Chronica Horticulturae

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Horticultural Highlights

Less Can Make More – Revisiting Fleshy Fruit Quality and Irrigation in Horticulture

Symposia and Workshops

Loquat • Pear • Balkan Vegetables and Potatoes

ISHS

Chronica Horticulturae

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Membership and Orders of Chronica Horticulturae

Chronica Horticulturae is provided to the Membership free of charge: Individual Membership is 75 EUR (including VAT) per year (or two years for members in developing countries), 65 EUR per year/two years for members of affiliated national societies. Student Membership: 40 EUR per year (including VAT). For details on ISHS membership categories and membership advantages, or to apply for ISHS membership go to **www.ishs.org/members**.

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Acta Horticulturae

Acta Horticulturae is the series of proceedings of ISHS Scientific Meetings, Symposia or Congresses (ISSN: 0567-7572). ISHS Members are entitled to a substantial discount on the price of Acta Horticulturae. A complete and accurate record of the entire Acta Horticulturae collection, including all abstracts and full text articles is available online at **www.actahort.org**. ISHS Individual membership includes credits to download 15 full text Acta Horticulturae articles. All Acta Horticulturae titles – including those no longer available in print format – are available in the **ActaHort CD-ROM** format.

Scripta Horticulturae

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.

PubHort - Crossroads of Horticultural Publications

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 68,500 downloadable full text scientific articles in pdf format, and includes The Journal of Horticultural Science & Biotechnology, Journal of the American Pomological Society, Journal of the International Society for Mushroom Science, Fruits, Proceedings of the International Plant Propagators' Society, Journal of the Interamerican Society for Tropical Horticulture, Plant Breeding Reviews, Horticultural Reviews, etc.

Additional information can be viewed on the PubHort website **www.pubhort.org**.

Cover photograph: With the expected climate changes, water shortages may prevail. New strategies will have to be adopted to cope with these stressful growing conditions. Alternative irrigation practices need to be developed ensuring acceptable yield and maintaining fruit quality. The article presented by L. Urban et al. in 'Horticultural Science Focus' deals with this concern.

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.

ISHS

Contents

ISHS Publications 2.0

Yves Desjardins, ISHS Board Member Responsible for Publications

Yves Desjardins

Dear colleagues ISHS members,

After our exciting and hectic horticulture gathering in Brisbane, we are back in our labs preparing for our next encounter. On my part, I am now implementing the changes presented at the General Assembly, which will propel ISHS publications into a new era. Let me first thank the Council members who have endorsed the new orientations taken by our Society with respect to publications and have re-elected me to the Board. I am honored by their support and feel much obliged for this vote of confidence. Rest assured, changes to the publications of ISHS will be significant; they will affect all of us to some extent, for the better. Be ready for a paradigm shift in the way we carry out day-to-day business. In this sense, we can certainly say that ISHS is entering a new era of PUBLICATIONS 2.0.

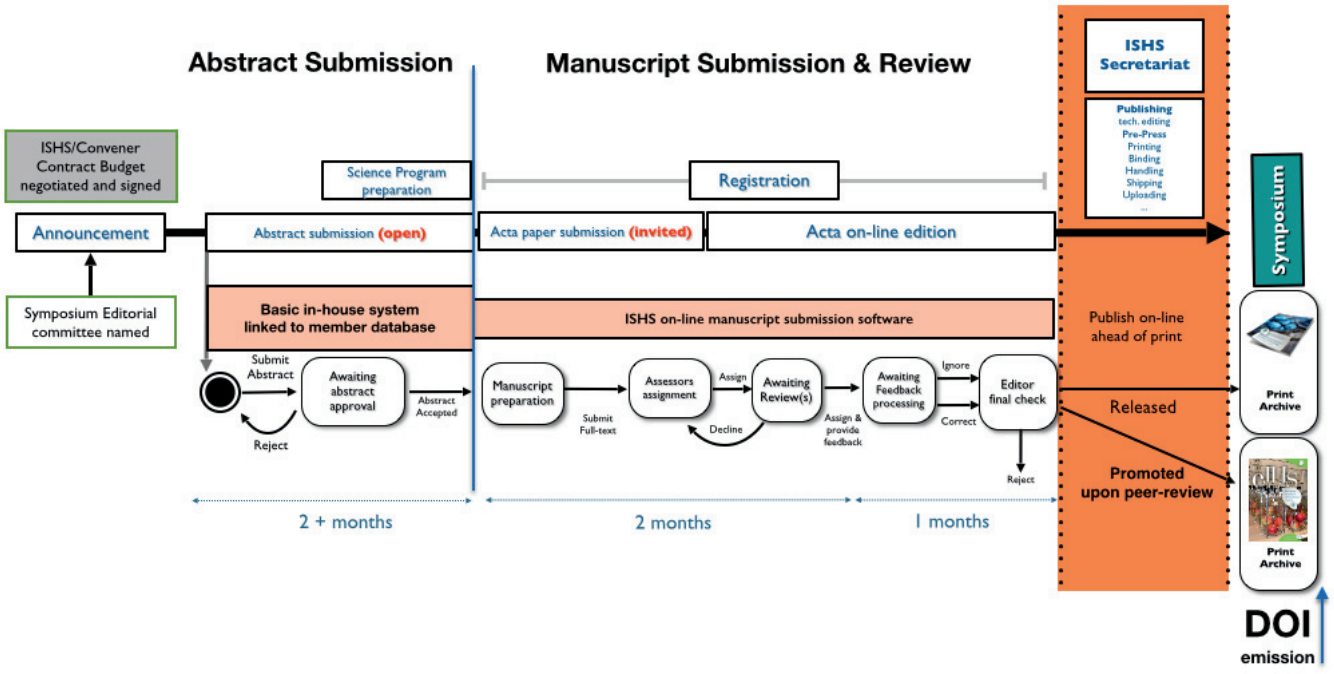
ACTA HORTICULTURAE: "THE TIMES THEY ARE A-CHANGIN"

After many years of questioning and reflecting on the role of *Acta Horticulturae* as a communication vehicle within ISHS, the Council, upon recommendation from the Board, has decided to move forward and mandate the Secretariat to implement the "new *Acta*". This revamped *Acta* is one of the building blocks of the comprehensive publication strategy our Society has chosen for the future.

Some of the premises that have guided the proposed changes enacted today are that *Acta Horticulturae* is not a "true" peer-reviewed publication and will never be granted an Impact Factor by ISI-Thomson Reuters. *Acta* is classified by this organization as conference proceedings and is thus indexed in a separate database to reflect this fact. Under this classification, it remains fully searchable, citable and referenced. We in ISHS accept this reality and must now acquiesce to this decision: *ACTA HORTICULTURAE* IS A CONFERENCE PROCEEDINGS. Yes, it is a conference proceedings, and it is a very good one indeed! *Acta Horticulturae* fills a distinct niche in the field of horticulture and serves a unique function marking the state of science at a precise point in time and providing searchable archives of this knowledge over time. With this in mind, the proposed changes to *Acta* will make it even better.

As before, we will thoroughly revise papers to standardize their content and bring them to a high level of quality in terms of both language and science. As you are aware, the rejection rate is very low (less than 5%). The role of the editorial board is to improve most manuscripts to an acceptable level, reflecting the presentations made at our symposia. Using a new manuscript submission system (MSS) developed in house by the Secretariat, we will strive to make available all manuscripts in an *Acta* by the start of each symposium or early thereafter. This new *Acta* submission process will change the way ISHS symposium participants prepare their scientific contributions and participate in conferences. This paradigm shift means that authors will have to submit their manuscript four months in advance of the meeting. The manuscripts must be written early enough to allow for the review process. According to our plan, the MSS will enable conveners and editors of symposia to monitor the review process to keep *Acta* production within the prescribed delivery dates (Fig. 1). To keep up with the tight publication timeframe, we have streamlined the ISHS Secretariat's pre-press capacity to technically edit manuscripts more professionally, using industry standard publishing tools like eXtyles®,

Figure 1. Overview of the *Acta Horticulturae* roadmap from submission to publication.



InDesign page layout software and others. Once released for publication, each manuscript within an *Acta* will be attributed a DOI (Digital Object Identifier), allowing unique searching and renewed citation capability. Cross-referencing will also be available, allowing for easy navigation through electronic Enhanced PDF.

The cornerstone of the new submission system will be the appointment of a capable and willing editorial board early during the planning of each symposium. This editorial board will consist of the symposium editor/convener as Chair and associate reviewers (assessors) and they will be assisted in their task by a newly appointed ISHS Science Editor, a new position created to foster and follow the *Acta* review process. More on that a little later.

The changes made to *Acta* are not only organizational and structural but are also aesthetic and will include a new look and feel to the publication. Indeed, the Board is proud to present the new visual signature of *Acta Horticulturae* (Fig. 2). This new look will be streamlined and consistent for each of the ISHS publications. This style will be easily identifiable through consistent use of logo and format. Moreover, because most of us will be consulting *Acta* articles on-line in the near future, individual articles will also benefit from a distinct web style including color, new layout and bibliographic style. Each article will benefit from enhanced PDF capacity with cross-references, and individual download and citation "Altmetrics". With this new process *Acta* will continue to be at the top of web query results.

ISHS REFEREED JOURNAL

One of the most important changes to mark the ISHS PUBLICATIONS 2.0 transition is the strong commitment of the previous Board to acquire an established peer-reviewed impact factor publication. Taking into account the diverse interests and origins of ISHS members, the Board felt the critical need to provide them with an array of publication options. It's unusual for an international society like ours, with close to 7000 members, not to have its own peer-reviewed journal. With this in mind, ISHS has recently acquired eJHS, the European Journal of Horticultural Science. This journal, formerly owned by the German Society for Horticultural Science, now joins the scope of the ISHS publication family.

Starting on the 1st of January, the eJHS will be available in open-access. It will publish 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 eJournal will focus on applied and fundamental aspects of the entire food value chain, ranging from breeding, production, processing, trading to retailing of horticultural crops and commodities in temperate, subtropical and tropical regions. It will particularly emphasize integrated crop management strategies during the preharvest and postharvest stages, aiming at sustainably increasing the quantity and quality of horticultural products.

The eJournal will publish peer-reviewed articles, reviews and special thematic issues in the following science areas:

- breeding and genetic resources;
- clonal (micro)propagation and seed physiology;
- cropping systems, including crop management practices;
- plant/fruit growth and development, including interactions with environments and organisms;
- plant protection and plant nutrition;
- irrigation and plant water relation;
- whole plant physiology and source/sink relation;
- urban horticulture/protected cultivation;
- fruit ripening and product quality;
- storage technologies, including postharvest disorders;
- food processing technologies/horticultural engineering;
- marketing/economics;
- education and consultancy;
- consumer sciences.

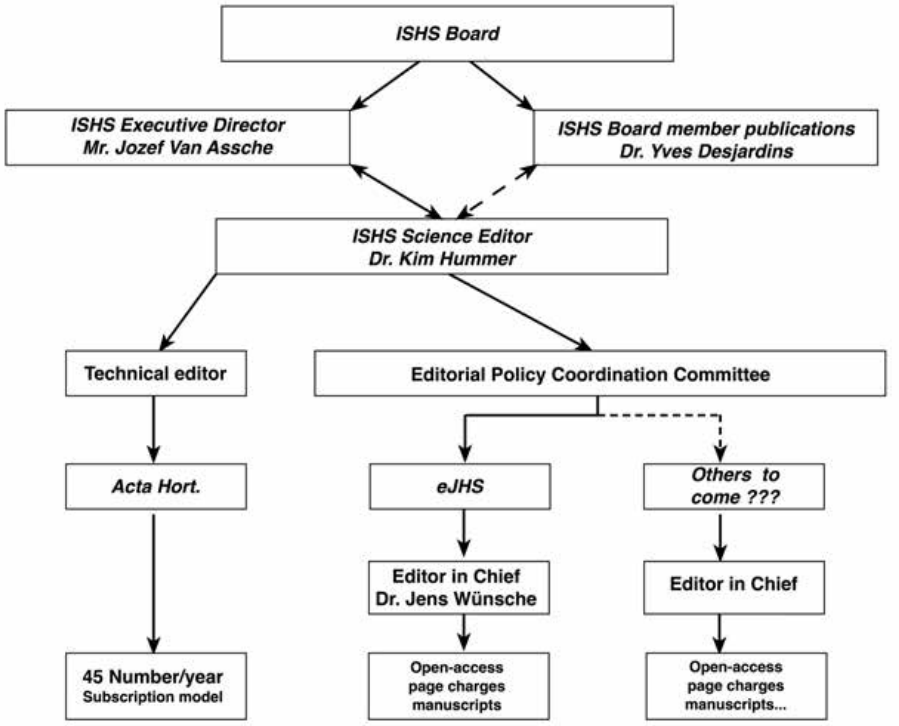
To harmonize the editorial policies of the new ISHS eJournal and to facilitate its transparent integration into the *Acta Horticulturae* workflow, the Board has created a new ISHS Science Editor position. This person will be responsible for the overall quality and intellectual content of ISHS-managed publications, timeliness and quality of the review process. The ISHS Science Editor will particularly work with symposium conveners and editorial boards to swiftly review manuscripts, and to publish them at the time of the symposia.

The new ISHS publication portfolio will provide new advantages and opportunities. Articles resulting from noteworthy symposium presentations, at the request of the Science Editor and after passing full journal review, can now be published in our ISHS peer-reviewed journal (Fig. 3). The Science Editor may also solicit and identify series of manuscripts for special issues of the eJHS. The DOI can also be published or referenced in the *Acta Horticulturae* so that it can be part of and traced to a symposium series as well. Through this mechanism, we have found a way to publish ISHS symposia presented research with impact, while maintaining the historical structure of our symposia series.

The ISHS Science Editor will also chair the ISHS Editorial Policy Coordination Committee with the mandate to actively define aims, policies and editorial coverage of ISHS-managed publications. Considering the central role of the Science Editor in the smooth operation and coordination of the ISHS scientific publication portfolio, the appointed person will need to be a well respected scientist in horticulture, with a broad knowledge of scientific publications and an indisputable reputation among their peers. Being granted the highest authority in ISHS science publication matters, this person must have a deep understanding of the science structure and activities of the ISHS. Finding such a pearl is not an easy task as the appointment has many implications for the Society. I am very happy to announce today that Dr. Kim Hummer has been offered and has accepted the part-time position of ISHS Science Editor for the next two years. She will be working closely with the Secretariat, the conveners, the journal Editor-in-Chief and

Figure 2. New visual signature of *Acta Horticulturae*.

Figure 3. New organizational structure of ISHS publications portfolio.



myself to oversee the ISHS publications portfolio. Please join me in welcoming Dr. Hummer into this position. We are very proud that she has accepted this challenging task and feel that this new position will contribute to the credibility and scientific standards of our Society.

MANY CHALLENGES AHEAD

The scientific publishing field is evolving rapidly. To stay ahead of the game, scientific societies like ours must adapt and be proactive in implementing new strategies to respond to membership needs and the rapidly changing publication environment. The success of the proposed PUBLICATIONS 2.0 plan will entirely depend on the willingness of members, like you and me, to consciously decide to support the ISHS publications and journal. It is the Board's goal to make our publications the best in the field of horticulture. However, this can only be achieved if you decide to participate in ISHS symposia, prepare short proceeding manuscripts rapidly and publish in "your" ISHS journal. By doing so, you will increase the impact of our journal and raise the impact of your research in the international horticulture community.

Appointment of Dr. Kim Hummer as ISHS Science Editor

Yves Desjardins, ISHS Board Member Responsible for Publications

The Board of ISHS is proud to announce that Dr. Kim Hummer has been appointed as the new ISHS Science Editor for a two year term. The ISHS Science Editor (SE) will be responsible for the overall quality and intellectual content of ISHS-managed publications and for the timeliness and quality of the peer review process. She will work in conjunction with the ISHS Board and the staff of the Secretariat. She will also be working closely with ISHS Symposium Conveners and Editor-in-Chief of the ISHS journal. Most importantly, the ISHS Science Editor will operate with full editorial independence.

Kim E. Hummer has broad experience and many qualities that make here fit for this job.

She was born in Washington, D.C. in 1952, received her B.S. in Biology from St. Lawrence University in 1974, her M.S. in Plant and Soil Science from the University of Vermont in 1978, and her doctorate in Horticulture from Oregon State University in 1981. Her scientific expertise includes the conservation of fruit, nut, and specialty crop genetic resources. Her present research passion involves the study of ploidy in berry species. She also actively studies genetics and chemical constituents of strawberries, blueberries, blackberries, raspberries, currants, gooseberries, and unusual berry crops such as blue honeysuckle.

Kim E. Hummer

During her career she has been a participant of more than 18 plant collecting and exchange expeditions to locations including Canada, China, India, Italy, Japan, Portugal, Russia, and throughout the United States including Alaska and Hawaii. She was selected as Specialty Crop Curator for the US Department of Agriculture (USDA), Agricultural Research Service (ARS), National Clonal Germplasm Repository in Corvallis, Oregon in 1987, and became Research Leader of that gene bank in 1989. In addition, from 2009 through 2012, she managed the Palmer, Alaska, Arctic and Subarctic Plant Gene Bank until its closure. In October 2013, she became the Location Coordinator for the three scientific units of the Agricultural Research Service of the US Department of Agriculture in Corvallis, Oregon.

Dr. Hummer is an active member of the American Society of Horticultural Science, and was selected as a Fellow in 2006. She was the first woman president of the American Pomological Society (2004-2006), and has been the liaison between that society and the International Society for Horticultural Science to assist in

digitization of information and on-line services. In 2006, she chaired the expert committee that developed the Global Conservation Strategy for Strawberry, sponsored by the Global Crop Diversity Trust. She has been collaborating with the Trust and international horticulturists in the development of global strategies for citrus and apple since then.

Dr. Hummer is the author or co-author of 200 scientific publications, 16 chapters, and has co-written or edited 10 books. She has named a strawberry species, released three plant cultivars and an advanced germplasm selection.

In 2009, she was recognized by the Sveriges Lantbruksuniversitet with an honorary doctorate in Agronomy. She was the Chair of the ISHS Commission on Plant Genetic Resources from 2002-2010. During that term, she convened or was scientific chair of 5 international symposia, and was a member of the scientific committee or represented ISHS at 7 additional symposia. She also participated on the ISHS publication committee from 2006-2010. She was the Vice President of ISHS from 2010-2014. In that position she was a member of the ISHS Board. During that period she managed meetings of the 24 member ISHS Executive Committee, and oversaw the scientific activities of the Society. Dr. Hummer was particularly involved in the International Cultivar Registration Authority nomenclatural issues as well as encouraging interaction between ISHS and other plant-oriented scientific societies. She represented the ISHS at international symposia (7th International Strawberry Symposium in Beijing, China, in 2012), as well as regional horticultural conferences, such as the 2nd All Africa Horticultural Congress in South Africa, in 2012, and the Tri-Society Conference "Horticulture for the Future" in Lorne, Australia in 2011. She was recognized as a honorary member of the Società di Ortoflorofrutticoltura Italiana (SOI) at Matera, Italy in 2013.

IHC2014 – the 29th International Horticultural Congress, Brisbane, Australia

Ian J. Warrington, Congress Co-President (on behalf of the IHC2014 Organising Committee)

Ian J. Warrington

"Outstanding", "spectacular" and "overwhelming" were some of the words used by delegates in response to the 29th International Horticultural Congress (IHC2014) that was recently (17-22 August) held in Brisbane, Australia. There were 3290 registrations for this week-long event from 97 different countries. All regions of the world were strongly represented (see Tables 1 and 2).

Main registration – hundreds of delegates from many countries collect their registration packs and event tickets for the week ahead.

Table 1. Numbers of delegates from top 10 countries attending IHC2014.

Australia	761
People's Republic of China	339
USA	252
Japan	148
New Zealand	124
Brazil	85
South Africa	76
Germany	73
Republic of Korea	66
Thailand	61

Floral displays were a prominent feature of the congress.

Table 2. Geographic distribution of registrants who attended IHC2014. Numbers in parentheses are those from IHC2010 that was held in Lisbon, Portugal.

Geographic region	Number of countries represented	Proportion (%) of registrants*
Africa	21 (21)	5.4 (4.0)
Asia and Oceania	28 (28)	63.5 (25.7)
Central and South America	12 (11)	5.0 (7.7)
Europe (incl. Russia)	33 (37)	16.5 (54.2)
North America	3 (3)	9.6 (8.4)
Total	97 (100)	100 (100)

* Although the number of countries within each region was similar across the two congresses, the distribution of representation by delegates was markedly different.

Table 3. Summary of the titles, speakers and chairs for the plenary sessions held during the congress.

Plenary session title	Invited speakers	Chair
Sustaining Lives: Global Food Security	Julian Cribb, Shenggen Fan	P. Batt
Sustaining Lives: Plants for Health	Joanne Jamie, Tony Worsley	J. Stanley
Sustaining Landscapes: Greener Cities - Healthier Cities	William Bird, Malcolm Smith	E. Hewett
Sustaining Livelihoods: Management of Global Crises	Koki Kanahama, Martin Hamer	R. Drew

Table 4. Overview showing the numbers of sessions, invited speakers, oral and poster presentations and the names of the conveners for each of the symposia held during the congress.

Symposium	No. days oral sessions	No. oral/ poster sessions	No. invited speakers	No. orals	No. posters	Total no. papers	Conveners
S01. 6th International Symposium on Human Health Effects of Fruits and Vegetables (FAVHealth2014)	4	9/2*	8	43*	32*	83	T. O'Hare, B. Patil, O. van Kooten
S02. 12th International People Plant Symposium: Horticulture and Human Communities: People, Plants and Places	2	6/1	1	25	8	34	C. Shoemaker, F. Di Iacovo, E. Rappe
S03. Horticulture in Developing Countries and World Food Production	3	9/4	2	46	56	104	A. Gracie, M. Taguchi, F. Appiah, G. Rogers
S04. Impact of Asia-Pacific Horticulture – Resources, Technology and Social Welfare	1	3/1	3	13	18	34	R. Tao, K. Sun Kim, R. Sun
S05. Water Scarcity, Salinization and Plant Water Relations for Optimal Production and Quality	2	6/2	1	26	33	60	R. Snyder, S. Ortega-Farias
S08. Physiology of Perennial Fruit Crops and Production Systems in a Changing Global Environment	3	9/5	2	51	79	132	S. Tustin, B. van Hooijdonk
S09. Abscission Processes in Horticulture and their Manipulation to Improve Crop Growth, Development and Quality	2	5/1	10	15	10	35	S. Meir, J. Roberts, J. Wünsche
S10. 4th International Symposium on Tropical Wines and International Symposium on Grape and Wine Production in Diverse Regions	2	6/2	5	29	30	64	P. Read, G. Pereira
S11. Consumer and Sensory Driven Improvements to the Quality of Fruits and Nuts	1	3/1	3	13	12	28	Y. Erner, D. Avanzato, R. Harker
S12. 2nd International Berry Fruit Symposium: Interactions! Local and Global Berry Research and Innovation	4	12/3*	9*	39*	50*	98*	C. Finn, B. Mezzetti
S13. Promoting the Future of Indigenous Vegetables Worldwide	3	9/1	5	33	9	47	D. Keatinge, J. Wang
S14. High Value Vegetables, Root and Tuber Crops and Edible Fungi - Production, Supply and Demand	2	6/2	3	23	34	60	C. Birch, B. Searle
S15. Ornamental Horticulture in the Global Greenhouse	4	10/6	4	56	100	160	R. Criley, E. Morgan, M. Serek, D. Marcsik, V. Loges
S16. Mechanisation, Precision Horticulture, and Robotics in Fruit and Vegetable Production	1	3/1	1	16	9	26	M. Whiting, J. McPhee, Q. Zhang
S17. Non-Destructive Assessment of Fruit Attributes	2	6/1	3	28	15	46	G. Costa, K. Walsh
S18. Innovative Plant Protection in Horticulture	3	9/2	3	48	31	82	C. Hale, D. Hunter
S19. Postharvest Knowledge for the Future	3	9/3	4	50	53	107	J. Golding, J. Heyes, P. Toivonen
S20. 7th International Symposium on Education, Research Training and Consultancy	2	6/1	4	29	11	44	R. McConchie, B. Jones
S21. 17th International Symposium on Horticultural Economics and Management and 5th International Symposium on Improving the Performance of Supply Chains in the Transitional Economies	3	9/1	1	52	15	68	P. Batt, P. Oppenheim
S22. Innovation and New Technologies in Protected Cropping	3	9/3	3	52	49	104	S. De Pascale, G. Connellan, J. Weijie

Symposium	No. days oral sessions	No. oral/ poster sessions	No. invited speakers	No. orals	No. posters	Total no. papers	Conveners
S23. Plant Breeding in Horticulture	3	9/7	3	49	126	178	A. Currie, N. Onus
S24. Molecular Biology in Horticulture	3	9/4	5	45	78	128	R. Muleo, D. Chagné
S25. 3rd International Genetically Modified Organisms in Horticulture Symposium – Past, Present and Future (OECD Symposium: invited speakers only)	1	4/0	15	0	0	15	B. Panis, T. Hvoslef-Eide, V. Villegas, V. Lane
S26. Micropropagation and In Vitro Techniques	2	6/2	2	33	45	80	M. Lambardi, S. Hamill, R. Drew
S27. 4th International Symposium on Plant Genetic Resources: Genetic Resources for Climate Change	2	6/1	3	31	20	54	H. Jaenicke, S. Ashmore, L. Guarino, M. Taylor, E. Dulloo
S28. 5th International Conference on Landscape and Urban Horticulture	2	6/2	3	32	33	68	G. Groening, J. Reyner
S29. 3rd International Conference on Turfgrass Management and Science for Sports Fields	2	6/1	7	18	7	32	P. Nektarios, K. McAuliffe
S30. Organic Waste to Horticultural Resource	2	5/1	2	21	16	39	B. Carlile, M. Raviv, M. Nichols
S31. Eco-efficiency in the Lifecycle of Horticultural Production	1	3/1	2	14	1	17	B. Clothier, I. Goodwin
S32. Biosecurity, Quarantine Pests and Market Access	1	3/1	3	15	6	24	B. Ikin, B. Roberts, P. Whittle
S33. Sustainable Management in the Urban Forest	1	3/1	5	4	2	11	B. Wilcock, G. Moore
S34. 4th International Symposium on Papaya	2	4/1	4	18	7	29	M. Fitch, J. Zhu, R. Drew
S35. 8th International Pineapple Symposium	2	5/1	3	19	8	30	G. Smith
S36. Unravelling the Banana's Genomic Potential	3	9/2	7	37	37	81	I. Van den Bergh, M. Smith, J. Daniells, R. Miller
S37. Tropical Fruit	2	6/2	4	30	35	69	B. Nissen, S. Mitra, S. Somsri
S39. Mango	2	6/1	2	27	1	30	C. Honsho
S40. Root and Tuber Crops: Sustaining Lives and Livelihoods into the Future	2	6/1	1	35	18	54	N. Benkeblia
S42. Plants, as Factories of Natural Substances, Edible and Essential Oils	1	2/1	2	13	3	18	Á. Máthé, V. Sergeeva
S43. 3rd International Jujube Symposium	1	3/1	3	13	21	37	M. Liu, G. Yan
S52. 'Go Nuts' Symposium	2	5/2	2	24	30	56	C. Ross, M. Wirthensohn
WOCMAP S1: From Biodiversity to Finished Products - Production, Phytochemical Studies and Quality Control of Medicinal and Aromatic Plants	3	4/2	3	23	22	48	M. Deseo
WOCMAP S2: New Biological and Pharmacological Approaches to the Study of Medicinal and Aromatic Plants	3	4/1	2	17	12	31	H. Baser
WOCMAP S3: Medicinal and Aromatic Plants - The Interface between Local Knowledge, and Environmental and Health Sciences	1	2/3	1	4	24	29	M. Heinrich
TOTAL			159	1209	1206	2574	

*3 sessions were jointly held between Symposium 1 and Symposium 12. Numbers for orals and posters held in joint sessions were included in Symposium 12 totals only.

The main exhibition hall with exhibitor booths flanking the ISHS booth in the foreground, and the e-poster venue in the rear behind the black wall that is supporting the photographic competition.

A

The entertainment at the Opening Ceremony comprised content that reflected joint planning and organisation of the congress by Australia, New Zealand and the Pacific Island Nations and Territories. A. Pasifika Voices, performing arts students and their lecturer from the University of the South Pacific, entertain during the opening ceremony. B. Aboriginal didgeridoo player and accompanying performance of a traditional dance. C. Maori performer from New Zealand entertaining with a haka.

B

C

Every aspect of horticultural science was covered in the program, which focussed on the theme "Horticulture – Sustaining Lives, Livelihoods and Landscapes". Tropical horticulture was also given special attention since this was the first congress of this nature to be held in a tropical zone. The rising importance of horticulture in Asian countries in general, and in China in particular, was also a feature of the overall program. The program comprised 159 keynote presentations, 1209 oral papers, 1206 electronic poster presentations and 8 very special plenary talks by eminent international speakers (Tables 3 and 4). Special commendation is afforded to all of the symposium conveners who made such a comprehensive program possible and are now working on the preparation of the congress proceedings.

The week was arranged around 43 symposia, many of which are on the regular conference program of the ISHS. To present the entire program in five days, up to 20 concurrent sessions were held daily, and the entire resources of the Brisbane Convention and Exhibition Centre (BCEC) were required to accommodate all of these sessions. The 5th World Congress on Medicinal and Aromatic Plants (WOCMAP V) was also held in conjunction with IHC2014. In addition, 29 workshops (Table 5) and a range of other meetings were held during the week, including, for example, board meetings of GlobalHort and the HortCRSP initiative.

All fruit, vegetable and ornamental crops were well represented, as were disciplines such as production and postharvest horticulture along with plant protection and protected cultivation. Plant breeding was particularly well supported, which was not expected initially. Areas that are expanding within the ISHS portfolio were also well supported, for example, topics such as wine grapes, nut crops, plant genetic resources, and organic waste as a horticulture resource. However, areas such as biosecurity and product life cycles were not well supported, perhaps indicating the weak efforts world-wide in these topics that are critical not only for horticulture but for international trade.

Tropical horticulture was well represented with strong symposia covering banana (81 abstracts), papaya, pineapple and mango.

There were some special features of the congress that warrant particular mention. These included:

E-Posters. This was the first time that electronic posters had been used to fully replace physical posters at an ISHS congress. Overall, this innovation was strongly welcomed by delegates. E-posters were available to delegates immediately following registration on the day prior to the congress. They remained accessible on-line throughout the congress and for the following six months. This is in contrast to printed posters that are available only as long as they are on display physically (typically for only 3 days at such a conference). Aside

Table 5. Titles and chairs/organisers for each of the workshops held during the congress.

Workshop no.	Chairs/Organisers
Workshop 1: Cryopreservation and In Vitro Conservation	B. Panis, M. Lambardi
Workshop 2: Genome Stability in Micropropagation	A. Rival
Workshop 3: Screens in Horticulture	Y. Shahak
Workshop 4: Quality Planting Materials*	S. Mitra
Workshop 5: Hands-On Introduction to Functional-Structural Plant Modelling for Horticulture	J. Hanan, E. Costes
Workshop 6: Applications of Functional-Structural Plant Modelling in Horticulture	E. Costes, J. Hanan
Workshop 8: Horticultural Programming for Life-Long Education and Training	R. Kahane
Workshop 9: Lessons Learned in Horticultural Development: an Exploration of Good Practices	E. Mitcham
Workshop 10: Connecting Industry with ISHS	T. Briercliffe, E. Hewett, G. Dixon
Workshop 11: Horticulture Technology and Innovation: Regional Models for Research and Development	P. Kasemsap
Workshop 12: International Competitiveness of Horticultural Production Systems: the Agri Benchmark Horticultural Network	W. Dirksmeyer
Workshop 13: ROOTOPOWER Workshop on Vegetable Grafting: Understanding the Power of Root Traits for Producing More with Less	F. Pérez-Alfocea, I. Dodd
Workshop 14: GreenGrowing - Knowledge Transfer in the Greenhouse Industry	C. Ottosen
Workshop 15: Reproductive Biology and Genetic Control of Invasive Ornamental Plants	Z. Deng, S. Wilson
Workshop 16: Exploring Innovative Educational Programs in Horticulture for Developing Countries	A. Hunter
Workshop 17: Predicting Postharvest Storage Out-Turn of Batches of Fresh Products	A. East, J. Heyes
Workshop 18: A Glimpse of GLMMIX (with a Peak at R) for Use in Horticultural Research	W. Stroup, E. Paparozzi
Workshop 19: Strengthening Informal Seed Systems: Integrating Plant Genetic Resources Conservation within a Larger Development*	H. Jaenicke
Workshop 20: Developing Trade through Market Access R&D	D. Minnis, M. Christoe, P. Leach
Workshop 21: Global Conservation Strategies for Horticultural Crops	K. Hummer
Workshop 23: International Mango Consortium – Sequencing the Genome	D. Kuhn, N. Dillon
Symposium 33 Workshops (Sustainable Management in the Urban Forest):	
Decision Matrices to Aid Tree Managers as Climate Change	G. Moore
Urban Forest Management: Still One Tree at a Time	
Micro Organisms: Hard Workers for Tree/Plant Health that are Often Overlooked	B. Wilcock, G. Sait
Tree Body Language: an Australian Perspective	C. Humphries
Symposium 34 Workshop (Papaya): Papaya Grower Workshop	G. Kath
Symposium 36 Workshops (Banana):	
General ProMusa Workshop	I. Van den Bergh
Banana Streak Viruses and Their Impact on the Use of Germplasm	J. Thomas
The Global Spread of Tropical Race 4 and Means to Address Its Threat to Banana Production	A. Viljoen, G. Molina

*Workshops 4 and 19 were combined.

Delegates enjoying "Breakfast at the Park" at the Roma Street Parklands.

Grower involvement in the congress was very strong – here enjoying a working breakfast.

E-posters were very popular.

from on-line access, six independent monitor screens in the exhibition hall were heavily used throughout the week, indicating that many were readily able to access the posters – the touch screen monitors could also be used for "browsing" when they were not in use during formal sessions and many took advantage of that utility as well. Delegates appreciated the fact that there were no costs

The meals served at the BCEC paid special attention to celebrating the ISHS.

Executive Chef Martin Latter explaining the food policies of the BCEC at the combined Board, Executive Committee and Council dinner. The BCEC purchases all food for the convention centre from within a 100 km radius of the complex. All food is screened for quality and safety before it is prepared for consumption.

Representatives of the IHC2014 Organising Committee being introduced at the Opening Ceremony.

A "talking stick" being handed to the three Congress Co-Presidents (left to right: Emeritus Prof. Ian Warrington, Luseane Taufa and Prof. Rod Drew) by a member of the local aboriginal tribe (left) for passing on to the Executive Director Jozef Van Assche for safekeeping at the ISHS headquarters. The Talking Stick represents a cultural passport used by the ancient people of Australia. In this same spirit, we trust that it will be a passport for those in the international horticultural science community to continue the tradition of having all members of the Society treated equally regardless of race, gender or political allegiance.

involved in preparation for the digital system and no need to carry physical posters onto aircraft or when travelling.

A number of the delegates took advantage of the opportunities that the digital format offered with some using embedded video clips and animations, while some even used voice-overs where English wasn't their first language. The scope for doing a lot more in this regard will be realised as people become more familiar and confident with this mode of presentation.

A major unexpected advantage of the format was that administrators across the board accepted that the 5-minute oral presentations at the digital poster sessions were equivalent to oral presentations in the lecture rooms (whereas any presentation at a physical poster is not regarded in the same way). Hence many delegates were allowed to come to the congress on this basis and were funded to do so.

Overall the e-poster presentations were very popular. Typically around 10 and up to 30 people were at many of the presentations on the digital screens. This is far more than typically turn up to, or can be accommodated around, physical poster boards. In general, the e-poster format was very cost-effective from a budget perspective. The touch-screen monitors and related infrastructure was certainly more affordable compared with the hundreds of poster boards and large additional floor area that would have been needed with a conventional poster system. However, some lamented the fact that authors were not available at their posters for 1-2 hours as would have been the case with printed posters.

Electronic Connectedness. In addition to e-posters, abstracts for all presentations were made available to delegates electronically. This was fully searchable. The program was printed in booklet form but it too was electronically searchable and provided delegates the opportunity to construct on-line their program of sessions and events for the week.

Industry Participation. A particular feature of the congress was the strong interaction with industry in some of the sectors. This particularly applied to papaya and pineapple, to nut crops, and to turf production. Specific technical field trips and a grower breakfast were elements of their programs.

Training Sessions. Formal training sessions, involving around 20 instructors, were provided to 50 registrants from developing countries in the week leading up to the congress. These delegates came from a number of Pacific Island Nations, Caribbean countries, The Philippines, Pakistan, and Papua New Guinea. Funding sources for this training, associated travel and living costs, and registrations included the Crawford Fund (Australia), the CTA Scientific Committee (Technical Centre for Agriculture and Rural Cooperation – ACP countries and EU), and ACIAR (Australian Centre for International Agricultural Research). Courses covered both Production Horticulture, and Postharvest Horticulture and included participation in the congress technical tours.

Volunteers. More than 100 volunteers were available to provide delegates with a range of support including an airport welcome, an "Ask Me" service, help with English language (especially to Chinese delegates), and support at the e-posters.

Theming. Spectacular garden and floral displays within the BCEC (especially in the foyer, exhibition hall and great hall) emphasised the overall horticultural science theme of the event – even the main stage was covered in specially maintained turf throughout the week. Large photographic images of horticultural crops decorated the foyer and main exhibition hall. A special photographic competition based on horticultural subjects was also held.

Tours. The one-day technical tours were very popular. These included visits to enterprises involved with subtropical fruits, macadamia nuts and berries, vegetables, turf, landscape, plant nurseries, urban horticulture (botanical gardens, parks), organics and pineapples. Regrettably, only the post-congress tours within Queensland were adequately subscribed.

Table 6. Members of the IHC2014 Organising Committee*.

	Portfolio	Affiliation
Prof. Rod Drew	Co-President	Griffith University, Australia
Emeritus Prof. Ian Warrington	Co-President	Massey University, New Zealand
Ms. Luseane Taufa	Co-President	Ministry of Agriculture, Tonga
Ms. Jill Stanley	Vice-President – Scientific	Plant & Food Research, New Zealand
Dr. Russ Stephenson	Vice-President – Operations and Industry Liaison	Dept. of Agriculture, Fisheries and Forestry, Australia
Mr. John Chapman	Finance and Sponsorship	Dept. of Agriculture, Fisheries and Forestry, Australia
Mr. Nick Macleod	Treasurer	Dept. of Agriculture, Fisheries and Forestry, Australia
Dr. Robin Roberts	Volunteers and Community Engagement	Griffith University, Australia
Ms. Elizabeth Smith	Horticulture and Garden Display Coordinator	Horticulture Training, Australia
Prof. Peter Batt	Scientific Liaison	Peter J. Batt and Associates, Australia
Prof. Julian Heyes	Scientific Liaison	Massey University, New Zealand
Dr. Richard Markham	International Aid Liaison	ACIAR, Republic of the Fiji Islands
Dr. Alistair Gracie	International Aid Liaison	University of Tasmania, Australia
Prof. David Aldous *(In Vale)*	Communications and Marketing	Australia

* Acknowledgement is also given to the valued inputs of Dr. Peter Oppenheim, Dr. John Palmer, Mr. Tony Biggs, Mr. Gerard McEvilly and Mr. Bob Martin.

Delegates celebrating the end of a highly successful week at the gala dinner.

Turkish entertainment to celebrate the handing over for IHC2018.

The International Horticulture Congress is a major undertaking. IHC2014 was 8 years in the making and involved a budget of $Aust 4.4 million (or € 3.0 m). It also involved hundreds of hours of voluntary effort by many people over that time. The involvement of the professional congress organizer, ICMS Australasia Ltd, ensured that the highest standards were achieved in all aspects of this major event, including arranging the spectacular performances at the opening session and at the farewell gala dinner. Very special thanks is extended to the members of the main Organising Committee (Table 6) who shared the range of responsibilities involved and ensured that such a large and diverse event was a success. We offer our full support and best wishes to the organisers of IHC2018 in Turkey.

2010-2014 Board Report to the General Assembly – Brisbane

António A. Monteiro, Past President of ISHS

A video of the General Assembly is available at https://www.youtube.com/user/HorticulturalScience

The 2010-2014 ISHS Board. From left to right: Jozef Van Assche, Executive Director; Ian Warrington, Co-President of IHC2014; Georg Noga, Treasurer; Kim Hummer, Vice-President; António Monteiro (standing), President; Yves Dejardins, Responsible for Publications; Errol Hewett, responsible for Innovation, Industry and Insight.

As required by the Statutes of ISHS, the 2010-2014 President convened the General Assembly on August 21, 2014, during the 29th International Horticultural Congress, in Brisbane, Australia.

The major purpose of the General Assembly is to inform ISHS members of the activities of the Society during the four-year period between congresses. It is also the opportunity to announce the location of the forthcoming congresses (IHC2018, 12-16 August 2018, Istanbul, Turkey and IHC2022, 14-20 August 2022, Angers, France), to acknowledge the outgoing Board and Executive Committee members and the IHC2014 Presidents, Organizing Committee and PCO staff members for their years of service to the Society, to present the ISHS Awards, to proclaim the names of the newly elected officers of the Society and finally to install the new Board. Since most of these activities have already been reported in *Chronica Horticulturae*, this article will focus on the report detailing the actions and achievements of the Board and the Society, which is required to be formally accepted by the General Assembly.

2010-2014 President Monteiro led the presentation of the Board's report. He started with a summary of the most important achievements of the ISHS during the past four years, followed by a comment on the main challenges and opportunities facing our Society. The floor was then handed to other Board members, who reported on their specific responsibilities. This text quotes part of their presentations.

THE ISHS TO FILL THE GAP BETWEEN SCIENCE AND INDUSTRY

Horticulture products such as fruits, vegetables and flowers are very popular and have a very good image with consumers. They are also an important economic pillar and fulfil the basic needs of the world's population. However, very few people understand horticulture and know about the science and the industry behind these

António Monteiro, ISHS President 2010-2014.

lovely products. The lack of understanding about horticulture is not limited to consumers, but also includes scientists and policy makers. Our Society has to deliver a strong message to

The organizing team of IHC2018, Istanbul, Turkey. From left to right: Prof. Gokhan Soylemezoglu, Prof. Ayse Gül, Prof. Yüksel Tüzel, Prof. Uygun Aksoy and Assoc. Prof. Masum Burak.

From left to right: The IHC2014 Co-Presidents, Rod Drew, Luseane Taufa and Ian Warrington, and the 2010-2014 ISHS President António Monteiro.

the rest of our world about the high value of horticulture. The ISHS publication "Harvesting the Sun" was a firm step in that direction, as explained below.

Horticulture chains are increasingly complex, demand rapid product innovation and integrate many new components. This creates vast opportunities to apply scientific knowledge, making horticulture a relevant target for top quality research. The areas of science that are involved in horticulture are dispersed throughout academia and include multi-disciplinary knowledge, some of which is so distant from the final application that many scientists who are producing useful knowledge in horticulture, do not realise they are part of horticulture science.

Also, the paradigm of traditional university departments and state laboratories focusing on horticulture is changing very rapidly and the relationship between science and horticulture innovation is currently managed according to open and informal models. As a result of this new situation, the abundant and widespread fields of science required to service horticulture, become difficult to identify because most of the time an appropriate interface is missing.

This is good news for the ISHS due to the new opportunities being offered. Our presence is needed more than ever to fill the gap left by the closure of traditional institutions devoted to horticulture. The ISHS as a knowledge broker plays a key role in the interaction between knowledge providers and knowledge users wherever they are. ISHS meetings attract a diversified audience and, together with its publications, create an ideal forum to integrate knowledge and to make it easily accessible.

THE FOUR PILLARS OF BOARD ACTION

The ISHS Board established a strategic plan and recognised the need to focus activity on key priorities. This was done by defining the following four pillars for Board action:

Pillar 1 – To update IT and social media for efficient communication and adequate support of *Acta Horticulturae* and ISHS journals.

Pillar 2 – To actively involve Chairs of S&C in the preparation of fewer and better ISHS meetings to launch the "ISHS 2nd Generation Symposia".

Pillar 3 – To increase participation of industry in ISHS activities and events.

Pillar 4 – To establish an ISHS scientific journal and to recover the image of *Acta Horticulturae* as proceedings.

The Board gave priority of ISHS resources to the quality of meetings and competitiveness of publications, with the objective of closing the gap between science and horticulture innovation. Neglecting these core activities would have affected the general performance of the Society and its capacity to continue providing these valuable products and services to the horticultural scientific community.

SCIENTIFIC ACTIVITY

Dr. Kim Hummer, 2010-2014 Vice-President of the ISHS, summarised the most important achievements in ISHS scientific activity. Quoting her own words: *"These past 4 years have been a great opportunity for me as the first woman Vice-President of the International Society for Horticultural Science. I have greatly appreciated working with my fellow Board members, chairing the Executive Committee (EC), and representing the Society at scientific functions. I commend the dedication and sincerity of each of the volunteers in these managerial positions. I have been amazed at the high quality ISHS symposia that continue to occur at the average rate of about 1/week each year. The Acta Horticulturae, as printed books and on-line publications, produced from these symposia, are a great horticultural scientific record of historical note; they provide the backbone of strong financial support for our Society".*

Dr. Hummer also explained that during this term the EC members developed a responsibility statement for their positions. This will be useful for orienting newly elected committee members to their tasks. The reduced world economic climate has brought corresponding reductions in the EC structure. We have made the difficult decision to reduce the number of Sections by one and change one of the Commissions to a "Special Commission" that meets half as frequently. We encouraged EC members to coordinate their symposia to have larger, more effective meetings – rather than smaller, too frequent ones. Our new on-line submission of abstracts and manuscripts will enable speedier preparation of the final *Acta* without loss of manuscripts.

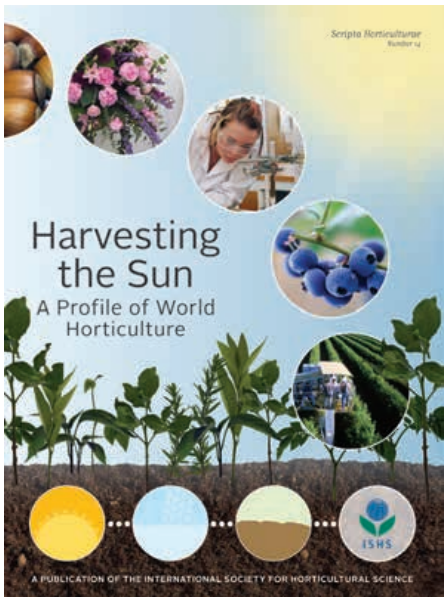
During this term we have increased the gender, racial, and ethnic diversity of the Society's managers. An Asian representative has been added to the new Board, which also includes two females (more than ever before at one time). In addition, a female has been appointed as Convener of the next International Horticultural Congress. Representatives of the EC are also more diverse than previous ECs.

As the Board term ends, we feel that the science continues to be of the highest quality and I look forward to the continued development of the Society in the digital age.

ADVOCACY AND MEMBERSHIP

Professor Errol Hewett, the 2010-2014 Board member responsible for innovation, industry and insight, explained Board activity related to advocacy for horticulture and membership in the Society.

António Monteiro, ISHS President 2010-2014, presents the ISHS Mass to Rod Drew, ISHS President 2014-2018.



Harvesting the Sun is freely available for ISHS members to view, use and share.

Harvesting the Sun

The ISHS Board made a big effort in advocating for horticulture by producing "Harvesting the Sun", a publication already known to ISHS members. In addition to the book there are leaflets available that can be translated and adapted to horticulture situations in various countries.

It is pleasing to report that the video based on the publication "Harvesting the Sun" is now on-line at You Tube and can be accessed at https://www.youtube.com/user/HorticulturalScience

All members need to be made aware that this is available for them to view, use and share. We need to encourage the use of social media links to spread the information to a wider and more general audience. Members are encouraged to get these resources into schools where careers advisory people can use them for student guidance.

Membership

Latest figures indicate a net decline in member number of 1,054, from the peak of 7,346 in 2009 to 6,292 in December 2013. During this same period 7,659 lapsed memberships occurred at an average of 1,915 per year. Membership remains a key concern for the Board and needs to be monitored closely. There have always been fluctuations in membership but in the past few years this has become a more serious issue and the numbers involved are alarming. It is clear that many of the lapsed members are those people who joined ISHS to receive reduced cost of registration at symposia; in particular this probably applied to the Lisbon Congress. However, whatever the reason, the benefits of continued membership were not recognised or were not sufficient to persuade these individuals to renew and maintain their membership. This is in spite of the fact that we have identified a potential cost benefit of € 375 per year for full active membership.

Corporate Membership

The ISHS survey undertaken in 2011 indicated that private sector participants valued membership of ISHS for two main reasons: linking with university scientists; and networking with other industry colleagues. Also of importance was that discussions can lead to collaborative projects with university/government scientists. The relationship of ISHS with industry is a critical factor for increasing the attractiveness of our meetings and the impact of our activity in the scientific development of horticulture. A substantial number of our members come from industry and we also know that some of the most successful symposia have strong industry involvement. The Council has approved Board recommendations to establish a corporate membership category as a firm step towards an institutional relationship with industry. A workshop entitled 'Linking industry and ISHS' was held at this Brisbane Congress and the report from this event will make specific recommendations to the new Board on the benefits for corporate members and their interaction with the Society.

PUBLICATIONS

Professor Yves Desjardins, the 2010-2014 Board member responsible for publications, presented the highlights of the ISHS publication-revolution carried out by the Board over the past four years.

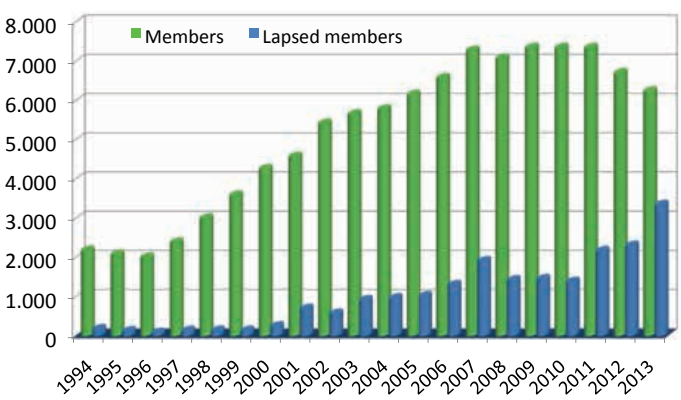
ISHS Publications Visual Signature

The new strategy of ISHS relative to publications will be manifest starting in 2015. In order to make a strong statement about the proposed changes, a new standardised visual signature was developed with the objective of creating a common visual identity for all of the Society's publications.

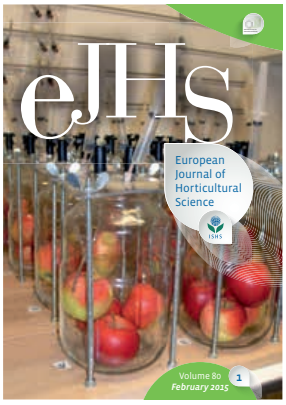
Acta Horticulturae On-line Manuscript Publication

The Board has developed a new on-line submission system for *Acta* that will hasten publication with an ultimate goal of providing a printed version of the *Acta* Proceedings the day of the symposium. However, to avoid the rush of printing and book delivery to the convener before a symposium, a transient procedure should be adopted. Briefly, once a manuscript has been reviewed by the *Acta* reviewers and processed by the Secretariat's staff, it can be published ahead-of-print on the *Acta* symposium website. This is probably the quickest way to publish reviewed manuscripts rapidly before definitive print. These on-line papers are the definitive versions; they do not change before appearing in print and can be referenced as soon as they appear with their DOI. This is the "new" *Acta Horticulturae* that should focus on quick and informal information, making oral and poster presentations available worldwide in real time, which could later be further elaborated as full content articles and published in ISHS scientific journals.

Membership statistics.



ISHS collaborate journals.



ISHS publications visual signature.

Publications of Scientific Journals

The ISHS has acquired the European Journal of Horticultural Science (eJHS) and the terms of the contract signed by the Society and the German Society for Horticultural Science, the formal journal owner, essentially give full control of the journal to ISHS who will become on the 1st of January 2015 the owner of the journal. In the meantime, the ISHS has also signed a partnership agreement with the Trustees of the Journal of Horticultural Science and Biotechnology (JHSB) for the joint publication of this prestigious journal. For the first time, the Society is in a position to offer its members direct access to prestigious scientific journals.

Scientific Editor/Coordinator of *Acta Horticulturae*

Because the *Acta* manuscript submission system (MSS) will be fully functional by the 1st of January 2015, the ISHS needs to fill the position of ISHS/*Acta* Science Editor (SE). Considering the new journal acquisition and partnerships, integration of JHSB and eJHS into the ISHS publication portfolio, and implementation of *Acta* MSS, this person will be responsible for the supervision of the publication of *Acta* using MSS, and also the coordination of the publication of the refereed journals of the Society. The SE will work with conveners and symposia editorial committees to assist them in the use of the on-line submission system, identifying and solving bottlenecks in the review process, and solving specific publication issues concerning *Acta Horticulturae*. The SE will also cooperate closely with the Editors-in-Chief of the journals to coordinate in respect to editorial policy and publication standards. For the first time the ISHS will have a person devoted to implementation of a consistent publishing policy.

The ISHS Becomes a Publishing House

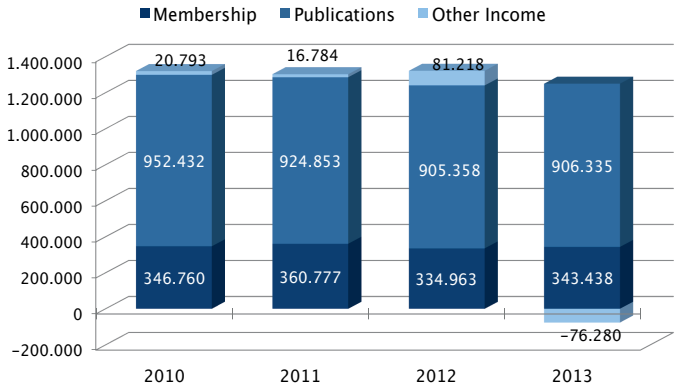
Now more than ever, ISHS is becoming a hub for the publication of horticultural information and content. Clearly, ISHS is playing the role of a publishing house through PubHort and *Scripta Horticulturae*. Why should our members be mobilized and mandated to write or edit books by other publishing organizations when our Society now has the full capacity to provide this service? Indeed, ISHS has the potential to become a major publisher in the field of horticulture and should take this opportunity. Apart from building on the investment already made in our electronic submission and editing system, it is clear that ISHS can play the role of a science information broker and provide opportunity to our members to publish books in specialized areas. For example, in the coming months ISHS will publish an English version of the Italian book "Arboriculture Generale" edited by Silviero Sansavini. More than ever the Society is open to proposals for horticultural books.

FINANCES

Finally Prof. Georg Noga, the 2010-2014 ISHS Treasurer, presented an overview of the financial situation of the ISHS during the years 2010-2013.

Balance Sheet 2010-2013

For 2013 and the previous years the balance sheet shows a healthy organization. Equity, i.e. the accrued net result, shows a satisfying development, from € 1,071,290 in 2010 to € 1,195,477 in 2013. The goal set by the Board and approved by Council, to have one year's turnover in reserve and have a sound basis for



ISHS income 2010-2013.

Table 1. Balance sheet 2010-2013.

	2010	2011	2012	2013
ASSETS				
Current assets				
Cash and deposits	1,458,579	1,601,607	1,455,299	1,395,675
Accounts receivable/prepayments	93,812	71,634	47,988	178,495
Inventories	39,722	52,167	74,577	56,283
Total	1,592,113	1,725,408	1,577,864	1,630,453
Long term assets				
Long-term receivables	30,063	27,896	125,500	3,000
Property, plant and equipment	44,353	33,841	20,220	10,936
Intangible fixed assets	-	-	-	6,684
Total	74,416	61,737	145,720	20,620
TOTAL ASSETS	**1,666,529**	**1,787,145**	**1,723,584**	**1,651,073**
LIABILITIES AND EQUITY				
Current liabilities				
Accounts payable & accrued charges	595,239	685,095	552,468	455,596
Equity	1,071,290	1,102,050	1,171,116	1,195,477
TOTAL LIABILITIES AND EQUITY	**1,666,529**	**1,787,145**	**1,723,584**	**1,651,073**

Table 2. Profit-and-loss account 2010-2013.

	2010	2011	2012	2013
REVENUES				
Contribution members (dues)	346,760	360,777	334,963	343,438
Sales	952,432	924,853	905,385	906,335
Other income	20,793	16,784	81,218	-76,280
Total	**1,319,985**	**1,302,414**	**1,321,566**	**1,173,493**
EXPENSES				
Costs books	226,522	177,373	214,881	224,533
Personnel costs	578,286	558,711	561,381	532,931
Office costs	142,045	135,330	138,352	144,880
Depreciation	13,498	14,824	14,447	13,386
General management costs	252,466	239,405	256,425	244,123
Changes in provisions	94,328	146,013	67,014	-10,721
Total	**1,307,145**	**1,271,656**	**1,252,500**	**1,149,132**
Result: Revenues over Expenses	**12,840**	**30,758**	**69,066**	**24,361**

future developments, was reached. The value of cash and deposits grew from € 1,240,757 at the end of 2009 to € 1,395,675 at the end of 2013. However, ISHS reached a peak of cash on hand in 2011, with an amount of € 1,601,607, followed by 2010 and 2012 with € 1,458,579 and € 1,455,299, respectively.

Investment Portfolio

The value of the reserves in the ISHS investment accounts slightly increased from € 1,029,071 at the end of 2010 to € 1,062,308 at the end of 2013. However, for the years 2011 and 2012 the value of ISHS investments was € 1,277,715 and € 1,201,762, respectively.

Profit-and-Loss Account 2010-2013

During the period of 2010-2012 both revenue and expenses remained stable. Only in 2013 did finances of the Society experience a decrease in both revenue and expenses. It should be mentioned that this plunge in revenue for 2013 was caused by a decrease in the investment portfolio (gold) of € 100,741. Revenue from membership and sale of the Society's publications remained stable throughout the last 4 years.

Income 2010-2013

As in previous years, a breakdown of the income into membership/Society-related results and publications-related results shows that the majority of ISHS income is generated through publications. When looking at the Society´s net income (also taking into account working hours devoted by staff in the Secretariat and expenses involved), it becomes clear that the expenses incurred by membership/Society-related activities are more than compensated for by the revenue gained from publications-related activities.

Relation between Turnover and Investments

The evolution of our investment portfolio shows that the goal set by the Board and approved by Council, of having one year's turnover in reserve and having sufficient reserves to deal with unforeseen financial problems, has been met successfully.

Conclusion

The accounts of the Society are in good shape. Revenue has exceeded expenses in the past few years, and the goal of achieving one year's turnover in safe reserves has been accomplished. The negative result from Society/membership-related activities (including costs of personnel at the Secretariat) is more than compensated for by the positive contribution from publications-related activities.

Acknowledgement

The 2010-2014 Treasurer very much appreciates the professionalism and dedication of the ISHS team at the Secretariat and the great support experienced during the term while serving the Society as a Board member.

We look forward to meeting you again at IHC2018 in Turkey!

The name HortiKoala for the little koala IHC2014 mascot came from Vera Sergeeva.

A Report on IHC2014 from HIA Ltd.: the Major Sponsor

This year's return of the International Horticultural Congress to Australian shores after 36 years delivered enormous opportunities for growers, researchers and industry bodies such as Horticulture Innovation Australia Limited (HIA Ltd.). HIA Ltd., which is one of 15 Australian Research and Development Corporations, invests more than $100 million in research, development and marketing programs annually.

As a major sponsor, HIA Ltd. has contributed a total of $1.7 million in voluntary contributions, industry levies and government matched funds to the Congress over the past 13 years. This funding assistance was bolstered by in-kind support from HIA Ltd. staff, who worked closely with the IHC2014 secretariat in the lead up to and during the event.

"With over 3,000 national and international experts converging in Brisbane for the event, IHC2014 can only be described as the Olympics of horticulture," said Brad Wells, who represented HIA Ltd. on the IHC2014 organising committee.

Selwyn Snell, HIA Ltd. Chairman.

HIA Ltd. staff. From left to right: Brad Wells, Jo Houssenloge, Ben Callaghan and Greg Murdoch.

"Horticulture is Australia's third largest agricultural industry with a GVP of just below $10 billion per annum. Our annual investment in research and development is predominately domestic in focus, however we have started to place a lot of emphasis on developing international links with research leaders in their field and connecting them to growers.

IHC2014 bought all of these people together and for five fantastic days, we were able to network, learn and share our research learnings, challenges and opportunities. The long term benefits of these networks will be felt in years to come, not just in Australia, but globally."

Contact

Horticulture Innovation Australia Limited (formerly Horticulture Australia Limited), Level 8, 1 Chifley Square, Sydney NSW 2000, Australia

IHC2014 Pre-Congress Training for Developing Country Scientists

Russ Stephenson and Geoff Bulow

Geoff Bulow instructing the Production Horticulture class.

Bob Nissen (rear) watches over the Postharvest Horticulture class at work.

In the lead up to the 29th International Horticultural Congress, two live-in horticultural training short courses were conducted from 13-15 August, 2014, in Production and Postharvest Horticulture. They were held at Mapleton, which is located in the Sunshine Coast hinterland, 110 km north of Brisbane.

Forty one (41) participants from South Pacific nations, Asia, the Caribbean and Pakistan attended the courses, with 17 and 24 trainees on Production Horticulture and Postharvest Horticulture courses, respectively. The following countries were represented: Fiji (11), Samoa (6), Vanuatu (2), Solomon Islands (3), Papua New Guinea (5), Cambodia (1), Philippines (4), Trinidad (1), Jamaica (2), Pakistan (6). Both male and female participants, covering a range of experience and education qualifications, attended.

Instructors were drawn from the Queensland Departments of Agriculture Fisheries and Forestry (DAFF), Science, Information Technology Innovation and the Arts (DSITIA), The University of Queensland, the University of Canberra, the University of Tasmania, the University of Agriculture, Pakistan and the private sector, all at no charge.

Russ Stephenson, as Congress Vice-President (Operations), had many responsibilities in addition to the pre-congress training. Consequently, Geoff Bulow agreed to fill the role of Chief Instructor responsible for the conduct of the training, which was greatly appreciated. Geoff, ably supported by Bob Nissen, discharged this role with distinction and provided the leadership and guidance that resulted in an outstanding training event.

Dr. Peter Hofman and Dr. Andrew Macnish organised the content for the Postharvest Horticulture course, based on the University of Queensland curriculum. Dr. Al Gracie provided the basic course outline for the Production Horticulture course, based on the University of Tasmania curriculum. We are particularly grateful to the extensive list of friends and colleagues who presented training modules and assisted with course preparation and delivery: Dr. Andrew Macnish (Senior Instructor and co-ordinator Postharvest Horticulture course), Prof. Steven Underhill, Dr. Muhammad Amin, Dr. Robert Fitzgerald (by Skype), Dr. Aman Malik, Ms. Jodie Campbell, Mr. Terry Campbell, Mr. Tony Cooke, and Mr. Ian Wells (Instructors Postharvest Horticulture course) and Dr. Al Gracie, Dr. Phil Moody, Dr. Chris Menzel, Dr. Mark Boesema, Mr. Johannes Biala, Mr. Bob Nissen, Ms. Tegan Kukulies and Dr. Russ Stephenson (Instructors Production Horticulture course). They all gave freely of their time and expertise in delivering an excellent training course.

Participants were not assessed on the knowledge gained from the course but were required to develop a "learning project" to be implemented on return to their workplace as a method to increase the application of knowledge.

A formal evaluation was conducted to assess the participants' views about the usefulness of the training. Overall the evaluation from attendees was that the course was very well received and provided relevant concepts and ideas that could be applied in their home countries. Many of the attendees suggested the need for more courses, but of a longer timeframe, so that more opportunities could be provided to practice skills. Several attendees were interested in a combined production and postharvest course as they identified the intrinsic links between production and final product quality.

These courses would not have been possible without funding and sponsorship from the Australian Centre for International Agricultural Research (ACIAR), the Crawford Fund, Centre Technique de Cooperation Agricole et Rurale (CTA) and over 228 days (by organisers and instructors) in-kind and material support from the Queensland government, Australian universities and private organisations. I hope the course outcomes provide a sound return on the investment for many years to come for both trainees and funding bodies.

Contact

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Volunteers Come Out in Force to Help at the International Horticultural Congress

Amy Mitchell-Whittington, reporter from Griffith University Journalism School

The IHC2014 organizers sent out a call for volunteers and were overwhelmed with the number of people wanting to be a part of this exciting and unique experience in Brisbane.

The Congress was held from 17-22 August 2014 and showcased a range of international scientific and research developments in the field of horticulture. Over 3,000 scientists and researchers from around the world gathered at Southbank for the week-long Congress, precipitating the need for volunteers at this prestigious event.

IHC2014 Executive and Volunteer Co-ordinator, Dr. Robin Roberts, said that the benefits of the Congress extended beyond the principal business of presenting international research papers. "The volunteer's role in an event of this size was a necessary value-add that lifted the Congress from being good to great. The volunteers took their mission to heart and delivered a significant contribution to the overall success of the Congress", Dr. Roberts said. "Based on the feedback we have received, the enthusiasm, friendliness and helpfulness of the volunteers left a lasting impression in the minds of the many delegates and their partners who attended the event in Brisbane".

The Congress drew volunteers from differing areas of education, work, interests and cultures in the name of collaboration and opportunity, with the anticipation of interacting with globally recognized scientists and researchers.

Recently completed PhD student, Michele Bruschi, said the Congress represented what Australia meant to him and he thoroughly enjoyed being involved in it. "The Congress represented my idea of Brisbane and Australia, as in the gardens, the good climate and permaculture", Dr. Bruschi said. "I thought it would be a good way to contribute, to learn, to expand my networks and gain new knowledge".

Keen exotic fruit grower, Lou Madjeric, is a member of the subtropical fruit club of Queensland and said he enjoyed trying out volunteering for the first time. "There was a conjunction of a few areas of interest for me, one is the horticultural aspect and the other is the volunteering aspect", Mr. Madjeric said. "I wanted to get some sense of what volunteering is all about".

Griffith University Engineering and Commerce student, Rishka Qazi, volunteers regularly. "I believe you should always volunteer because you gain new experiences and you get to meet new people and learn new things", Ms. Qazi said. "I wanted to gain different experiences and see what horticulture is all about".

IHC2014 volunteer team training session, August 2014.

Dr. Roberts said the inclusion of a volunteer program made a significant contribution to the overall success of the IHC2014 Congress. "Whether it was the younger people taking selfies with leading scientists or the older people engaging with internationally renowned researchers, there was something for everyone and I believe the visitors and the volunteers both had an exciting time", Dr. Roberts said.

The wealth of knowledge presented by the science community combined with the hospitality and warmth of the volunteers set against the relaxed backdrop of the scenic city of Brisbane delivered a memorable event.

Thank you to all who contributed his or her time, effort and energy for IHC2014. We look forward to reconnecting with everyone at the 2018 International Horticultural Congress in Turkey!

Contact

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Miklos Faust Travel Award for Young Pomologists Presented at IHC2014

Norman E. Looney, Past President of ISHS

The Miklos Faust Travel Award for Young Pomologists was established in 2001 to honor the life and outstanding career of Miklos Faust (1927-1998). Dr. Faust, who received his post-graduate degrees at Rutgers University (MSc 1960) and Cornell University (PhD 1965) was a Chief Scientist of the USDA Fruit Laboratory at Beltsville, Maryland until 1992. However, he did not arrive in the USA until after his 30th birthday, having received his basic education in horticultural science in his native Hungary. Circumstances in Hungary (the Hungarian Uprising of 1956) precipitated his migration to America in 1957 and gave him a life-long appreciation of the importance of providing opportunities for young scientists to develop their career through international travel and collaboration. The achievements and lasting impact of Miklos' work have been summarized by Dr. Amnon Erez in his "Dedication to Miklos Faust 1927-1998" that appeared in *Acta Horticulturae* volume 513 (1998).

Dr. Jens Wünsche congratulating Dr. Graciela da Rocha Sobierajski.

The Faust Award was first presented at the 26th International Horticultural Congress (Toronto 2002) and has been awarded at each subsequent IHC. The terms of reference for this Award speak to the importance of providing an opportunity for a young fruit crops scientist to attend the International Horticultural Congress and, when possible, for travel to an annual meeting of the American Society for Horticultural Science. The Award is managed by a team of senior scientists chaired by Dr. Dariusz Swietlik of the USA. Judges for the 2014 Award were Norman Looney, Silviero Sansavini, Jules Janick and Carl Sams. The endowment for the Faust Award is managed by the American Society for Horticultural Science.

The winner of the 2014 Award is Dr. Graciela da Rocha Sobierajski of Brazil. Dr. Sobierajski is engaged in peach, nectarine and macadamia nut breeding at the Agronomic Institute of São Paulo State. Travel to Australia to participate in the IHC gave her the added opportunity to meet face to face with a new collaborator, Dr. Bruce Topp who is breeding low chill peaches with the Queensland Department of Primary Industries. Following the Congress they were able to spend time together at the Maroochy Research Station at Nambour, Queensland.

Dr. Norman Looney introducing Dr. Graciela da Rocha Sobierajski.

Dr. Sobierajski was introduced during the General Assembly and again at the gala dinner on the last night of the Congress. During that gala event she was also congratulated by Dr. Jens Wünsche of the University of Hohenheim. Dr. Wünsche was the inaugural winner of the Faust Award.

Less Can Make More – Revisiting Fleshy Fruit Quality and Irrigation in Horticulture

Laurent Urban, Michael Staudt, Julie Ripoll, Félicie Lopez-Lauri and Nadia Bertin

Global climate change entails many threats and challenges for the majority of crops. Above all, a reduction in yield is expected in many parts of the world, and drought is generally believed to represent one of the most important negative results of climate change. Fruit crops will certainly also suffer from the increased extension of drought conditions; however, yield is arguably not as important for fruit as for grain crops or oil crops. Yield does matter for fruit crops, but quality criteria are as important if not more important. Fruits are expected to supply health benefits and to bring hedonistic pleasures associated with specific aromatic compounds. We may thus distance ourselves from the dominant deleterious effect of drought on crop performance and consider the potential benefits. Fruits from drought-stressed plants may in particular display a higher content in health-promoting phytochemicals. The stimulation of secondary metabolism following water stress may also be beneficial to plant natural defences. However, current results also strongly suggest that taking advantage of stress will require a better understanding of the underlying mechanisms of drought adaptation. Conducting laboratory studies on the effect of a single severe stress applied during a very short period of time should be avoided in the future. Instead, one should examine the effects of variable and repeated periods of drought applied at different stages of the crop cycle, possibly in combination with other forms of stress, as these conditions reflect free living crop conditions more accurately. Integrated models must be developed to address the complexity of adaptation processes involved and to generate novel research ideas and avenues for plant physiologists. We also require novel monitoring tools to assess the level of fruit/plant stress, such as volatile organic compounds (VOC) signatures and parameters derived from measurements of chlorophyll fluorescence. Fortunately, the information analysed as part of this review is sufficiently mature and promising to encourage researchers shifting their approach to drought research versus fruit quality.

INTRODUCTION

Horticulture is facing increasingly frequent periods of drought, and in the future, water shortage is expected to exert the most adverse impact upon plant growth and productivity. In many countries where lack of water is not yet critical, crops are currently irrigated in excess to promote plant growth; however, this irrigation may be detrimental to crop quality and water resources around the world. A considerable amount of water could be saved by increasing water use efficiency (WUE) (FAO website). For instance, regulated deficit irrigation and partial root drying have been proposed to reduce water consumption in fruit orchards and to stimulate plant adaptation to stress-prone environments. These strategies are promising but they have insufficiently been "explored" to preserve yield while maintaining high crop quality. Based on our knowledge of the mechanisms involved in plant and fruit responses to water deficit (WD), we believe other irrigation strategies involving a greater reduction in water supply could be developed. Moreover, we propose a re-examination of the commonly held assumptions concerning the amount of water required to obtain high crop performance in light of current knowledge of the effect of drought on quality criteria, such as the content of phytonutrients.

A wealth of studies have compared the behaviour of different plant species under well-irrigated and deficit irrigation conditions. The molecular responses to drought have been intensively investigated in many species and numerous responsive genes have been shown to be involved in complex signaling and metabolic pathways. Yet, to date, only a few candidate genes for stress resistance have been characterized; the links between gene or protein expression and plant or organ phenotype under field conditions are still poorly understood. At the plant or organ level, many studies have discussed the overall negative impact of WD on yield, which leads to reduction or even cessation of growth or even plant death or organ abortion under extreme conditions. One of the major and most well-documented effects of drought is stomatal closure, which decreases transpiration and maintains water balance. However, this positive effect comes at a price: a reduction in net CO_2 uptake. A decrease in net photosynthesis not only translates into a decrease in carbon supply to the fruits, it also creates conditions leading to photo-oxidative stress. Because oxidative stress stimulates the accumulation of antioxidant compounds, many descriptive studies suggest that water stressed plants may have higher health value (Nora et al., 2012). For instance, a recent review (Wang and Frei, 2011) outlined some typical patterns in crop-quality response to several abiotic stressors and indicated a tendency towards a loss in taste but an increase in nutritional value. Thus, trade-offs between crop yield and quality might be achieved under controlled WD conditions provided that growers have access to quantitative information related not only to productivity but also to crop quality. Since one single stress factor rarely occurs in isolation in the field, several complex interactions and feedback cycles involved in plant responses should be considered. Following this approach, experiments should strive to replicate field conditions whereby plants are progressively exposed to stress and soil dehydration through repeated alternating stress and recovery cycles that occur during different stages of plant development. This would have the added advantage of taking into account the cumulative or transient effects that are integrated by the plant throughout the crop cycle.

We present here a few mechanisms by which WD may affect quality criteria of fleshy fruits (soluble sugars, organic acids, phytochemicals, VOC and texture) and we examine the numerous factors that impact on the complex balance between productivity, adaptation to stress and quality under WD (stress intensity, duration and repetition of WD periods, stage of plant development during the period of WD, genetic factors and other co-occurring stresses).

THE IMPACT OF WATER DEFICIT ON PROCESSES UNDERLYING FRUIT ORGANOLEPTIC QUALITY

Important characteristics of fruit organoleptic quality include external appearance, size, texture and taste underpinned by a number of physiological processes that are regulated by

High yields make it possible to offer to consumers produce at lower prices.

complex ontogenetic programs and in response to environmental conditions (Génard et al., 2007). While the negative effect of WD on plant growth and fruit yield is acknowledged, the effects of WD on fruit quality are highly variable and occasionally conflicting due to the large number of underlying processes that interact during fruit development and the timing and intensity of WD and because different species show different sensitivities (Ripoll et al., 2014).

The Effect of Water Deficit on Fruit Development and Growth Processes

Cell division, cell expansion and ripening are the main stages of fruit development and they determine the final size and composition.

In grape berries (*Vitis vinifera* L.), negative or no effects of WD on cell division were reported depending on the timing of treatment. There was also no impact of WD on olives (*Olea europaea* L.) and pear fruit, unless severe stress was imposed. In this case, the induced carbon starvation may negatively regulate cell division, as has been observed in tomato fruit at the gene and tissue levels. On the contrary, cell expansion is clearly restricted in fruits grown under WD, as has been observed in olives, pears, grapes and tomatoes. WD may affect tissue expansion via its effects on the biophysical, metabolic and hormonal processes involved in the regulation of cell turgor and osmotic pressures and cell wall extension. Finally the onset of fruit ripening is hastened by WD, for instance in peach (*Prunus persica* L.), apple (*Malus domestica* B.) and detached avocado (*Persea americana* M.). These effects are brought about by stress-induced increase in endogenous ethylene, which plays an important role in the coordination of fruit-ripening processes in many fruit crop species, including climacteric (e.g., tomato, apple or banana) and non-climacteric (e.g., strawberry, citrus or grape berries) fruits.

The Effect of Water Deficit on Fruit Texture

Fruit texture is a primary determinant of consumer acceptance, and greatly impacts organoleptic quality, flavour, aroma perception, shelf-life and transportability. Several descriptive studies have reported significant but contrasting variations in fruit firmness (physical component of texture) under WD. For example, WD increases the firmness of pears but not apricots, kiwifruit and apples. The most likely hypotheses explaining these contrasting responses are that WD impacts texture through different effects on cell size, cell turgor, solute transport and the accumulation of osmotically active solutes at the cell level. Indeed, a positive link between dry matter or total soluble solids (TSS) and firmness was reported for tomato and kiwifruit. In addition, drought stress has been shown to cause alterations in the chemical composition and physical properties of the cell wall. The oxidative stress-induced accumulation of antioxidant compounds, which prevent oxidative damage, may also affect texture. For example, ascorbate has been shown in vitro to solubilise tomato pectins, a response that may explain the positive correlation between fruit firmness and reduced ascorbate content observed in tomato in response to postharvest chilling injury. The effect of water supply during fruit growth on postharvest texture is an additional important factor. Kiwifruit, apple and pear fruits grown under WD have been shown to have a better shelf life after harvest. In contrast, no effect of growth conditions on postharvest firmness has been reported for apricot or kiwifruit. This phenomenon needs further investigation.

The Effect of Water Deficit on Fruit Taste Relative to Sugar and Acid Content

Soluble sugars and organic acids (primarily malic and citric acids) are major osmotic compounds accumulating in fleshy fruits and impacting taste. Under WD, fruit sugar content increases in tomato fruit depending upon the cultivar and timing of stress with the greatest positive impact when WD is applied near ripening (Ripoll et al., 2014). In contrast, the effects of WD on fruit acidity are more conflicting in the literature. The variations in soluble sugar and acid accumulation in response to WD, often reported on the basis of fresh weight, may result from dilution/dehydration effects, from active solute accumulation, or from starch breakdown. In addition, WD-induced carbon starvation is thought to decrease fruit sugar content, as has been observed in grape berries, peaches, tomatoes, mangoes and clementines, whereas organic acids typically show the opposite trend.

In tomato, invertases, whether alone or combined with plant hormones, have been recognised as key metabolic enzymes involved in plant responses to environmental stimuli due to their role in sugar signalling and sensing (Ruan et al., 2010). For instance, the reduction in apoplastic invertase activity has been suggested as an early step in the signal transduction cascade induced by water stress that leads to irreversible fruit abortion (Zanor et al., 2009). However, the effects of WD on sugar-metabolising enzymes in sink organs remain poorly documented. An increase in sucrose synthase activity has been observed in water-stressed orange fruits. In peach fruit, water stress-induced abscisic acid (ABA) stimulates sugar accumulation by increasing the activity of sorbitol oxidase; this effect was observed under moderate water stress but not under severe water stress. A recent study with transformed tomato lines revealed a negative link between malate accumulation and levels of transitory starch and final soluble sugar content and suggested the regulation of AGPase activity by the cellular redox status in developing fruit.

For many fleshy fruits, consumer acceptance not only correlates with individual concentrations of sugars and acids but also with the sugar/acid ratio, the variations of which under WD are difficult to anticipate and depend on season, plant fruit load and carbon status (Poiroux-Gonord et al., 2013b).

The Effect of Water Deficit on Fruit Aromas

All fleshy fruits contain and release a great variety of VOC that confer their typical aroma. For example, in tomatoes, over 400 VOC have been identified, many of which affect consumer taste perception together with sugars and acids (Baldwin et al., 1998). Several independent studies on grapevines have shown that WD

increases VOC content, in particular carotenoid breakdown volatiles (so-called norisoprenoids), in relation with an increased abundance of carotenoid cleavage enzyme transcripts (Song et al., 2012; Deluc et al., 2009). The increase in norisoprenoids in fruits may be associated with metabolic responses to excess light energy and the build-up of oxidative stress under WD (Deluc et al., 2009). In addition to grapes, some studies reported significant positive effects of WD on the concentration of aroma compounds in apples (Hooijdonk et al., 2007), in tomatoes (Veit-Köhler et al., 1999) and in strawberries (Modise et al., 2006).

However, in many studies, the gain in aroma content was accompanied by a loss in fruit size (e.g., Song et al., 2012) and therefore, it remains unclear whether the enhancement in aroma was due to the true stimulation of aroma biosynthesis or, rather, due to a dilution/concentration effect. In future studies, particular attention should be paid to the timing and intensity of WD because the majority of aroma compounds and/or their precursors accumulate primarily during fruit growth and subsequently change during ripening and/or senescence. Besides, more quantitative measurements of aroma compounds in the headspace of intact fruits should be done since the profiles of aromas released by intact fruits may differ greatly from their aroma content. Indeed not all VOC produced and released by fruits accumulate in fruit tissues at detectable levels.

The Effect of Water Deficit on Health-Promoting Phytochemicals

Fruits supply a wide range of health-promoting phytochemicals such as terpenoids (carotenoids, ABA and others) and phenolic compounds, along with ascorbate. There is clearly great potential to increase the concentrations of phytochemicals in horticultural products using agronomic approaches in addition to using genetic approaches. Of all the environmental factors that play a stimulating role in the synthesis and accumulation of useful phytochemicals in fruits, moderate stress, and more specifically, controlled drought, appears promising (Poiroux-Gonord et al., 2010). With respect to phenolic compound content, the response to drought generally appears positive and peaks at +40%. The picture is slightly different for carotenoids, for which the effects range from negative to highly positive (+150%). With respect to vitamin C, the findings are quite similar, with many reports showing positive effects of WD. It is important to stress that these studies show variable effects depending on genetic and seasonal factors or the intensity and duration of treatment. Drought may influence the metabolism of these phytochemicals via at least two major mechanisms that are not mutually exclusive and that may even interact. First, drought typically induces a decrease in leaf stomatal conductance, resulting in a decrease in net photosynthesis. The decrease in net photosynthesis results in a reduced transport of primary metabolites to the fruits that are the major source of precursors for the biosynthesis of phenolic compounds, carotenoids and ascorbate. Second, drought may exacerbate oxidative stress/oxidative signalling. Oxidative stress is known to directly or indirectly influence the biosynthetic pathways of these compounds. Both mechanisms appear closely linked because the accumulation of carbohydrates may exacerbate photo-oxidative stress in photosynthetic organs, such as leaves, whereas the latter mechanism may influence primary metabolism in nearby fruits. Moreover, WD may influence the metabolism of health-promoting phytochemicals by hastening fruit development.

It has often been reported that the availability and long-distance transport of primary metabolites determines the biogenesis of phytochemicals in fruits. Most recent observations appear to refute the idea that carbohydrate availability determines the synthesis and accumulation of secondary metabolites or vitamin C, at least in fruits (Poiroux-Gonord et al., 2013a). Sugar signalling has modified our simplistic view of the effect of carbohydrate availability on secondary metabolism. The emerging mechanistic view is instead one of a modulating role of carbohydrates with regard to the biogenesis of secondary metabolites.

There is strong evidence showing that the unbalanced cellular redox state, resulting from the stress-induced production of reactive oxygen species (ROS), ROS regulatory processes, and the accumulation of reducing power, tightly controls the synthesis of carotenoids in leaves and fruits. Similarly, the entire biosynthetic pathway of phenolic compounds is under ROS/redox control. The idea that the biosynthetic pathways of carotenoids and phenolic compounds are under ROS/redox control is consistent with knowledge of the gene-controlling role of redox-sensitive systems. Figure 1 summarizes the effects of WD on quality criteria of fleshy fruits associated with photooxidative stress and reduced carbon gain.

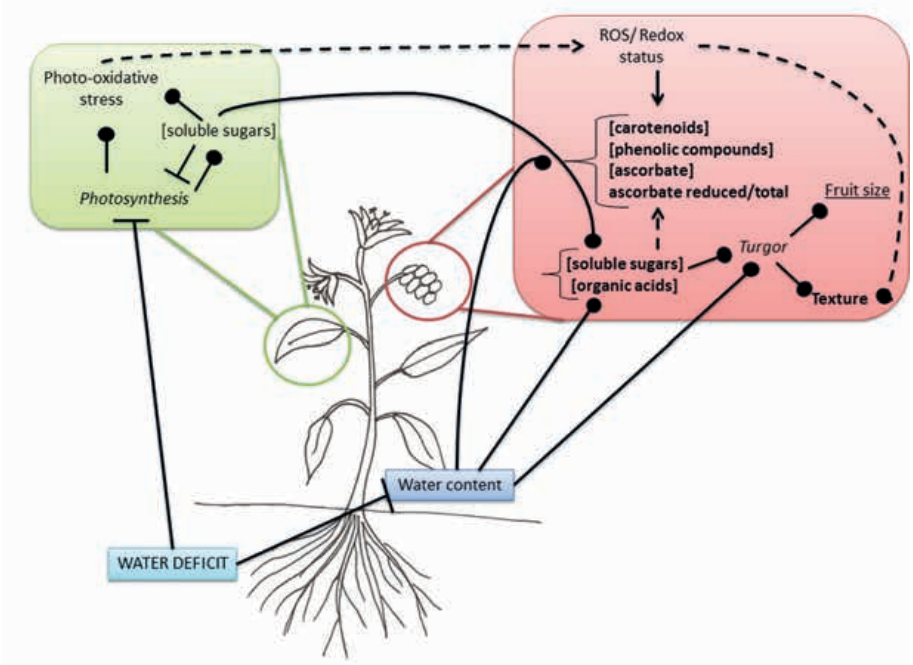
HOW DO DIFFERENT TYPES OF WATER DEFICIT AFFECT FRUIT QUALITY?

The great number of studies on WD underlines the highly variable responses of plants and fruits depending on the length and intensity of the deficit, the plant/fruit development stage affected by the WD protocol, the genotype and the presence or absence of other stress factors. In this section, we review the variable effects of a few of these primary factors on fruit quality.

Polyethylene glycol induced WD is mostly lethal during seed germination, depending on the concentration and duration of the treatment (Kulkarni and Deshpande, 2007). During the vegetative growth stage, WD reduces plant growth and the subsequent fruit yield due to numerous fruit abortions (Gladden et al., 2012). During the reproductive period, WD primarily impacts the number of reproductive organs and potentially leads to an increase in fruit size and quality by increasing the availability of assimilates for the remaining fruits (Wang and Frei, 2011), although intensive stress may lead to abnormal ovule development. At the fruit level, moderate WD applied during cell division or rapid endocarp hardening improves peach fruit size, sweetness and flavour intensity

Yield and perfect visual appearance of produce have been the major agronomic objective of fruit growers until now.

Figure 1. A simplified model of the prevailing effects of water deficit (WD) on quality criteria of fleshy fruits, derived from the available literature on peach, tomato and orange fruits (after Ripoll et al., 2014). This model brings forward the way WD influences quality criteria in fruits, either directly or indirectly, through its effects on leaves. Up- and down-regulations are indicated by arrow endings (circles and bars, respectively), except when no general trend predominates (arrow endings), depending on species, genotypes, plant and fruit stage, and intensity of WD.



phenomenon is called "primed acclimation" or "priming" (see review by Filippou et al., 2013). The improvement of plant tolerance to stress is explained on the one hand by the cascade of responses to priming that cause morphological, physiological and biochemical changes that make the plant more tolerant to subsequent stress, and on the other hand by a "memory" created in primed plants of encountered stress conditions that enables them to enhance their adaptation to changing environments by a faster activation of defence responses following stress perception (Trewavas, 1999). This strategy could represent an adaptive and cost-efficient defence strategy that increases the plant's ability to survive in hostile environments and also improves fruit quality through the up-regulation of the synthesis of antioxidant compounds that possess several health promoting properties.

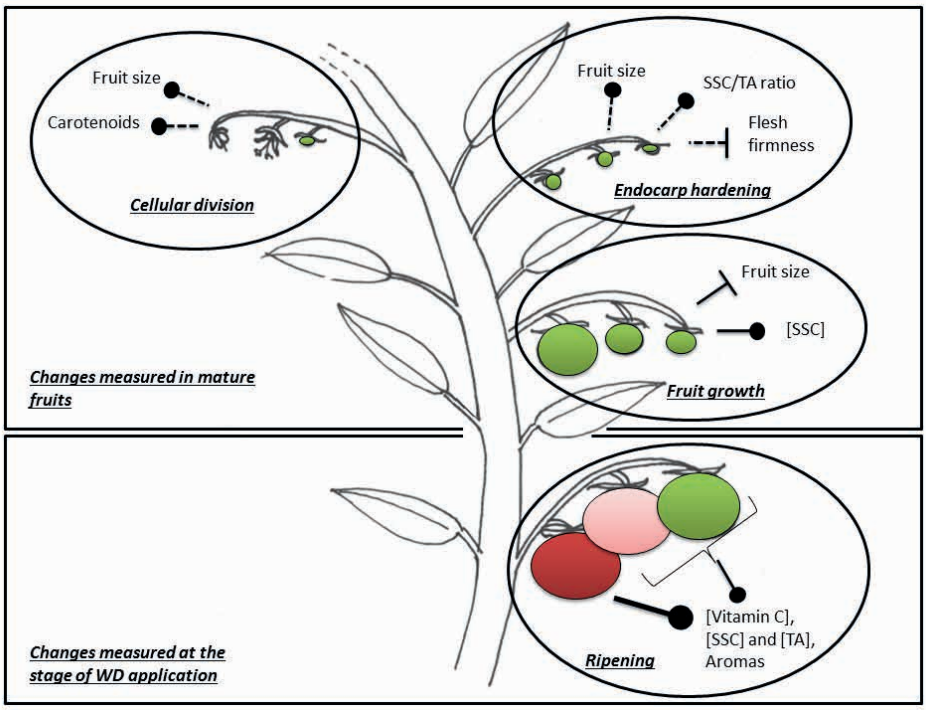
FACTORS AFFECTING THE FRUIT RESPONSE TO WATER DEFICIT

Because plants are exposed simultaneously to multiple abiotic and biotic stresses under natural crop conditions, interactions among stress factors under realistic ranges of variability are important. Endogenous phytohormones act as signals to combat many stress factors. Some (Vallverdu et al., 2012), while during the main fruit-growth stage, WD negatively impacts on yield and water content. The ripening period is the most sensitive to WD with a reduction of yield and a great increase in fruit quality (soluble sugars, organics acids, aromas and vitamin C) when applied during the red stage (Veit-Köhler et al., 1999).

Whatever the stage of application, the intensity of WD is an important determinant of plant and fruit responses. In oranges, different combinations of two stress intensities (55% and 70% of control) were applied during two phases (flowering, fruit growth or ripening), and the results indicated that the improvement in fruit quality was counterbalanced by a decrease in yield when at least one development phase is exposed to intensive stress (García-Tejero et al., 2010). All in all, these results suggest that a compromise between yield and quality could be achieved if WD occurs at the right intensity and at the right period of plant and fruit development. Figure 2 summarises the potential impact of WD on fruit yield and quality depending on fruit development phase, excluding severe stress, which is clearly deleterious.

Controlled WD periods applied to plants could also be used to acclimate and to confer tolerance to more severe drought phases. In fact, plants have the ability to enhance their tolerance to future stresses upon appropriate stimulation by a prior exposure to stress. This

Figure 2. A simplified model of the effects of water deficit (WD) applied during specific fruit developmental stages on fruit size and criteria of quality according to the literature on peach, tomato and citrus (after Ripoll et al., 2014). This model summarizes the effects of WD applied during specific fruit developmental stages on fruit size, soluble solids concentration (SSC), titratable acidity (TA), firmness, aromas and the concentration in phytonutrients. A stimulating effect is expressed by lines ending with circles; lines ending with bars express an inhibitory effect, whereas dotted arrows express hypothetical or year-dependent effects of WD.



phytohormones, such as ABA, are specific to abiotic factors, in particular WD, whereas others, such as salicylic acid (SA), jasmonic acid (JA) and ethylene (ET), are more specific to biotic stresses, although signalling pathways are interconnected, particularly through sugar status (Baena-González and Sheen, 2008), and multiple individual stress factors do not show simple additive effects when combined. These phytohormones influence plant growth processes (ET and JA) and plant survival mechanisms (ABA and SA). Generally, interactions among abiotic stress factors, such as a combination of very high temperatures and WD, induce more deleterious effects for plant health than individual factors (Mittler and Blumwald, 2010). In contrast, interactions between biotic and abiotic stresses often show beneficial effects of one or both stressors. For example, molecular studies have shown that *Botrytis cinerea* infection triggers the expression of genes involved in pathogen resistance. In tomato, the co-occurrence of *B. cinerea* and abiotic stresses (water stress, osmotic stress and oxidative stress) reduces the susceptibility to the pathogen and induces tolerance to the abiotic stress (AbuQamar et al., 2008). Similar positive interactions have been reported between powdery mildew and water stress, saline stress or proton stress (low-pH nutrient solution) in barley (Wiese et al., 2004). Beneficial interactions between pests and drought have also been reported in *Citrus latifolia* (Quiros-Gonzalez, 2000) and in apple (Gutbrodt et al., 2012), independent of stress intensity. Fruit quality may be impacted by interactions between stressors. For example, in tomato, nematode attacks combined with 3-week WD promoted sugar and flavonoid levels compared to control and stressors alone (Atkinson et al., 2011). However, this stress combination often reduced the above- and below-ground biomass (Grinnan et al., 2013) and thus may induce negative effects on plant yield. In contrast, biotisation, which comprises the inoculation of young plants with beneficial micro-organisms such as bacteria or mycorrhizal fungi, may increase antioxidant contents in fleshy fruit and improve tolerance to abiotic stress, as observed on tomato (Subramanian et al., 2006).

A great deal of research has been conducted to identify genes that are sensitive to WD. The majority of the molecular mechanisms (involved in plant growth and ABA signaling) have been elucidated, in particular in *Arabidopsis*. However, their use and transfer to cultivated genotypes is far from simple. In tomato, only a small proportion of genes involved in adaptation to water stress is known (Labate et al., 2007). Genetic sources of variability to abiotic stress adaptation in tomato primarily include a small number of wild species, which made their use for breeding long and intricate. Moreover, water stress-responsive genes are involved in a myriad of physiological processes, but they do not necessarily confer plant resistance (Gong et al., 2010) or yield stability. Genes and quantitative trait loci (QTLs) for plant stress adaptation should be identified by comparing genotypes with contrasting behaviour under stress conditions (Labate et al., 2007). For example, a transcript study of metabolic pathways affected by WD carried out on two cultivars of grape berries revealed 6,000 unigenes that vary with the cultivar and WD treatment and play a role in the phenylpropanoid, ABA, isoprenoid, carotenoid, amino acid and fatty acid pathways (Deluc et al., 2009). Because WD is expected to enhance fruit quality, interesting QTLs that enable adaption to WD should improve plant development, carbon acquisition and allocation to fruits, thereby maintaining yield under WD. In practice, several genotypes have been identified as tolerant to drought, either in terms of metabolic content and plant survival (for example in cucumber and in tomato), or in terms of yield stability. Such cultivars represent important genetic resources for breeding.

Consumers expect fruits to look great and taste great, and they are increasingly aware that fruits should also supply them with health benefits.

NEW PERSPECTIVES FOR MONITORING AND SENSING WATER DEFICIT AND ITS IMPACT ON FRUIT QUALITY

Setting up innovative irrigation-sparing strategies requires efficient and non-destructive methods enabling the real-time monitoring of relevant indicators of plant physiological status and fruit quality. Although methods exist for assessing soil humidity, leaf photosynthetic activity, water fluxes or plant growth, the majority of current measurements of fruit quality are destructive, particularly with respect to biochemical components. Complementary non-destructive methods that could be used to better assess plant and fruit physiological responses to WD or to understand the complex interactions among the numerous factors exist and should be used. Moreover fruit quality under different scenarios of WD could be predicted.

The Volatile Metabolome as a Potential Indicator of Plant Health Status

Plants lose a considerable portion of carbon and biochemical energy gained in photosynthetic processes via the biosynthesis of VOCs. The majority of plant VOCs can be assigned to the biochemical classes of terpenoids, lipoxygenase (LOX) products and phenylpropanoids. Many studies have proven the great interest in using VOC measurements for the in vivo monitoring of metabolic processes and the determination of the health and developmental status of plants. In particular there is increasing evidence that the VOC signature of plants can indicate the presence of stress and its type and intensity, as well as the plant's capacity to cope with the stress (McCormick et al., 2012). For example in tomato plants, increased emissions of methanol were found to be associated with cell growth (Oikawa et al., 2011) and increased emissions of methylsalicylate (among other VOCs) with caterpillar (Vercammen et al., 2001) and spider mite parasitism (Kant et al., 2004) and infestations with *Tobacco mosaic virus* and *Botrytis cinerea* (Jansen et al., 2010). Wounding, chilling, heat exposure and severe oxidative stress can trigger the emissions of volatile products of fatty acid and carotenoid breakdown (Copolovici et al., 2012). Regarding WD, numerous studies have described the effects of drought on constitutive VOC emissions ranging from decreased to increased emissions (Penuelas and Staudt, 2010). In addition, several independent studies have reported that WD stimulated biotic stress-induced VOC emissions (Copolovici et al., 2014 and references therein), perhaps by enhancing ROS formation and the associated stress signalling. All these studies underline that the in vivo monitoring of VOC signatures from plants offers a novel avenue for the control of abiotic and biotic stresses in crop management and could be advantageously considered on phenotyping platforms for breeding or engineering stress-resistant genotypes (e.g. http://www.plant-phenotyping-network.eu) (Fig. 3).

Alternative Non-Destructive Methods to Determine Fruit Quality and Plant Health Status

There are several non-destructive methods available to determine fruit quality and plant physiological status (Ripoll et al., 2014). These methods are based on the measurement of physical

Figure 3. The quantity and quality of volatiles released by plants may indicate the presence and type of stress, as well as the plant's capacity to cope with the stress. They can be measured by sampling the headspace air around plant organs on cartridges containing an adsorbent, which are subsequently analyzed by thermal desorption/injection unit coupled to a gas chromatograph with mass spectrometer.

properties that correlate with the physiological status of plants and also with quality criteria, such as electromagnetic (or optical) properties related to fruit appearance, mechanical properties related to texture and chemical properties related to flavour. In our view the most promising tools for the future are nuclear magnetic resonance (NMR), near infrared spectroscopy (NIRS), parameters based on measurements of UV/visible wavelengths such as the photochemical reflectance index (PRI) or Dualex/Multiplex (Force A©), and analysis of fluorescence transient of chlorophyll a, which are often used for monitoring plant physiological status but rarely fruit quality. All of these methods can be used in situ with the exception of NMR.

Process-Based Models: Promising Tools for the Analysis and Prediction of Fruit Quality during Water Deficit

Because variations in fruit quality under WD involve many mechanisms and feedback loops at the plant and fruit levels, a modelling approach may help define relevant strategies for irrigation and designing model plants adapted to drought, i.e., genotypes capable of maintaining yield and producing high-quality fruits, may be useful. Indeed, process-based models are appropriate tools for integrating knowledge from the gene to the fruit, predicting the behaviour of complex systems such as fruits in fluctuating environments and analysing gene-environment interactions. The virtual fruit model (Génard et al., 2007) may be a basis for understanding fruit quality in response to environmental fluctuations and analysing interactions between WD and other environmental or genetic factors or cultural practices. In the future, this integrated model could be a powerful tool for understanding the complex interactions between water and carbon balance in response to WD at the plant and fruit levels.

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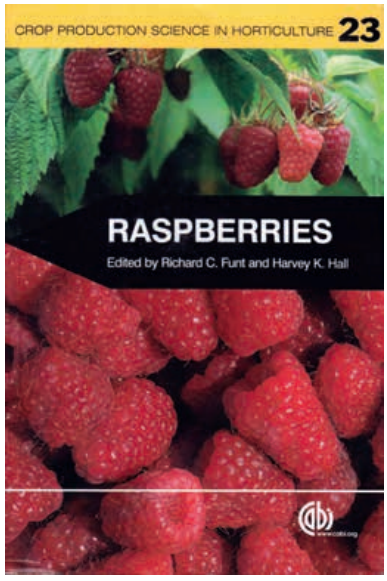
New Books, Websites

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

Raspberries. Richard C. Funt and Harvey K. Hall (eds.). 2013. Crop Production Science in Horticulture 23. CABI Publishing, Wallingford, Oxfordshire, UK. 300p. ISBN 978-1-84593-791-1 (paperback). £ 37.50 / € 50 / $ 72.50. http://www.cabi.org/bookshop/book/9781845937911



The four most important berry crops in order of production are strawberries, blueberries, raspberries and blackberries. World production of each is increasing with fruits available continuously at moderate prices. Thus, the new volume *Raspberries* edited by Richard C. Funt and Harvey K. Hall, is another welcome addition to the CABI series on Crop Production Science in Horticulture. It consists of 16 contributed chapters and includes two appendices (windbreaks and fertigation) and two glossaries (biological and business terms). The opening chapter by Kim Hummer and Harvey Hall is very well done and will be required reading for all would-be raspberry workers. The second chapter on Growth and Development explains floricane fruiting (cultivars with canes that fruit in the second year) and primocane fruiting (also called autumn fruiting, cultivars with canes that fruit in the first year). The difference is critical to modern raspberry production, for as we shall see in Chapters 3 and 4, while floricane cultivars are adapted only to cool temperate regions, primocane fruiting permits broader adaptation including much colder climates (annual canes can be pruned to the ground eliminating the need for cold hardiness), and warmer climates up to the equator if chilling requirements can be eliminated. Cultivar development is superficially reviewed in Chapter 5 but contains tables describing floricane and primocane cultivars. Nursery production and propagation are briefly covered in Chapters 6 and 7. Chapters 8 to 10 review projection practices, including site preparation, soil and water management, and pruning and training. A table of herbicides is presented. The pruning and training chapter by Richard Funt will be of particular value to both gardeners and producers. Pest and disease management covered in Chapter 11 may not be helpful to growers and gardeners because specific pesticides are not included. Chapter 12 on crop production duplicates some material in previous chapters but does mention a few spe-

cific pesticides. Postharvest physiology is covered in Chapter 13. Chapters 14 and 15 review marketing and farm management. World production is covered in Chapter 15 by continent with graphs covering 1960 to 2010 but I looked in vain for total world production. The graphs indicate that the greatest increase has occurred in Canada. The two appendices on windbreaks and fertigation are very general. The biological glossary may be helpful to students but the business glossary is rather elementary and I wonder why it was included. There are many colored figures but the quality is uneven. The series is described as student oriented with usefulness to growers and gardeners. I do not think researchers will find this book of special value as the scientific level is low but the extended list of literature cited will be useful.

Reviewed by Jules Janick, Purdue University, USA

NEW TITLES

Dugan, Frank. 2015. Hidden Histories and Ancient Mysteries of Witches, Plants, and Fungi. APS Press, St. Paul, MN, USA. 192p. ISBN 978-0-89054-465-5 (paperback). $69.95. www.shopapspress.org

Samac, Deborah A., Rhodes, Landon H. and Lamp, William O. (eds.). 2015. Compendium of Alfalfa Diseases and Pests, Third Edition. APS Press, St. Paul, MN, USA. 138p. ISBN 978-0-89054-446-4 (softcover). $99.00. www.shopapspress.org

Stevenson, Katherine L. and Jeger, Michael J. (eds.). 2015. Exercises in Plant Disease Epidemiology, Second Edition. APS Press, St. Paul, MN, USA. 276p. ISBN 978-0-89054-440-2 (softcover). $199.00. www.shopapspress.org

Courses and Meetings

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

Postharvest Short Course: Quality and Safety of Fresh Cut Produce, 21-23 January 2015, Cardiff University, UK. Info: Dr. Carol Wagstaff, Department of Food and Nutritional Sciences, University of Reading, PO Box 226, Whiteknights, Reading, RG6 6AP, UK, Phone: +44(0)118 378 5362, Email: c.wagstaff@reading.ac.uk, Web: http://sites.cardiff.ac.uk/fresh-cut-produce/

8th North American Strawberry Symposium and North American Strawberry Growers Association (NASGA) 2015 Berry Conference, 3-6 February 2015, Ventura, CA, USA. Info: Dr. Oleg Daugovish, Farm Advisor: strawberry and vegetable crops, University of California Cooperative Extension, 669 County Square Drive, Suite 100, Ventura, CA 93003, USA, Phone: (805) 645-1454, Fax (805) 645-1474, Email: odaugovish@ucdavis.edu, Web: http://www.nasga.org/

IX Curso Internacional de Tecnologia Postcosecha y Procesado Minimo Hortofruticola, 5-11 March 2015, Cartagena, Spain. Info: Prof. Dr. Francisco Artes Calero, Postharvest & Refrigeration Group (GPR), Universidad Politecnica de Cartagena, Paseo Alfonso XIII, 48, 30203 Cartagena, Murcia, Spain, Email: gpostref@upct.es, Web: www.upct.es/gpostref/

IX Curso-Congreso Internacional de Hidroponia, 12-14 March 2015, Toluca, Estado de Mexico, Mexico. Info: Asociación Hidroponica Mexicana A.C., Phone: (722) 215 81 54, Fax (722) 214 03 88, email: anilusa@prodigy.net.mx, Web: www.hidroponia.org.mx

Advanced Course on Innovative Technologies to Enhance the Traceability of the Food Chain, 23-27 March 2015, Zaragoza, Spain. Info: Mediterranean Agronomic Institute of Zaragoza (IAMZ) – CIHEAM, Avenida Montanana 1005, 50059 Zaragoza, Spain, Phone: +34 976 716000, Fax: +34 976 716001, Email: iamz@iamz.ciheam.org, Web: www.iamz.ciheam.org

Eucarpia Leafy Vegetables Congress, 14-17 April 2015, San Pedro del Pinatar, Murcia, Spain. Info: Dr. Carol Wagstaff, Department of Food and Nutritional Sciences, University of Reading, PO Box 226, Whiteknights, Reading, RG6 6AP, UK, Phone: +44(0)118 378 5362, Email: c.wagstaff@reading.ac.uk, Web: www.eucarpia2015.org

10th International Congress on Plant Biotechnology and Agriculture (BioVeg2015), 11-15 May 2015, Ciego de Ávila, Cuba. Info: Executive Chair, Bioveg2015, Bioplantas Center, University of Ciego de Avila, Car. a Moron km 9, CP 69450, Ciego de Avila, Cuba, Email: bioveg2015@gmail.com or bioveg@bioplantas.cu, Web: http://bioveg.bioplantas.cu

Fascination of Plants Day, 18 May 2015. Info: For European countries - Przemysław Wojtaszek, EPSO Coordinator for Fascination of Plants Day 2015, Email: fopdpw@amu.edu.pl; For countries beyond Europe - Trine Hvoslef-Eide, EPSO Coordinator for Fascination of Plants Day 2015, Email: trine.hvoslef-eide@umb.no; General requests - Karin Metzlaff, EPSO Executive Director, Email: epso@epsomail.org, Web: www.plantday.org

Sustainability of Well-being International Forum 2015: Food for Sustainability and not just Food, 4-6 June 2015, Florence, Italy. Info: Simone Cesaretti Foundation, Via dello Studio n° 5, 50122 Firenze, Italy, Phone: (+39) 055 0601877, Email: forum@florenceswif.org, Web: www.florenceswif.org

Section Pome and Stone Fruits

Fourth Int'l Symposium on Loquat

Opening ceremony.

The Fourth International Symposium on Loquat was successfully held on 12-15 May, 2014 in Palermo, Sicily (Italy). The symposium was organized by the Department of Agricultural and Forest Sciences, at the University of Palermo under the auspices of the International Society for Horticultural Science (ISHS) and with the support of the Italian Society for Horticultural Science (SOI), the Key Laboratory of Innovation and Utilization for Germplasm Resources in Horticultural Crops in Southern China of Guangdong Higher Education Institutes (South China Agricultural University), the Italian Ministry of Food and Agriculture, the Department of Agriculture of the Sicilian Local Government and the Palermo City Hall. The symposium attracted 52 participants from 11 countries (China, Egypt, Greece, Iran, Israel, Italy, Japan, Pakistan, Spain, Turkey and the USA), sound confirmation of the broad interest in loquat science and cultivation in spite of the economic restrictions that affect several countries and their research institutions.

Prof. Guglielmo Costa (left), outgoing Chair of ISHS Section Pome and Stone Fruits, handing over the ISHS medal award to Co-Conveners Dr. Francesca Barone (center) and Dr. Riccardo Lo Bianco (right).

The symposium consisted of 5 sessions: 1) Cultivars, Rootstocks, Production and Marketing, 2) Biology and Ecophysiology, 3) Orchard Management and Crop Protection, 4) Genetic Resources, Breeding and Biotechnology, and 5) Fruit Quality and Postharvest Management. The program listed 36 invited and contributed oral presentations and 37 posters. Two and a half days were devoted to scientific sessions and one day to a technical excursion to loquat orchards in three different locations. An exhibition of the major and new Sicilian loquat cultivars was set up at the symposium hall.

The opening ceremony started with a brief welcome address by Dr. Francesca Barone and Dr. Riccardo Lo Bianco, Co-Conveners of the symposium, in which they extended their thanks and gratitude to the participants and the members of the Scientific and Organizing Committees. The second presentation by Prof. Manuel Agustì honored the memory of Prof. Francesco Calabrese and his work to increase scientific knowledge and appreciation of loquat in Sicily. Subsequently, Prof. Guglielmo Costa, ISHS representative, presented information about ISHS activities and conferred the ISHS medal to the Co-Conveners of the symposium. Prof. Stefania De Pascale, President of SOI, confirmed SOI support of the symposium.

After the welcome ceremony, Prof. Maria L. Badenes gave a keynote speech entitled "Progress and advancements of the loquat scientific community and future expectations". Dr. Badenes recalled the progress made during the previous symposia and underlined that the production of seedless loquat is expected to revolutionize the loquat industry in the next decade. During the symposium several important aspects of loquat culture, biology and genetics were discussed. In the first session on Cultivars, Rootstocks, Production and Marketing, Profs. Shunquan Lin and Jules Janick presented a complete and updated picture of *Eriobotrya* species and cultivars from around the world. In the second session, important advancements in flower and fruit biology as well as loquat responses to water stress were highlighted. Some important aspects of irrigation and scab management were also presented in session 3, while several diverse topics concerning in vitro regeneration methods were discussed in session 4. Antioxidant properties and ethylene involvement during cold storage were the key issues presented during the last session on Fruit Quality and Postharvest Management.

Prior to the welcome buffet dinner, participants were guided through the Palaces of the University administration offices in a historical tour of the old Inquisition Prisons. The gala dinner was held in the marvelous setting of the baroque Villa Niscemi, in the heart of downtown Palermo, where participants enjoyed a rich variety of Mediterranean flavors from the Sicilian cuisine.

May 14 was entirely dedicated to field excursions to Santa Maria di Gesù, Ciaculli and Trabia. Participants visited both experimental fields and family orchards where fruit was being harvested and transported down the hill to the farm shed on unique trail-bins. In Trabia, the main loquat cultivation area in Sicily, participants were offered a number of typical products and sweets made from loquat and were

Field excursion to a loquat orchard in Ciaculli (A) and Trabia (B).

entertained by folk dancers. A guided tour to the old castle of Trabia was also organized.

At the end of the fifth and last session, a short closing ceremony was held, led by Francesca Barone, Riccardo Lo Bianco, Manuel Agustì, Shunquan Lin, and Jules Janick, who summed up the scientific achievements of the symposium.

All participants agreed that the scientific sessions, tours, and cultural events were a great success and that the exchange of information, reinforcement of established collaborations, and creation of new friendships will have a positive impact on loquat science and industry.

Riccardo Lo Bianco

Contact

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Section Pome and Stone Fruits

Twelfth Int'l Pear Symposium

From 14-18 July 2014, Tom Deckers (Convener) and Jef Vercammen (pcfruit research station) organized the 12th International Pear Symposium in Leuven, Belgium, in collaboration with the KU Leuven, Department of Biosystems, Division of Crop Biotechnics, Laboratory for Fruit Breeding and Biotechnology (Prof. Wannes Keulemans). This symposium was a great success and follows in the series of pear symposia of the International Society for Horticultural Science (ISHS). With 180 participants attending, pear experts from 30 different countries worldwide were present. During the symposium a half-day session was organized for Belgian and Dutch fruit growers and advisors. During this afternoon about 70 participants joined the group of scientists. There were 53 oral and 87 poster presentations covering subjects from European pear growing to nashi growing.

In the opening session Philippe Appeltans from the Belgian Horticultural Cooperations gave an overview of pear production in Belgium and in The Netherlands, with a comparable situation in both countries in terms of area, production and pear cultivars.

The first invited speaker of the symposium was Prof. Amit Dhingra from Washington State University (USA), who gave an overview of current genetic research on pear and future perspectives of biotechnology applied to pear. Recent availability of large portions of the pear genome has opened new possibilities for introducing new traits to existing pear cultivars and for developing new pear cultivars. On the other hand, it is clear that this technique will not solve all pear fruit growing problems and, in particular, the control of scab (*Venturia pirina*) or fire blight (*Erwinia amylovora*). A new in vitro technique has been developed to bring young trees into flowering after one year in vitro and this will accelerate pear breeding programs. Using new genetic tools, a molecular comparison has been carried out on different types of Asian pears such as the white Chinese pear, the Chinese sand pear, the Japanese pear and the Ussurian pear (Y. Teng, Japan). These genetic tools have also been used to compare pear collections at Brogdale in the United Kingdom with those of the USA (K. Evans, USA). In this study attention was focused on an important nomenclature problem in the different collections that is not always exact and leads to errors in the naming of collections. New techniques have also been used to describe the diversity of selections in the genus *Mespilus* and quince rootstock in the USA (J. Postman). Interesting interactions between the scab pathogen and pear cultivars on which the fungus developed, were found and suggested an adaptation of the fungus to the host plant (W. Keulemans). Research has been conducted on the genetic background of scab resistance on pear and on resistance of pear rootstock against *Agrobacterium tumefaciens*.

The second session of this symposium covered the "Evaluation of pear cultivars and rootstocks". For pear rootstocks, interesting results were shown for the new quince rootstock 'Eline'. It was found to be clearly less susceptible to winter frost than quince 'C' and quince 'Adams' after the frost in February 2012 with temperatures of -23°C at ground level (F. Maas). This difference has also been observed in the fruit tree nursery. Results presented by M. Neumüller from Germany show

Participants of the symposium in front of the new building of pcfruit research station in St. Truiden.

that Amelanchier can be used as a pear rootstock. This rootstock is not susceptible to iron chlorosis and pear decline and is frost hardy. The compatibility of this new rootstock with different pear cultivars should be tested over several years. In New Zealand, a breeding program involving crosses between European and Asian pears has been started. The program aims to combine the good taste of European pears with the good texture and juiciness of Asian pears in a new pear selection (L. Brewer). A first selection has been launched under the name Piqa® Boo. In Norway the focus is more directed to early pear cultivars like 'Celina' (S.H. Hjelnes). In Japan the focus is on self-fertile pear cultivars with scab resistance within the group of Japanese pears (H. Kato). In Belgium 'Cepuna' is favoured by EFC (European Fruit Cooperation) as a new green pear cultivar which has regular production and is 5 mm bigger in fruit size than 'Conference' pears.

For the session "Training and pruning systems", Dr. Luis Asin from IRTA in Lleida, Spain, was the invited speaker. He gave an interesting overview of the intensive pear production systems in Spain where double or triple axe systems are applied to 'Conference' trees resulting in good quality fruits produced close to the fruiting axes. In Portugal, improvement of the productivity of 'Rocha' pears was studied with the development of a model to predict growth, production and fruit quality within a training system (J.P. de Melo e Abreu). In The Netherlands a comparison was made between a spindle system and a V hedge system in an intensive training system including the installation costs and the production (G. Heijerman). Using the technique of remote sensing, yield estimation and fruit quality determination were studied (J. Van Beek). In the USA intensive planting systems on 'OHF' pear rootstock were studied (T. Robinson). The fertility of pear trees in intensive systems can be improved using gibberellins during bloom or by applying Regalis (10% prohexadione-Ca) after bloom with the aim of reducing the June drop (J. Vercammen).

In the session "Nutrition, water and soil management", Dr. Enrique Sanchez from Argentina was asked to give an overview of recent advances in his region. He has vast experience in the nutrition of fruit trees and wrote a very interesting book on this topic. The importance of irrigation in fruit growing is increasing because of climate change, which will result in increased irregularity of rainfall and drought periods during consecutive months. Interesting data on the calculation of evaporation from pear trees was presented by Dr. Ian Goodwin from New-Zealand. In many orchards application of water and nutrition is combined in the fertigation schedule. A positive correlation has been found between the % Brix and the taste of Belgian 'Conference' fruits and this could be linked to the mineral composition of the fruits (P. Janssens). A new method to monitor the ripening of fruits on trees was presented by Prof. Guglielmo Costa from Italy. The DA-meter is a portable, user-friendly vis-NIR-instrument that allows measurement of a new parameter, the "Index of Absorbance Difference (I_{AD})". This index is a non-destructive means of monitoring the ripeness of fruits that are still on the tree (G. Costa, Italy) and decreases as fruits ripen. With respect to soil management, the effects of different types of mulching were compared (J. Zhang, China). The difference between covering the soil with a plastic sheet and with a reflective fabric (Extenday™) was studied (R. Elkins, USA), and the effect on long term productivity and fruit quality was discussed.

In the session "Plant growth regulators and fruit set" much attention was devoted to cytokinine 6-benzyladenine (6-BA), applied alone or in combination with naphthalene acetic acid (NAA), for fruit thinning. NAA application on pear has a tendency to produce smaller fruits and the effect of 6-BA strongly depends on the temperature. In Argentina interesting thinning results were obtained with the combination of 6-BA and abscissic acid

(S-ABA) (M.C. Dussi). Research in Belgium in Louvain-la-Neuve indicated the importance of finding the balance between pollinated and parthenocarpic fruit set on 'Conference' when aiming to achieve good fruit size (M. Quinet). Strong hand thinning of flowers on 'Forelle' pears in South Africa did not always result in strong fruit thinning because of a reaction of increased fruit set on the remaining flowers (K. Theron). Mechanical thinning with a Darwin machine improved fruit size of 'Forelle' pear. Aminovinylglycine (AVG) showed positive effects on fruit set of 'Beurré d'Anjou' in the USA (T. Einhorn).

In the session "Plant protection, diseases and pests", Robert Van Steenwyk spoke on the codling moth, an important pest of pear in the USA, and its control using a combination of pheromones and chemical control. Botrytis rot on 'Forelle' pears in South Africa is an important storage problem; benomyl (Benlate), iprodione (Rovral) and pyrimethanil (Scala) are effective against this disease (Ch. Lennox). In Germany the mycoplasma 'pear decline' is a growing problem, resulting in the death of infected trees. A new method for detection has been developed, the LAMP (loop-mediated isothermal amplification) method based on DNA multiplication of the phytoplasma (J. Hadersdorfer). The use of spinetoram (an analogue of spinosad (Tracer)) against codling moth stimulated rust mites. Spinetoram is harmful to earwigs and other beneficials. Dr. Tim Beliën of pcfruit summarized recent results on *Pentatoma rufipes*. These insects can spread bacteria in the lab but not in the orchard and they are not able to spread phytoplasma. Recent results on the role of spiders in pear psylla control were given by K. Vrancken of pcfruit. The presence of spiders in organic orchards can explain the easier psylla control. Finally, it was reported by R. Petré from Belgium that fosetyl-Al (Aliette) not only had a positive effect on the number of flowers on pears and on flower bud quality, but also played an interesting role in the control of brown spot (*Stemphylium vesicarium*), scab (*Venturia* sp.) and mildew (*Podosphaera leucotricha*). In trials carried out in Italy (10-12 treatments) and in Belgium (8 treatments) there was a synergistic effect with applied fungicides. This effect was linked to the molecules salicylic acid and jasmonic acid, as both compounds interfere with host susceptibility of plants.

For fruit quality determination, a new software program (Plantoon®) from Italy was presented that could reconstruct the architecture of a tree, allowing for the exact place of the fruit on the tree to be determined. In Ferrara, fruits of 'Abate Fetel' from spindle trees were more heterogenous in ripening than fruits from Bibaum® trees. Fruit on quince 'Sydo' were more heterogenous in ripening than fruits on quince 'Adams'. Analysis with a DA-meter showed great variation in fruit maturity; fruits with an IAD > 2.10 never ripened (S. Musacchi, USA). In South Africa consumers preferred green fruits of 'Forelle' pears harvested from the centre of the tree over the well colored fruits from the periphery, and here mealiness was the determining factor (W. Steyn). When stored 'Beurré d'Anjou' needs cold temperatures to ripen (60 days at -0.5°C). Without cold temperatures ethylene production does not start. The use of 1-methylcyclopropene (1-MCP (Smartfresh)) can cause irregular ripening during and after storage (A. Dhingra, USA). Fruits with low N and high K content harvested in time showed less storage problems (D. Sugar, USA). In The Netherlands the infections of *Cadophora* (= *Phialophora* = fish eyes) and *Gloeosporium* are the most important storage diseases of pear (M. Wenneker). Belgian research indicated that 'Conference' treated with 1-MCP stays green during storage and does not ripen further, even during shelf life. Treatment with ethylene is indicated to restore the capacity to ripen (A. Schenk).

Start of an octacopter drone loaded with a camera for inspection of a pear orchard.

A field day started with a visit to the orchard of Albert Jan Markvoort and his wife Gertie in Kumtich, where the focus was placed on the production of high quality fruit sold in bins at harvest. In this orchard the results of 3 PhD students from the KU Leuven were explained to the participants: one on the use of remote sensing to study the variability of moisture content in pear orchards (J. Van Beek), one on mechatronical pneumatical blossom thinning of pear (N. Wouters) and one on the irrigation and fertigation of pear (P. Janssens). Afterwards the group was invited to the academy room of St. Truiden by the Mayor of the city, Veerle Heeren. In the academy room the general director of pcfruit, Dany Bylemans, presented the new structure of the pcfruit research station. In the afternoon a visit to the new pcfruit research station was scheduled and each department explained some interesting work related to pear: Dr. W. Van Hemelrijck – pear scab, Dr. T. Beliën – pear psylla, Ir. J. Vercammen – pear planting systems, Ir. H. Schoofs and Dr. S. Delalieux from Vito – drones, K. Ruyse – biofilter and mechanization, ing. A. Gomand – new pear cultivars. During this visit new equipment was demonstrated, including a new Belgian picking platform from the company BAB and a hot air blowing frost protection system from the company Agrofrost. The field day was concluded with a visit to different fruit farms: a smaller family-based fruit farm (Lousberg), a bigger family-based fruit farm (Bels), an exporting family-based fruit farm (Wouters) and a family-based fruit tree nursery (J. and L. Nicolai).

During the business meeting the ISHS participants voted to hold the next pear symposium in Uruguay and Dr. Roberto Zopollo from INIA will be the next Convener. Dr. Frank Maas of The Netherlands was re-elected as Chair of the ISHS Working Group on European and Asian Pears.

Tom Deckers

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Sixth Balkan Symposium on Vegetables and Potatoes

Section Vegetables, Roots, Tubers, Edible Bulbs, Brassica, Asparagus – Commission Protected Cultivation

Participants of the symposium.

The 6th Balkan Symposium on Vegetables and Potatoes was organized in Zagreb, the capital of Croatia, from September 29 to October 2, 2014. The symposium was co-organized by ISHS and the University of Zagreb, Faculty of Agriculture, in collaboration with the Faculty of Agriculture in Osijek, the Institute for Adriatic Crops and Karst Reclamation in Split, the Institute of Agriculture and Tourism in Poreč, and the College of Agriculture in Križevci.

The symposium was opened by Prof. Dr. Silvana Nicola, ISHS Vice-President, and the Symposium Co-Conveners, Dr. Bozidar Benko and Dr. Sanja Fabek. The symposium was attended by 110 participants from 24 countries. During two working days participants presented their latest scientific achievements through five invited lectures, 54 oral and 66 poster presentations divided into seven sessions.

ISHS Vice-President Prof. Silvana Nicola (center) presenting the ISHS medal award to Co-Conveners Dr. Sanja Fabek (left) and Dr. Bozidar Benko (right).

The invited lectures highlighted the current situation, challenges and research work on vegetables and potatoes in the region, as well as vegetable product quality and safety. In the session Production Technologies there were numerous interesting and useful presentations about different sources of fertilizers, effect of inoculation, mulching, irrigation and salinity accumulation. Further, the latest achievements in hydroponics and organic production of vegetables were shown. In the session Plant Protection, the importance of pest and disease monitoring, as well as methods of prevention and control were presented. The main topics of the Production Economics and Management session were: an analysis of the Croatian vegetable market, marketability of vegetables and potatoes, and economic, social and environmental aspects of organic growing. Session Genetic Resources and Breeding emphasized genotype diversity and application of new methods, for example, molecular markers in vegetable and potato breeding. The largest number of presentations took place in the session Product Quality and Postharvest Technology, which indicates the importance of this topic for researchers, producers and consumers. Presentations during the session Plant Propagation focused on the positive effects of supplemental lighting (especially LED), as well as the impact of stress factors on growth and development during seedling production. During the poster sessions, presenters briefly explained the aim of their research and their most important research results, which was followed by a short discussion with participants.

At the beginning of the session Balkan Protected Cultivation, the chairman, Dr. Nazim Gruda, gave an overview of protected cultivation, entitled "Status-Quo and Perspectives of Protected Vegetables for a Sustainable Production in South-East Europe (SEE)", based on the data of questionnaires completed from 11 countries as well as from other statistical and literature data. Afterwards, participants from all these countries reported and commented on specific statistics from their respective countries, thereby completing the vision of protected cultivation development in this region. It turns out that SEE countries differ in total greenhouse area, types of greenhouses built, technologies used and thus yield per unit area obtained. This is a result of differing climatic conditions and level of development in each country. A number of problems are common to all countries, that is high production costs and restricted market opportunities. Despite the perceived differences and problems between the countries, it was concluded that vegetable production in SEE countries has a bright future if growers are adopting Good Agricultural Practices (GAP) and sustainable production technologies and if they improve the competitiveness of the greenhouse sector.

An FAO workshop was organized in a special session. Messrs. Baudoin and Nersisyan from

FAO explained the need for an illustrated manual to support greenhouse growers in the region with the aim of increasing production per unit area. They indicated that this material should be easily understandable by extension workers and farmers and supported by figures, schemes and pictures. At the end of this workshop participants reached a consensus to write a book that will serve as a guide for SEE greenhouse farmers. This book will explain in a practical way all news and greenhouse technologies for this area.

At the end of the second day an election was planned to decide the host country for the 7th Balkan Symposium on Vegetables and Potatoes. Unfortunately, there were no nominations from interested countries and institutions. This situation resulted in a discussion about changing the name of the symposium. Finally, it was decided that the name will change to 7th South-Eastern Europe Symposium on Vegetables and Potatoes. Prof. Martina Bavec from the Faculty of Agriculture and Life Sciences in Maribor, Slovenia, accepted the task to host the next symposium in June 2017.

The third working day was dedicated to technical and cultural visits. The symposium participants visited two vegetable producers in Zagreb County (Zarja grupa and Agrosan). Zarja grupa d.o.o. is a market leader in production of fresh consumer tomatoes in the region. Their production involves 3 ha of soilless culture tomatoes grown in greenhouses. The agricultural craft company Agrosan produces various vegetables for the fresh market on 50 ha of open field, and packs vegetables for soups. They produce seedlings for their own vegetable production. The cultural visit included Krapina Neanderthal Museum during the early afternoon. Participants had a chance to see the exhibition set up as a time machine through the history of the Universe, the Earth and Man, leading up to the present day, with special emphasis on the Neanderthal period and Hušnjakovo habitat. This exciting day finished with a symposium dinner at "Klet Kozjak", Sveti Križ Začretje, where participants enjoyed Croatian traditional music and food.

Visit to Zarja grupa d.o.o.

Božidar Benko and Sanja Fabek

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From the Secretariat

New ISHS Members

ISHS is pleased to welcome the following new members:

NEW INDIVIDUAL MEMBERS:

Albania: Klod Zigori; **Argentina:** Mr. Gustavo Marcelo Perez, Mr. Gustavo Ventura; **Australia:** Mr. Andrew Easton, Ms. Bettina Gollnow, Mr. Frederick Hellriegel, Mr. Robert Misst, Mr. Regin Paul; **Belgium:** Mr. Karel Bolckmans, Johan Janssens; **Brazil:** Prof. Dr. Daniela Chaves, Prof. Dr. Regis Ferreira, Dr. Carlos Gava; **Canada:** Michael Bomford, Mr. Frederick Laforge, Mr. Changpeng Qiu, Mr. Qihe Xu; **Chile:** Prof. Dr. Jose Delatorre-Herrera, Mr. Felipe Jimenez Aspee, Ms. Maria Martinez; **China:** Jigang Han, Prof. Dr. Shu'ang Peng, Dr. Lanlan Zhang; **France:** Mr. Benoit Guerry, Dr. Daciana Papura; **Germany:** Mr. Karim Aouini, Mr. Stephan Meyerding, Ms. Meike Rombach; **Guernsey:** Mr. Nigel Clarke; **Haiti:** Prof. Harold Corantin; **India:** Mr. Satheesh Kumar; **Ireland:** Mr. David Currid; **Israel:** Dr. David Granot; **Italy:** Sara Melito; **Japan:** Dr. Marco Cossu, Kohei Kaneda, Dr. Ayako Katayama-Ikegami, Prof. Dr. Hisato Kunitake, Ms. Xi Li; **Jordan:** Mr. Shaker Al-Zaben; **Kenya:** Ms. Cynthia Ryan; **Korea (Republic of):** Mr. Jeong Hong Eun, Ms. Ji Hyun Kim; **Kosovo:** Mr. Lavdim Lepaja; **Kuwait:** Ms. Laila Ali; **Mauritius:** Mr. Prakash Mohith; **Mexico:** Mr. Raul Aguilar, Dr. Julieta Benitez-Malvido; **Netherlands:** Mr. Reinout de Heer, Mr. Jeroen van Leeuwen; **New Zealand:** Dr. Paul Datson, Dr. Bruce MacKay, Mr. Hinga Marsh; **Nigeria:** Mr. Samaila Mohammed; **Poland:** Dr. Bozena Szewczyk-Taranek; **South Africa:** Ms. Nicole Windell; **Spain:** Josefa Blaya, Esteban Candel Ayala; **Tanzania:** John De Wolff; **Thailand:** Mr. Rachen Duangsi, Dr. Pimpinan Somsong, Mr. Anan Suwannarat, Dr. Pimsiri Tiyayon; **Trinidad and Tobago:** Mr. Ayoub Mohammed, Mr. Micah Mungal; **Turkey:** Dr. Birol Akbas, Ms. Lütfiye Erkmen; **Ukraine:** Dr. Oleksandr Iareshchenko; **United Kingdom:** Mr. Tim Biddlecombe, Ron Marshall, Dr. Susan Williams; **United States of America:** Lisa DeVetter, Robert D. Brennan, Mun Wye Chng, Dr. Edward Durner, David Engel, Dr. Claire Federici, Dr. Raquel Folgado, Jose Franco, Nicole Habecker, John Herlihy, Mr. Friedrich Honeyman, Mr. Ryan Hughes, Neal Job, Dr. Judith Johnson, Dr. Kerry Kakazu, Eric Laszlo, Yuan Li, Shannon McCall, Dr. Melody Meyer, Dr. Steve Millett, Amrita Mukherjee, James S. Jr. Owen, Marisa Potter, Paul Rasch, Rosa Raudales, Dr. ulises sabato, Ms. Andrea Salas, Ms. Alejandra Salgado, San-Beth Samuels, Michael A. Schnelle, Prof. Dr. Fred Stevens, Mr. Donald Thomson, Mr. Jordan Tolley, Ms. lu wang, Dale Wettlaufer, Dr. Joel Whitaker, Ms. Rhiannon Woo; **Vietnam:** Mr. Quang Vu Ngo

Calendar of ISHS Events

For updates and extra information go to www.ishs.org and check out the calendar of events. Alternatively use the "science" option from the website navigation menu for a comprehensive list of meetings for each Section, Commission or Working Group.
To claim reduced registration for ISHS members your personal membership number is required when registering - ensure your ISHS membership is current before registering. When in doubt sign in to your membership account and check/renew your membership status first: www.actahort.org or www.ishs.org

YEAR 2015

- March 16-18, 2015, Bogotá (Colombia): **International Symposium on Medicinal Plants and Natural Products.** Info: Dr. Jalal Ghaemghami, Great Partners, PO Box 320172, West Roxbury, MA 02132, United States of America. Phone: (1)3393686838, Fax: (1)3393686838, E-mail: jalal@phytoessence.org or Yann-Olivier Hay, Calle 235 #79-30 Casa 6, Conjunto Santillana Bogotá, Colombia. Phone: (57)1-8619400, E-mail: yann.olivier.hay@gmail.com E-mail symposium: information@phytoessence.org Web: http://phytoessence.org/ISMPNP2015

- NEW April 7-12, 2015, Kaohsiung County (Chinese Taipei): **International Symposium on GA3 Tropical Fruit (Guava, Wax Apple, Pineapple and Sugar Apple).** Info: Dr. Chung-Ruey Yen, Nat'l Pingtung University, Science and Technology, Dept. of Plant Industry, Neipu, Ping Tung 91207, Chinese Taipei. Phone: (886)87740265, Fax: (886)87740392, E-mail: yencr@mail.npust.edu.tw Web: http://www.2015ga3.org/

- April 19-24, 2015, San Remo (Italy): **VI International Symposium on Production and Establishment of Micropropagated Plants.** Info: Dr. Margherita Beruto, Regional Institute for Floriculture, IRF, Via Carducci 12, 18038 San Remo (Imperia), Italy. Phone: (39)0184535149, Fax: (39)0184542111, E-mail: beruto@regflor.it Web: http://www.regflor.it/ISHS2015/

- April 20-24, 2015, Murcia (Spain): **III International Symposium on Organic Matter Management and Compost Use in Horticulture.** Info: Dr. Miguel A. Sánchez-Monedero, CEBAS-CSIC, Campus Universitario de Espinardo, 25, 30100 Murcia, Spain. Phone: (34) 968396364, Fax: (34)968396213, E-mail: monedero@cebas.csic.es or Dr. Mariluz Cayuela, CEBAS-CSIC, Campus Universitario de Espinardo, 25, 30100 Murcia, Spain. E-mail: mlcayuela@cebas.csic.es Web: http://www.compost-for-horticulture.org

- April 21-24, 2015, Izmir (Turkey): **II International Workshop on Bacterial Diseases of Stone Fruits and Nuts.** Info: Prof. Dr. Hatice Özaktan, University of Ege, Faculty of Agric., Dept. Plant Protection, 35100 Bornova-Izmir, Turkey. Phone: (90)232 3884000, Fax: (90)232 3744848, E-mail: hatice.ozaktan@ege.edu.tr

- NEW May 1-4, 2015, Kermanshah (Iran): **III International Conference on Quality Management in Supply Chains of Ornamentals (QMSCO 2015).** Info: Prof. Dr. Mohammad Mahdi Jowkar, Dept. of Agronomy and Plant Breeding, College of Agriculture, Islamic Azad University, Kermanshah, Iran. E-mail: mjowk@yahoo.co.uk Web: http://www.qmsco2015.com/

- May 18-22, 2015, Beijing (China): **V International Symposium on Ecologically Sound Fertilization Strategies for Field Vegetable Production.** Info: Prof. Dr. Silvana Nicola, University of Turin, Dept. of Agric., Forest and Food Sciences, Leonardo Da Vinci 44 (L.Paolo Braccini, 2), 10095 Grugliasco (TO), Italy. Phone: (39)0116708773, Fax: (39)0112368773, E-mail: silvana.nicola@unito.it or Prof. Dr. Guoyuan Zou, Institute of Plant Nutrition and Resources, Beijing Academy of Agric. & Forestry Sci., No. 9, Middle Shuguanghuayuan Rd., Beijing, Haidian District, China. Phone: (86)1051503998, Fax: (86)1051503996, E-mail: zouguoyuan@baafs.net.cn E-mail symposium: ishs2015@163.com Web: http://ishs2015beijing.csp.escience.cn

- May 21-25, 2015, Nigde (Turkey): **VII International Symposium on Edible Alliaceae.** Info: Ali Fuat Gokce, Nigde University, Faculty of Agric. Sci. and Technologies, Department of Agri. Genetic Engineering, 51240 Nigde, Turkey. Phone: (90)05365434241, E-mail: gokce01@yahoo.com E-mail symposium: isea2015turkey@yahoo.com Web: http://sempozyum.nigde.edu.tr/isea2015/

- May 24-27, 2015, Hazyview (South Africa): **IV International Symposium on Guava and Other Myrtaceae.** Info: Ms. Karin Hannweg, ARC-ITSC, Private Bag X11208, Nelspruit Mpumalanga 1200, South Africa. Phone: (27)13752354, E-mail: karin@arc.agric.za or Maritha Schoeman, ARC-ITSC, Private Bag X11208, Nelspruit, 1200 Mpumalanga Nelspruit, South Africa. Phone: (27) 13 7537000, Fax: (27) 13 7523854, E-mail: maritha@arc.agric.za Web: http://www.4thisgm.co.za/

- May 31 - June 3, 2015, Alnarp (Sweden): **XVIII International Symposium on Horticultural Economics and Management.** Info: Dr. Lena Ekelund Axelson, Dept. of Work Science, Business Econ., Environmental Psychology, Box 88, S-230 53 Alnarp, Sweden. Phone: (46)40-415000, Fax: (46)40-415076, E-mail: lena.ekelund@slu.se Web: http://www.slu.se/ishseconomicman2015

- NEW June 2-4, 2015, Chantaburi (Thailand): **International Symposium on Durian and Other Humid Tropical Fruits.** Info: Mr. Anan Suwannarat, Director General, Department of Agriculture, Chatuchak, Bangkok 10900, Thailand. E-mail: dhtf2015@gmail.com E-mail symposium: dhtf2015@gmail.com Web: http://www.hsstth2.com/pdf/first%20announcement-DHTF2015.pdf

- NEW June 2-5, 2015, Montpellier (France): **X International Symposium on Modelling in Fruit Research and Orchard Management.** Info: Dr. Evelyne Costes, INRA UMR DAP, 2, place Viala, 34060 Montpellier Cedex 1, France. Phone: (33)499612787, Fax: (33)499612616, E-mail: costes@supagro.inra.fr Web: https://colloque.inra.fr/modellingfruit2015

- NEW June 7-11, 2015, Bari (Italy): **III International Symposium on Postharvest Pathology: Using Science to Increase Food Availability.** Info: Antonio Ippolito, Dept soil plant and food science, University of Bari, Via Amendola 165/A, 70126 Bari, Italy. Phone: (39)0805443053, Fax: (39)0805442911, E-mail: antonio.ippolito@uniba.it E-mail symposium: postharvest.bari2015@uniba.it Web: http://www.postharvestbari2015.it

- June 8-12, 2015, Avignon (France): **International Symposium on Innovation in Integrated and Organic Horticulture (INNOHORT).** Info: Stephane Bellon, INRA, Ecodevelopment Unit, SAD, Site Agroparc, Avignon Cedex 9, 84914, France. Phone: (33)432722583, E-mail: bellon@avignon.inra.fr or Dr. Nadia Bertin, INRA, Site Agroparc Domaine St Paul, Avignon 84914 Cedex 9, France. E-mail: nadia.bertin@avignon.inra.fr or Dr. Sylvaine Simon, INRA PACA AVIGNON, Domaine Saint Paul, Site Agroparc, 84914 Avignon Cedex 9, France. Phone: (33)432722560, Fax: (33)432722562, E-mail: sylvaine.simon@avignon.inra.fr or Prof. Dr. Laurent Urban, Campus Agroparc, 301 rue Baruch de Spinoza, BP 21 239, 84916 Avignon, France. Phone: (33)490842214, E-mail: laurent.urban@univ-avignon.fr

- NEW June 8-11, 2015, Lleida (Spain): **VIII International Symposium on Irrigation of Horticultural Crops.** Info: Dr. Jordi Marsal, IRTA, Centre udl-IRTA, Av. Rovira Roure 177, Lleida 25198, Spain. Phone: (34)973702639, Fax: (34)973238301, E-mail: jordi.marsal@irta.es Web: http://www.ipcongressos.com/en/symposium/irrigation-horticultural-crops

- June 14-18, 2015, Bologna (Italy): **XIV Eucarpia Symposium on Fruit Breeding and Genetics.** Info: Dr. Stefano Tartarini, Dipartimento Scienze Agrarie, University of Bologna, Viale Fanin 46, 40127 Bologna, Italy. Phone: (39)0512096420, Fax: (39)0512096401, E-mail: stefano.tartarini@unibo.it E-mail symposium: convener@eucarpiafruit2015.org Web: http://www.eucarpiafruit2015.org
- June 21-24, 2015, Asheville, NC (United States of America): **XI International Rubus and Ribes Symposium.** Info: Dr. Gina Elizabeth Fernandez, North Carolina State University, 210 Kilgore Hall BOX 7609, Raleigh, NC 27695-7609, United States of America. Phone: (1)9195151188, Fax: (1)9195152505, E-mail: gina_fernandez@ncsu.edu E-mail symposium: rubusribes2015@newbeginningsmanagement.com Web: http://www.rubusribes2015.com
- NEW June 22-26, 2015, Cartagena, Murcia (Spain): **V International Symposium on Cucurbits.** Info: Dr. Francisco Pérez-Alfocea, Dept. of Plant Nutrition, CEBAS-CSIC, PO Box 164, 30100 Murcia, Spain. Phone: (34)968396342, Fax: (34)968396213, E-mail: alfocea@cebas.csic.es or Dr. M.L. Gómez-Guillamón, Plant Breeding Dept., IHSM-La Mayora, CSIC-UMA, 29750 Algarrobo-Costa, Málaga, Spain. Phone: (34)952548990, Fax: (34)952552677, E-mail: guillamon@eelm.csic.es E-mail symposium: csoriano@cebas.csic.es Web: http://www.cucurbits2015.org
- June 28 - July 2, 2015, Melle (Belgium): **XXV Eucarpia Symposium on Ornamentals.** Info: Dr. Johan Van Huylenbroeck, ILVIO- Plant Unit, Applied genetics & breeding, Caritasstraat 21, 9090 Melle, Belgium. Phone: (32) 9-2722862, Fax: (32) 9-2722901, E-mail: johan.vanhuylenbroeck@ilvo.vlaanderen.be E-mail symposium: eucarpia-ornamentals@ilvo.vlaanderen.be Web: http://www.eucarpiaornamentals2015.be/
- NEW June 29 - July 3, 2015, Shenyang City, Liaoning Province (China): **XVI International Symposium on Apricot Breeding and Culture.** Info: Dr. Weisheng Liu, Liaoning Inst. of Pomology, Xiongyue Town, Yingkou City Liaoning 115009, China. Phone: (86)417-7032822, Fax: (86)417-7842942, E-mail: weishengliu@aliyun.com Web: http://www.apricot2015.com
- July 5-8, 2015, Jupiter's Gold Coast, QLD (Australia): **ICESC2015: Hydroponics and Aquaponics at the Gold Coast.** Info: Mr. Graeme Smith, PO Box 789, Woodend Victoria 3442, Australia. Phone: (61)354272143, E-mail: graeme@graemesmithconsulting.com or Dr. Mike Nichols, 10 Newcastle St, Palmerston North 5510, New Zealand. Phone: (64)6-3576922, E-mail: m.nichols@inspire.net.nz E-mail symposium: secretariat@icesc2015goldcoast.org Web: http://www.icesc2015goldcoast.org/
- July 19-23, 2015, Evora (Portugal): **Greensys 2015 - International Symposium on New Technologies and Management for Greenhouses.** Info: Prof. Dr. Fátima Baptista, Universidade Evora, Dept.Eng.Rural - ICAAM, Nucleo da Mitra, Apartado 94, 7002-554 Évora, Portugal. Phone: (351)266760823, Fax: (351)266711189, E-mail: fb@uevora.pt or Prof. Dr. Jorge Ferro Meneses, Instituto Superior de Agronomia, Tapada da Ajuda, 1349-017 Lisboa, Portugal. Phone: (351)213602082, Fax: (351)213621575, E-mail: jmeneses@isa.utl.pt or Prof. Dr. Luís Silva, University of Evora - ICAAM, Dept. Eng.Rural - ICAAM, Nucleo da Mitra, Apartado 94, 7002-554 Evora, Portugal. Phone: (351)266760933, Fax: (351)266760911, E-mail: llsilva@uevora.pt Web: http://www.greensys2015.uevora.pt
- July 26-29, 2015, Fredonia, NY (United States of America): **II International Workshop on Vineyard Mechanization and Grape and Wine Quality.** Info: Terence Bates, 6592 West Main Road, Portland, NY 14769, United States of America. E-mail: trb7@cornell.edu or Dr. Nick Dokoozlian, E & J Gallo, P. O. Box 1130, Modesto, CA 95353, United States of America. Phone: (1)5596466587, Fax: (1)5596466593, E-mail: nick.dokoozlian@ejgallo.com Web: http://events.cals.cornell.edu/ishs
- NEW August 5-8, 2015, Yakima, WA (United States of America): **IV International Humulus Symposium.** Info: Dr. Paul Matthews, S.S. Steiner Inc., 1 West Washington Avenue, Yakima, Washington, 98908, United States of America. E-mail: pmatthews@hopsteiner.com or Prof. Dr. Fred Stevens, 307 Linus Pauling Science Center, Corvallis, OR 97331, United States of America. Phone: 541-737-9534, E-mail: fred.stevens@oregonstate.edu Web: http://ihs.hopsteiner.us/
- August 6-9, 2015, Kyoto (Japan): **II International Symposium on Pyrethrum.** Info: Prof. Kazuhiko Matsuda, Department of Applied Biological Chemistry, Faculty of Agriculture, Kinki University, 3327-204 Naka-machi, Nara 631-8505, Japan. Phone: (81)742-437153, Fax: (81)742-431445, E-mail: kmatsuda@nara.kindai.ac.jp
- August 20-24, 2015, Perth (Australia): **VIII International Symposium on New Ornamental Crops and XII International Protea Research Symposium and XVII International Protea Association Conference.** Info: Dr. Robyn McConchie, The University of Sydney, Faculty of Agriculture Food and Natural Res, NSW 2006, Australia. Phone: (61) 2 8627 1045, E-mail: robyn.mcconchie@sydney.edu.au Web: http://protea-new-ornamentals2015.org/
- August 31 - September 3, 2015, Napoli (Italy): **V International Symposium on Fig.** Info: Prof. 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. Boris Basile, Department of Agricultural Sciences, Università di Napoli Federico II, Via Università, 100, 80055 Portici NA, Italy. Phone: (39)081-2539387, Fax: (39)081-2539389, E-mail: boris.basile@unina.it E-mail symposium: figsymposium2015@soishs.org Web: http://www.soishs.org/fig
- September 7-11, 2015, Vienna (Austria): **International Symposium on Growing Media, Composting and Substrate Analysis - SusGro2015.** Info: Dr. Andreas Baumgarten, Austrian Agency for Health and Food Safety, Institute for Soil Health and Plant Nutr., Spargelfeldstrasse 191, 1226 Wien, Austria. Phone: (43)50555 34100, Fax: (43)50555 34101, E-mail: andreas.baumgarten@ages.at E-mail symposium: susgro2015@ages.at Web: http://www.susgro2015.at
- September 8-12, 2015, Abuja (Nigeria): **II International Symposium on Mycotoxins in Nuts and Dried Fruits.** Info: Dr. Anthony Negedu, Raw Materials R&D Council, Food and Beverages Division, 17 Aguiyi Ironsi Street, Maitama, Abuja, Nigeria. Phone: (234)8055240599, E-mail: tonyneg2000@yahoo.com E-mail symposium: mycotoxinsymposium2015@rmrdc.gov.ng
- September 13-16, 2015, Davis, CA (United States of America): **III International Conference on Fresh-Cut Produce: Maintaining Quality and Safety.** Info: Dr. Marita I. Cantwell, University of California Davis, Department of Plant Sciences, Mann Laboratory, Davis, CA 95616-8746, United States of America. Phone: (1)5307527305, Fax: (1)5307524554, E-mail: micantwell@ucdavis.edu Web: http://fresh-cut2015.ucdavis.edu
- September 13-16, 2015, Washington (United States of America): **II International Symposium on Mechanical Harvesting and Handling Systems of Fruits and Nuts.** Info: Dr. Matthew Whiting, Washington State University, IAREC, 24106 N. Bunn Road, Prosser, WA 99350, United States of America. E-mail: mdwhiting@wsu.edu or Prof. Dr. Qin Zhang, Center for Precision & Automated Agri. Sys., Washington State University, Prosser, WA 99350, United States of America, Phone: (1)509-786-9360, E-mail: qinzhang@wsu.edu
- September 16-18, 2015, Belgrade (Serbia): **III Balkan Symposium on Fruit Growing.** Info: Prof. Dr. Dragan Milatovic, Faculty of Agriculture, Nemanjina 6, 11080 Beograd - Zemun, Serbia. Phone: (381)112615315, Fax: (381)112193659, E-mail: mdragan@agrif.bg.ac.rs E-mail symposium: 3bfsg@agrif.bg.ac.rs Web: http://3bsfg.agrif.bg.ac.rs

- September 28 - October 2, 2015, Darwin, Northern Territory (Australia): **XI International Mango Symposium.** Info: Mr. Bob Williams, 3 Hayward Place, Durack, Darwin 0830, Australia. Phone: (61)8 89314013, E-mail: rcekwilliams3@bigpond.com or Dr. Lucy Tran-Nguyen, NTDPIF, GPO Box 3000, Darwin Northern Territory 0801, Australia. Phone: (61)8 8999 2235, Fax: (61)8 8999 2312, E-mail: lucy.tran-nguyen@nt.gov.au or Dr. Ian Bally, Agri-Science Queensland, Dept. of Agriculture Fisheries and Forestry, PO Box 1054, Mareeba QLD 4880, Australia. Phone: (61)740484644, Fax: (61)74093593, E-mail: ian.bally@daff.qld.gov.au E-mail symposium: mango2015symposium@conlog.com.au Web: http://mango2015.com.au
- September 28 - October 2, 2015, La Plata (Argentina): **IX International Symposium on Artichoke, Cardoon and their Wild Relatives.** Info: Stella Maris García, Campo Experimental J.F. Villarino, C.C. 14, Zavalla S 2125 ZAA, Argentina. Phone: (54)341-4970080, Fax: (54)341-4970080, E-mail: sgarcia@unr.edu.ar or Vanina Pamela Cravero, Campo Experimental J.F. Villarino, C.C. 14, Zavalla S 2125 ZAA, Argentina. Phone: (54)341-4970080/85, Fax: (54)341-4970080/85, E-mail: vcravero@unr.edu.ar Web: http://www.alcachofa2015.com/
- October 11-14, 2015, Wageningen (Netherlands): **V International Symposium on Applications of Modelling as an Innovative Technology in the Horticultural Supply Chain - Model-IT 2015.** Info: Rob Schouten, Horticultural Production Chains, Wageningen University, Droevendaalsesteeg 1, 6708 Pd Wageningen, Netherlands. E-mail: rob.schouten@wur.nl or Prof. Dr. Leo F. M. Marcelis, Wageningen University, Horticulture & Product Physiology, Droevendaalsesteeg 1, 6708 PB Wageningen, Netherlands. Phone: (31)317485675, E-mail: leo.marcelis@wur.nl
- NEW October 18-22, 2015, Port-au-Prince (Haiti): **International Symposium on Valorisation, Preservation and Processing of Tropical Fruits and Vegetables.** Info: Dr. Marie Thérèse Charles, 430 Boulevard Gouin, Saint-Jean-sur-Richelieu QC J3B 3E6, Canada. Phone: (1)450-346-4494, Fax: (1)450-346-7740, E-mail: mariethereese.charles@agr.gc.ca or Prof. Harold Corantin, Damien, route Nationale #1, Port-au-Prince, BP: 1441, Haiti. Phone: (509)48927198, E-mail: hcorantin@yahoo.fr Web: http://fruitsvegetableshaiti2015.com
- NEW November 15-18, 2015, Manila (Philippines): **I International Symposium on Moringa.** Info: Dr. Manuel C. Palada, Central Philippine University, College of Agriculture, Res & Env Sciences, Lopez Jaena St, Jaro, Iloilo City, Philippines. Phone: (63)333331795, Fax: (63)333203685, E-mail: mpalada@gmail.com or Dr. Andreas Ebert, AVRDC - The World Vegetable Center, 60 Yi-Min Liao, Shanhua, 74151 Tainan, Chinese Taipei. Phone: (886)65837801, Fax: (886)65830009, E-mail: ebert.andreas6@gmail.com Web: http://ism2015.moringaling.net/
- NEW November 16-19, 2015, Florence (Italy): **II World Congress on the Use of Biostimulants in Agriculture.** Info: New Ag International SARL, Jean-Pierre Leymonie, Managing Director, 12 rue du Hagueneck, 68000 Colmar, France. E-mail: newag@newaginternational.com E-mail symposium: biostimulants@newaginternational.com Web: http://www.biostimulants2015.com/
- December 7-9, 2015, Ubon Ratchathani (Thailand): **I International Symposium on Quality Management of Organic Horticultural Produce.** Info: Dr. Wiraya Krongyut, 2, Faculty of Agriculture, Ubon Ratchathani Rajabhat University, Nai Muang 34000, Thailand. Phone: (66) 45-352-000, Fax: (66)45-352-088, E-mail: wirayakrongyut@gmail.com

YEAR 2016

- January 11-17, 2016, Giza (Egypt): **IX International Symposium on In Vitro Culture and Horticultural Breeding.** Info: Adel A. Abul-Soad, Horticulture Research Institute, 9 Cairo University St., 12619 Giza, Egypt. E-mail: adelaboelsoaud@gmail.com E-mail symposium: 9ivchbegypt16@gmail.com
- NEW March 6-9, 2016, Santiago (Chile): **XIV International Symposium on Processing Tomato - XII World Processing Tomato Congress.** Info: Dr. Cosme A. Argerich, Instit. Nac. de Tecnol. Agro.,C.C. Nro. 8, La Consulta, 5567 Mendoza, Argentina. Phone: (54)2622470304, Fax: (54)2622470753, E-mail: argerich.cosme@inta.gob.ar or Prof. Dr. Montaña Cámara, Dpto. Nutrición y Bromatología IIFacultad Farmacia, UCM, Plaza Ramón y Cajal sn, 28040 Madrid, Spain. Phone: (34) 913941808, Fax: (34) 913941799, E-mail: mcamara@farm.ucm.es E-mail symposium: wptc2016@tomate.org
- NEW March 7-9, 2016, Krabi Province (Thailand): **I International Symposium on Tropical and Subtropical Ornamentals.** 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: tso-2016thailand@gmail.com
- April 10-14, 2016, Orlando, FL (United States of America): **XI International Vaccinium Symposium.** Info: James Olmstead, University of Florida, 2211 Fifield Hall, Gainesville, FL 32611, United States of America. E-mail: jwolmstead@ufl.edu
- NEW April 11-14, 2016, Izmir (Turkey): **III International Symposium on Organic Greenhouse Horticulture.** 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
- May 1-1, 2016, Antalya (Turkey): **III International Symposium on Biotechnology of Fruit Species.** Info: Prof. Dr. Ahmet Naci Onus, Department of Horticulture, Faculty of Agriculture, Akdeniz University, 07059 Antalya, Turkey. Phone: (90) 242-3102441, Fax: (90) 242- 2274564, E-mail: onus@akdeniz.edu.tr
- NEW May 6-10, 2016, Istanbul (Turkey): **III International Symposium on Plum Pox Virus.** Info: Prof. Dr. Kadriye Caglayan, Mustafa Kemal University, Agriculture Faculty, Plant Protection Department, 31034 Antakya-Hatay, Turkey. Phone: (90)326 2455836 Ext.1347, Fax: (90)326 2455832, E-mail: kcaglayano@yahoo.com or Dr. Birol Akbas, Tarimsal Arastirmalar ve, Teknoloji Gelistirme Kampüsü, Istanbul Yolu Üzeri No 38, P.K. 51, 06171 Yenimahalle Ankara, Turkey. Phone: (90) 312 3271793, Fax: (90) 312 32708024, E-mail: bakbas@tagem.gov.tr E-mail symposium: k_degirmenci@hotmail.com
- May 22-26, 2016, East Lansing, MI (United States of America): **VIII International Symposium on Light in Horticulture.** Info: Prof. Erik Runkle, 1066 Bogue Street, Room A288, Michigan State University, East Lansing, MI 48824, United States of America. Phone: (1)517.355.5191 x350, Fax: (1)517.353.0890, E-mail: runkleer@msu.edu or Prof. Roberto G. Lopez, Purdue University, 625 Agriculture Mall Drive, West Lafayette, Indiana, USA 47907, United States of America. Phone: (1) 765 4963425, Fax: (1) 765 4940391, E-mail: rglopez@purdue.edu Web: http://www.lightsym16.com
- NEW June 20-25, 2016, Athens (Greece): **VI International Conference on Landscape and Urban Horticulture.** Info: Prof. Dr. Maria Papafotiou, Dept. Floriculture & Landscape Architecture, Agricultural University of Athens, 75, Iera Odos, 118 55 Athens, Greece. Phone: (30)2105294555, Fax: (30)2105294553, E-mail: mpapaf@aua.gr or Dr. Panayiotis Nektarios, Dept Floriculture & Landscape Architecture, Agricultural University of Athens, 75, Iera Odos, 118 55 Athens, Greece. Phone: (30)2105294554, Fax: (30)2105294553, E-mail: pan@aua.gr or Dr. Angeliki Paraskevopoulou, Dept. Floriculture & Landscape Architecture, Agricultural University of Athens, 75, Iera Odos, 118 55 Athens, Greece. Phone: (30)2105294554, Fax: (30)2105294553, E-mail: aparas@aua.gr

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Index to Volume 54 of *Chronica Horticulturae*

Subject Index

The World of Horticulture

Author Index

Available Issues of *Acta Horticulturae*

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Acta Number	Acta Title	Acta Price (EUR)
1059	IX International Symposium on Temperate Zone Fruits in the Tropics and Subtropics	66
1058	X International Symposium on Integrating Canopy, Rootstock and Environmental Physiology in Orchard Systems	140
1057	VII International Symposium on Olive Growing	153
1056	XIII International Workshop on Fire Blight	77
1055	Proceedings of the International Plant Propagator's Society - 2013	110
1054	International Conference on Agricultural Engineering: New Technologies for Sustainable Agricultural Production and Food Security	84
1053	II International Symposium on Discovery and Development of Innovative Strategies for Postharvest Disease Management	67
1052	VIII International Congress on Hazelnut	89
1051	Middle East Horticultural Summit	51
1050	VII International Walnut Symposium	93
1049	VII International Strawberry Symposium	169
1048	II International Symposium on Biotechnology of Fruit Species	64
1047	III International Conference on Postharvest and Quality Management of Horticultural Products of Interest for Tropical Regions	85
1046	X International Conference on Grapevine Breeding and Genetics	143
1044	VIII International Symposium on Chemical and Non-Chemical Soil and Substrate Disinfestation	100
1043	II European Congress on Chestnut	63
1042	XII International Symposium on Plant Bioregulators in Fruit Production	75
1041	II International Symposium on Organic Greenhouse Horticulture	77
1040	III International Symposium on Human Health Effects of Fruits and Vegetables - FAVHEALTH 2009	90
1039	II International Symposium on Plant Cryopreservation	78
1038	VII International Symposium on Irrigation of Horticultural Crops	143
1037	International Symposium on New Technologies for Environment Control, Energy-Saving and Crop Production in Greenhouse and Plant Factory - Greensys 2013	233
1036	International Symposium on Papaver	62
1034	International Symposium on Growing Media and Soilless Cultivation	129
1033	Eurasian Symposium on Vegetables and Greens	40
1032	I International Symposium on Fruit Culture and Its Traditional Knowledge along Silk Road Countries	72
1031	XI International Protea Research Symposium	57
1030	International Symposium on Medicinal Plants and Natural Products	56
1028	VI International Symposium on Almonds and Pistachios	92
1027	III International Symposium on the Genus Lilium	67
1026	International Symposium on Banana	37
1025	International Symposium on Orchids and Ornamental Plants	66
1021	International Symposium on Urban and Peri-Urban Horticulture in the Century of Cities: Lessons, Challenges, Opportunitites	100
1020	VI International Cherry Symposium	114
1019	V International Chestnut Symposium	70
1018	I International Symposium on Organic Matter Management and Compost Use in Horticulture	144
1016	II International Conference on Postharvest and Quality Management of Horticultural Products of Interest for Tropical Regions	62
1015	International CIPA Conference 2012 on Plasticulture for a Green Planet	85
1014	Proceedings of the International Plant Propagators' Society - 2012	112
1013	International Symposium on Growing Media, Composting and Substrate Analysis	113
1012	VII International Postharvest Symposium	298
1011	II Asia Pacific Symposium on Postharvest Research Education and Extension: APS2012	111
1009	I World Congress on the Use of Biostimulants in Agriculture	67
1008	Ist International Symposium on CFD Applications in Agriculture	76
1007	II All Africa Horticulture Congress	203
1006	IV International Symposium on Improving the Performance of Supply Chains in the Transitional Economies	99
1005	VI International Symposium on Brassicas and XVIII Crucifer Genetics Workshop	133
1004	International Symposium on Soilless Cultivation	65
1002	XI International Symposium on Flower Bulbs and Herbaceous Perennials	96
1001	II International Organic Fruit Symposium	93
1000	VII International Symposium on New Floricultural Crops	125
999	III International Conference on Landscape and Urban Horticulture	81
998	EUFRIN Thinning Working Group Symposia	53
997	International symposium on Medicinal and Aromatic Plants - SIPAM 2012	81
996	V International Symposium on Persimmon	105
995	VII International Congress on Cactus Pear and Cochineal	92

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