prof. Hiroyuki Konuma, Director of the Organization for International Collaboration, Meiji University ASEAN Center, Japan, attended the conference as the guest of honour. Prof. R.L. Wijeyaweera, Deputy Vice Chancellor of the University of Peradeniya, and Prof. Gamini Pushpakumara, Dean of the Faculty of Agriculture, University of Peradeniya, were among other special guests. Prof. Margrethe Serek from Leibniz University of Hannover, Germany, addressed the inaugural gathering representing the ISHS. Prof. Buddhi Marambe from the Faculty of Agriculture, University of Peradeniya, delivered the keynote address on "Pesticides and food safety in fruits and vegetables: challenges in feeding 9.7 billion people by 2050".

The highlight of the scientific programme of the conference was seven plenary talks delivered by invited keynote speakers, who are world-renowned experts in their research fields. The titles of the keynote speeches were:

- 'Use of genetic manipulation for reduction of ethylene sensitivity in ornamental plants' by Prof. Margrethe Serek, Leibniz University of Hannover, Germany;
- 'The effects of thermal treatment and sonication on the quality of guava (*Psidium guajava*) and pineapple (*Ananas comosus*) juice blend' by Dr. Chandran Somasundram, University of Malaya, Kuala Lumpur, Malaysia;
- 'Hexanal based nanotechnology to minimize postharvest losses in tropical fruits' by Prof. J.G. Janavi, Tamil Nadu Agricultural University, Coimbatore, India;
- 'Potentials and constraints to develop Sri Lankan fruit and vegetables supply chain' by Dr. K.H. Sarananda, Wayamba University of Sri Lanka;
- 'Investigating postharvest chilling injury in tomato fruits' by Prof. Diane Beckles, University of California, Davis, USA;
- 'Recent developments in postharvest technology of pineapple' by Prof. Sisir Kumar Mitra, India;
- 'Production of planting material through low-cost micropropagation' by Prof. Sriyani E. Peiris, University of Peradeniya, Sri Lanka.

The scientific sessions of the conference were comprised of 37 oral presentations and 10 posters grouped within five thematic areas: Good Postharvest Practices (GPPs) targeting quality consumers, Quality fruits and vegetables for healthy life, Value chain and supply chain management for better quality, Manipulating the growing environment for product quality, and Managing agro-inputs for high quality products.

Among the notable scientific communications were presentations on the production and commercialization of eco-friendly packaging materials, Community of Practice (CoP) on food loss reduction, a low-cost fruit ripening chamber, crowd sourcing for value chain management, development of electrospun nano-fibre matrix and pre-harvest sprays of hexanal nano-formulation to extend shelf-life of mango, improving postharvest quality of perishables using partially burnt rice hull as a low cost silicon source in the growing medium, and effect of thermal summation on harvest maturity of *Citrus*.

There was a panel discussion on "Industry for Research – Research for Industry", aiming to bridge the gap between researchers and the industry community, which was moderated by Dr. Chalinda Beneragama, Convener, and Mr. I. Ananda Tissa, who is a leading ornamental plant exporter in Sri Lanka. Issues relating to the focus of research in developing countries and to industry needs were discussed extensively.

After the scientific sessions, the conference concluded with an ISHS business meeting. Prof. Margrethe Serek, ISHS Executive Committee member, presented information about the Society to all participants, and invited them to become members. ISHS student awards were given to Ms. Himali Balasooriya, PhD student from the Faculty of Veterinary and Agriculture, University of Melbourne, Australia, for the best oral presentation entitled "High temperature effect on strawberry fruit quality and antioxidant content", and to Ms. R. Shanmugapriya, PhD student from the Department of Nanoscience and Technology, Tamil Nadu Agricultural University, Coimbatore, India, for the best poster entitled "Development of electrospun nano-fibre matrix to extend shelf-life of mango fruits".

During the business meeting, Dr. Chalinda Beneragama was elected as the new Chair of the ISHS Working Group Postharvest in Emerging Countries. He accepted the new position. Prof. Omar Franco-Mora kindly agreed to organize the V International Conference on Postharvest and Quality Management of Horticultural Products of Interest for Tropical Regions in Toluca, Mexico, in 2021. All ISHS members who were present at the business meeting supported his proposal unanimously.

The post-conference technical tour visited a leading floriculture produce export company in Sri Lanka (Mike Flora Pvt Ltd) and the Royal National Botanic Gardens in Peradeniya. In addition, participants enjoyed visiting an elephant orphanage in Pinnawala where about 100 elephants are housed.

Chalinda Beneragama

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From the Secretariat

› New ISHS members

ISHS is pleased to welcome the following new members:

New Individual Members

Afghanistan: Mr. Gerrit Booyens; **Algeria:** Assoc. Prof. Mahieddine Boumendjel; **Argentina:** Consuelo Day Vila; **Australia:** Ms. Vasumathi Arumugam, Dr. Leo Padilla Balito, Andrew Barnett, Mr. Michael Coates, Prof. John Fielke, Ms. Tsvakai Gama, Shahla Hosseini Bai, Mr. Kim Jones, Mr. James Kelly, Dr. Michael Lang, Dr. Winnie Liu-Heang, Dr. Jacquelyn Simpson, Dr. Pangzhen Zhang; **Austria:** Mr. Wolfgang Leonhardt, Mr. Ahmad Ramazani; **Belgium:** Mr. Charles Buddendorf, Elke Van Engeland; **Brazil:** Dr. Emanuel Abreu, Mr. Maximiliano Dini, Prof. Dr. Patricia Fernandes, Edson Ortiz, Aristoteles Pires de Matos, Prof. Dr. José Aires Ventura; **Canada:** Mr. Loren Coutts, Dr. Ronald A. Javitch, Mr. Alex Pijl; **Chile:** Ms. Mónica Flores, Prof. Dr. Pilar Gil, Mr. Gaspar Goycoolea, Mr. Juan Goycoolea, Mr. Jorge Mohr; **China:** Limin Chen, Prof. Xueping Li, Huifang Zhao, Assoc. Prof. Xiaoyang Zhu; **Chinese Taipei:** Dr. Sung Pin-Hui; **Costa Rica:** Zulay Castro Jiménez; **Croatia:** Ms. Mirjana Sokol; **France:** Dr. Jean-Marc Blazy, Marc Cases, Dr. Marc Chillet, Dr. Elisabeth Dirlewanger, Paul-Alex Marie-Alphonsine, Dr. Mathilde Orsel; **Germany:** Stefan Requardt; **India:** Mr. Chaitanya Dhareshwar, Dr. Sangram Dhumal, Mr. Deepesh Jain; **Ireland:** Mr. Andres Bascope, Zoe Stiles; **Israel:** Ms. Miri Kupermintz, Dr. Itamar Nadav; **Italy:** Dr. Simona Aprile, Dr. Valentina Goffi, Dr. Oriano Navacchi, Dr. Elodie Vandelle; **Japan:** Assist. Prof. Mitsuru Hamano, Assoc. Prof. Tomoo Maeda, Mr. Kazuhiro Nishioka, Hijiri Yamagata; **Jordan:** Mr. Iad Abu Zurayk; **Korea (Republic of):** Ms. Hyun Jin Choi, Ms. Ryu Seulki; **Lithuania:** Mr. Benas Urbonavicius; **Madagascar:** Mr. Patrice Faudot, Ms. Isabelle Rahetsivololona; **Malaysia:** Mr. Faiz Ahmad, Assoc. Prof. Rashidi Othman; **Mexico:** Dr. Mariana Chávez Pesqueira, Jaime Alberto Corona Calleja, Dr. Luisa Lopez Ochoa, Dr. Luis Cuauhtémoc Navarro Mastache, Dr. Sergio Rosales-Mendoza, Dr. Juan A. Villanueva-Jiménez; **Morocco:** Ms. Zakia Amahmid; **Namibia:** Dr. Peter Lenhardt; **Netherlands:** Bert Meurs, Deedi Sogbohossou; **New Zealand:** Mr. Max Harrison, Ms. Shelley Struthers; **Nigeria:** Ms. Amah Delphine; **Peru:** Ms. Natalia Ayulo; **Poland:** Dr. Agnieszka Medynska-Juraszek; **Portugal:** Dr. Sofia Mendes Moreira Correia; **Puerto Rico:** Mr. Jaime Acevedo; **South Africa:** Mr. Andries Daniels; **Spain:** Dr. Lorena Lourdes Funes, Dr. María José Grajal-Martín, Pari Madloo, Dr. Manuel Madrid, Mr. Esau Martinez Burgos, Mr. Paul Witte; **Switzerland:** Mr. Tiago Meier, Mr. Juerg Streckeisen; **Thailand:** Assist. Prof. Daruni Naphrom; **Tonga:** Dr. Pila Kami; **Turkey:** Dr. Ozlem Akan, Dr. Nevzat Aslan, Prof. Dr. Mikdat Doganlar, Ms. Burcu Göksu, Prof. Dr. Ali Kuden, Prof. Dr. Salih Maden, Prof. Dr. Hakan Özkan; **United Kingdom:** Ms. Manolya Adan, Ms. Claudia Carvalho, Dr. Keara Franklin; **United States of America:** Dr. Vikramjit Bajwa, Clive Bock, Dr. Alyssa Cho, William Darlington, Ms. Terez Egi, Daniel Flick, Assist. Prof. Amelie Gaudin, Dr. Robert Glass, Mr. Rich Guggenheim, Mark Holsman, Assist. Prof. Lav Khot, Dr. Daniel Kluepfel, Mr. Scott Laskowski, Nicole Level, Vincent Marrocco, Dr. Themis Michailides, Assoc. Prof. Richard Moore, Jeff Muse, Mohamed Nouri, Corina Serban, Dr. Reza Shekarriz, Assoc. Prof. Jason Smith, Mr. Daniel Spitzer, Dr. Florent Trouillas, Mr. James Zingle

› In memoriam

Dr. Ron Davison (1927-2017)

Dr. Ron Davison, a pioneering specialist on kiwifruit and a former Assistant-Director of the Division of Horticulture and Processing of the New Zealand Department of Scientific and Industrial Research (DSIR), died in April 2017.

After completing his MSc at Auckland University College in 1948, Ron joined the DSIR Fruit Research Station, which, after various name changes, is now part of Plant & Food Research. He was to spend the next 40 years at the Mt Albert Research Centre in Auckland. His first task was to study the potential use of synthetic hormones and plant growth regulators on tree crops, for fruit thinning, for control of fruit set, for preventing fruit drop and for the control of fruit ripening. It was then the responsibility of the Fruit Research Station to obtain information for the certification of plant hormones.

In 1958, Ron went to the United Kingdom to undertake a PhD at King's College, University of London. On his return he continued his work on plant hormones including studies on the use of chemical thinning sprays. This developed into a major research interest – the regulation of cropping on fruit trees, particularly apples. In 1968, he spent about 15 months at Michigan State University, East Lansing, where he continued to work on the regulation of yield in fruit trees, with Dr. John Bukovac. When he returned to Mt Albert he concentrated his efforts more and more on kiwifruit. At that time, kiwifruit plantings were beginning to expand rapidly and Ron was one of the very first scientists to appreciate the potential of this new crop. He studied various aspects of crop management, such as the use of girdling to enhance cropping, and he built up a collection of different male kiwifruit vines at the Te Puke Research orchard. He also encouraged work on the chemical control of vegetative growth in kiwifruit.

Ron's greatest contribution to the kiwifruit industry was his insistence on the need to breed new cultivars to complement the existing 'Hayward' cultivar. Ron argued long and hard for the appointment of kiwifruit breeders. Many in the industry, and probably some within DSIR at the time, were rather sceptical, but the last twenty years have shown just how right and how far-sighted he was. The products of the kiwifruit breeding programme that he fostered have earned New Zealand billions of dollars in export earnings. In 1981, Ron and a colleague went on a lengthy trip to China to collect kiwifruit germplasm, the first essential for a breeding programme. Today, trips to China are simply routine, but in 1981 their trip was pioneer-

ing, demanding and arduous and also very rewarding. Ron fostered links with China. He had a genuine regard for his many Chinese friends and he did much to assist Chinese scientists and students going to New Zealand.
As horticultural production expanded, Ron took on more and more administrative responsibilities. For many years he was in charge of DSIR's pomological research and he was responsible for the Division's network of research orchards. Ron always insisted that the work of the Division should meet the requirements of the fruit-growing industries. He was well respected by orchardists and he had particularly good links with the early leaders of the kiwifruit industry. He had the ability to set long term goals with the quiet persistence to ensure that those goals were achieved.
Ron was strong-minded and tenacious. He strove for what he felt was right and for the good of DSIR and for the fruit-growing industries of New Zealand.

Ross Ferguson, ISHS Fellow

› Calendar of ISHS events

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Year 2017

- October 2-6, 2017, Trebinje (Bosnia and Herzegovina): **II International Symposium on Fruit Culture along Silk Road Countries.** Info: Prof. Dr. Gordana Djuric, University of Banjaluka, Genetic Resources Institute, Bulevar vojvode Petra Bojovica 1A, 78000 Banjaluka, Bosnia and Herzegovina. Phone: (387)51461392, Fax: (387)51463024, E-mail: gordana.djuric@igr.unibl.org E-mail symposium: info@silksym2017.org Web: http://silksym2017.org/
- October 9-13, 2017, Samsun (Turkey): **VI International Chestnut Symposium.** Info: Prof. Dr. Umit Serdar, Ondokuz Mayis University, Faculty of Agriculture, Horticultural Department, 55139 Samsun, Turkey. Phone: (90)3623121919, Fax: (90)3624576034, E-mail: userdar@omu.edu.tr Web: http://chestnut2017.org/
- October 15-19, 2017, Havana (Cuba): **IX International Pineapple Symposium.** Info: Dr. Juliette Valdés-Infante, IIFT, Ave. 7ma e/ 30 y 32, Miramar, Playa, 10100 C. Habana, Cuba. Phone: (53-7) 209-3585, Fax: (53-7) 204-6794, E-mail: mejoramiento@iift.cu E-mail symposium: fruticultura2017@iift.cu Web: http://www.fruticulturacubana.co.cu/fruticultura.html
- October 17-20, 2017, Madrid (Spain): **VI International Conference Postharvest Unlimited.** Info: Prof. Dr. Daniel Valero, University Miguel Hernandez, Ctra. Beniel Km. 3,2, 3312 Orihuela (Alicante), Spain. Phone: (34)966749743, Fax: (34)966749677, E-mail: daniel.valero@umh.es or Dr. Maria I. Gil, CEBAS-CSIC, Campus Universitario de Espinardo, Ed. 25 (Apdo 164, Espinardo), Murcia 30100, Spain. Phone: (34)968396315, Fax: (34)968396213, E-mail: migil@cebas.csic.es Web: http://www.postharvest-unlimited2017.org
- October 24-27, 2017, Mérida Yucatán (Mexico): **V International Symposium on Papaya.** Info: Dr. Jorge Manuel Santamaría-Fernandez Centro de Investigación Cientifica, de Yucatan A.C., Biotecnología, Calle 43 No. 130 Col. Chuburná de Hidalgo, Mérida, Yucatán CP 97200, Mexico. Phone: (52)9999428330ext203, Fax: (52)9999813900, E-mail: jorgesm@cicy.mx E-mail symposium: symposium.papaya@cicy.mx Web: http://www.cicy.mx/sitios/V-Symposium-on-papaya/index.html
- November 4-7, 2017, Taichung (Chinese Taipei): **I International Symposium on Bonsai.** Info: Dr. Hsueh-Shih Lin, Director, TDAIS, Council of Agriculture, No.370 Song-Hwai Road, 51544 Changhua Tatsuen Village, Chinese Taipei. Phone: (886)48522624, Fax: (886)48521148, E-mail: hslin@tdais.gov.tw or Dr. Hsin-Fu Yen, No. 1, Guancian Rd., 40453 Taichung, Chinese Taipei. Phone: (886)4 23285320, E-mail: hfyen@mail.nmns.edu.tw or Dr. Sean SC Huang, 10, Lane 91, Zhong Xiao Street, 510 Taiwan Yuanlin City, Changhua, Chinese Taipei. E-mail: seanschuang@yahoo.com.tw E-mail symposium: 2017bonsai@gmail.com Web: http://www.bonsai2017.com.tw/
- November 5-9, 2017, Adelaide (Australia): **VII International Symposium on Almonds and Pistachios.** Info: Dr. Michelle Wirthensohn, Discipline of Wine and Horticulture, Waite Campus, University of Adelaide, PMB 1 Glen Osmond SA 5064, Australia. Phone: (61)883136653, E-mail: michelle.wirthensohn@adelaide.edu.au Web: http://www.isap2017.com.au
- November 29 - December 1, 2017, Santiago (Chile): **VIII International Symposium on Walnut, Cashew and Pecan.** Info: Alvaro Jimenez, v. Kennedy 6690 of. 301 Vitacura, Santiago 7650672, Chile. Phone: (56)228257904, E-mail: ajimenez@chilenut.cl or Vittorio Bianchini, Avenida La Dehesa 1201 office 522, Lo Barnechea, Santiago, Chile. E-mail: vbianchini@frunut.cl E-mail symposium: chilenut@chilenut.cl Web: http://www.chilenut.cl/symposium

Year 2018

- March 7-9, 2018, Seoul (Korea (Republic of)): **III International Orchid Symposium.** Info: Prof. Dr. Ki Sun Kim, Department of Plant Science, CALS, Seoul National University, Seoul 151-921, Korea (Republic of). Phone: (82)2-880-4561, Fax: (82)2-873-2056, E-mail: kisun@snu.ac.kr E-mail symposium: info@ios2018.kr Web: http://ios2018.kr
- March 26-28, 2018, Bangkok (Thailand): **III International Symposium on Plant Cryopreservation.** Info: Dr. Kanchit Thammasiri, Department of Plant Science, Faculty of Science, Mahidol University, Rama VI Road, Phyathai, Bangkok 10400, Thailand. Phone: (66)89-132-7015, Fax: (66)2-354-7172, E-mail: kanchitthammasiri@gmail.com E-mail symposium: cryosymp2018@gmail.com Web: http://www.sc.mahidol.ac.th/scpl/cryosymp2018
- April 16-18, 2018, Canelones (Uruguay): **IV International Symposium on Citrus Biotechnology.** Info: Dr. Fernando Rivas, Ruta 3, Camino al Terrible SN, Salto 50000, Uruguay. Phone: (598) 47332300, E-mail: cfrivas@inia.org.uyE-mailsymposium:info@citrusbiotechnology2018.uy Web: https://www.citrusbiotechnology2018.uy/ NEW
- May 29-31, 2018, Bordeaux-Arcachon (France): **XXI CIPA Congress on Agriculture, Plastics and Environment.** Info: Mr. Bernard Le Moine, CIPA-CPA-APE, Plasticulture in Agriculture, 125, rue Aristide Briand, 92300 Levallois Perret, France. Phone:

(33)144011649, E-mail: b.lemoine@plastiques-agriculture.com Web: http://cipa-congress.com/

- June 11-15, 2018, Athens (Greece): **XV International Symposium on Processing Tomato - XIII World Processing Tomato Congress.** Info: Prof. Dr. Montaña Cámara, Dpto. Nutrición y Bromatología II, Facultad Farmacia. UCM, Plaza Ramón y Cajal sn, 28040 Madrid, Spain. Phone: (34) 913941808, Fax: (34) 913941799, E-mail: mcamara@farm.ucm.es or Dr. Luca Sandei, ssica, Tomato area, Viale f.Tanara 31/a, 43121 Parma PR, Italy. Phone: (39) 0521795257, Fax: (39) 0521771829, E-mail: luca.sandei@ssica.it or Dr. Panagiotis Kalaitzis, Mediterranean Agronomic Inst. Of Chania, 85, Macedonia Str. P.O. Box 85, 73100 Chania, Greece. Phone: (30)2821035030, E-mail: panagiot@maich.gr E-mail symposium: wptc2018@tomate.org Web: http://www.worldtomatocongress.com

NEW

- July 15-20, 2018, Bordeaux (France): **XII International Conference on Grapevine Breeding and Genetics.** Info: Prof. Serge Delrot, ISVV, 210 Chemin de Leysotte, 33882 Villenave d'Ornon, France. Phone: (33) 631122791, Fax: (33)557575903, E-mail: serge.delrot@inra.fr E-mail symposium: gbg2018@u-bordeaux.fr Web: http://gbg2018.u-bordeaux.fr/en

- August 12-16, 2018, Istanbul (Turkey): **XXX International Horticultural Congress: IHC2018.** Info: Prof. Dr. Yüksel Tüzel, Ege University, Agriculture Faculty, Department of Horticulture, 35100 Bornova Izmir, Turkey. Phone: (90)2323111398, Fax: (90)2323881865, E-mail: yuksel.tuzel@ege.edu.tr E-mail symposium: secretariat@ihc2018.org Web: http://www.ihc2018.org

Symposia at IHC2018:

- August 12-16, 2018, Istanbul (Turkey): **VIII International Symposium on Education, Research Training and Consultancy.** Info: Dr. Rémi Kahane, CIRAD, Dept Persyst TA B-DIR/09, Avenue Agropolis, 34398 Montpellier cedex 5, France. Phone: (33)467614938, E-mail: remi.kahane@cirad.fr or Prof. Dr. Ismet Boz, OMU Faculty of Agriculture, Department of A, OMU Faculty of Agriculture, Department of A, OMU Faculty of Agriculture, 55139 Samsun, Turkey. Phone: 3623121919, E-mail: ismet.boz@omu.edu.tr E-mail symposium: secretariat@ihc2018.org Web: http://www.ihc2018.org/en/S36.html
- August 12-16, 2018, Istanbul (Turkey): **XIX International Symposium on Horticultural Economics and Management and VII International Symposium on Improving the Performance of Supply Chains in the Transitional Economies and II International Symposium on Horticulture Economics, Marketing and Consumer Research.** Info: Prof. Dr. Ismet Boz, OMU Faculty of Agriculture, Department of A, OMU Faculty of Agriculture, Department of A, OMU Faculty of Agriculture, 55139 Samsun, Turkey. Phone: 3623121919, E-mail: ismet.boz@omu.edu.tr or Prof. Dr. Peter J. Batt, 3 Rodondo Place, Shelley, WA 6148, Australia. Phone: (61)401636242, Fax: (61)8 9266 3063, E-mail: peterjbatt@gmail.com E-mail symposium: secretariat@ihc2018.org Web: http://www.ihc2018.org/en/S24.html
- August 12-16, 2018, Istanbul (Turkey): **International Symposium on Evaluation of Cultivars, Rootstocks and Management Systems for Sustainable Production of Deciduous Fruit Crops.** Info: Dr. Gregory L. Reighard, Department of Horticulture, 170 Poole Agricultural Center, Box 340319, Clemson, SC 29634-0319, United States of America. Phone: (1)8646564962, Fax: (1)8646564960, E-mail: grghrd@clemson.edu or Brunella Morandi, Università di Bologna, Viale Fanin 44, 40127 Bologna, Italy. E-mail: brunella.morandi@unibo.it or Prof. Dr. Ayzin B. Küden, University of Cukurova, Dean of the Faculty of Agriculture, Department of Horticulture, 01330 Adana, Turkey. Phone: (90)3386364/3386447, Fax: (90)3386364/3386447, E-mail: abkuden@cu.edu.tr E-mail symposium: secretariat@ihc2018.org Web: http://www.ihc2018.org/en/S09.html
- August 12-16, 2018, Istanbul (Turkey): **International Symposium on Viticulture: Primary Production and Processing.** Info: Prof. Dr. Zeki Kara, Selcuk University Faculty of Agriculture, Department of Horticulture, 42003 Konya Selcuklu, Turkey. Phone: (90)332-2232899, Fax: (90)332-2410108, E-mail: zkara@selcuk.edu.tr or Prof. Dr. Gökhan Söylemezoglu, Ankara University, Faculty of Agriculture, Department of Horticulture, Ankara 06110, Turkey. Phone: (90)3125961304, Fax: (90)3123179119, E-mail: soylemez@agri.ankara.edu.tr or Prof. Dr. Ahmet Altindisli, Ege University Faculty of Agriculture, Department of Horticulture, 35100 BornovaIzmir, Turkey. Phone: (90)2323882622, Fax: (90)2323881865, E-mail: ahmet.altindisli@gmail.com E-mail symposium: secretariat@ihc2018.org Web: http://www.ihc2018.org/en/S13.html
- August 12-16, 2018, Istanbul (Turkey): **II International Symposium on Soilless Culture.** Info: Prof. Dr. Michael Raviv, Agric. Res. Organization, Newe Ya'ar Research Center, PO Box 1021, Ramat Yishay 30095, Israel. Phone: (972)49539505, Fax: (972)49836936, E-mail: mraviv@volcani.agri.gov.il or Prof. Dr. Ayse Gül, Department of Horticulture, Faculty of Agriculture, Ege University, 35100 Bornova Izmir, Turkey. Phone: (90)2323884000, Fax: (90)2323881865, E-mail: ayse.gul@ege.edu.tr or Prof. Dr. H. Yildiz Dasgan, Cukurova University, Agricultural Faculty, Horticultural Department, 01330 Adana, Turkey. Phone: (90)3223386388, Fax: (90)3223386388, E-mail: dasgan@mail.cu.edu.tr E-mail symposium: secretariat@ihc2018.org Web: http://www.ihc2018.org/en/S18.html
- August 12-16, 2018, Istanbul (Turkey): **II International Symposium on Root and Tuber Crops: Value Added Crops for the Next Generation.** Info: Dr. Ali Fuat Gokce, Ömer Halisdemir University, Faculty of Agric. Sci. and Technologies, Department of Agri. Genetic Engineering, 51240 Nigde, Turkey. Phone: (90)05365434241, E-mail: gokce01@yahoo.com or Prof. Dr. Umezuruike 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 E-mail symposium: secretariat@ihc2018.org Web: http://www.ihc2018.org/en/S19.html
- August 12-16, 2018, Istanbul (Turkey): **International Symposium on Advances in Production and Processing of Medicinal and Aromatic Plants.** Info: Prof. Dr. Bhimanagouda Patil, VFIC, Texas A&M University, Department of Horticulture, 1500 Research Parkway Ste A120, College Station, TX 77845, United States of America. Phone: (1)9794588090, Fax: (1)9798624522, E-mail: b-patil@tamu.edu or Dr. Fatma Uysal Bayar, BATEM, Antalya, Turkey. E-mail: uysal.fatma@tarim.gov.tr E-mail symposium: secretariat@ihc2018.org Web: http://www.ihc2018.org/en/S29.html
- August 12-16, 2018, Istanbul (Turkey): **International Symposium on Culinary Herbs and Edible Fungi.** Info: Prof. Dr. Lyle Craker, Dept. of Plant & Soil Science, University of Massachusetts, Stockbridge Hall, Amherst, MA 01003-7245, United States of America. Phone: (1)413-545-2347, Fax: (1)413-545-3958, E-mail: craker@pssci.umass.edu or Prof. Dr. Aysun Peksen, Ondokuz Mayis University, Faculty of Agriculture, Department of Horticulture, Samsun 55139, Turkey. Phone: (90)3624576020/1137, Fax: (90)3624576034, E-mail: aysunp@omu.edu.tr or Mr. Mustafa Kemal Soylu, Atatürk Central Horticultural Research Inst, 77102 Yalova, Turkey. Phone: (90)2268142520, Fax: (90)2268141146, E-mail: mksoylu@hotmail.com E-mail symposium: secretariat@ihc2018.org Web: http://www.ihc2018.org/en/S30.html

- August 12-16, 2018, Istanbul (Turkey): **IV International Conference on Turfgrass Management and Science for Sports Fields: Bridging the Needs and Research on Turfgrass at the Age of Climate Change.** Info: Prof. Dr. Giorgio Prosdocimi 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 or Erik Ervin, Virginia Polytechnic Inst.& State University, Dept of Crop and Soil Environment Sciences, 335 SMY TH, Blacksburg 24061, VA, United States of America. Phone: (1)5402315208, Fax: (1)5402313431, E-mail: eervin@vt.edu or Assoc. Prof. Songul Sever Mutlu, Akdeniz University, Ziraat Fakultesi, Peyzaj Mimarligi bolumu, Antalya, Turkey. Phone: (90)242-2455, E-mail: songulmutlu@akdeniz.edu.tr E-mail symposium: secretariat@ihc2018.org Web: http://www.ihc2018.org/en/S26.html
- August 12-16, 2018, Istanbul (Turkey): **VIII International Symposium on Seed, Transplant and Stand Establishment of Horticultural Crops.** Info: Prof. Dr. Daniel Leskovar, 1619 Garner Field Rd., Texas A&M AgriLife Research, Texas AM Univeristy, Uvalde Texas 78801, United States of America. Phone: (1)830-278-9151, Fax: (1)830-278-1570, E-mail: daniel.leskovar@agnet.tamu.edu or Prof. Dr. Ahmet Korkmaz, KSU, Faculty of Agriculture, Dept. of Horticulture, Kahramanmaras, Turkey. Phone: 90-344-2802035, E-mail: akorkmaz@ksu.edu.tr or Prof. Dr. Halit Yetisir, Deparment of Horticulture, Faculty of Agriculture, University of Erciyes, 38039 Kayseri, Turkey. E-mail: yetisir1@yahoo.com E-mail symposium: secretariat@ihc2018.org Web: http://www.ihc2018.org/en/S35.html
- August 12-16, 2018, Istanbul (Turkey): **V International Symposium on Plant Genetic Resources: Sustainable Management and Utilization for Food, Nutrition and Environmental Security.** Info: Dr. Sandhya Gupta, National Bureau of Plant Genetic Resources, Pusa Campus, New Delhi, Delhi, 110 012, India. Phone: (91)9958499781, Fax: (91)11-25842495, E-mail: sandhya_gupta87@yahoo.com or Hülya Ilbi, Ege University, Faculty of Agriculture, Dept. Of Horticulture, 35100 Bornova Izmir, Turkey. E-mail: hulya.ilbi@ege.edu.tr or Assoc. Prof. Birsen Cakir, Ege University Faculty of Agriculture, Department of Horticulture, Bornova, 35100 304zmir, Turkey. Phone: (90) 232 3112633, Fax: (90)2323881865, E-mail: birsencakir@hotmail.com E-mail symposium: secretariat@ihc2018.org Web: http://www.ihc2018.org/en/S01.html
- August 12-16, 2018, Istanbul (Turkey): **International Symposium on Tropical and Subtropical Vegetable Production: Tackling Present and Future Global Biotic and Abiotic Stressors.** Info: Prof. Dr. Hakan Aktas, Suleyman Demirel University, Agriculture, Faculty, Horticulture Dept, 32260 Isparta, Turkey. Phone: (90)2462118533, Fax: (90)2462118533, E-mail: aktashakan33@gmail.com or Dr. Srinivasan Ramasamy, AVRDC-The World Vegetable Center, 60 Yi Minga Liao, Shanhua, 74151 Tainan Tainan, Chinese Taipei. Phone: (886)6-5852499, Fax: (886)6-5830009, E-mail: srini.ramasamy@worldveg.org or Prof. Dr. Umezuruike 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 Assist. Prof. Golgen Bahar Oztekin, Ege University, Faculty of Agriculture, Department of Horticulture, 35100 Bornova Izmir, Turkey. Phone: (90)2323112577, Fax: (90)2323881865, E-mail: golgen.oztekin@ege.edu.tr E-mail symposium: secretariat@ihc2018.org Web: http://www.ihc2018.org/en/S16.html
- August 12-16, 2018, Istanbul (Turkey): **II International Symposium on Mechanization, Precision Horticulture, and Robotics.** Info: Prof. Reza Ehsani, Department of Mechanical Engineering, University of California, Merced, 5200 N. Lake Road, Merced, CA 95343, United States of America. Phone: (1)2092283613, Fax: (1)2092284047, E-mail: rehsani@ucmerced.edu or Assoc. Prof. Selçuk Arslan, Uludag Univesity Faculty of Agriculture, 16059 Bursa, Turkey. Phone: +90 224-2941606, E-mail: sarslan@uludag.edu.tr E-mail symposium: secretariat@ihc2018.org Web: http://www.ihc2018.org/en/S31.html
- August 12-16, 2018, Istanbul (Turkey): **IV International Jujube Symposium.** Info: Prof. Dr. Mengjun Liu, Research Center of Chinese Jujube, Agricultural Univesity of Hebei, Baoding, Hebei, 71001, China. Phone: (86)312754342, Fax: (86)3127521251, E-mail: lmj1234567@aliyun.com or 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 or Assoc. Prof. Kazim Gunduz, Mustafa Kemal University, A287riculture Faculty, Department of Horticulture, 31034 Hatay Antakya, Turkey. Phone: +90 0326 245 5845, Fax: +90 0326 245 5832, E-mail: kgunduz44@gmail.com E-mail symposium: secretariat@ihc2018.org Web: http://www.ihc2018.org/en/S08.html
- August 12-16, 2018, Istanbul (Turkey): **International Symposium on Understanding Fruit Tree Behaviour in Dynamic Environments.** Info: Dr. Evelyne Costes, INRA UMR AGAP, 2, place Viala, 34060 Montpellier Cedex 1, France. Phone: (33)499612787, Fax: (33)499612616, E-mail: costes@supagro.inra.fr or Dr. Pasquale Losciale, Council for Agric. Research & Economics, Research Centre for Agric. & Environment, Via Celso Ulpiani 5, Bari, Italy. Phone: (39)0805475036, Fax: (39)0805475023, E-mail: pasquale.losciale@crea.gov.it or Prof. Dr. Ayzin B. Küden, University of Cukurova, Dean of the Faculty of Agriculture, Department of Horticulture, 01330 Adana, Turkey. Phone: (90)3386364/3386447, Fax: (90)3386364/3386447, E-mail: abkuden@cu.edu.tr E-mail symposium: secretariat@ihc2018.org Web: http://www.ihc2018.org/en/S10.html
- August 12-16, 2018, Istanbul (Turkey): **III International Berry Fruit Symposium.** Info: Prof. Dr. Sezai Ercisli, Ataturk University Agricultural Faculty, Department of Horticulture, 25240 Erzurum, Turkey. Phone: (90) 442-2312599, Fax: (90) 442 2360958, E-mail: sercisli@atauni.edu.tr or Prof. Dr. Sedat Serçe, Nigde University, Faculty of Agricultural Sciences and Techn., Dept. Agricultural Genetic Engineering, Nigde, 51240, Turkey. Phone: (90) 388 2254463, Fax: (90) 388 2254440, E-mail: sedatserce@gmail.com E-mail symposium: secretariat@ihc2018.org Web: http://www.ihc2018.org/en/S12.html
- August 12-16, 2018, Istanbul (Turkey): **International Symposium on Carob: a Neglected Species with Genetic Resources for Multifunctional Uses.** Info: Prof. Dr. Hamide Gubbuk, Akdeniz University, Faculty of Agriculture, Department of Horticulture, 07058 Antalya, Turkey. Phone: (90)2423102422), Fax: (90)2422274564, E-mail: gubbuk@akdeniz.edu.tr E-mail symposium: secretariat@ihc2018.org Web: http://www.ihc2018.org/en/S37.html
- August 12-16, 2018, Istanbul (Turkey): **International Symposium on Ornamental Horticulture: Colour Your World.** Info: Prof. Dr. Rina Kamenetsky, Institute of Plant Sciences, Agricultural Research Organization, The Volcani Center, Rishon LeZion, 7528809, Israel. Phone: (972)39683511, Fax: (972)39660589, E-mail: vhrkamen@volcani.agri.gov.il or Prof. Dr. Yüksel Tüzel, Ege University, Agriculture Faculty, Department of Horticulture, 35100 Bornova Izmir, Turkey. Phone: (90)2323111398, Fax: (90)2323881865, E-mail: yuksel.tuzel@ege.edu.tr or Ass. Prof. Soner Kazaz, Ankara University, Faculty of Agriculture, Department of Horticulture, Diskapi - Ankara, Turkey. Phone: (90)312-596 12 87, Fax: (90)312-317 91 19, E-mail:

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- August 12-16, 2018, Istanbul (Turkey): **III International Symposium on Innovation and New Technologies in Protected Cultivation.** Info: Dr. Murat Kacira, Dept. of Agric. and Biosystems Enginering, 1177 East 4th Street, Room 403, Shantz Building, 38, Tucson, AZ 85721-0038, United States of America. Phone: (1) 520-626-4254, Fax: (1) 520-626-1700, E-mail: mkacira@cals.arizona.edu or Dr. Silke Hemming, Wageningen UR, Plant Research International, PO Box 16, 6700 AA Wageningen, Netherlands. Phone: (31)317 4 86921, Fax: (31)317 423110, E-mail: silke.hemming@wur.nl or Prof. Dr. Yüksel Tüzel, Ege University, Agriculture Faculty, Department of Horticulture, 35100 Bornova Izmir, Turkey. Phone: (90)2323111398, Fax: (90)2323881865, E-mail: yuksel.tuzel@ege.edu.tr or Dr. Hatice Filiz Boyaci, Demircikara Mah. Pasakavaklara Cad. P.O35, Muratpasa, 07100 Antalya, Turkey. Fax: (90)242-3211512, E-mail: filiz_boyaci@yahoo.com E-mail symposium: secretariat@ihc2018.org Web: http://www.ihc2018.org/en/S17.html
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- August 12-16, 2018, Istanbul (Turkey): **International Symposium on Strategies and Technologies to Maintain Quality and Reduce Postharvest Losses.** Info: Dr. Mustafa Erkan, Akdeniz University, Department of Horticulture, 07058 Antalya, Turkey. Phone: +90 242 3102428, Fax: +90 242 2274564, E-mail: erkan@akdeniz.edu.tr E-mail symposium: secretariat@ihc2018.org Web: http://www.ihc2018.org/en/S32.html
- August 12-16, 2018, Istanbul (Turkey**): International Symposium on Water and Nutrient Relations and Management of Horticultural Crops.** Info: Prof. Dr. Esmaeil Fallahi, University of Idaho, Parma Res. & Extension Center, 29603 University of Idaho Lane, Parma, ID 83660-6699, United States of America. Phone: (1)2087226701 ext225, Fax: (1)2087226708, E-mail: efallahi@uidaho.edu or Prof. Dr. Dilek Anaç, Kaz305mdirik mahallesi 156 sokak No. 132, Nur Apt. Bornova-304zmir, 35040 Bornova, Turkey. E-mail: dilek.anac@ege.edu.tr or Dr. Alon Ben-Gal, Environmental Physics and Irrigation, Gilat Research Center, Agricultural Research Organization, Mobile Post Negev 2 85280, Israel. Phone: (972)8 9928644, Fax: (972)8 9926485, E-mail: bengal@agri.gov.il or Mr. Janjo de Haan, Soesterweg 410, 3812BK Amersfoort, Netherlands. Phone: (31)320291211, E-mail: janjo.dehaan@wur.nl or Dr. Clive Rahn, 60 Ettington Close, Wellesbourne, Warwick, CV35 9RJ, United Kingdom. E-mail symposium: secretariat@ihc2018.org Web: http://www.ihc2018.org/en/S33.html
- August 12-16, 2018, Istanbul (Turkey): **International Symposium on Quality and Safety of Horticultural Products.** Info: Prof. Dr. Güner Arkun, Istanbul Aydin University Engineering Facul, Besyol Mah Inonü cad no 38 Kücükcekmece, 34295 Istanbul, Turkey. Phone: (90) 4441428, Fax: (90) 212 4255759, E-mail: gunerozay@aydin.edu.tr or Dr. Kamer Betul Ozer, Ege University, Faculty of Agriculture, Department of Horticulture, Evka-3, 35100 Izmir Bornova, Turkey. Phone: (90)232-3112631, E-mail: betul.sintra@gmail.com E-mail symposium: secretariat@ihc2018.org Web: http://www.ihc2018.org/en/S21.html
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- August 12-16, 2018, Istanbul (Turkey): **II International Symposium on Date Palm.** Info: Dr. Yuval Cohen, Volcani Research Center, Department of Fruit Tree Sciences, Institute of Plant Science, Bet Dagan 50250, Israel. Phone: (972) 3-9683407, Fax: (972) 3-9669583, E-mail: vhyuvalc@volcani.agri.gov.il or Assist. Prof. Hatice Ikten, Akdeniz University Agricultural Faculty, Department of Agricultural Biotechnology, 07070 Antalya, Turkey. Phone: (90)242 3106557, E-mail: hikten2@hotmail.com E-mail symposium: secretariat@ihc2018.org Web: http://www.ihc2018.org/en/S34.html
- August 12-16, 2018, Istanbul (Turkey): **International Symposium on Fruit and Vegetables for Processing.** Info: Prof. Dr. Mehmet Ali Koyuncu, Süleyman Demirel University, Agriculture Faculty, Department of Horticulture, 32260 Isparta, Turkey. Phone: (90)246 2118529, Fax: (90)246 2118696, E-mail: koyuncu.ma@gmail.com E-mail symposium: secretariat@ihc2018.org Web: http://www.ihc2018.org/en/S27.html
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- August 12-16, 2018, Istanbul (Turkey): **International Symposium on Nuts and Mediterranean Climate Fruits: Advances in Breeding and New Strategies of Horticultural Management for Sustainable Production.** Info: 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 Dr. Moshe A. Flaishman, Department of Fruit Trees Sciences, ARO - The Volcani Center, PO Box 6, 50-250 Bet Dagan, Israel. Phone: (972)39683394, Fax: (972)39683793, E-mail: vhmoshea@volcani.agri.gov.il or Dr. Louise Ferguson, 2037 Wickson Hall, Plant Sciences Department Mail Stop II, UC Davis 1 Shields Ave. Davis CA 95616, United States of America. Phone: (1) 559 737 3061, Fax: (1) 530 752 8502, E-mail: lferguson@ucdavis.edu or Deniz Sanal, Alata Horticultural Research Station, Mersin, Erdemli, Turkey. E-mail: denizsanal06@gmail.com E-mail symposium: secretariat@ihc2018.org Web: http://www.ihc2018.org/en/S11.html
- August 12-16, 2018, Istanbul (Turkey): **VII International Conference on Landscape and Urban Horticulture.** Info: Federica Larcher, Largo P. Braccini 2, 10095 Grugliasco, Torino, Italy. E-mail: federica.larcher@unito.it or Jesus Ochoa, Universidad Politécnica de Cartagena, Paseo Alfonso XIII, 48, 30203 Cartagena, Murcia, Spain. E-mail symposium: secretariat@ihc2018.org Web: http://www.ihc2018.org/en/S25.html
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