

CHRONICA HORTICULTURAE

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Horticultural Highlights

Interpreting Responses to Observed Climate Shifts Helps Managers of Temperate Perennial Horticulture Plan for Future Change • Feeding a Hungry World: the Challenge of Developing Safe and Effective Methods of Food Preservation • The Centenary of the Romanian Horticultural Society • The Global Plant Council

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Cover photograph: Climate change will have a deep impact on horticultural production. This will be particularly the case for the grape industry as discussed in the article by Rebecca Darbyshire and Leanne Webb on page 5.





A Bright Future for the ISHS

António Monteiro, President of ISHS

An editorial at the end of the President's term of office could be the occasion for a reminder of the achievements that have been made during the past four years. I prefer to use this opportunity to write about the future of the Society.

I am conscious that predicting the future is for gurus, and we have experienced how easily they fail. It is not my intention to make this a divining exercise and to produce magic prophecies.

I believe that taking the right decisions now will prepare the Society for the uncertainties of the future. The ISHS strategy should be to invest in its core activities because that's what will give the Society significance in the scientific community and in horticulture worldwide.

THE RELEVANCE OF THE ISHS

When I stood for President four years ago I presented three priorities to Council: i) investing in publications, the core business of the ISHS; ii) strengthening links with the horticulture industry; and iii) expanding the ISHS to parts of the world where horticulture is increasing. These were the priorities of Board action during the past four years, and we believe that developing these three important components of the Society makes it stronger and better prepared for the future.

The ISHS is important to members of the Society. Some of us dedicate quite a lot of time and resources to it. We love ISHS because it is our Society. However, we should also look at the ISHS from the outside to critically review what we are doing and to question the role and mission of the ISHS at the present time.

Do the scientific community and the horticulture industry really need a scientific society like ours? My answer is a clear "Yes". The ISHS is much more relevant than we could have anticipated because it is so well adapted to current trends in knowledge transfer, as will be discussed later. As in any organisation, there is a permanent need to change our methods of work and to improve the quality of publications and meetings, to ensure they continue to be sufficiently relevant, attractive and prestigious.

THE ISHS IS COMMITTED TO PRODUCING KNOWLEDGE THAT FEEDS INNOVATION

According to the Statutes, ISHS is concerned with science and education, but also with

knowledge transfer, i.e. innovation. Horticulture innovation is the key to generating value added and to raising the income of those who live from horticulture.

What is the contribution of the ISHS to horticulture innovation? It is difficult to give a proper answer to this question because the use of knowledge to produce innovation is complex.

This is not the appropriate place to discuss the various models that explain how knowledge transfer occurs. However, the open-innovation model described by Chesbrough (2003) is well known and is compatible with horticulture value chains where small and medium companies with little capacity to have their own research facilities predominate.

According to this model, the high-quality knowledge that companies require to improve existing technologies, products and processes, is abundant and widespread. To take advantage of new business opportunities companies will use knowledge from all sources that fit into their needs, but the knowledge must be easily accessible and freely available.

A recent report of the European Parliament concerning knowledge transfer from public research organisations (Arnold et al., 2012) stated that the two most important methods for knowledge transfer are: i) the traditional published academic outputs such as journal articles, conference proceedings and books; and ii) informal interactions including personal contacts at conferences, seminars and via professional associations.

This is very good news for ISHS because it confirms that publications and symposia, the core activities of the Society, promote the flow of new knowledge into the economy. These critical ISHS activities are much needed and constitute the pillars of knowledge transfer to innovation.

To play a serious role in knowledge transfer and to give a solid contribution to horticulture innovation, ISHS needs to publish recognized scientific journals, organize meetings well attended by scientists and experts from industry, and make the information presented at such meetings readily available worldwide.

Our Society has made steady progress in these areas during my term as President.

PUBLICATIONS HAVE A KEY ROLE IN HORTICULTURE INNOVATION

PubHort, the ISHS basket of publications, is experiencing important improvements as Yves



António Monteiro

Desjardins, the Board member responsible for publications, will explain. The ISHS recently added a scientific journal to its portfolio after the Board signed an agreement with the Journal of Horticultural Science and Biotechnology. Similar agreement is being made with the European Journal of Horticultural Science. This will reinforce the presence of the ISHS in scientific publications.

Some of these journals should become open-access because it is the most efficient way to ensure that the information published by ISHS reaches the entire horticultural community and funding agencies will be requesting that publicly funded research be openly accessible.

We expect ISHS publications to have high impact. However, the methods used nowadays to estimate the impact of a publication are inaccurate and inappropriate to horticultural sciences. Thomson Reuters' journal impact factor or the number of citations per article estimate only the impact of an article within the scientific community. Furthermore, comparisons between absolute values of these indices should not be made because of huge differences between scientific areas. In the case of applied sciences, such as horticultural sciences, it is relevant to use a method that can estimate the impact published information has outside the scientific community and particularly on its contribution to innovation.

PLOS-ONE, a well-known open-access journal, addresses this question by presenting an innovative "Articles Level Metrics" where relevant indicators of impact, e.g. viewed, cited, saved, discussed and recommended, help users to determine the value of an article. This open-access approach is very interesting to horticulture science because it could take into consideration not only the scientists, but also the millions of horticulture stakeholders spread all over the world, most of whom have no access to scientific libraries but instead get most of their knowledge from the Internet. Which paper has higher impact: one that is published in a high IF journal and is cited a few times or another that is downloaded by thousands of people worldwide?

SYMPOSIA ARE STRONG MAGNETS FOR SCIENTISTS AND THE HORTICULTURE INDUSTRY

As stated above, meetings are the second most important vehicle for knowledge transfer to stakeholders. Participants from industry at ISHS symposia are estimated between 20 and 30% of the total, which is a rather good figure but can still be increased.

The ISHS Executive Committee, under the leadership of Vice-President Kim Hummer, has been working towards this goal as shown by this extract from the guidelines for EC members and symposium conveners: "Actively encourage conveners to involve private sector/industry representatives on the local organizing and scientific committees. Also actively provide opportunities for private sector/industry personnel to chair sessions, provide keynote addresses, and/or submit papers at ISHS symposia".

ISHS symposia are a strong magnet for researchers working in different scientific disciplines. When discipline-oriented scientists are focused on a horticulture crop they can better understand the advantages of multidisciplinary approaches and benefit from interaction and scientific exchange between research teams. An important extra advantage to these researchers is the direct contact with industry people.

The ISHS is well known for its symposia. This is our best product, which should be continuously monitored and improved, e.g. by increasing the critical mass of participants and ensuring that meetings are professionally organised. If we add to symposia the value created by the publication of the proceedings in *Acta Horticulturae*, our meetings become a remarkable contribution to horticulture innovation.

ACTA AMPLIFIES SYMPOSIUM PRESENTATIONS

The profile of *Acta Horticulturae* as symposium proceedings is well established and has been reinforced by the recent involvement of the ISHS in the publication of scientific journals. Proceedings must be readily published. The Society has made an important investment in information technologies to make *Acta* available at the time of each symposium using the new integrated on-line system for abstract and manuscript submission and reviewing.

Because *Acta* will also be available on-line, and articles will have all current features such as DOI and cross references, the information of oral and poster presentations will be available worldwide in real time. This is the "New" *Acta Horticulturae* that should focus on quick and informal information, which could later be completed by full content articles published in ISHS scientific journals.

MAINTAINING THE ROUTE TO SUCCESS

It is good to see the Society focused on its core business to achieve the most important component of its mission: to make science available to horticulture and people. I believe that the ISHS is preparing a bright future when it is publishing good scientific journals, organizing symposia on relevant specialized topics that are well attended by both scientists and participants from industry, and making the respective proceedings readily available on-line.

The ISHS is an information broker. Basically, we spread information all over the world and put people in communication with each other to share information and knowledge. This is a

very competitive area of activity that undergoes rapid changes. Recent technologies that looked quite promising sometimes vanish very quickly. However, if the ISHS continues to manage well its sources of information, e.g. symposium presentations, manuscript submission and the capacity to organize competitive meetings, information technologies will become less relevant because they are just the tools to process the information.

The present success of ISHS does not mean that it is time to relax and enjoy the benefits of recent improvements in our core activities. There is a need for continuous improvement of our meetings and publications, and for monitoring the market and the options our competitors are taking. This is our way to stay at the front line of scientific information, which will give us the ability to look forward and to choose the best tools to deliver our scientific products in a timely manner.

We are experienced sailors in the ocean of scientific information. To ensure a bright future for the ISHS we have to hold to the route even when there is change in the wind.

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Interpreting Responses to Observed Climate Shifts Helps Managers of Temperate Perennial Horticulture Plan for Future Change

Rebecca Darbyshire and Leanne Webb

Changes to the climate are likely to impact key aspects of temperate perennial horticultural production. Understanding how shifts in the climate will impact physiology is critical to allow managers and researchers to maintain and expand future production. Effective adaptation efforts are required to minimise potential adverse effects and to take advantage of possible benefits of future warming.

Many analyses of historical data of temperate perennial fruit have indicated that recent climate changes have influenced plant physiology (e.g. Chmielewski et al., 2004; Grab and Craparo, 2011; Legave et al., 2008). Based on these studies it can be surmised that further changes are likely to occur due to continued global warming. Here we explore this idea and focus on how best to understand the causes of the shifts both from a physiological and an environmental perspective. To examine these issues two Australian studies will be used as examples. Firstly, pome fruit flowering will be considered in terms of the importance of understanding the physiological response when interpreting climate impacts. Secondly, wine-grape maturation will be discussed in terms of attributing observed trends to both climate and non-climate drivers. Options to assist with the management of these likely future changes will also be presented.

POME FRUIT FLOWERING

Recent observations of the timing of pome fruit flowering have by-and-large shown a trend towards earlier emergence. For instance, in France and South Africa flowering of 'Golden Delicious' apple has advanced respectively by 2.6–3.0 and 1.9 days per decade (Grab and Craparo, 2011; Legave et al., 2008). These changes have been associated with recent observed warming in the respective regions. With projections for warming to continue into the future (IPCC, 2013), it is likely that the timing of flowering will continue to occur earlier and earlier. Or will it?

Flowering advancement affects horticultural industries in several ways. The most obvious

impact from earlier flowering is an increase in frost risk. Less obvious though just as significant is the potential separation of the flowering periods of cross-pollinating species that could lead to poor fruit set. Another relationship that may be disturbed is the timing of flowering with the appearance of insect pollinators. Adaptive planning is necessary in order to reduce such negative consequences. However, in order to plan and adapt to these potential impacts an understanding of the mechanisms behind the trends is required.

The precise physiological pathways that lead to pome fruit flowering are still unclear. Nevertheless, it is known, in a general sense, that flowering occurs in response to the stimulus offered by increasing temperature in the spring season, after having been released from winter dormancy. Generally, higher springtime temperatures accelerate biophysical processes advancing the timing of flowering (Chmielewski et al., 2004). The effect of the warm spring temperatures is suppressed, however, until a

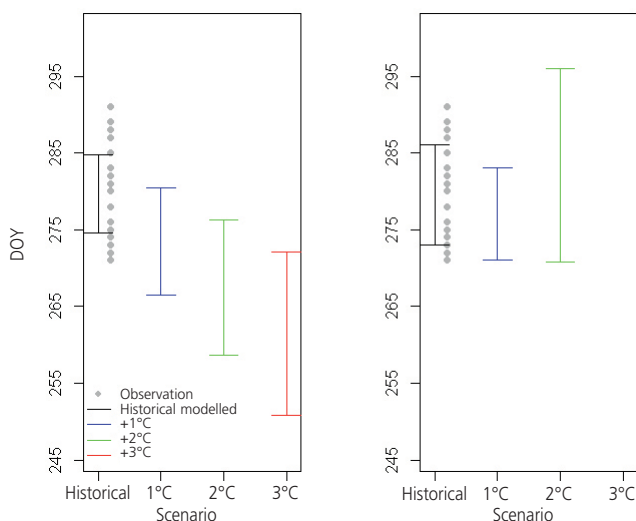
quota of cold temperatures, or 'chill', is accumulated (Saure, 1985) releasing the plant from winter dormancy.

In analysing past trends of the timing of flowering, two different temperature-dependent methods are often applied:

1. Fixed Thermal Time method. This method assumes that winter chill will be satisfied. Changes to flowering timing are considered in relation to changes in springtime temperatures alone.
2. Sequential Chill-Growth method. This method includes the sequential effects of temperature on breaking winter dormancy as well as the influence of springtime warming.

Using both of these approaches in a comparative assessment Darbyshire et al. (2013) estimated flowering timing under warmer climatic conditions for pome fruit grown in southern Australian locations. The difference obtained in the results due to employing the different methods is illustrated in Figure 1.

Figure 1. Modelled range of projections of changes to flowering timing using (left) Fixed Thermal Time and (right) Sequential Chill-Growth methods, for 'Granny Smith' apple in Tatura, south-east Australia (Darbyshire et al., 2013). Day of Year (DOY) is the calendar day of year. Responses for 1, 2 and 3°C mean global temperature increase are shown. Ranges of days shown indicate results from regional representation of output from six global climate models. The grey dots indicate observed timing of flowering for the site (1982 to 2009).



Using the assumption that only springtime temperatures drive flowering (Fixed Thermal Time in Fig. 1), a clear progression towards earlier flowering with increased warming is predicted. If it is assumed that the timing of frost does not change, a greater frost risk is likely in the future. In contrast, when the second method is employed, Sequential Chill-Growth, limited change to flowering timing is likely with climate warming. Note that no prediction was made for +3°C warming with this method as in this case insufficient chill accumulated. What these results highlight is the limitation of the fixed thermal time approach to indicate the inability to attain enough chill.

Exploring results from the second method reveals that, although little change to flowering timing is predicted, there is still a temperature response in the data. The two components of the Sequential Chill-Growth model are highlighted in Figure 2. With warming, the time needed to meet winter chilling requirements increases whilst concurrently, the time required to meet growth requirements reduces. Warming has opposing effects on the two parts of the model which, in this case, effectively balance to nil change.

We can demonstrate some potential consequences of the aforementioned example using the results from a recent global study investigating winter chill (Luedeling et al., 2011).

Luedeling et al. (2011) found many important growing regions, such as the Sacramento Valley in California, Chile's Valle Central and parts of southern Australia, will experience a decline in chill accumulation. They found other regions are likely to be minimally affected. Interestingly, cold regions may increase chill accumulation under a warming scenario. This predicted increase in chill accumulation, which appears counterintuitive, is due to the assumption that freezing temperatures are not effective in accumulating chill. Thus an increase in temperature in cold areas, like the Okanagan Valley in Canada, increased the proportion of non-freezing temperatures, which can contribute to chill, elevating total chill accrual.

Using Luedeling et al. (2011) chill projections, and the assumption that springtime warming will generally accelerate flowering, the Sequential Chill-Growth model indicates that flowering timing may move in different directions in different locations under warming climatic conditions:

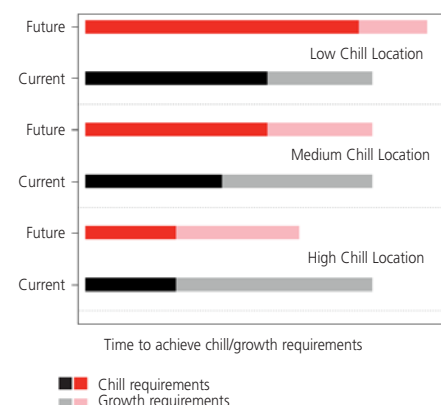
- For locations predicted to receive less chill, a lengthening of the time that chill requirements are satisfied may occur. This could outweigh the acceleration of the growth component of the model leading to an overall delay to flowering.
- Those locations with stable or increasing chill will likely respond to a shortening of the

growth period, causing an advancement of flowering.

- No change to flowering may also eventuate if a delay in chill accumulation is balanced by an acceleration of the growth period, as already demonstrated.

Figure 3 illustrates these potential different responses in timing of flowering for idealised high-, medium- and low-chill locations. In this example, the high-chill location accumulates chill requirements similarly in both current and future warmer climates, but the time needed for growth requirements is reduced with warmer spring temperatures advancing flowering. At the medium-chill location, the time required to meet chill requirements is increased in a warmer future climate, and this is balanced by a reduction in time needed to meet growth requirements, resulting in no overall change to timing of flowering. Finally, the increase in time required to reach chill requirements at the low-chill location over-rides the contraction in the growth period, leading to a delay in flowering.

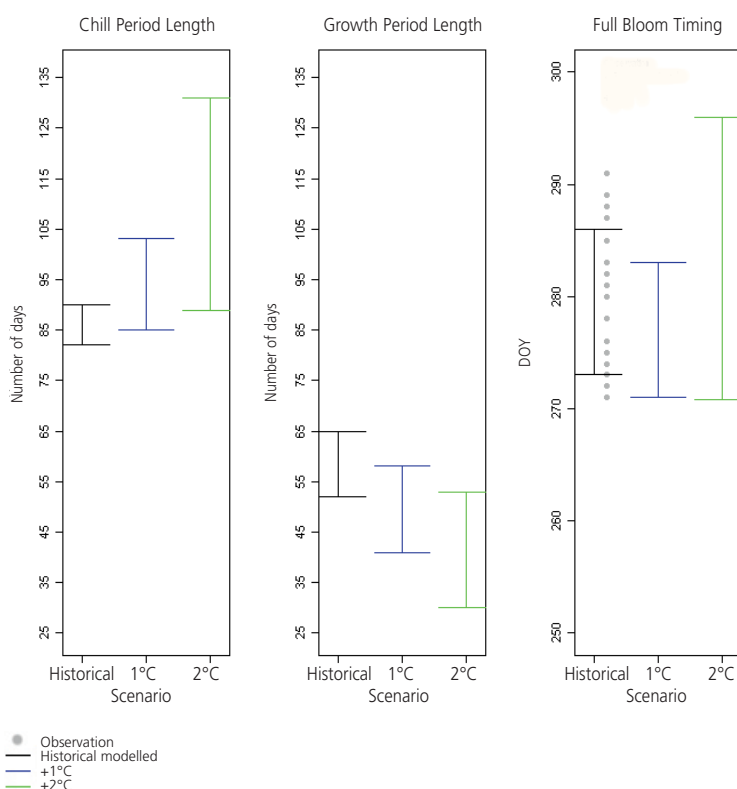
Figure 3. Theoretical changes to the time needed to achieve chill and growth requirements with warming at 'high', 'medium' and 'low' chill locations. The chill period is represented by solid bars and the growth period by shaded bars.



In addition to differences in flowering responses between locations with different climates, changes to flowering timing may not be unidirectional over time. Take a hypothetically moderate- to high-chill location. With a small amount of warming, chill may not be substantially delayed but the growth period noticeably shortened causing flowering to advance. Further in the future, additional climate warming may moderately delay chill and return flowering timing to current conditions. Even more warming may cause chill to be substantially delayed, leading to an overall delay in flowering.

Adaptive strategies resulting from the assumption that flowering would be advancing may include installation of sprinklers for frost protection. In cases where flowering is more likely to be delayed, this would be a waste of resources. It is important to avoid maladaptive manage-

Figure 2. Components of the Sequential Chill-Growth model for 'Granny Smith' apple at Tatura, south-east Australia (Darbyshire et al., 2013). Day of Year (DOY) is the calendar day of year. Results for 1, 2 and 3°C mean global temperature increase are shown. Ranges of days shown indicate results from regional representation of output from six global climate models. The grey dots indicate observed timing of flowering for the site (1982 to 2009).



ment decisions resulting from interpretation of studies where the modelling method employed was ill-conceived. Where the climate is currently very cold and chill is easily attained, this issue is less important as accumulation of chill is unlikely to be greatly affected by warming, at least in the near-term. Ideally, more research into the physiological responses to temperature is required to confirm modelling results, and until then, caution should be applied in their interpretation.

So, how should growers interpret these findings when implementing their adaptation strategies?

For growers in low-medium chill locations:

- What potential problems may result from later flower emergence?
- Will insufficient chill begin to affect profitability?

For those in higher chill locations:

- Will earlier emergence increase frost risks?
- Will effective pollination be achieved?

Managing orchards to effectively break from their dormant phase at the end of winter, especially where chill accumulation is marginal, will likely be required to alleviate negative impacts. These impacts include changed exposure to frost risk and issues with pollination and/or light, variable and delayed flowering.

It appears that there may be rootstock properties that can be exploited for adaptive management purposes. Finetto (2004) investigated the influence of rootstock on chilling requirements of 'Golden Delicious' apple. Trees on 'M-11' rootstock were found to require less chill than those on either 'M-26' or 'M-27'. Observations by cherry growers in Australia have provided anecdotal evidence that trees on 'Gislea' rootstock require less chill than those on 'Colt'.

Application of dormancy breaking chemicals can also be employed as an adaptive measure against a reduction of winter chill. These agents act to reduce the chill requirement of the plant. A study for pistachio indicated Dormex increased floral bud-break, advanced flowering and compressed the flowering period (Elloumi et al., 2013). It should be noted that the timing of application of these agents can be important. For instance, when using Dormex, spraying too early in the season has minimal effect whilst spraying too late can be phytotoxic. Managers wishing to trial such products will need to engage with the flowering timing of their crops.

Management to reduce temperatures in the orchard during winter is another potential adaptation option. For instance, overhead sprinklers have been used to reduce temperatures (average weekly maximum) by about 4.3°C and dormancy was broken earlier in one experiment (Gilreath and Buchanan, 1981). For locations like southern parts of Australia that are water constrained, targeted use of overhead sprinklers at times of high winter temperatures only (e.g.

16°C or higher) is worth considering. Such an approach has been shown to be beneficial for increasing chill accumulation in nectarines (Erez and Couvillon, 1983).

When planning for the longer term, a different suite of adaptation strategies may be required. For instance, selecting alternative cultivars may need to be considered with lower chill cultivars or fruit types preferentially introduced into orchards. Plant breeding programs may also be useful in selecting for lower chill cultivars.

It is important to remember that uptake of any adaptation strategy needs to be made with consideration of the system more broadly. For instance, use of additional overhead sprinklers to mitigate declining chill may not be appropriate if water resources are limited.

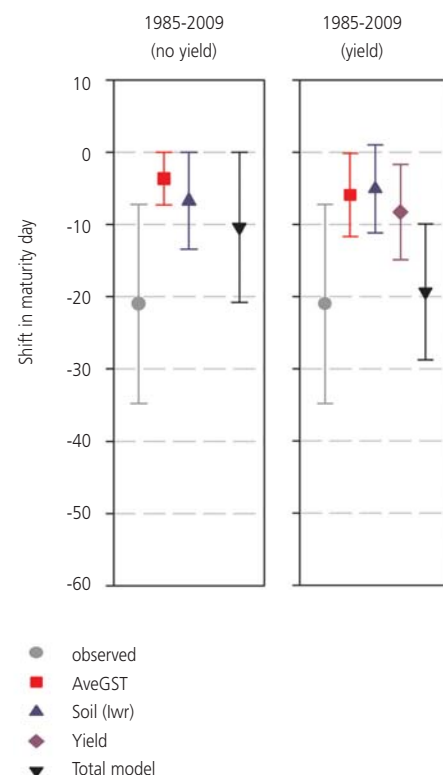
WINE-GRAPE MATURATION

Similar to pome fruit flowering, earlier maturation of wine-grapes has been observed. In a study of southern Australian vineyards shifts towards earlier maturation, measured using records of sugar concentration, were found for all but one of the 10 regions studied. It was found that maturity advanced by, on average, 1.7 days/decade from 1993-2009 (Webb et al., 2011). Acceleration of maturity in wine-grapes can influence the quality of resultant wine through changes in sugar concentration and therefore alcohol content as well as influencing the balance of flavour compounds, acidity development and aromas (Webb et al., 2010). Changes to maturation times may also add additional logistical pressure at harvest with processing capacity stretched to handle a condensed harvest window due to parallel maturation of previously sequentially maturing cultivars.

Following on from the importance of understanding physiological responses in interpreting climate impacts, another important aspect to understand are the causes, or drivers, of observed changes. In the previous example it was assumed that temperature was the primary driver of changes to the timing of pome fruit flowering. However, attribution of the observed changes to temperature as a driver was not specifically assessed. While such attribution analyses are not common, a recent analysis aimed at defining the drivers of earlier wine-grape maturation has been undertaken (Webb et al., 2012). Temperature, rainfall, incident solar radiation, soil moisture indices and crop yield were all assessed as potential contributors to the observed shifts.

Using multivariate modelling, higher growing season temperatures (mean Oct-Apr), lower soil moisture and lower crop yields were all found to be associated with earlier ripening. On average, for the 1985-2009 period, the shift in maturation was roughly equally attributed to each of these drivers, that is a third each (Fig. 4). The results were very consistent across the climatically varied sites, several cultivars and

Figure 4. The shift in maturity for Marsanne grapes located in Central Victoria (Australia). The observed shift is indicated by the grey circle, each of three drivers, growing season temperature (GST; red square), soil moisture (lower part of the soil profile; grey triangle), and crop load (purple diamond) contribute equally to the shift. The total modelled shift (black triangle) is calculated by summing the components of the shift from all three drivers. The total shift is compared with yield excluded (left) and included (right).



under different management strategies, and this strengthens the findings of this study.

It was anticipated that higher temperatures would be associated with advanced ripening due to temperature related acceleration of biophysical processes and this was borne out in the results of the study.

In regard to lower soil moisture being associated with earlier ripening, two mechanisms were suggested. Firstly, lower soil moisture is related to the production of abscisic acid by the roots, and this compound has been connected to earlier ripening. Secondly, drier soils will heat more quickly. This can influence maturation rates as warm roots may be related to higher sugar concentrations.

The influence of yield, or crop load, in modifying maturity timing was discussed in terms of a source-to-sink model. The authors state that "sugar accumulation is a function of photosynthetic capacity and distribution of sugars is a function of volume of grapes. Lower crop yields will therefore mature faster, all other factors being equal." (Webb et al., 2012).

In conducting an attribution analysis, Webb et al. (2012) identified that only a proportion of the observed change in maturity is related to increasing temperatures. The additional finding that drier soils have also contributed is of particular interest for locations like southern parts of Australia, where trends towards higher temperatures and lower soil moisture are likely.

Perhaps of greater interest to managers are the strategies highlighted in this study that can be implemented to mitigate against earlier ripening. Increasing soil moisture will act to delay advancing maturity. This could be achieved via additional irrigation or applying mulch. Carrying a larger crop load also assists in delaying maturation. Of course, if applying any of these strategies, the impact on the quality of the grapes must also be considered.

As demonstrated by this recent and unique attribution study, understanding the role of management strategies in mitigating negative impacts from climate shifts in perennial horticulture is in its infancy. Other Australian research addressing the undesirable advancing trend in maturity timing has captured information from an earlier study (Dunn and Martin, 2000) and is focussing on altering pruning times. Petrie (2012) has shown that by postponing winter pruning until after bud break, harvest times can be delayed by 2-3 weeks (Fig. 5).

DISCUSSION

Agricultural systems are already responding to observed changes in the climate. Any resulting negative impacts may require management input if they are to be minimised. In order to ensure production is maintained or increased, future changes need to be anticipated to support effective adaptation strategies (Howden and Stokes, 2010). Temperate perennial crops present particular adaptive challenges due to the long productive life of the crop (25 or more years), and also the associated infrastructure often required in their management. As such, decisions made now will need to consider projected climate conditions and require careful adaptive planning.

Adapting temperate perennial horticultural crops to projected climate changes is a critical challenge to be met by both researchers and crop managers. The studies outlined here illustrated some adaptive options to alleviate potential negative consequences of continued warming. Some of these options can be incorporated into current systems, such as the application of dormancy breaking agents, or perhaps soil moisture retention management in wine-grapes. However, these incremental adjustments may not be sufficient with greater levels of warming. Larger transformations such as varietal development and selection, trellis orientation or even transition to other agricultural products or other growing regions may be

Figure 5. Effect of winter pruning (bunch on the left) and late pruning (bunch on the right). A clear delay in maturity is observed on the right. (Photo courtesy P. Petrie, Treasury Wine Estates, Australia).



needed (Webb and Whetton, 2010). Individual circumstances and capacity will dictate the timing and the scale of such adaptive changes.

Understanding the sensitivity of crops to climate change in the context of other factors will inform the most appropriate actionable outcomes for perennial horticulturists. Research, such as that outlined here, provides motivation for deeper understanding of interpretation of results and the importance of methodological selection and application. These aspects are key for the development of appropriate adaptation action.

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aspect of the research. In her current role Rebecca is incorporating additional production elements, extreme heat damage and potential yield, into climate impact analyses. The research is orientated towards providing timely and relevant information regarding climate adaptation to industry. Email: rebecca.darbyshire@unimelb.edu.au

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HORTICULTURAL SCIENCE FOCUS

Feeding a Hungry World: the Challenge of Developing Safe and Effective Methods of Food Preservation

Michael Wisniewski, Samir Droby and Charles Wilson

THE CHALLENGE

As the world population continues to exponentially increase and climate change begins to threaten world food production, the scenario is being set for a "perfect storm" that will challenge the creativity and good will of the human race. Increasingly, governments are focusing on food security and developing strategies to ensure a safe and reliable food supply for their respective countries. Niek Koning in his foreword to the book 'Feeding the World in the 21st Century' (Smedshaug, 2010) writes, "Farming remains indispensable for producing vital necessities for human life." In this book, Smedshaug provides an excellent historical overview of world agriculture, global food production, and the economic and political forces

that have shaped how we grow and provide food for domestic consumption and export. Smedshaug (2010) emphasizes that in order to face the challenges of food production in the 21st century nothing less than a Roosevelt-era "New Deal" for *food production* will be required, especially in developing countries.

While increasing food production is and should be a main focus for ensuring sufficient supplies of food to feed a hungry world, it is doubtful that this in itself will be enough. Limits to the potential of breeders to increase crop productivity, loss of arable land, increased temperatures, and water shortages, among several other factors all represent significant hurdles to our ability to "produce" ourselves out of the problem. In this regard, Wilson (2013) has emphasized that the other half of the production equation

is the ability to safely preserve commodities after harvest and prevent significant postharvest losses. This aspect of food availability is, for the most part, overlooked in regards to our ability to provide a sufficient global food supply and yet is an area that can have a significant impact. In a study by the United Nations Food and Agricultural Organization (FAO), it was estimated that one-third of the food produced worldwide for human consumption is lost after harvest (Gastavsson et al., 2011).

Kader (2005) categorized crop losses occurring between harvest and consumption as qualitative (i.e., a reduction in edibility, nutritional value, or consumer acceptance) or quantitative (i.e., reductions due to physiological and pathological disorders). Losses experienced throughout the supply chain due to patho-

gen-induced diseases are a major component of food wastage. Postharvest decay can be traced to infections that occur either during crop development (flowering to harvest maturity) or during harvesting and subsequent handling, storage, marketing, and post consumer purchase. Efforts have been made to minimize these losses through developing a better understanding of the biology and etiology of postharvest diseases, as well as by developing adequate postharvest handling technologies and control strategies.

Although the use of synthetic chemical fungicides is still the predominant method of managing postharvest diseases, significant research has been focused on finding safe and effective alternatives. This is driven by problems associated with synthetic chemical fungicides, including 1) the development of fungicidal resistance, 2) consumer demand to reduce human and environmental exposure to chemicals, and 3) increased restrictions imposed by governmental regulatory agencies on specific agro-chemicals and/or their allowable residues, especially after harvest.

Alternative methods of preventing postharvest losses need to be effective, "environmentally-friendly," economic, and adaptable for use in developing countries where resources and technology are limited. The development of these new strategies was the subject of a recent ISHS symposium organized by Pervin Kinay, Michael Wisniewski and Samir Drobey, the Chairs of the ISHS Working Group on Biological Control of Postharvest Diseases, in Kusadasi, Turkey on April 28 – May 2, 2013, entitled, "Discovery and Development of Innovative Strategies for Postharvest Disease Management" and forms the foundation of the current report. These alternatives can be generally divided into four categories: biological control, natural compounds, physical approaches (heat, UV, etc.), and natural resistance (which includes manipulation of the natural microbiome). Oftentimes, combinations of these approaches have also been explored.

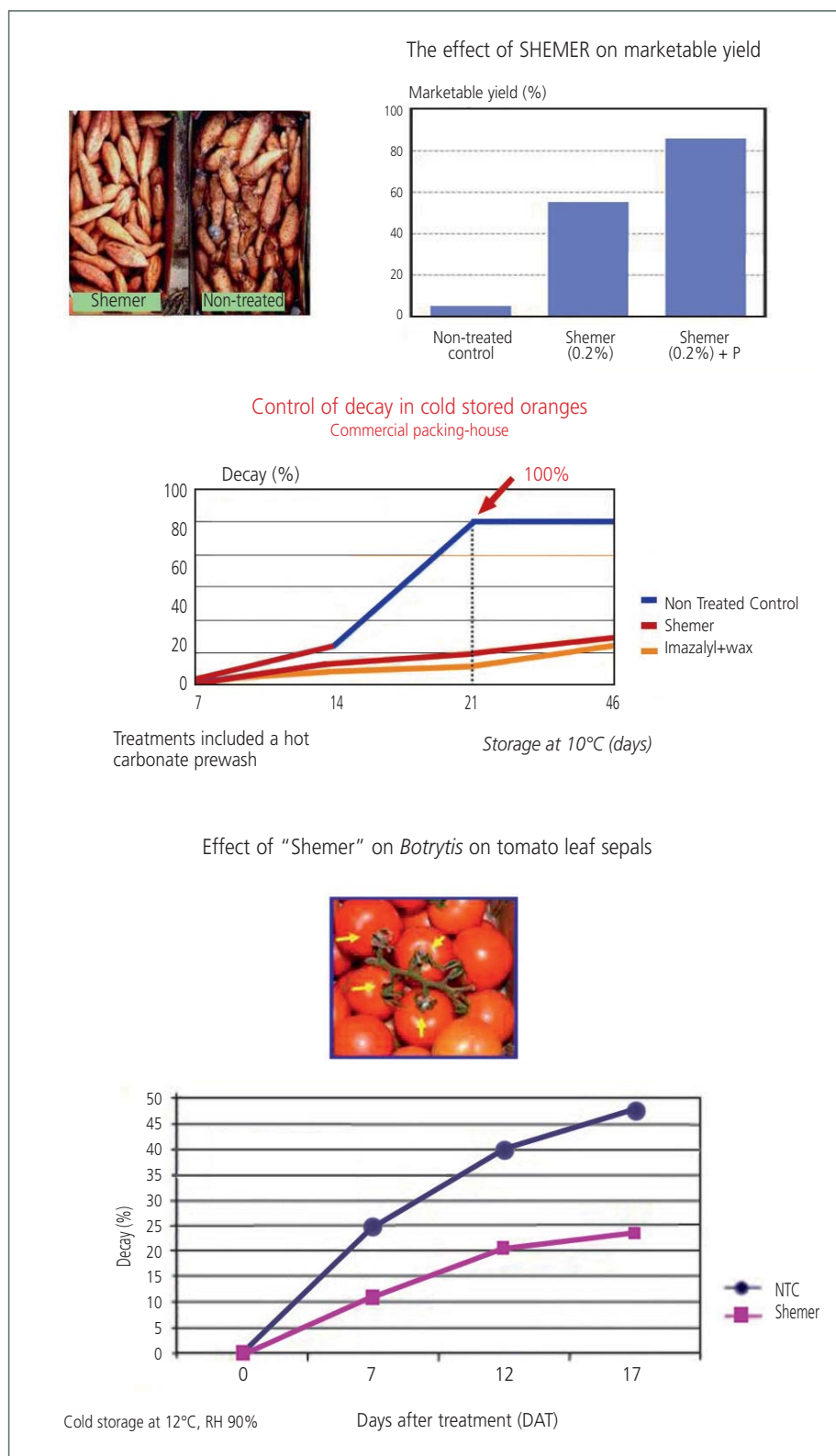
ALTERNATIVE APPROACHES

Biological Control

In the past twenty-five years, significant research has been focused on the use of various, microbial antagonists (yeasts and bacteria) that occur naturally on fruit surfaces as antagonists that inhibit the ability of postharvest pathogens to establish infections in wounded fruit. The history of the development of the first, yeast-based biocontrol product was reviewed by Wisniewski et al. (2007) and a critical review of 20 years of postharvest biocontrol research was written by Drobey et al. (2009).

The ability of a microbial antagonist to prevent postharvest diseases in harvested commodities relies on their ability to outcompete the patho-

Figure 1. An example of a postharvest biocontrol product (Shemer) based on the yeast *Metschnikowia fructicola*. Increase in marketable yield of sweet potatoes treated with Shemer (top); control of decay in oranges treated with Shemer is equivalent to oranges treated with the chemical fungicide imazalil (center); control of *Botrytis* on sepals of harvested tomato fruit (bottom).

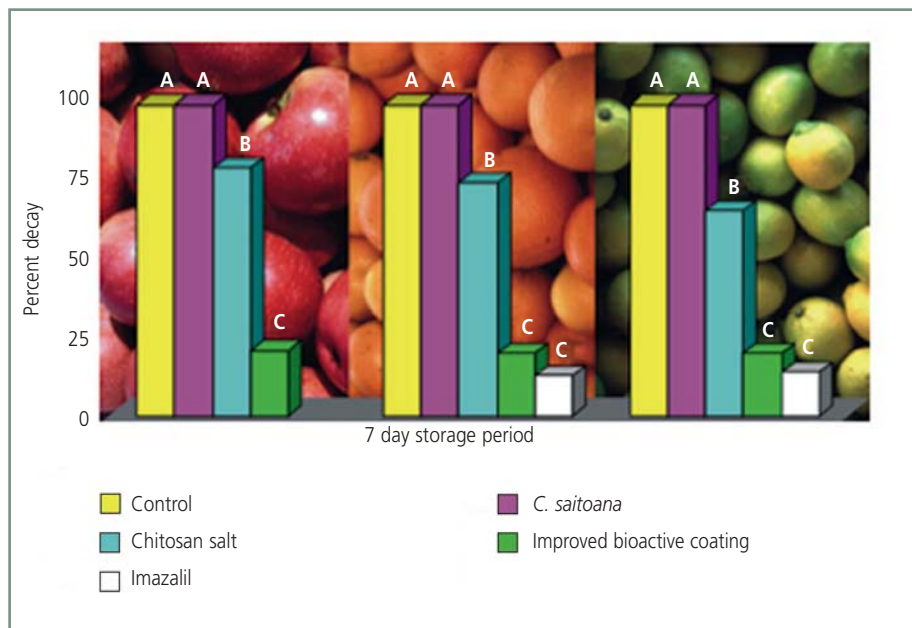


gen for nutrients in the wound site and/or to form an impervious layer (biofilm) that physically prevents pathogen propagules (conidia) from receiving nutrients or other germination

cues (Fig. 1). Many postharvest pathogens require an infection court (wound, bruise, etc.) to establish themselves and initiate an infection (Liu et al., 2013). The role of reactive



Figure 2. Synergistic activity when the yeast antagonist is combined with a chitosan salt (improved bioactive coating) on apples, oranges, and lemons to prevent decay. Treatments included a control (non-treated), the yeast alone, a chitosan salt, and a bioactive coating. In the case of citrus, a treatment with imazalil was also included.



oxygen species (ROS) acting as defense signaling compounds or as toxic metabolites, and the ability of pathogens to inhibit ROS production in the host or yeast biocontrol agents to stimulate ROS production has highlighted the important role that ROS play in biocontrol systems (Macarasin et al., 2010). Since the discovery of the first microbial antagonists, many researchers globally have identified and continue to identify new antagonists that have been demonstrated to have the potential to control a wide range of postharvest pathogens on a wide range of species (temperate and tropical). Despite their potential use as an alternative approach, the use of postharvest biocontrol agents as commercial products remains limited. This lack of widespread commercial application has been attributed to a number of factors, including uneven performance, lack of eradication ability, lack of resources to conduct large marketing campaigns, and varying regulatory requirements in different countries, which prevents their widespread use. In order to improve the efficacy of biocontrol agents, research has been conducted to combine their use with other alternative approaches. These other alternatives have often been explored as “stand alone” approaches in their own right.

Natural Compounds

There is a rich and copious literature on the ability of various microbial and plant derived products to control various pathogens, postharvest or otherwise, and the use of these compounds in conjunction with postharvest biocontrol agents has been reviewed by Vero and Garmendia (2011). In addition to the use of a wide variety of essential oils, perhaps

the greatest amount of research has been conducted on the use of chitosan (a natural antimicrobial product derived from shellfish). This material has been used alone to prevent postharvest infections, and El-Ghaouth et al. (2000) demonstrated that when chitosan is combined with a yeast biocontrol agent that there is a synergy that significantly enhances efficacy and also provides eradication activity (Fig. 2). The use of chitosan has also been explored as a fruit coating. In addition to its antimicrobial activity, chitosan stimulates host defense responses. The use of Generally Regarded as Safe (GRAS) chemicals, such as bicarbonates and weak acids (e.g. sorbic acid) alone and in combination with a biocontrol agent has also been investigated (Vero and Garmendia, 2011).

Physical Treatments

Regarding physical treatments, administered on packing lines, alone or in combination with biocontrol agents, heat (both wet and dry) and UV have shown the most promise (Vero and Garmendia, 2011). In both cases, these treatments have been shown to increase the efficacy of biocontrol agents by their direct ability to inhibit or kill pathogens or in some way stimulate host defense responses (Fig. 3). Interestingly, both UV-C and heat treatments also affect fruit physiology and have been shown to delay ripening and reduce chilling injury. Lastly, regarding physical treatments, increased research into intelligent and active packaging has received great interest, especially by industry (Wilson, 2007). Timed release of natural antimicrobial agents, and modified atmospheres, are two examples of the

applied use of novel packaging materials. This approach would also have potential benefits for consumers since a great deal of produce becomes inedible or diseased after it has been purchased in the grocery store and before it has been consumed.

Natural Resistance

Breeding for natural resistance has been one of the most durable approaches to preventing plant diseases, however, it has not been extensively applied to postharvest diseases. This is because other fruit quality traits (color, flavor, taste, size, etc.) have been the main focus, and in the case of tree fruit crops, the time required for evaluating and selecting for a trait, such as postharvest disease resistance, is lengthy. Recent research (Janisiewicz et al., 2008) has identified apple germplasm with innate resistance to blue mold (*Penicillium expansum*) in *Malus sieversii* (a progenitor of the modern apple, *Malus × domestica*) germplasm (Fig. 4) and efforts are being made to identify the genetic basis for the resistance using QTL mapping and transcriptomic studies (Norelli et al., in press).

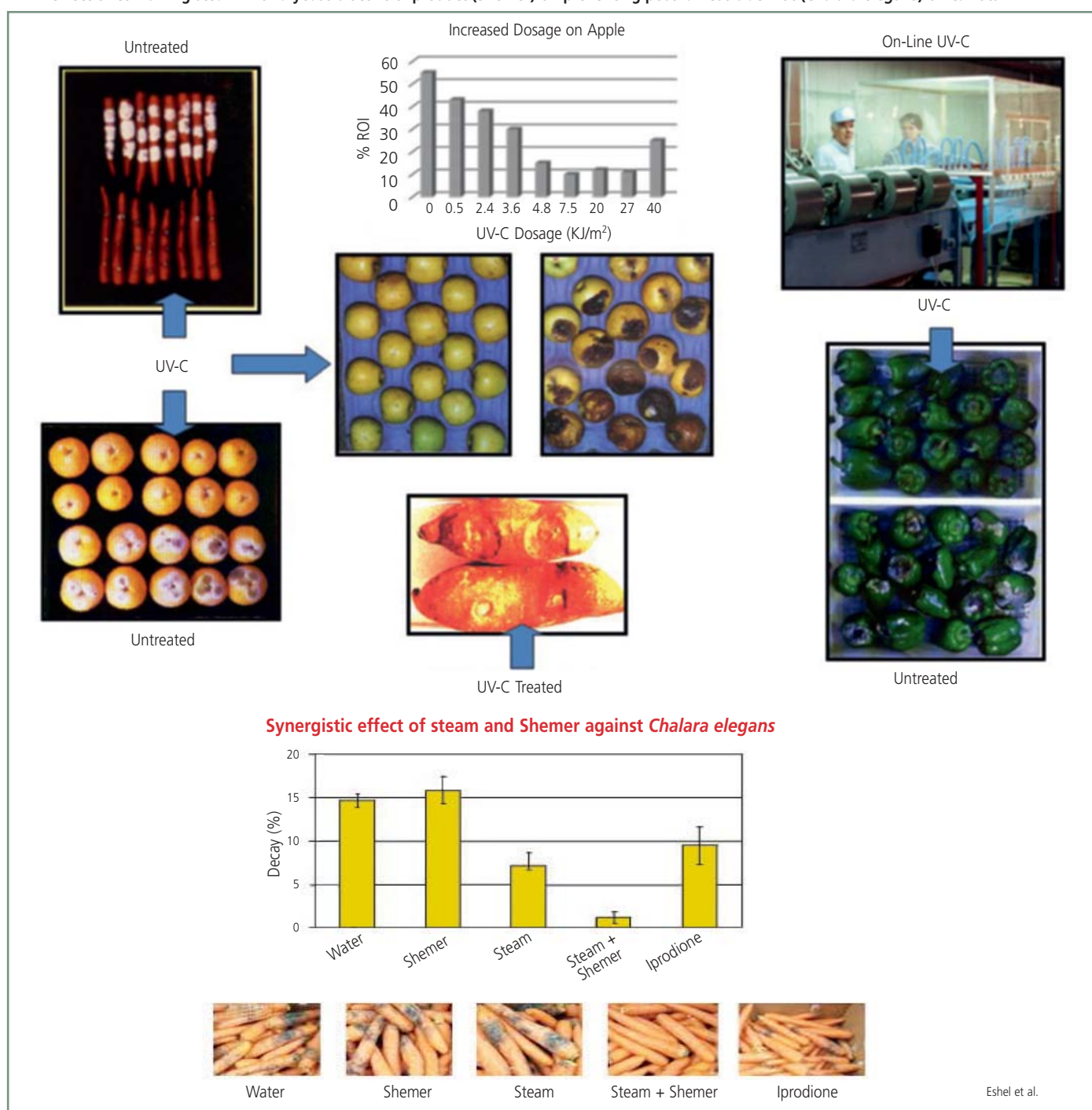
Integrated Approaches

Alternative methods of postharvest disease control must perform effectively under commercial application and storage conditions, providing an acceptable and consistent level of control of target diseases. As a standalone treatment, however, many of the alternative control methods mentioned above are not fully capable of providing the level and consistency of control under the wide variety of environmental and packinghouse conditions that exist in the ‘real’ world. Therefore, researchers have sought new ways of increasing the efficacy of alternative control methods by the use of different combinations of microbial biocontrol agents, natural antimicrobials, salts that alter the pH, and manipulation of the physical environment (e.g. heat treatment, UV, controlled or modified atmospheres) (Droby et al., 2009). Such approaches have shown great promise (Fig. 5).

THE FUTURE

Preventing the loss of harvested commodities to either postharvest diseases or physiological breakdown (uncontrolled ripening) offers a promising approach to providing the increased yields of food that will be needed to feed the world population in the 21st century (Wilson, 2013). Activities sponsored by ISHS and their efforts to stimulate global cooperation in agricultural research can also help to address this challenge. Additional human and financial resources should be allocated to postharvest research, education and extension to achieve the goal of reducing postharvest food losses and waste. Also, more national and international cooperation is needed to efficiently

Figure 3. Top panel – Effect of low doses of UV-C light on the development of decay on different fruits and vegetables. Lower panel – Synergistic effect of combining steam with a yeast biocontrol product (Shemer) on preventing postharvest black rot (*Chalara elegans*) on carrots.



disseminate science-based information about food quality and safety to all those involved in food production, handling, and marketing.

Specifically related to the preservation of harvested commodities, Wilson (2013) has founded a World Food Preservation Center (worldfoodpreservationcenter.com) whose mission is to provide a world-class education to young scientists in developing countries in advanced technologies for food preservation and to conduct research on postharvest food preservation technologies especially adapted for developing countries, such as solar refrigeration, biological control, and active and

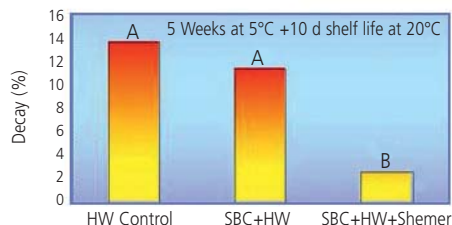
Figure 4. Genotypes in the GMAL4593 (*Malus sieversii* PI613981 × 'Royal Gala') mapping population of apple that are either resistant or susceptible to *Penicillium expansum* (blue mold). The *Malus sieversii* parent (PI613981) is the source of the resistance.



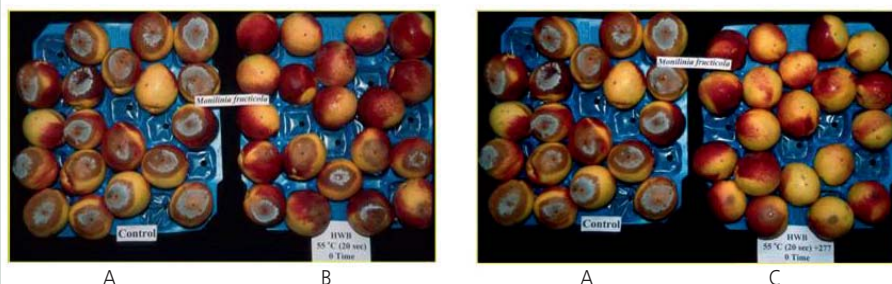
Figure 5. Integrated biological control. Top panel – Comparison of green mold decay control on grapefruit. HW = hot water, SBC + HW = 2% sodium bicarbonate plus hot water, SBC + HW + Shemer = sodium bicarbonate plus hot water plus application of a yeast biocontrol product (Shemer). Lower panel – Integrated control of brown rot (*Monilinia fructicola*). A = control, untreated, B = hot water brushing, C = hot water brushing plus application of a yeast antagonist (strain 277).

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Integrated control of *Penicillium* decay on organic 'Ruby Red' grapefruit



Integrated control of *Monilinia* (brown rot) decay on nectarines



intelligent packaging. Time is short, and we will need to work as a global community, and governments and industry will need to commit major financial resources, to overcome the challenges of providing sufficient food for a growing world population under the conditions of climate change. Such efforts will be important to the security of all nations.

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The Centenary of the Romanian Horticultural Society

Gheorghe Glăman

On October 29, 2013, The Romanian Horticultural Society (SRH) organized its XIth Horticultural Congress on the occasion of its 100 year celebration of its foundation.

The SRH was set up at the initiative of a group of 41 founding members on February 17, 1913. As a result of their activities to support horticulturists (practical courses, conferences, annual horticultural exhibitions, the monthly publishing of "Revista Horticola", and so on), the Society has gradually nurtured the organization of a horticultural sector, which at that time in Romania was just beginning. In 1922, the first horticultural congress was held so that horticulturists could express their wishes, transpose them into motions and submit them to decision makers and of course, to the media as "the pressure" factor. Thus, on January 1st, 1925, under the Ministry of Agriculture and Domains, a Department of Horticulture was established and in the autumn of the same year, the first National School of Horticulture IInd grade began in Bucharest.

Since 1923, SRH has participated in the ISHS International Horticultural Congresses (held that year in Amsterdam, the Netherlands), thus



King Carol I granted SRH with the order
Agricultural Merit in grade of knight in
1938.

making known the achievements of Romanian horticulturists.

In 1938, at the celebration of its 25th anniversary, the Society's activity was recognized by the state authorities when King Carol I granted the Order "Agricultural Merit" in grade of knight.

Unfortunately, with the setting up of Soviet power and communism in Romania on June 11, 1948, the beneficial activity of the Society was suddenly interrupted, when by Nationalization Law no. 119, all non-governmental organizations were banned, including SRH, passing to a centralized leadership.

During the years of 1913 to 1948, SRH was led by 4 presidents of high professional and moral standing: Prof. Ion Hașeganu (1913-1921); Jan Rothan (1921); Charles Faraudo (1922-1936) and Prof. Ernest Grințescu (1936-1948).

As a result of the outlawing of SRH, the Ministry of Agriculture became a "factotum" in agriculture, but it maintained and even further developed the Horticultural Department and set up more horticultural research stations. In 1962, on the occasion of its participation in the XVIth ISHS International Horticultural Congress held in Brussels, Belgium, Romania joined and became

First edition of *Revista Horticola* (horticultural review) founded in March 1923.



Left: Prof. Ion Hașeganu, the first President of SRH (1913-1921). Right: Prof. Ernest Grințescu, President of SRH (1936-1948).





• The II SRH Horticultural Exhibition in 1923. From left to right: The Queen Mother Elisabeta, King Ferdinand and SRH President Charles Faraudo (1922-1936).
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• President Traian Basescu awarding the SRH the Order of Agricultural Merit in grade of knight.
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Congresul Horticultorilor, ținut în București la Parcul Carol, între 26-28 August 1923.

• Participants at the II Congress of Horticulture, Bucharest in 1923.
•••••

• Members of the SRH visiting the Annual Horticultural Exhibition in 1936, Dresden, Germany.
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a full member of ISHS, after intense lobbying by the employees of the department, some of them members of the former SRH leadership. At the congress, Prof. Nicolae Constantinescu (1962-1973) presented the paper "Concepts synthesis in fruit tree pruning problem". Over time, other Romanian representatives have participated in ISHS congresses: Dr. Ing. Constantin Ioniță (1974-1985) and Dr. Ing. Pârvan Parnia (1985-2000).

Since 1962, Romania has participated in all International Horticultural Congresses organized by ISHS. Moreover, ISHS offered Romania, a country beyond the "iron curtain", the opportunity to organize some important events, of which we can mention: the International Symposium on Vegetable Crops under Glass Protection (1976) and the VII Symposium on Apricot Culture and Decline (1980). The scientific papers presented at these events were published in *Acta Horticulturae*, no. 58 (1977) and no. 121 (1983).

After the collapse of communism (December 1989), some civic organizations including SRH resumed their activity, and on April 16, 1991 SRH convened the General Assembly for Refoundation of the Society, which was attended by 69 of its founding members. On May 24, 1991, the Society began its activity in law according to the Civil Sentence nr. 357. On the basis of its status, the society set up subsidiaries in all 40 counties of the country. At first, the Society focused on the support of small horticultural producers, who, as a result of the decentralization of the economy and decline of farmland, faced inherent technological problems. The Society enjoyed extremely valuable support due to the fact that all five horticultural research institutes (for vegetable growing, potatoes, fruit tree growing, viticulture-oenology,



Participants of the XIth Centennial Horticultural Congress of SRH.

capitalization), along with the 45 coordination stations (all under the coordination of the Academy of Agricultural Sciences) had signed up to SRH since its inception and have provided unswerving support to organize hundreds of events each year. Professors from five faculties of horticulture (Bucharest, Cluj, Craiova, Iasi and Timisoara) joined them, thus the Society managed to fill the gap in horticultural extension despite the lack of a national agricultural consultancy system.

Maintaining the tradition, horticultural congresses were organized every five years. The first (VIth in chronological order), was organized in 1993 (at Murfatlar, Constanța) on the occasion of the 80th anniversary of SRH.

On October 29, 2013, SRH celebrated 100 years since its inception (1913-2013). The event was

marked by "The XIth Centennial Horticultural Congress" and attended by 300 delegates from all research branches and was honoured by the presence of the Romanian President, Traian Basescu, and EU Commissioner for Agriculture, Dacian Ciolos (horticultural engineer and honorary member of the Society). The program of the Centenary Congress included:

- Scientific sessions held for each of the five sectors of horticulture, each organized by the relevant department (vegetable and flower growing and landscape architecture, potato crop, pomiculture, viticulture and oenology, horticultural production capitalization). A development strategy for each sector for both the short and medium term (production-research) was presented.
- Three papers published to mark the Centenary: "The Gold Book of the Romanian Horticultural Servants" (including the CVs of 1400 horticulturists, of which 1200 had photos); the "Monograph of the Romanian Horticultural Society (1913-2013)" and "Romanian Horticulture over Time" (The English version of this work was presented to the members of the ISHS Board at IHC2010 in Lisbon, Portugal, August 2010. The Romanian version has been updated and presented to the Romanian public).
- A horticultural exhibition, where achievements in research, education and horticultural exploitations between 2009 and 2013 were presented.
- SRH Awards granted for research, horticultural books and horticultural farms development investment, all for the period 2009-2013.

Appreciating with laudatory words the activity of the Romanian Horticultural Society, President

Traian Basescu awarded the Society the Order of Agricultural Merit in grade of knight, and the Honorary President of SRH gave him the Centennial Medal and Diploma issued on this occasion. All those present participated in a group photo to remember the event.

ABOUT THE AUTHOR



Gheorghe Glăman

Prof. Gheorghe Glăman is President of the Academy of Agricultural and Forestry Sciences "Gheorghe Ionescu-Sisesti" (AAFS) and of the Romanian Horticultural Society (SRH). He has published over 245 papers, from which we can mention "The Romanian Horticulture over Time" (5 volumes, in Romanian, 2008), a book awarded the Romanian Academy Prize (2010). He has been involved in the development of 21 vegetable cultivars and 2 flower cultivars and has received 5 patent-inventions. Prof. Glăman has been an ISHS Council Member since 2000. Email: doruglaman@yahoo.com; srh1913@yahoo.com

Honorary President of SRH awarding the Centennial Medal and Diploma to President Traian Basescu.





GPC Annual Members Meeting October 2013. Back row left to right: Shahrokh Khanizadeh (Plant Canada), Ariel Orellana (Chile's National Network of Plant Biologists), Zuhua He (Chinese Society of Plant Biology), Russell Jones (American Society of Plant Biologists), Vicky Buchannan-Wollaston (Society of Experimental Biology), Carl Douglas (Canadian Society of Plant Biologists), Bruce Osbourne (Federation of European Societies of Plant Biology), Front row left to right: Gustavo Habermann (Brazilian Society of Plant Physiology, BSPP), Barry Pogson (Australian Society of Plant Scientists), Antonio Costa de Oliveira (International Crop Science Society), Karin Metzlauff (European Plant Science Organisation), Zhihong Xu (Chinese Society of Plant Biology), Jim Beynon (UK Plant Sciences Federation), Rodomiro Ortiz (Scandinavian Plant Physiology Society), Henry Nguyen (Crop Science Society of America), Wilhelm Gruiters (European Plant Science Organisation).

National plant and crop science societies and organizations from around the world have established the Global Plant Council (GPC) to provide a strong voice for plant science in addressing global issues. The GPC is a research driven network, which has its roots based in understanding plants and their interactions with the environment. In collaboration with others, we will strive to bring this knowledge into the policy and decision making arena to develop plant-based solutions to many of the problems currently facing humanity.

A registered not-for-profit entity representing over 50,000 plant and crop science experts from 28 member organizations on 5 continents, including the ISHS, the GPC aims to:

- Be an advocate for plant and crop science at the global level to increase awareness of the centrally important role that plant research can make towards solving the most critical global problems we currently face.

- Act as a catalyst to generate plant-based solutions for sustainable intensification of agriculture while preserving biodiversity and protecting our environment, reducing world hunger, and improving human health and wellbeing.

By mobilizing its network of members, the GPC will link plant and crop science experts together to generate sustainable solutions to help feed a growing global population and to use plants as a sustainable source of food, fuel and fiber. To achieve this we have initially identified three priority areas:

- Agricultural Productivity and Sustainability
- Food and Human Health
- Adaptation to Climate Change

Within these areas the GPC focuses on specific initiatives to evaluate ongoing research programs, identify important gaps and bottlenecks, find solutions, prevent duplication of effort and funding, and facilitate urgently required

global strategic programs. During the next three years the GPC will specifically focus on three initiatives, Digital Seed Bank, Biofortification and Improving Stress Resilience, each of which addresses at least one of the Council's priority areas.

The Global Plant Council promotes plant science and uses its global network to increase our understanding of the value that plant research generates, and the essential roles plants play in everyone's life. To raise awareness of the importance of plants, the GPC focuses on generating advocacy literature, providing educational materials and publicizing success stories in plant science from across the globe.

If you would like to learn more about the Global Plant Council visit our website www.globalplantcouncil.org, contact us via email info@globalplantcouncil.org or find us on Twitter @GlobalPlantGPC



New Books, Websites

BOOK REVIEWS

Following Walnut Footprints (*Juglans regia* L.): Cultivation and Culture, Folklore and History, Traditions and Uses. Damiano Avanzato, Gale H. McGranahan, Kourosh Vahdati, Mihai Botu, Luis Iannamico and Jozef Van Assche (eds.). 2014. *Scripta Horticulturae* 17. International Society for Horticultural Science and International Nut & Dried Fruit Council. 442p. ISBN 978-94-6261-003-3. € 40. Available from the ISHS Secretariat (www.ishs.org/scripta-horticulturae)

This edition on Walnut is the fifth in the *Scripta Horticulturae* series "Following Footprints", after the previously published volumes on Almond, Pistachio, Chestnut and Olive.

"Following Walnut Footprints" visits 58 walnut growing countries, more specifically: Afghanistan, Albania, Algeria, Argentina, Armenia, Australia, Azerbaijan, Bulgaria, Canada, Chile, China, Czech Republic, Denmark, Egypt, France, Georgia, Germany, Great Britain, Greece, Hungary, India, Iran, Italy, Japan, Kazakhstan, Kirgizstan, Korea DPR, Korea Republic, Lebanon, Macedonia, Mexico, Moldova, Montenegro, Morocco, Nepal, Netherlands, New Zealand, Nigeria, Norway, Pakistan, Poland, Portugal, Romania, Serbia, Slovak Republic, Slovenia, South Africa, Spain, Sweden, Switzerland, Tajikistan, Tunisia, Turkey, Turkmenistan, Ukraine, Uruguay, USA, and Uzbekistan. One hundred and twenty specialists from all over the world have collaborated on this book.

Members of the Editorial Board were selected on a geographic basis. Gale McGranahan (University of California, USA) took care of contacts from English-speaking countries and the Commonwealth, Kourosh Vahdati (University of Tehran, Iran) the Middle East and Muslim countries, Botu Mihai (University of Craiova, Romania) countries of Central and Eastern Europe, Iannamico Luis (Instituto Nacional de Tecnología Agropecuaria Río Negro, Argentina) countries of South America and Spanish tongue, Jozef Van Assche (Executive Director of the International Society for Horticultural Science, Belgium) countries of northern Europe, and Damiano Avanzato (Chair of ISHS Section Nuts and Mediterranean Climate Fruits for the period 2006-2014) Asian countries and others. The work started in November 2012 and was completed in December 2013.



This book reports the status of the walnut industry country by country. Information is given on the geographical distribution of the species of *Juglans*, its historical origin and its introduction into different countries. Also presented are techniques of cultivation of the Persian walnut, information on native varieties, as well as commercial data.

Among dried fruit, walnut is one of the most important species from an economic and botanical point of view, and in many countries it has a rich cultural heritage. Today walnut is grown in over 60 countries around the globe, and is harvested from both cultivated orchards and wild populations. Modern techniques of production have resulted in the cultivation of selected varieties; modern machinery is now responsible for much of the processing (de-hulling, cleaning, grading, storage, packaging); and the range of processed products has been expanded. All of these factors have extended the period for consumption of walnuts. In the past, the highest demand for walnuts occurred during the Christmas period, but nowadays nut consumption is constantly extending into other times of the year. The country that dominates the international market for standardized walnuts is the USA, which, together with France, was the first country to offer the cultivation of selected walnuts. There are now many countries that are equipped to produce quality nuts, including Chile, Argentina and Australia, and countries such as Turkey, Iran, Spain, Italy, Romania and Hungary. China has the highest production of walnuts in the world, in terms of area cultivated and quantity of nuts produced. Their industry is based mainly on seedling trees, the product of which is greatly affected by nut variability. However, an effort is underway to encourage

the planting of walnut orchards with locally selected cultivars or with foreign cultivars that are commercially recognized as being of high value, e.g., 'Chandler'.

The authors of this book were requested to include descriptions of traditional uses of walnut, both of the fruit itself, and also of the plant. The result has been a collection of data that relates to the original uses of walnut wood (e.g. cabinet making and handcrafts), leaves (e.g. medicinal use), husks (e.g. extraction of dye), shells (e.g. domestic heating and the cleaning of jewelry), and kernels (direct consumption and in the preparation of sophisticated sauces). Even the membrane that divides the valves of the kernel has been used as "confetti" decoration! In many cases, the authors report on the use of walnut in culinary recipes and reveal how it has sparked the imagination of mankind both throughout history and in modern times. The authors have made significant efforts to collect data, as evidenced by the more than 800 references that accompany the various chapters.

In publishing this volume, the International Society for Horticultural Science (ISHS) has made a significant contribution to the exchange of information between developed and developing countries, confirming the vocation of the organization to promote international cooperation between scientists from around the world.

As Chair of the ISHS Section Nuts and Mediterranean Climate Fruits from 2006 until 2014, I thank all those who have collaborated on this volume and hope that similar initiatives will be launched in the future for other fruit species. The next challenge will be the preparation of a volume "Following Hazelnut Footprints"!

Reviewed by Damiano Avanzato, Chair ISHS Section Nuts and Mediterranean Climate Fruits

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

NEW TITLES

Fideghelli, Carlo (coordinator). 2011. Le Varietà Costituite dall'Istituto Sperimentale per la Frutticoltura (ora CRA-Centro di Ricerca per la Frutticoltura). Varieties Released by Fruit



Research Institute (now CRA-Fruit Research Centre). Ministero delle Politiche Agricole Alimentari e Forestali / CRA-Centro di Ricerca per la Frutticoltura, Italy. ISBN 978-88-97081-16-6. € 25. sito.entecra.it/portale/cra_dati_istituto.php?id=208&access_flag=0

Nath, P., Bouzayan, M., Mattoo, A. and Pech,

J.C. (ed.). 2014. Physiology, Signalling and Genomics. CABI Publishing, Wallingford, Oxfordshire, UK. 352p. ISBN 9781845939625 (hardback). £95.00 / €125.00 / \$180.00.

20% discount with discounted code "CCFR20" when ordering through <http://www.cabi.org/bookshop/book/9781845939625> or direct.orders@cabi.org

Oelbermann, Maren (ed.). 2014. Sustainable Agroecosystems in Climate Change Mitigation. Wageningen Academic Publishers, Wageningen, The Netherlands. 272p. ISBN 978-90-8686-235-1 (hardback). € 76. www.WageningenAcademic.com/agroecosystems



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

XXXVII Congreso Argentino de Horticultura 'Mendoza 2014', 23-26 September 2014, Chacras de Coria, Luján de Cuyo, Argentina. Info: EON Argentina – Carlos A. Puntón, Don Bosco 350, Mendoza, Phone/Fax: +54-261-4200014, Mobile phone: 261-5415263, Email: eon@eonargentina.com.ar, Web: www.asaho.org.ar/webs/congreso_inicio/40

International Conference on Current Status, Opportunities and Challenges in Medicinal Plants and Natural Product Research, 24-26 September

2014, Bardoli, Gujarat, India. Info: Dr. Mitesh Dwivedi, Convener, C.G. Bhakta Institute of Biotechnology, Uka Tarsadia University, Tarsadi, Bardoli, Dist. Surat 394 350, Gujarat, India, Mobile phone: +919723142350, Email: mitesh.dwivedi@utu.ac.in, Web: cgbibt.edu.in or utu.ac.in

Annual Symposium of the BeNeLux Society for Horticultural Science on Horticulture - Connecting Plants with People, 31 October 2014, Delft, The Netherlands. Info: Prof. Olaf Van Kooten, Convener, Wageningen University, Horticultural Production Chains Group, PO Box 630, 6700 AP Wageningen, The Netherlands, Email: olaf.vankooten@wur.nl, Web: <http://www.beneluxshs.eu>



SYMPOSIA AND WORKSHOPS

Eighth Int'l Congress on Cactus Pear and Cochineal

The 8th International Congress on Cactus Pear and Cochineal was held from October 28-31, 2013 in Palermo (Italy), under the aegis of the International Society for Horticultural Science and the FAO-ICARDA International Technical Cooperation Network on Cactus Pear and Cochineal (CactusNet). The event was co-convened by Prof. Paolo Inglese of the Department Agriculture and Forest Sciences, University of Palermo, and Prof. Innocenza Chessa of the Department of Science for Nature and Environmental Resources, University of Sassari.

In the opening session, the 20th anniversary of the CactusNet foundation was celebrated and special recognition was expressed to Prof. Giuseppe Barbera, University of Palermo, Honorary President of the Congress and representative of the committee that twenty years ago recognized the importance of networking for the development of research and technology of cactus pear.

As a multi-purpose plant species and undervalued crop, cactus pear has considerable value in terms of horticultural production, as a key component for the productivity and sustainability of arid and semi arid areas and as an option crop in facing the threats linked to environmental changes. In today's very unstable climate situation and in view of the expected increased warming, cactus pear has become one of the most well-known examples of exotic plant species, having spread to several world regions from the native highlands of Mexico. In the new areas of diffusion the *Opuntiae* are also extraordinarily important as part of the landscape, for forage and fodder, in subsistence agriculture, and in the market-oriented fruit industry.

In the plenary lecture given at the opening session, the achievements of scientists and technicians during the last twenty years on cactus as a crop in both subsistence and market-oriented agriculture, together with future challenges,

were highlighted by Dr. Ali Nefzaoui from the International Center for Agricultural Research in Dry Areas (ICARDA) and General Coordinator of the CactusNet.

Thirty-eight oral presentations, including six plenary lectures, and 85 posters were presented during the congress by the 134 participants, who came from 20 countries. Recent findings on genetic resources and breeding, fruit and forage production and utilization, agroindustrial and pharmaceutical uses and cochineal were presented. Among the issues discussed, a novel interest in development and marketing became apparent and the dedicated scientific session involved participants in an open and active discussion. Oral and poster presentations effectively updated the status of research in the various countries, and focused on the most significant achievements.

The pomological exhibition, organized by the International Scientific Committee of the



Participants of the congress.

CactusNet, displayed a wide range of the plant and its products, and the commercial opportunities that may arise from the exploitation of the whole plant, using both traditional and innovative technologies. The development of cactus in several countries in the world was documented, giving a better understanding of the importance of cactus pear as a crop and of the diverse range of creative ways it may be used.

The two field trips clearly showed the relevance of the cultivations of cactus pear in Italy, which is mainly oriented towards fruit production. During the visit in San Cono, plantations of different size and age (from 60 to 3-year-old) were visited. The main management practices and marketing strategies were explained directly by the growers, demonstrating the advantages of applying scientific results to pruning, fruit thinning, harvesting and postharvest handling of

fruit. Participants witnessed the important role of the crop in the conservation of traditional farming systems and their natural values, and the maintenance of rural landscape. At the same time the potential of this crop as a source of innovation for sustainable agriculture, even in areas where it has been introduced, was evident.

The numerous social activities during the congress (welcome party at the "Galleria d'Arte Moderna Sant'Anna", social dinner at Villa Niscemi, food academy lunch, tours, etc.), offered by the sponsors, created a pleasant atmosphere among researchers. Enjoying the unusually warm weather, the beautiful landscape of Sicily, and fascinating historical remains, the researchers were continuously involved in fruitful and enjoyable discussions even on complex scientific issues lasting well beyond the official congress sessions.



Cactus pear orchard in San Cono area, Az. Spitale.

On the last day, Prof. Innocenza Chessa was elected Chair of the ISHS Working Group on Cactus Pear and Cochineal. Finally, it was agreed that the 9th edition of the International Congress on Cactus Pear and Cochineal would be held in 2016 in Lagos de Moreno (Jalisco, Mexico), organized by Dr. Liberato Portillo (Guadalajara University, Mexico) who accepted the role of convener.

Innocenza Chessa and Paolo Inglese

Closing ceremony.



CONTACT

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Prof. Dr. Paolo Inglese, Department Agriculture and Forest Sciences, Università degli Studi di Palermo, Viale delle Scienze, ED. 4, 90142 Palermo, Italy, email: paolo.inglese@unipa.it



Section Nuts and Mediterranean Climate Fruits

First Int'l Symposium on Fruit Culture and its Traditional Knowledge along Silk Road Countries



Participants of the symposium.

"The Great Silk Road is a route of dialogue, mutual understanding and rapprochement of traditions and cultures. The Great Silk Road, like the Phoenix bird, is beginning its scientific revival."

The First International Symposium on Fruit Culture and its Traditional Knowledge along Silk Road Countries was held in two sub Caucasian countries, Armenia and Georgia, on November 4-8, 2013.

The Great Silk Road is historically famous for being associated with trade between East and West, but what many do not know is that along this path a richness of plant species can be encountered, many of which have given rise to those selected and cultivated by modern man. The Silk Road, in fact, crosses through the Balkans, the Caucasus, Central Asia and China, which are centers of differentiation of important plant species such as many grains, *Prunus*, *Malus*, *Citrus*, *Vitis* and other species. The country life is still characterized by many small farms where all the necessary needs of the family are produced and where almost all plants are native and propagated from seed. This constant reproduction by seed is the genetic richness of these countries!

The symposium aimed to catalyze research and knowledge in the fruit sector, including nuts, *Citrus*, *Vitis* and any others that play a specific role in food traditions, in all countries crossed by the Silk Road. At the same time the symposium created the opportunity for culture to overwhelm human division and promote international cooperation.

The symposium was organized by the Agrarian universities of Armenia and Georgia. Forty-five participants representing around 20 countries participated in the symposium. Three keynote speakers were invited by the scientific committee: Dr. Kourosh Vahdati, Head of the Iranian Center of Excellence in Walnut Improvement and Technology of the University of Tehran, Iran; Dr. Jozef Turok, Regional Coordinator of the International Center for Agricultural Research in the Dry Areas (ICARDA), Tashkent, Uzbekistan; and Dr. Celal Tuncer, Head of the Department of Plant Protection, Ondokuz Mayıs University, Turkey.

The opening ceremony, as well as the scientific sessions held in Armenia, took place in the Hall of Ararat Brandy-Wine-Vodka Factory in Yerevan, which is located on the site of the ancient Yerevan fortress and is famous for its glorious 136-year history. The opening cer-

emony started with remarks by one of the symposium conveners, Dr. Gagik Santrosyan, Head of the Scientific Committee, followed by Dr. Damiano Avanzato, Chair of the ISHS Section Nuts and Mediterranean Climate Fruits, and Dr. Rosa Tsarukyan, Chairman of the National Union of Farmers and the manager of "Multi Agro" Scientific and Production Center of the "Multi Group" concern. Welcoming all participants to historical, bright Armenia, Rosa Tsarukyan introduced briefly the national traditions of Armenian viticulture, wine making and fruit growing.

The symposium contained 8 scientific sessions:

- Historical background of fruit culture
- Past and present technology for fruit uses
- Cultural practices applied to fruit sector
- Biology, genetics, and biotechnology
- Phytosanitary issues related to plants
- Chemistry and physiology
- Genetic resources, rootstocks and varieties
- Pre and postharvest practices affecting quality

All presentations were followed by active discussions and all scientific sessions were followed by poster presentations.



Preparation of sujukh during a field trip to Ashtarak town.



Testing of 100-year-old Armenian wine in the old cellars of Ararat wine factory.

On November 6 the participants took part in a technical tour, during which they visited Ararat wine factory and Ashtarak community of Aragatsotn region of Armenia and became acquainted with the production of traditional Armenian sujukh – threaded walnuts dipped in sweet spiced fruit-syrup coating and dried. They also visited Lori and Tavush regions of Armenia, after which they crossed the border to Georgia and reached Tbilisi, where the second part of the symposium was held.

Scientific sessions 6, 7 and 8, as well as the closing ceremony were held in the Hall of the Agrarian University of Georgia. The scientific part of the symposium was followed by a post symposium tour to Mtskheta, the old capital of Georgia, and a fine dinner in a traditional Georgian restaurant.

Aleksandr Kalantaryan

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Section Ornamental Plants Second Int'l Orchid Symposium



Group photo of Co-Conveners with keynote and invited speakers and sponsors. From left to right: Dr. Teresita Amore, Assoc. Prof. Dr. Y.C. Alex Chang, Prof. Fure-Chyi Chen, Dr. Yung I. Lee, Prof. Choy Sin Hew, Prof. Sek-Man Wong, Prof. Chin-An Chang, Mr. Chamrong Daoruang, Assoc. Prof. Dr. Sakarindr Bhumiratana, Prof. Dr. Masahiro Mii, Assoc. Prof. Dr. Kanchit Thammasiri, Dr. Setapong Lekawatana, Yupin Kasinkasabmpong, Assoc. Prof. Dr. Sakda Intaravichai, Assoc. Prof. Dr. Surawit Wannakraioj, Asst. Prof. Dr. Apiradee Uthairatanakij, Assoc. Prof. Dr. Pattana Srifa Huehne.

The 2nd International Orchid Symposium (IOS 2014) "Diversity & Design" was organized by the Division of Postharvest Technology, King Mongkut's University of Technology

Thonburi (KMUTT) in cooperation with Kasetsart University, Department of Agriculture and Department of Agricultural Extension, the Ministry of Agriculture and the National

Science and Technology Development Agency under the auspices of the International Society for Horticultural Science (ISHS) during 19-21 February 2014. The first day of the sympo-





Assoc. Prof. Dr. Erik Runkle presenting the ISHS certificate and medal to Co-Conveners (A) Asst. Prof. Dr. Apiradee Uthairatanakij, (B) Prof. Dr. Fure-Chyi Chen and (C) Prof. Dr. Chin-An Chang.

sium was an excursion tour, during which participants visited an orchid production area in Ratchaburi Province in the morning, and tissue culture and postharvest management of cut orchids at Thai Orchids Co., Ltd. in Bangkok in the afternoon.

The symposium was held at the Golden Tulip Sovereign Hotel, Bangkok, Thailand. At the opening ceremony, Assoc. Prof. Dr. Sakarindr Bhumiratana, President of KMUTT, welcomed 150 participants from 17 countries to the symposium. In the first keynote presentation, Prof. Dr. Masahiro Mii from Chiba University, Japan, related his experience on transgenic *Phalaenopsis* to confer the blue color characteristic, and the second speaker, Prof. Dr. Choy Sin Hew from Nanyang Technological University, Singapore, gave a presentation on photoassimilate partitioning and on growth and development of tropical orchids. The scope of the symposium covered orchid breeding and selection, ecology and taxonomy, diseases and pests, and postharvest management. Thirty-two oral and 38 poster presentations were given on several topics during the symposium.

Participants and accompanying persons were entertained at a welcome reception featuring



Prof. Dr. Masahiro Mii (left) presented the certificate for the best poster to Dr. Florence C. Ginibun (right). (B) Prof. Dr. Choy Sin Hew (left) presented the certificate for the best oral presentation to Dr. So-Young Park (right).

a wide variety of wonderful Thai food and Thai classical music and dance, performed by graduate students and assistant researchers from the Division of Postharvest Technology, KMUTT.

Participants had ample opportunity to network and exchange knowledge and ideas during the symposium. The symposium was very well organized with a wide coverage of interesting topics. The visit to the orchid farm was interesting and rewarding. In addition, it was a great opportunity for graduate students to be involved as volunteers, receiving comprehensive training on preparing and organizing a symposium.

The proceedings of the symposium will be published as a volume of *Acta Horticulturae*.

Apiradee Uthairatanakij

Excursion tour to an orchid production area in Ratchaburi Province.



CONTACT

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Section Ornamental Plants Third Int'l Symposium on the Genus *Lilium*



Participants of the symposium.

The IIIrd International Symposium on the Genus *Lilium* of ISHS Section Ornamental Plants was organized by The Sino-Europe Agricultural Development Centre (SEADC), Zhangzhou, China in cooperation with Wageningen University, The Netherlands. The city of Zhangzhou is famous for the cultivation of the Chinese sacred lily (*Narcissus tazetta* var. *chinensis*), which for centuries has been used in Chinese New Year's celebrations. For this reason a *Narcissus* seminar was organized on March 31, the day before the *Lilium* Symposium. For this one day seminar four speakers were invited, 25 posters were presented and an exhibition of carved *Narcissus* was held. The Lily Symposium

was opened on April 1 by Aalt Dijkhuizen, former president of Wageningen University. The meeting included 37 oral presentations and 29 posters on biodiversity, flowering, postharvest and cultural aspects, genetics and breeding, tissue culture and plant protection. The location for the symposium was the China Merchants Hotel. The local government of Zhangzhou China Merchants Development Zone (CMDZ) showed us some of their ambitious projects including the Double Happiness Island, an artificial Island similar to the Palm Islands of Dubai. Besides three days of presentations, one day was devoted to excursions. A short excursion on the first day of presentations was a visit to CMDZ and SEADC. The day excursion was a visit to the fields of Chinese sacred lily, The Zhangzhou Expo (Flower Paradise), the Haixia flower distribution center, a Phalaenopsis exhibition center and the *Dendrobium* cultivation base of Fujian Yangji Biotechnology Co, Ltd.

In each of the different sessions keynote speakers presented the newest developments in their field of interest. In the biodiversity session, Hiroshii Okubo gave a lecture on the "History of *Lilium* species in Asia". Xuewei Wu demonstrated the genetic variation of *Lilium* in China in his talk on "Native species of the genus *Lilium* in China". Ki-Byung Lim presented "Ecological, morphological and cytogenetics analysis of Korean Martagon *Lilium* species". In the flowering session, Rina Kamenetsky reviewed the "Flowering biology in *Lilium*". Bill Miller from Cornell University spoke during the session on postharvest and cultivation on "Postharvest of



A detailed carved *Narcissus* as used traditionally during Chinese New Year.



Former president of Wageningen University Aalt Dijkhuizen in the opening ceremony.

Lilium: experiment to industry adaptation". In this session Ding Mu and Lianwei Qu reported on the production and cultivation of lilies in China. Although the statistics are difficult to trace in China it is quite clear that lily is the number one cut flower in that country. The genetics and breeding session was a long session with two keynote speakers: Paul Arens lectured on "Molecular breeding of *Lilium*"





10-15 years. Although in many fields they are lagging behind, it is clear that in the future China will play a dominant role in research and development.

In total more than 150 participants from 14 countries attended the meeting. The proceedings of this symposium were published as *Acta Horticulturae* 1027 and were ready for the participants during the meeting. The book of abstracts can be downloaded from the congress website www.lilium2014.org. The conveners wish to thank all participants for their contribution and enthusiasm, and the organizers, especially Songlin Xie, Secretary of the Symposium, and Wangzhao Zhu, Director of SEDAC, and sponsors for their work and hospitality. We are looking forward to the next *Lilium* symposium!

Jaap van Tuyl

Exhibition of carved *Narcissus*.

and Rodrigo Barba-Gonzalez on "Cytogenetics of lily". Qiaochun Wang presented interesting work on "Plant regeneration and cryopreservation of *Lilium*". In the plant protection session, Dr. Cor Conijn gave an excellent review of "Lily diseases and their developments in control".

This symposium clearly showed the importance of lily research in China. At least 30 research groups are presently working on lily, some of them on the medicinal and edible aspects. China is the most important gene center for *Lilium* and has made enormous progress in the last

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Section Pome and Stone Fruits Twelfth Int'l Symposium on Plant Bioregulators in Fruit Production

The XII International Symposium on Plant Bioregulators in Fruit Production was held in conjunction with the 40th Annual Meeting of the Plant Growth Regulation Society of America (PGRSA) in Orlando, FL, USA from 28 July to 1 August, 2013. The meeting attracted more than 100 delegates from 14 countries, who presented more than 30 oral and 35 poster presentations.

Highlights of the symposium included three invited presentations. The first speaker, Dr. Rick Amasino, University of Wisconsin, opened the meeting with an excellent talk on the regulation of flowering by environmental cues, with specific emphasis on the elucidation of florigen. The second by Dr. Evelyne Costes, French National Institute for Agricultural Research (INRA), discussed approaches to modeling branching and flowering patterns in fruit tree development. The third invited presentation was by Dr. Hayk Khachatryan, University of Florida, who talked about consumer prefer-

Symposium Co-Convener Dr. Steve McCartney goofs around with a Goofy topiary sculpture while touring Walt Disney World's Horticultural Operations during the post-symposium tour.



ences for plant attributes as determined from eye tracking studies.

The PGRSA also had two presentations associated with awards at its annual meeting. The first was the Valent BioSciences Young Scientist of the Year, which was presented to Dr. Moritz Knoche from Leibniz University. After receiving his award, Dr. Knoche gave a well-received presentation about the factors that limit PGR penetration, focusing specifically on temperature, humidity and rewetting of droplet residues. The second award was the Historical Perspectives Award, which was given to Dr. Duane Bartholomew from the University of Hawaii. Dr. Bartholomew spent his career working with the Hawaii pineapple industry and gave an excellent presentation about the history of the world pineapple industry, the discovery of the plant's sensitivity to ethylene and subsequent commercialization of ethylene technology in the pineapple industry.



 **Participants of the symposium.**

Student participation is always important in a meeting like this and this year four students participated by giving either oral or poster presentations. All of the students were recognized for their participation during the meeting's concluding Awards Luncheon. The students attending and presenting at this year's meeting were Mara Grossman, Virginia Tech; Virgilio Olivera-Olivera, University of Puerto Rico; Soichiro Nishiyama, Kyoto University; and Theerawut Chutinantakun, University of Tsukuba.

About 25 attendees participated in the pre-symposium tour to NASA's Kennedy Space Center. Tour participants learned about the history of the U.S. Space Program through interactive displays and movies at the Kennedy Space Center's visitor complex, including an up-close view of the Space Shuttle Atlantis. They also participated in a guided tour of the Center's

Launch Complex, where mission control managers monitor all of the systems of the various space vehicles up to and during launch.

About 20 attendees participated in the post-symposium tour. This tour included a stop at the Walt Disney Corporation's Horticultural Operations, where all of the theme parks' and resorts' hanging baskets, topiaries and potted trees are grown and maintained. The group then visited the University of Florida's Mid-Florida Research and Education Center, which has teaching, research and extension programs centered on environmental horticulture, vegetable and fruit crops production. The final tour stop was at Pecketts' Nursery, which is a large wholesale grower of peace lily (*Spathiphyllum*) and holiday cactus (*Schlumbergia*).

The joint meeting of the XII International Symposium on Plant Bioregulators in Fruit

Production and the Plant Growth Regulation Society of America was a huge success. A good time was had by all and there was a lot of opportunity for socializing and scientific exchange between colleagues. The XIII International Symposium of Plant Bioregulators in Fruit Production will be hosted by Dr. Satoru Kondo of Chiba University in Japan in 2017.

Timothy Spann

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Section Vegetables

Thirteenth Int'l Asparagus Symposium

The XIIIth International Asparagus Symposium was successfully held in Nanchang, China from 16-18 October 2013 in conjunction with the Nanchang International Asparagus Industry Exposition. More than 330 participants attended this symposium. They were from 18 countries around the world including USA, Italy, Peru, Germany, The Netherlands, UK, Poland, Japan, Korea, Indonesia, and China.

This International Asparagus Symposium was the first to be held in China. Dr. Chen Guangyu, Chairman of the Chinese Asparagus Association, hosted the brief opening ceremony on the morning of October 16. In the opening remarks,

Dr. Silvana Nicola, Chair of the ISHS Section Vegetables, extended her congratulations to China for hosting the symposium and extended her well wishes for a successful event. The Vice Minister of the Ministry of Agriculture of China and the President of the Chinese Academy of Agricultural Sciences, Academician Dr. Li Jiayang attended the opening ceremony and gave an address to express a warm welcome to the participants from all over the world. With China's rapid economic development over the last decades, the Chinese government has placed a premium on the development of a modern horticultural industry. Asparagus is a

high value vegetable, supplying good nutrition and health benefits. The asparagus industry has developed very quickly in China in recent years, and faces good market prospects in the future. Dr. Li Jiayang hoped that all participants could share their newest research achievements, and together probe the future of the asparagus industry. He also expressed his desire for raised research levels in other countries and to promote the asparagus industry worldwide. After the opening ceremony, all participants visited the 4th International Asparagus Trial and the European Organic Certificated organic asparagus production base in a model greenhouse in Nanchang.



Presentation at the symposium. From left to right: Dr. Jan Graefe, Dr. Chen Guangyu – Convener, Dr. Silvana Nicola – Chair ISHS Section Vegetables, Dr. Hajime Araki, Dr. Yueping Zhang and Prof. Dr. Hab. Mikolaj Knaflewski – former Chair ISHS WG Asparagus.

Asparagus has a long processing chain. It can be processed into drugs that are anti-tumor or that reduce blood pressure and lipids. It can also be used to make drinks, wine, tea, cosmetics and animal feed.



More than 20 asparagus enterprises from all over the world brought their products and attended the Nanchang International Asparagus Industry Exposition. The Vice Minister of the Ministry of Agriculture of China, Academician Dr. Li Jiayang, speaks with a scientist from Peru at their booth.

Dr. Bernhard Brueckner presenting the XIVth International Asparagus Symposium that was voted to be in Potsdam, Germany.





Pre-symposium tour: green asparagus production in protected tunnel house model.

In 2010, the Ministry of Agriculture of China approved a Special Fund for Asparagus Research in the Public Interest. A national asparagus R&D program was established with Dr. Chen Guangyu as the chief scientist. The program involves 14 provinces from the northeast to Hainan Island in the south, with collaboration among research institutes, universities and some enterprises in China. This national technology innovation program is unique in the world and significantly promotes the asparagus industry in China. It focuses on applied research with the emphasis on the transfer of research achievements to growers and the industry. A series of new cultivars have been released and new cultivation models adaptable to different local climatic conditions have been developed. Asparagus is not only considered a delicacy in China, but is also recommended for its medicinal properties by the Ministry of Health. Research into the health functionality of asparagus is a new and important investigation area. Investigations into the anti-tumor effect of asparagus, its role in reducing blood pressure, lowering blood lipids and reducing blood sugar have been carried out in several institutes with encouraging results. Value-added, processed products such as asparagus juice, asparagus tea, asparagus wine, cosmetics and animal feed have been developed to exploit the whole value chain. Although it is not a native species, asparagus is becoming very popular in China and interest in the crop, both at the level of production and processing, is fostering rapid growth of the domestic market. Chinese production now accounts for almost half of total

production and consumption in the world. The XIIIth International Asparagus Symposium had a great impact on asparagus production and development in China.

Of the 75 abstracts received, 62 were accepted after peer review. Over the three-day symposium program, 30 oral and 32 poster presentations were made, including breeding and variety trials, processing and marketing, physiology and postharvest, biotechnology, pest and disease control, crop management, seed profiling and trends in the European asparagus industry. Dr. Jim Leebebs-Mack from the University of Georgia, USA, gave a keynote presentation outlining a milestone in asparagus research history: the Asparagus Genome Sequencing Project, an international achievement made by scientists from China, USA and Italy and led by Dr. Chen Guangyu. The genome was sequenced using the shotgun method (WGS) strategy. The de novo sequencing method was applied on double haploid male as starting material, followed by PacBio sequencing for optimization. At present, the genome sequencing, genome assembly, and genome annotation are completed and this should trigger more research and generate important benefits to the asparagus industry in the near future.

In conjunction with the symposium, an International Asparagus Industry Exposition was also held in Nanchang. There were more than 20 asparagus enterprises with their asparagus products attending this exposition. The companies were involved in food processing, medicines, cosmetics, fodder and ecological rehabili-

tation. During the pre-symposium tour, participants visited an organic asparagus production farm in Pudong Shanghai and protected cultivation of asparagus under tunnel in Hangzhou. Most of the participants flew to Beijing after the symposium for the post-symposium tour and visited an asparagus research center in Beijing. The participants also visited the Oriental Pearl TV Tower in Shanghai, the famous West Lake in Hangzhou, The World Natural Heritage Sanqingshan Mountain in Jiangxi, the Great Wall and the Forbidden City in Beijing.

After the academic program and the industry exposition, Dr. Daniel Drost, Chairman of the International Asparagus Association, presided over the closing ceremony on the afternoon of October 18. He made a passionate speech to congratulate the organizers for putting together the successful International Asparagus Symposium and Industry Exposition. The delegates voted for the XIVth International Asparagus Symposium to be in Potsdam, Germany in 2017.

Chen Guangyu

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Section Vegetables – Commission First Int'l Symposium on Vegetable Protected Cultivation Grafting



Opening ceremony. From left to right: Prof. Silvana Nicola, Chair of the ISHS Section Vegetables, Prof. Manzhu Bao, Dean of the College of Horticulture & Forestry Sciences, Huazhong Agricultural University, Dr. Yong Xu, Director of Beijing Vegetable Research Center, Dr. Rifei Sun, Vice President of Chinese Society for Horticultural Science, Mr. Chufa Lin, Deputy Director of Wuhan Academy of Agricultural Science, Mr. Guoliang Zhang, Director of Industry and Technology Division, Science and Education Department, Ministry of Agriculture of China, Prof. Chi Gao, Vice President of Huazhong Agricultural University, Mr. Nenghai Xu, Deputy Director of Agriculture Department, Hubei Province, Dr. Francisco Pérez-Alfocea, Chairman of the ISHS Vegetable Grafting Working Group, Mr. Pushe Yang, Chief Agronomist of Agriculture Bureau of Wuhan Municipality, Prof. Zhilong Bie, Symposium Convener.

Vegetable grafting is a centuries-old technique used in Asia to improve plant production, reduce soil borne disease susceptibility, and increase plant tolerance to abiotic stress, and it is becoming increasingly popular and important worldwide. These factors led to the creation of the ISHS Vegetable Grafting Working Group in 2010 (<http://www.ishs.org/vegetable-grafting-0>). At present, the Vegetable Grafting Working Group includes more than 100 members from all over the world.

An International Symposium on Vegetable Grafting was held from 3-5 October 2011 at Viterbo, Italy, organized by Tuscia University, Italy and the Institute of Vegetable and Ornamental Crops (IGZ), Germany. During this symposium, Prof. Zhilong Bie and Yuan Huang from Huazhong Agricultural University applied for the next grafting symposium, and it was suggested that this symposium would be organized under the aegis of the International Society for Horticultural Science following the creation of

the ISHS Vegetable Grafting Working Group in 2010, and that it would be named the First ISHS International Symposium on Vegetable Grafting.

Thus, the First ISHS International Symposium on Vegetable Grafting was held in Wuhan, China, from 17-21 March 2014. The Chinese Society for Horticultural Science (CSHS) and the Huazhong Agricultural University (HZAU) organized the symposium under the aegis of the ISHS. The theme of the symposium

Participants of the symposium.





ISHS representative Prof. Silvana Nicola (left) presenting the ISHS medal to Symposium Convener Prof. Zhilong Bie (right).



Participants interested in a vegetable grafting robot.

was "Environmental Friendly Production of Vegetables via Grafting".

The symposium brought together 250 delegates from 21 countries (Belgium, Chile, China, France, Germany, India, Indonesia, Iran, Israel, Italy, Japan, Korea, New Zealand, Peru, Philippines, Romania, Saudi Arabia, Spain, USA, Sri Lanka and Vietnam). Sixty-eight participants attended from private industry. Ten keynote speeches, 27 oral and 84 poster presentations were delivered. Oral presentations and poster viewing were spread over four days, combined with a mid-symposium technical tour.

The Opening Ceremony started with a welcome address by Prof. Chi Gao, Vice President of Huazhong Agricultural University, followed by Prof. Silvana Nicola, who gave a welcome speech on behalf of ISHS, and granted the ISHS medal and certificate of recognition to Prof. Zhilong Bie, the Symposium Convener. Then, Prof. Zhilong Bie gave a welcome speech and thanked the participants and the Scientific and Organizing Committees for their valuable contributions. Other speakers who welcomed participants to the symposium were: Mr. Guoliang Zhang, who described the China Agriculture Research System on behalf of the Ministry of Agriculture of China; Dr. Rifei Sun, on behalf of the CSHS; and Mr. Nenghai Xu, who represented the People's Government of Hubei Province.

The symposium was organized around six scientific sessions: grafted seedling production, rootstock breeding and biotechnology, grafting and biotic stresses, grafting and abiotic stresses, rootstock-scion/soil biota interactions, and rootstock-mediated effects on yield and fruit quality. The presenters gave excellent oral presentations. Notable were the keynote addresses delivered by Prof. William John Lucas focusing on long distance signaling through phloem between scion and rootstock, by Dr. Francisco Pérez-Alfocea focusing on exploiting rootstock-scion communication for yield stability, by Dr. Yong Xu on cucurbit soil borne diseases and resistant genes, by Dr. Giuseppe

Colla on vegetable grafting for abiotic stress tolerance, by Prof. Jung-Myung Lee on vegetable grafting technology, by Dr. Dietmar Schwarz on fruit quality of grafted vegetables, by Dr. Frank John Louws on grafting as a tool to manage soil borne pathogens, by Dr. Menahem Edelstein on grafting to increase tolerance to toxic elements in vegetables, by Dr. Xingping Zhang on breeding of vegetable rootstocks, and by Prof. Zhilong Bie on vegetable grafting in China.

The mid-symposium technical tour included a visit to Wuhan Weierfu Biological Technology Co., Ltd, a state-of-the-art nursery, where automatic and manual grafting techniques were demonstrated, and where several greenhouses of ornamental plants displayed a large variety of grafted transplants. Some spare-time was spent by the Yangtze River Beach and the Jiangnan commercial walking streets. Aboard a Yangtze cruise ship, participants enjoyed the night view of Wuhan.

The symposium also provided opportunity for participants to interact with each other, share information and enhance scientific and technical collaborations. The final outcome of the symposium will include the publication of the manuscripts in the symposium proceedings as a volume of *Acta Horticulturae*. During the symposium, an ISHS business meeting was organized and it was decided (i) to continue the symposium series at an interval of 3 years, (ii) to confirm Dr. Francisco Pérez-Alfocea as the chairperson of the Working Group on Vegetable Grafting until the next symposium, (iii) to explore the possible organization of the next event by colleagues from the USA (Frank John Louws, Chieri Kubota and Xin Zhao) in 2017, in Florida (USA). Finally, at the closing session, Dr. Francisco Pérez-Alfocea, the chairperson of the ISHS Working Group, summarized the main conclusions of the symposium. He highlighted the major advances presented, the new emerging areas of research and the need to keep together empiricism, technology and science. This integrated multi-actor approach

(farmers, engineers and scientists) is a powerful driving-force for the development of vegetable grafting in order to sustain socially and environmentally friendly and healthy food production, thus opening new opportunities for many horticultural areas throughout the world.

The Convener wishes to thank the Organizing and Scientific Committees, who kindly took charge of the smooth running of this symposium. Moreover, we thankfully acknowledge our sponsors for their financial support in conducting this successful event. Our sponsors included the National Natural Science Foundation of China (NSFC); China Agriculture Research System (Watermelon & Melon); Wuhan Weierfu Biological Technology Co., Ltd; Helper Robotech Co., Ltd; Jinan Weili Seed Co., Ltd; Beijing Kingpeng International Hi-Tech Corporation; Key Laboratory of Horticultural Plant Biology; Ministry of Education, China; Philips Lumileds Lighting Company; Ruyiqing Group Co., Ltd. In addition, special thanks are addressed to Miss Qingpiao Wang, who acted as full-time secretary and did a lot of work for the symposium, and thanks also to the many students who volunteered and helped to organize this successful symposium. Lastly, many thanks to the Hubei Mass Art Center for offering us unforgettable cultural events during the Welcome Banquet.

Zhilong Bie and Yuan Huang

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Commission Economics and Management

First Int'l Symposium on Horticulture Economics, Marketing and Consumer Research

The Conveners Jennifer H. Dennis (Purdue University) and Bridget K. Behe (Michigan State University) hosted the First International Symposium on Horticulture Economics, Marketing and Consumer Research on August 19-20, 2013, in Portland, Oregon, USA. The meeting was held in conjunction with the Far West Trade Show and Educational Seminars, which are hosted annually in Portland by the Oregon Association of Nurserymen (OAN). The Conveners are especially grateful to the staff at OAN for their gracious provision of meeting room space for the symposium. Dr. Robin G. Brumfield (Rutgers University) was the ISHS delegate who presented the Conveners with a medal of appreciation for their organization of the meetings. Twenty-five delegates from five countries presented 23 papers over the two-day period. Topics ranged from eye tracking, carbon conscious consumers, plant branding, customer satisfaction for German consumers and consumer perceptions of horticultural products like banana in central Kenya. In addition to networking and sharing research ideas, a welcome reception was held on Monday evening and tours on Wednesday. Local arrangements were especially well prepared by Ms. Tammy Goodale (Purdue University staff), with-
out whom this meeting would not have been



A

Dr. Robin G. Brumfield presenting the ISHS medal award to Conveners Jennifer H. Dennis (A) and Bridget K. Behe (B)



B

Dr. Leo Kelly from Monsanto Vegetable Seeds giving a presentation on "Beneforté Broccoli: Offering Consumers Improved Nutrition".



possible. Delegates enjoyed stimulating discussions during the symposium, which continued with a choice of tours on August 21. Some

enjoyed a tour of three Oregon coastal wineries while others enjoyed a tour of local nursery producers. Many of the American delegates stayed for a USDA Multi-State Regional Project summer meeting of the S-1051 group. Dr. Marco Palma (Texas A&M University) is the chair of this national committee and Dr. Jennifer Dennis (Purdue University) is the secretary for the group. The group invited ISHS delegates to attend the meeting (August 22) where consumer and other horticultural economic research was planned and discussed. ISHS delegates also were provided with free passes to the Far West Trade Show where hundreds of nursery producers, suppliers, and allied trade showcased their products.

Jennifer H. Dennis

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Second Int'l Symposium on Plant Cryopreservation

Commission Molecular Biology and
In Vitro Culture – Commission Plant
Genetic Resources



Participants of the symposium (courtesy of Chris Richards and Joseph Duchene).

The Second International Symposium on Plant Cryopreservation was held at the Hilton hotel in Fort Collins, Colorado, USA, from August 11-14, 2013. Fort Collins is located in the foothills of the Rocky Mountains with peaks over 4,000 m high and in close proximity of the spectacular Rocky Mountain National Park. The area has been visited by people for the last

11,000 years, first by Paleo-Indians, later by the Ute and Arapaho Tribes and nowadays by world tourists. The town of Fort Collins is home to the National Center for Genetic Resources Preservation, one of the largest genebanks in the world that stores seeds, clonally propagated plant material and animal germplasm and carries out research on cryopreservation of both plant and animal genetic resources. The Center has two independent units: Plant and Animal Genetic Resources Preservation Research, led and coordinated by Dr. David Dierig, and Plant Germplasm Preservation Research, led by Dr. Christina Walters. The facility is a part of the United States Department of Agriculture-Agricultural Research Service, National Plant Germplasm System and serves as the central back-up for American agricultural crops and their wild relatives, and provides storage for international plant genetic resources in the form of "black boxes", referring to collections that are not distributed. The center opened in 1958 as the National Seed Storage Laboratory, expanded in 1992 and was promoted to the National Center for Genetic Resources Preservation in 2000 after the animal germplasm preservation program was added. Colorado State University with over 28,000 students, and several high tech industries are also located in the town that was established in the middle of the XIXth century.



Keynote speakers: Dr. Hugh Pritchard (left) and Dr. Florent Engelmann (right) (courtesy of Jen-Mei Zhang and Gayle Volk).

Prof. Akira Sakai (1920-2012) (courtesy of Takeo Niino).



Cryopreservation is the most efficient means of long-term storage of genetic resources. It contributes to global efforts to secure food sustainability and the preservation of plant diversity.

The symposium brought together 90 scientists and professionals from 28 countries (Argentina, Australia, Belgium, Brazil, Canada, China, Colombia, Fiji, Finland, France, Germany, India, Italy, Japan, Kenya, Korea, Malaysia, Mexico, New Zealand, Nigeria, Norway, Peru, Poland, Saudi Arabia, Spain, Thailand, United Kingdom and United States of America) engaged in





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Touring the University Flower Garden by the Center of the Arts (photo by Gayle Volk).

cryobiology, genebanking and ex situ preservation of plants. It was organized by the Non-Conventional Conservation of Genetic Resources of Horticultural Crops Working Group of the International Society for Horticultural Science, as a continuation of the First International Symposium on Cryopreservation in Horticultural Species held in Belgium in 2009. Welcome greetings and opening remarks were delivered by Dr. Larry Chandler, Director of the Northern Plains Area of the United States Department of Agriculture-Agricultural Research Service, and Dr. Craig Beyrouthy, Dean, College of Agriculture, Colorado State University. A welcome letter to the symposium participants was issued by Mrs. Karen Weitkunat, Mayor of Fort Collins, CO. The ISHS was represented by Dr. Bart Panis, Vice-Chair of the ISHS Commission Molecular Biology and In Vitro Culture.

The program included a pre-symposium tour to the Rocky Mountain National Park, a visit to the National Center for Genetic Resources Preservation, a tour of the University Flower Garden by the Center of the Arts and ended with a rafting trip at the Poudre River. Social functions included a welcome reception on Sunday evening, continued by a tour of the Old Town breweries on Monday late afternoon, and a banquet at the Hilton on Tuesday evening.

Keynote lectures were given by two accomplished scientists; Dr. Hugh Pritchard, United Kingdom, on "How many species of higher plants need conserving by cryopreservation?" and Dr. Florent Engelmann, France, on "Cryopreservation of clonal crops: A review of some key parameters". Monday lunch included a guest lecture by Dr. Phil Purdy from the

U.S. National Animal Germplasm Preservation Program on "Current biotechnologies and future possibilities in preservation of animal germplasm". On the last day, a workshop on "Cryotanks – new designs and maintenance" was presented by Mr. Ian Pope, Cryo Associates, Inc.

The scientific program consisted of 38 oral presentations organized into five topical sessions and 44 poster presentations. The oral sessions included presentations of invited speakers who talked about their specialized research areas or institutional achievements. The topics in the scientific sessions included:

- **Advances in fundamental cryobiology.** Presentations in this session reported and discussed research on gene expression after liquid nitrogen (LN) exposure, the role of antioxidants in cryopreservation, life at low water content and temperatures, peroxidation and methylation changes after LN, cold hardiness, cryosurvival and tools for preservation and restoration of endangered species.
- **Special session – a tribute to Prof. Akira Sakai.** Prof. Sakai, a pioneer researcher on cold hardiness and plant cryopreservation, mentor and teacher and inspiring leader passed away in October 2012. A review of his research and scientific legacy was given by his colleagues and former students. The participants observed a moment of silence in his memory.
- **Applied cryobiology in plant cryopreservation.** This session reported research findings aimed at improving and simplifying the cryopreservation procedures, developing protocols for cryopreservation of new species, utilizing various plant fragments in the process, and

developing cryotherapy protocols and post cryo viability testing.

- **Storage of tropical, recalcitrant and endangered species in liquid nitrogen.** Application of systems biology, preservation of life cycles, orchid and medicinal plant species as well as recovery enhancement by over-expression in transgenic plants were discussed.
- **Cryo-genebanking of germplasm.** A review of plant cryopreservation status in Germany, Peru, China and India genebanks was presented, as well as some aspects of cassava and sweet potato cryo-banking.

Poster viewing was arranged in a "Short oral poster presentations" session and two separate viewing sessions. The "Short oral poster presentations" session gave participants the opportunity to present research that was not included in the already overloaded schedule of oral sessions. The poster display area was an attractive point for discussion and socializing during coffee breaks.

The business meeting of the ISHS Non-Conventional Conservation of Genetic Resources of Horticultural Crops Working Group was chaired by Dr. Panis, outgoing Chair of the group, in the presence of Dr. Reed, Vice-Chair of the ISHS Commission Plant Genetic Resources. In an open vote, the members of the Working Group:

- a) Decided to keep the Working Group affiliated with the Commission Molecular Biology and In Vitro Culture;
- b) Elected Dr. Maria Jenderek as the Chair of the Working Group;
- c) Accepted the offer of Dr. Marcos Martinez-Montero to organize the Third International Symposium on Plant Cryopreservation in Havana, Cuba, in 2017. The offer was presented by Dr. Panis in the absence of Dr. Martinez-Montero and was the only one officially presented.

The Second International Symposium on Plant Cryopreservation was a fruitful forum for reporting and discussion on research and application of cryopreservation in plants, provided opportunities for initiating scientific collaborations and strengthening old ones, enabled scientists to meet in person and created an atmosphere of friendship and professional camaraderie among the fairly small group of cryopreservation scientists worldwide.

Maria M. Jenderek

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Second Int'l Symposium on Organic Matter Management and Compost Use in Horticulture

Commission Organic Horticulture –
Commission Plant Substrates and
Soilless Culture



 **Participants of the symposium.** Photograph by courtesy of Ana Beatriz Torres.

The Universidad Técnica Federico Santa María, with the support of the United Nations Organization for Food and Agriculture (FAO), organized, with great success, the II International Symposium on Organic Matter Management and Compost Use in Horticulture under the aegis of the ISHS. The event was held in the facilities of FAO Regional Office in Santiago, Chile, during October 21-24, 2013. This event developed in conjunction with the III Workshop on Bioproducts for Agriculture and the III Workshop of Iberoamerican Network for Biological Fertilizers for Agriculture. For four days, more than 120 experts from 18 countries gathered to exchange ideas and

knowledge about different subjects, which ranged from production and quality of compost and organic amendments to their uses in horticulture production and soil remediation and recovery. Twelve keynote speakers from Chile, Mexico, Canada, Israel, Spain, Germany, USA and Colombia, presented their work and ideas in plenary sessions.

More than 50 oral and poster contributions were delivered in 9 thematic sessions:

- Compost, organic amendments, and clean agricultural production
- Compost, organic matter and climate change: emissions, technology, solutions
- Compost and organic matter management in conventional and organic horticultural production systems
- Regulations, biological products for agriculture, effects on plant and soil
- Compost quality: standards, production, experiences
- Organic matter in soil and biochemical transformations
- Organic matter and bioproducts in integrated plant nutrition
- Compost and organic amendments and biological control





■ **Keynote by Symposium Convener Dr. Rodrigo Ortega.** Photograph by courtesy of Ana Beatriz Torres.



■ **Keynote by Ms. Cecilia Céspedes from INIA, Chile. Oral session moderators Dr. Robert Miller (Colorado State University) and Dr. Marilyn Ericson (Georgia University).** Photograph by courtesy of Ana Beatriz Torres.

■ Compost and organic amendments and soil remediation

The sessions concluded with two excellent scientific technical excursions. The first excursion was to the Casablanca Valley (65 km west of Santiago, Via Valparaíso) to visit Veramonte winery, and the second was to Cachapoal Valley (120 km south of Santiago), to visit Fundo Sofruco - La Rosa at Peumo. Both visits included composting operations from wine process waste, as well as an organic and bio-

dynamic vineyard in Veramonte, and visits to avocado, plum, pear, and apple orchards, and vineyards in the case of Sofruco.

During the symposium, an ISHS business meeting was held to discuss the next symposium. Three countries, Israel, Spain and Mexico, presented their candidacy as potential organizers of the III International Symposium on Organic Matter Management and Compost Use in Horticulture in 2015. After checking the different alternatives, it was decided that



■ **Dr. Robert Prange, Chair of ISHS Commission Organic Horticulture (right), Dr. Michael Raviv, Chair of ISHS Working Group Composting for Horticultural Applications (center) and Ms. Raviv (left).** Photograph by courtesy of Ana Beatriz Torres.

the next symposium will be held in Murcia, Spain, in the spring of 2015.

María Mercedes Martínez

Keynote speaker	Country	Title
Dr. Robert Prange	Canada	Fruit and vegetable quality as affected by the use of compost and other organic amendments.
Dr. Michael Raviv	Israel	Can the use of composts and other organic amendments in horticulture help to mitigate climate change?
Dr. Miguel A. Sánchez-Monedero	Spain	Strategies to transform organic residues from olive and wine industries; gas emissions and climate change.
Dr. María Mercedes Martínez	Colombia	Bioproducts for horticulture use.
Dr. Refugio Rodríguez	Mexico	Regeneration by composting of agricultural soils contaminated with hydrocarbons and pesticides.
Dr. Jan Van Wambeke and Mrs. Pilar Román	FAO	Soils, climate change and food security.
Dr. Rodrigo Ortega	Chile	Integrated nutrient management in conventional intensive horticulture production systems.
Mrs. Cecilia Céspedes	Chile	Importance of soil organic matter in organic production systems.
Dr. Marilyn Erickson	USA	Horticulture production, food safety, and organic amendments: effects on public health.
Dr. Robert Miller	USA	Quality standards and proficiency testing program for compost.
Dr. Marc Janssens	Germany	Relative importance of soil organic matter, soil litter and litter fall in the tropics.

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Commission Organic Horticulture – Commission Protected Cultivation

Second Int'l Symposium on Organic Greenhouse Horticulture



Participants of the symposium. Photo by Jacques Fuchs.

Demand for organic products has grown more than threefold in the last 10 years and is now increasing by 7.7% in North America and by more than 10% in Europe. Consequently, horticultural organic farming, defined as production systems that sustain the health of soils, ecosystems, and people, has doubled in the last decade because of increasing demand by occidental consumers for organic fruits and vegetables. The total reported area of organic greenhouse crops is estimated at more than 5000 ha, which is almost entirely used for fruits and vegetables. Therefore, increasing interest among researchers in organic greenhouse horticulture has been recently observed, although the complexity of these biological systems as a whole makes research challenging for scientists.

In order to share knowledge, place organic farming background into a current context

and promote worldwide collaborations, the Second International Symposium on Organic Greenhouse Horticulture was held in Avignon, France, October 28 to 31, 2013. This ISHS symposium, organized by the ITAB and GRAB in partnership with the University of Avignon, in the frame of the EU-COST Action FA1105 "BioGreenhouse" (<http://www.biogreenhouse.org>), brought together around 120 researchers, producers and stakeholders from 38 countries such as the EU (78), Middle East (11), Canada (10), USA (2), Chile (3), Peru (3), Japan (2), Philippines (2), Malaysia (1), and Africa (8) to discuss key topics and promote research collaborations among the organic horticulture community. During the three days of lectures, Vianney Le Pichon (France), director of GRAB and president of IFOAM-France, opened the symposium by giving an overview of the constraints and challenges that growers

will have to face in the coming years as well as concerns about different organic regulations and points of view within the EU, Nordic

ISHS medals awarded to Co-Conveners
Nicolas Sinoir (left) and Jérôme Lambion
(right).



European countries and North America. The keynote address from Eliot Coleman (producer, USA) proposed a low-cost and crop scheduling option for a commercial mobile greenhouse, while Marc Tchamitchian (INRA, France) discussed the current challenges of the Southern Europe greenhouse systems, and underlined their evolution in the future by drawing a new research and development agenda for organic greenhouse systems in Southern Europe. The challenges include the outbreak of new pests and the potential changes in crop choices, both under the evolution of the climate and changes in marketing opportunities or concurrencies.

Within the key topic sessions on soil fertility, soil health, water management, robust planting material, pest and disease management, product quality, energy use and CO₂, economics, sustainability and standards, 36 oral and 61 poster communications were presented. These scientific communications pointed out the state-of-the-art of different greenhouse production systems adapted to various pedoclimatic conditions and country regulations. Sharing knowledge and the latest innovations enabled fruitful exchanges and enthusiasm that will contribute to substantial technical progress and reinforce or initiate new collaborations between researchers, growers and stakeholders. The highlights of the scientific communications presented in these sessions were as follows:

SOIL FERTILITY

The soil fertility session, which involved the complex relationships between physical, chemical and biological soil properties, was opened by Wim Voogt (The Netherlands) presenting the challenges in terms of nutrient balance and N and P leaching risks, as well as soil limits for intensive organic greenhouse crops such as tomato. Evaluation of different types of organic fertilizers, including digestate, in terms of nutrient availability and pollutant content, was provided as well as the efficiency and limits of using compost and vermicompost as soil fertility and plant health promoters. Fertilization strategies of organic ornamentals were also presented for different potted plants. To increase the sustainability of different organic greenhouse production systems, eco-intensification strategies were proposed and the efficiency of adding biochar as soil amendment and the limited bed growing system with recirculation of the effluent were discussed. (4 oral presentations, 3 short oral poster presentations and 13 posters)

SOIL HEALTH

Opened by Michael Raviv (Israel) who reviewed the state-of-the-art on building and maintaining soil health in the context of organic



..... Tour to an organic protected crop farm. Photo by Jacques Fuchs.

greenhouses, this session focused mainly on describing several aspects related to pathogens, nematodes and weed seed eradication and developing suppressiveness against soil-borne diseases. (4 oral presentations, 2 short oral poster presentations and 6 posters)

WATER MANAGEMENT

During this session different approaches (e.g. lysimeter, reduced water and nutrient use, consideration of the evolution of physical and hydraulic properties, the use of soil moisture sensors, artificial wetlands to treat crop effluent, the use of fish effluent as irrigation water) were proposed to reduce water use and limit nutrient emissions into the environment, while meeting plant water requirements, optimizing soil biological activity and reducing fungal disease infections. (3 oral presentations, 3 short oral poster presentations and 3 posters)

ROBUST PLANTING MATERIAL

The contribution of grafting to more robust planting material was addressed in several talks. Giuseppe Colla (Chair of COST Action 1204) gave an overview on a broad range of abiotic stress factors that could be controlled to some extent by grafting. Other talks addressed the selection of rootstocks for organic growing, the control of viruses by different agricultural techniques and long-term experiences in organic varietal trials. (4 oral presentations, 3 short oral poster presentations and 4 posters)

PEST MANAGEMENT

This session focused mainly on different approaches to control greenhouse pests (e.g.

Tuta absoluta, nematodes, aphids, mites, whiteflies) and to optimize the efficiency of natural predators (e.g. flower strips, resistant cultivars, intercropping, pollen) as well as a better understanding of the compatibility of biocontrol agents with plant protection products. Different predators/parasitoids were evaluated under different conditions and several effective methods were proposed. (5 oral presentations, 3 short oral poster presentations and 15 posters)

DISEASE MANAGEMENT

Vincent Michel (Switzerland) opened this session by presenting the potential of green manure to control soilborne diseases. Other suppressiveness methods were proposed (e.g. composted biowastes, biocontrol agents, plant extracts, light treatment, grafting) as well as mechanisms involved in plant resistance to pathogens. (4 oral presentations, 3 short oral poster presentations and 8 posters)

PRODUCT QUALITY

Although organic fruits and vegetables are generally considered by consumers to be safer (e.g. free of pesticides, lower antibiotic-resistant bacteria, no GMO), tastier and richer in nutritive and healthy components compared to conventional food, hence contributing to people's health, closer contact between animal waste products and edible plant organs might constitute a risk that should be considered. In this context, Beatrix Alsanius (Sweden) opened this session by presenting the "one health" concept and suggested potential intervention measures to mitigate or counteract the dispersal and proliferation of foodborne illnesses in organic greenhouse production. Several communica-

tions compared the nutritional value of organic fruits and vegetables to conventional crops, and proposed cultural practices (LED lighting, cultivars, irrigation, nutrients, amino acids, seaweed extracts, UV-C, greenhouse covering material) to improve their nutritive and gustatory quality. (4 oral presentations, 2 short oral poster presentations and 6 posters)

ENERGY USE AND CO₂

As energy is a main issue for heating, dehumidifying and cooling greenhouses, innovative approaches have been developed to reduce the dependency of the greenhouse industry on fossil fuels and thus improve its sustainability. As the opening talk, Frank Kempkes (The Netherlands) showed that by using highly insulating double glass and appropriate dehumidifying methods, up to 60% energy savings could be observed compared to a common greenhouse. A highly insulated greenhouse with optimized plastic film and two thermal screens combined to a non-fossil energy supply was studied under organic farming, and the use of thermal water evaluated. A semi-closed greenhouse adapted to a small organic facility was proposed using a gas absorption heat pump and short- and long-term energy storage. Life cycle assessment of organic and conventional greenhouse tomato production was presented as well as a new low energy production system aiming at a climate neutral organic product with a low ecological footprint. (4 oral presentations, 2 short oral poster presentations and 2 posters)

ECONOMICS, SUSTAINABILITY AND STANDARDS

Fabio Tittarelli (Italy) opened this session by presenting conclusions and recommendations from the Expert Group for Technical advice on Organic Production (EGTOP, mandated by the European commission). Organic rules in the EU were briefly introduced and new standards proposed for organic greenhouse production and then discussed in regard to the IFOAM EU. An overview of urban greenhouse production was presented as well as proposals on standards and certification. New opportunity for BCA approval at the phytochemical EC regulation was discussed. Improvements brought to and needed for the life cycle approach to be used as an environmental tool in organic farming were explained and a case study under a North American country (Canada) presented. Different cropping systems responding to spe-



■ Rob Meijer, Chair of the BioGreenhouse Cost Action at the farewell dinner. Photo by Jacques Fuchs.

cific socio-technical sets of constraints were evaluated in France. In Peru, a sustainable organic greenhouse production system was developed to improve productivity and quality. (5 oral presentations, 2 short oral poster presentations and 4 posters)

One of the highlights of the 2nd International Symposium on Organic Greenhouse Horticulture was the visits to organic protected crops in the south of France: experimentations and innovations at the experimental station of GRAB; employability and direct selling at Semailles (Jardin de Cocagne, which practices social inclusion through the production of vegetables and flowers in short circuit); the production system of Michel Tamisier, an organic producer who has succeeded in reconciling large distribution volumes and diversification; marketing and shipping at Pronatura, one of the largest wholesalers of fresh fruits and vegetables in Europe.

The organizers acknowledge all presenters and participants for the high quality of the scientific communications and fruitful discussions during the symposium and COST Action BioGreenhouse meeting.

This symposium was the second event organized by the ISHS Working Group on Organic Greenhouse Horticulture, which is part of the Commission Organic Horticulture. The Conveners, Nicolas Sinoir and Jérôme Lambion, assisted by the chair of the COST Action

BioGreenhouse, Rob Meijer (The Netherlands), and the Scientific Committee deserve our sincere thanks for this successful and fruitful event.

The third ISHS Organic Greenhouse Symposium will be held in Turkey in April 2016. Prof. Yüksel Tüzel has kindly agreed to organize this event, in collaboration with the EU-COST Action "BioGreenhouse".

During this symposium, Martine Dorais (Canada) was elected as Chair of the ISHS Working Group on Organic Greenhouse Horticulture in replacement of Rob Meijer. The ISHS members are very grateful to Rob Meijer for his significant achievements, dynamism, rigor, humor and kindness. His commitment has been outstanding and inspiring for many of us.

Martine Dorais

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Commission Plant Protection – Section Pome and Stone Fruits

First Int'l Symposium on Bacterial Canker of Kiwifruit



..... All the delegates who attended the 1st International Symposium on Bacterial Canker of Kiwifruit.

The 1st International Symposium on Bacterial Canker of Kiwifruit was held in Mount Maunganui, New Zealand on November 19-22, 2013. This inaugural symposium, supported by the International Society for Horticultural Science – Working Group Bacterial Diseases of Kiwifruit of Commission Plant Protection, and Section Pome and Stone Fruits – marked a milestone in the global fight against *Pseudomonas syringae* pv. *actinidiae* (Psa), the causal agent of bacterial canker of kiwifruit. With over 150 delegates in attendance, there were representatives and speakers from New Zealand, China, Canada, South Korea, Italy, Japan, France, USA, Spain and Norway. There was a cross section of the kiwifruit industry from scientists, industry figures and growers.

Dr. David Tanner, Co-Convener of the symposium, opened the event by highlighting that it was 3 years since Psa had been detected in New Zealand, and whilst it had affected other kiwifruit growing regions in the world, this marked the beginning of a coordinated, global assault on the pathogen. "The international research community has come together to defend grower's livelihoods, in a crop that produces highly

nutritious fruit for the global population, and we are fighting back".

Dr. Joel Vanneste, Co-Convener of the symposium and Chairman of the symposium Scientific Committee, explained the need for this symposium and the global impacts Psa has had. "*Pseudomonas syringae* pv. *actinidiae*, the causal agent of bacterial canker of kiwifruit, has become in less than five years the main pathogen of yellow and green fleshed kiwifruit. All major kiwifruit producing countries in the world have been affected by this bacterial pathogen, often leading to considerable economic damages. In some countries, this pathogen has become an impediment to a profitable and growing kiwifruit industry. The economic importance of this disease has led to international research projects on the pathogen, the disease or its control. This symposium is the first opportunity for scientists to come together and to share their experience, their results and their hopes. It will be a chance to learn from each other. Hopefully, it will also be a chance to strengthen existing collaborations and to start new ones. It is by working together that we will be able to reduce the economic importance of

this pathogen and return the kiwifruit industry to its original profitability."

The main theme of the symposium was "learning together is learning faster" and this was facilitated by keynote speakers who brought expertise most often acquired while working on other pathogens than Psa and on other crops than kiwifruit. Keynote speakers included University of Bologna's Professor Guglielmo Costa, Dr. David Guttman from the University of Toronto, Dr. Cindy Morris, director of the Plant Pathology Research Unit at the French National Agricultural Research Institute, Dr. Virginia Stockwell, a research faculty member in the Department of Botany and Plant Pathology at Oregon State University, Dr. Li Li standing for Prof. Huang Hongwen, director of Wuhan Botanical Garden, Chinese Academy of Science, and Dr. Ross Ferguson, senior scientist from Plant & Food Research in New Zealand.

The first keynote presentation was a joint lecture by Prof. G. Costa and Dr. R. Ferguson on the impact of Psa in the world. They explained how kiwifruit production has evolved since its inception last century and how Psa was affecting kiwifruit production in Europe and



• Elena Colombi, winner of the student poster award, being presented by Mark Whitworth, Port of Tauranga.



• Dr. Joel Vanneste.

New Zealand. This was followed by a presentation by Dr. Li Li, a research assistant at the Wuhan Botanical Gardens (part of the Chinese Academy of Science), who explored the origin of *Psa* in China. Her research has shown that *Psa* was first detected in China in 1985 in Hunan Province, spreading to other provinces in the 15 years that followed. Dr. D. Guttman, the next keynote speaker, explained how recent advances in molecular biology allowed determining where *Psa* was fitting in the *Pseudomonas syringae* complex and how such information could help to understand how *Psa* affects kiwifruit plants. This knowledge can then be used to construct, to breed or select cultivars of kiwifruit plants that are more resistant or less susceptible to this pathogen. Dr. C. Morris explored the origin of *Pseudomonas syringae*, demonstrating that this species complex most probably evolved in water and only later became a plant pathogen. She also explained today's link between *P. syringae* and the water cycle, which might be a consequence of the aquatic origin of the species, and she pointed out the impact of that link on the epidemiology of today's pathogens such as *Psa*. The last keynote speaker, Dr. V. Stockwell, has worked on many different plant pathogenic bacteria affecting a large number of crops. She accumulated a wealth of knowledge on how best to control or limit the incidence of bacterial diseases, which she shared with the audience. She selected pathogens and crops that offer some parallels with *Psa* and/or kiwifruit and gave us the lessons she had learned over many years on how best to control plant pathogenic bacteria such as *Psa*.

"Impact of *Psa* in the World" was the focus of the first session of the symposium and was led by international experts discussing the economic and scientific impacts that *Psa* has had in their countries. This session was then repeated as a grower-friendly open session to allow the transfer of information to New Zealand kiwifruit growers and to give growers and industry representatives an opportunity to ask questions

directly to the scientists in attendance. This industry-specific session was attended by over 100 growers.

Other topics covered in the 12-session symposium ranged from the "Ecology and epidemiology" to "Modelling and spatial and temporal movement of *Psa*" through to the "Genomics" of the bacteria and looking at the "Transcriptomics, proteomics and metabolomics" research that has been done to date. The potential and current control practices were discussed as well as the potential breeding options.

Delegates were also encouraged to present their research in the poster session. Consequently, in addition to the 44 oral presentations made, 21 posters were on display during the 3-day symposium. The symposium proceedings are currently being completed and are expected to be released in the third quarter of 2014.

The Port of Tauranga was the sponsor of the best student presentation and of the best student poster. Hossein Ali Narouei Khandan won the best student presentation for his paper entitled "Predicting the potential global distribution of *Pseudomonas syringae* pv. *actinidiae* (*Psa*): a comparative study using three different modelling approaches". The paper was co-authored by S.P. Worner, E.E. Jones, S.L.H. Villjanen-Rollinson, L. Gallipoli, A. Mazzaglia and G.M. Balestra. Elena Colombi was the winner of the best student poster for her work on "What has transformed *Psa* into a serial killer?" looking at what the genetic determinants might be of the heightened virulence of *Psa*-V. Her work was co-authored by Honor McCann and Paul Rainey from Massey University in New Zealand.

As part of the social programme, delegates were invited to attend a field trip and had the opportunity to visit Kiwi 360, Te Puke, to enjoy a helicopter ride over the Bay of Plenty and also to visit Plant & Food Research's Te Puke site providing valuable insight into the New Zealand kiwifruit industry. They were also invited to attend the "Hayward Medal Dinner", an annual

highlight of the New Zealand kiwifruit industry calendar where the Fresh Carriers Hayward Medal is presented to an individual who is recognised for his leadership and contribution to the New Zealand Kiwifruit Industry each year. John Palmer was recognised at the 2013 dinner for his leadership and tireless efforts as a former Chairman of the New Zealand Kiwifruit Marketing Board.

Dr. Vanneste closed the symposium with a challenge. "Your work is not finished. There will be more interaction that will need to happen. This is really just the beginning of the journey". Vanneste went on to say, "The first step was the theme of the symposium 'learning together is learning faster'. The next step is 'working together is going faster.' That will be the true measure of the success of this symposium and I think we're all ready to take that step."

Sponsorship of the symposium was led by Zespri, Kiwifruit Vine Health (KVH) and Plant & Food Research, however, many companies spanning the kiwifruit industry lent their support. For a full list, please see the website www.psa2013.co.nz/page/sponsors.

David Tanner, Clare Morris and Joel L. Vanneste

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Commission Quality and Postharvest Horticulture – Section Root and Tuber Crops

Second Southeast Asia Symposium on Quality Management in Postharvest Systems (SEAsia2013)



Opening ceremony with ISHS representative Prof. Sisir Mitra (left), Laos Vice Minister of Agriculture and Forestry, Dr. Phouang Parisak Pravongviengkham (center), and FAO-RAP Deputy Regional Representative, Mr. Vili Fuavao (right).

The 2nd Southeast Asia Symposium on Quality Management in Postharvest Systems (SEAsia2013) was successfully conducted on 4-6 December 2013 at Lane Xang Hotel, Vientiane, Laos, with 156 participants from 21 countries including 8 countries of Southeast Asia. It was held in conjunction with the Asia Pacific Conference on Postharvest

Systems Improvement for Food Security and Poverty Reduction (APC2013) sponsored by the Bangkok-based Food and Agriculture Organization of the United Nations-Regional Office for Asia and the Pacific (FAO-RAP). The joint conferences were designed to contribute to the Global Save Food Initiative and to bring to a less developed country agri-based science,

technology and collaboration as a foundation for sustainable economic development. SEAsia2013 was convened by Dr. Antonio Acedo Jr. of the Visayas State University, Leyte, Philippines and Dr. Sirichai Kanlayanarat of King Mongkut's University of Technology Thonburi, Bangkok, Thailand.

During the opening program, the Laos Vice Minister of Agriculture and Forestry, Dr. Phouang Parisak Pravongviengkham, thanked the organizers for holding the symposium in Laos, which is the first of its kind in the country, because it would catalyse the conduct of scientific research and technology in horticultural chain development and could significantly contribute to economic progress. Setting the tone of the symposium, the FAO-RAP Deputy Regional Representative, Dr. Vili Fuavao, delivered the opening keynote paper on the implications of postharvest losses and food waste for food security in the Asia-Pacific region. The 26 invited papers of eminent global scientists and development experts highlighted postharvest developments and future requirements at national, regional and international levels, consumer trends, quality and food safety management, recent trends and innovations in postharvest physiology and biotechnology, non-destructive quality evaluation, pre-harvest factors affecting product quality, recent developments in postharvest management, packaging and storage innovations, postharvest pest management, fresh cut production, product quality during processing, supply chains/value

Co-Conveners Dr. Sirichai Kanlayanarat (left) and Dr. Antonio Acedo Jr. (right) receiving the ISHS medal from ISHS representative Prof. Sisir Mitra (center).



Participants of the symposium.





Technical tour to an organic vegetable farm.

chains improvement, and international initiatives in postharvest education and research. The 49 oral and 101 poster presentations provided more developments and innovations in quality management. Concluding the two-day pres-

entations, the APC2013 Roundtable on Save Food led by FAO-RAP's Senior Agro-industry and Postharvest Officer, Dr. Rosa Rolle, together with a panel of discussants from the public and private sector of Malaysia, Philippines,

Singapore and Thailand, underscored the need and directions of a collective effort to reduce food losses and food waste in the Asia-Pacific region. The technical tour on the third and last day of the conference brought the participants to the lone fruit wholesale market in Laos and to rural production areas of organic vegetables. Participants took advantage of the occasion to renew and strengthen existing links and establish new ones. They expressed gratitude for the good organization of the symposium and were looking forward to SEAsia2015 to be held in Cambodia, which is also a less developed country like Laos.

Antonio Acedo Jr.

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Third Chinese Fig Industry Forum

The 3rd Chinese Fig Industry Forum was held on March 2, 2014 in Luancheng, Shijiazhuang City, Hebei Province. Currently, the total fig production area in China is about 300,000 Mu (20,000 ha) and production is 1 ton fresh figs per Mu. This amounts to approximately 80,000-90,000 tons per year. Most fig trees have been newly planted in the last two or three years. According to the statistics from the Academy of Forestry in Shandong Province and from the Agricultural University of China, there are 106 fig varieties. Chinese researchers are actively searching for new varieties. Today the main fig based products are fig jam, dried figs, sliced figs, fig wine, fig tea, fig chocolates and fig preserves, to name just a few.

Considering this interest in fig production in China, about 200 participants attended the forum, including leading experts and professors from the International Society for Horticultural Science (ISHS) and Chinese universities and research institutions, large scale growers, fig processing enterprises, government leaders and 16 news media and press agencies.

During the Forum, the following lectures were presented:

Dr. Damiano Avanzato - Activity of the ISHS Section Nuts and Mediterranean Climate Fruits

Dr. Mahuiqin - Research Status and Trends of Chinese Figs

Dr. Wang'anzhong - Basic Knowledge of Fig Cultivation and Processing

Dr. Caoshangyin - Excellent Varieties of Foreign Countries

Dr. Damiano Avanzato - Fig Industry in Italy: the Case of Dottato of Cosenza

Dr. Chaipeng - Impact of the Application of New Reflective Material on Figs

Dr. Kuangliuqing - Research on Botrytis Harm in Greenhouse Cultivation of Figs

Dr. Moshe Flaishman - The Fig: an Ancient Fruit with New Horizons: Genetic Resources, Horticulture and Breeding

Dr. Zhangzide - Fresh Technology on Figs

Dr. Lijinping - Selection and Evaluation of New Varieties of Figs in Beijing

Dr. Romano Roncasaglia - Fig In Vitro Propagation of Main Italian Varieties

Dr. Sunlei - Research and Development of Figs in Shandong Province

Dietitian Xiongminiao - How to Eat when you have Hypertension, Hyperglycemia and Hyperlipidemia.

At the end of the forum, the Chairman of both the forum and the Fig Industry Association, Dr. Zhao, announced that the next forum will be held on March 21, 2015 in Shandong Province. He indicated that he will actively work towards the publication of "Chinese Fig Memorabilia" and towards establishing a professional fund for figs, to enable the associations to better support the development of the national fig industry. The next ISHS V International Symposium on Fig will take place in Napoli, Italy from 31 August to 3 September 2015.

Jessie You

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New ISHS Members

ISHS is pleased to welcome the following new members:

NEW INDIVIDUAL MEMBERS:

Australia: Dr. Elizabeth Aitken, Mr. Bassam Alowaiesh, Mr. Mark Anthony, Robert Armstrong, Mr. Azmatullah Bajwah, Dr. Karen Barry, Mr. Owen Brinson, Ms. Cynthia Carson, Dr. Tariq Chattha, Dr. Robert Coe, Dr. Elizabeth Dann, Dr. Cathal Daynes, Mr. Trung Kien Do, Dr. Andre Drenth, Ms. Karen Eccleston, Ms. Sandra Fishwick, Mr. Julian Gorman, Mr. David Gourlay, Mr. Dale Griffin, Dr. Craig Hardner, Mr. Zaheer Iqbal, Mr. Jubin Jacob John, Mr. Robert James, Mr. Nate Jamieson, Dr. Rod Jones, Mr. Shamim AKU Khan, Dr. Vivian Ku, Ms. Vicki Lane, Mr. Nicholas Leywood, Guoqin Li, Mr. Muhammad Sohail Mazhar, Ms. Marjan Medhat, Mr. Wossen Mengesha, Mr. Mirko Milinkovic, Mr. Marco Montagna, Dr. Susan Murphy, TuanMinh Nguyen, Mr. Rory Nunes, Ms. michelle paynter, Dr. Kim-Yen Phan-Thien, Mr. Craig Pressler, Mr. Shaun Rebello, Mr. Muneer Rehman, Tram Anh San, Dr. Sandra Savocchia, Dr. Georges Srzednicki, Dr. Siva Subramaniam, Prof. Dr. Bob Teasdale, Ms. Ying Zhu; **Belgium:** Nick Hias, Ms. Ann Schenk, Dr. Alexander Siera, Mr. Jonathan Van Beek; **Bermuda:** Ms. Susan Wilson; **Brazil:** Dr. Lilian Cristina Anefalos, Prof. Renar Joao Bender, Dr. Lourdes Cabral, Ms. Luciana Dall'Agnese, Poliana Francescato, Ms. Nêmorah Garcia, Mr. Bruno Kreusburg Paulo, Dr. George Melo, Cristiano Quintino Furtao, Prof. Francesca Salla, Dr. Graciela Sobierajski, Ms. Maria Eduarda Ventura, Dr. Robson Yamamoto; **Cambodia:** Mr. Bauduin Parmentier; **Cameroon:** Mr. Essimi Menye; **Canada:** Dr. Samuel Asiedu, James Bambara, Dr. Amy Bowen, Ms. Marie-France Chevrefils, Dr. Ian Lloyd-George, Rene Schmitz, Ian Smith, Ms. Lisa Wegener; **Chile:** Prof. Dr. Peter Caligari, Assist. Prof. Susana Fischer, Dr. Richard Gaete-Holmes, Ms. Bravo Jimena, Monica Alejandr Ruiz Ogaz, Christian von Gehr, Manuel Yrarrazaval; **China:** Dr. Suhua Bai, Jun Bi, Qingqin Cao, XiangYang Ding, Prof. Dr. Zhaotang Ding, Yan Yan Guo, Assist. Prof. Jinghong Hao, Ms. Hu Hong-ju, Guixia Jia, Prof. Dr. Peng Jin, Fang Li, Mr. Meilan Li, Zhilin Li, Yan Lin, Jiang Ling, Jianran Luo, Prof. Dr. Weihong Luo, Jun Ming, Fengguang Qin, Prof. Lianwei Qu, Lejuan Shi, Junwei Su, Ms. Hongmei Sun, Daocheng Tang, Prof. Dr. Kexuan Tang, Assist. Prof. Yuxin Tong, Dr. Youguo Wang, Ms. Yuying Wang, Prof. Dr. Hongzhi Wu, Qingqing Wu, Assist. Prof. Zhuhua WU, Dou Xiaoying, Dr. Yu Xing, Dr. Liang Xu, Fanyue Yan, Liping Yang, Dr. Yanjuan Yang, Yingdong Yang, Hongjun Yu, Shujun Yu,

Chaojun Zhang, Ms. Hongyi Zhang, Prof. Dr. Jianguang Zhang, Dr. Jingli Zhang, Wen-E Zhang, Prof. Dr. Yugang Zhang, Prof. Dr. Yuxing Zhang, Xinghua Zhao, Dr. Dedong Zheng, Riru Zheng, Mr. Sixiang Zheng, Prof. Dr. Yonghua Zheng, Dr. Zheng Zheng, Prof. Li Zhong, Ms. Wu Zhuhua, Prof. Dr. Guoyuan Zou; **Chinese Taipei:** Mr. Chih-Hao An, Chen Chang, Mr. Hung-Sheng Chien, Assist. Prof. Ji-Wei Huang, Mr. Syuan-You Lin, Dr. Kin-Ying To, Ming-Hsuan Tsai; **Colombia:** Mr. Roberto Tisnes; **Cote d'Ivoire:** Mr. Aurélien Masson; **Croatia:** Dr. Slavica Dudas; **Czech Republic:** Peter Baista, Ludek Lanar; **Egypt:** Prof. Dr. Samy El-Shazly, Ms. Heike Hagenguth; **Estonia:** Assist. Prof. Ele Vool; **Fiji:** Mr. Stephen Henry, Mr. Livai Tora; **France:** Prof. Dr. Pierre-Emmanuel Bournet, Mr. Alexandre Bout, Mr. Richard Brun, Dr. péninna deberdt, Jean-Marie Joubert, Ms. Laurence Maillard, Fabienne Mathis, Mr. Eric Miannay, Mr. Bruno Paris; **Germany:** Mr. Klaas Koolman, Mr. Klaus Merckens, Caroline Stiller, Rattiya Suddeephong Lippe, Dr. Detlef Virchow, Ms. Sarah Weber; **Greece:** Mr. Petros Mavromatis, Dr. Ioannis Papadakis, Mr. Konstantinos Plevrakis; **India:** Mr. Pranit Banthia, Mr. Aashiq Hussain Taili, Dr. Surendra Malik, Dr. Mary Mathew K, Mr. Mallikarjun Patil, Mr. Ramakrishnan S, Mr. Shivshankar Singh, Mr. Srivignesh Sundaresan, Mr. Hafizullah Syed; **Indonesia:** Kumala Dewi, Dr. Fenny Dwivany, Ms. Merakati Handjaningsih, Prof. Dr. Edhi Martono, Ms. Yona Purba; **Iran:** Ms. Sara Sadeghnejad; **Iraq:** Dr. Ghazi Faiq Haji Khalifa; **Ireland:** Ms. Beata Tottosi; **Israel:** Mr. Ori Ben Herzel, Ms. Sigalit Berenzon, Menashe Cohen, Dr. Anurag Dagar, Mr. Amnon Haberman, Merav Kenigswald; **Italy:** Dr. Claudio D'Onofrio, Dr. francesco furnari, Dr. Giuseppe Lopriore, Dr. Franco Meggio, Beatrice Nesi, Paolo Paciello, Dr. Nicola Rinieri, Prof. alessandro roversi, Dr. Diego Tomasi, Dr. Gaetano Vivaldi; **Japan:** Dr. Yoichi Araki, Ms. Ayumi Deguchi, Dr. Ryosuke Endo, Assist. Prof. Shinji Fukuda, Mr. Yuji Hashida, Mr. Sotaro Hiraki, Naomi Horiuchi, Takahiro Ieguchi, Mr. Hidenori Kato, Mr. Yuki Mizunoe, Mr. Tomoyuki Nabeshima, Mr. Toyohiro Nagase, Dr. Aya Suzuki, Ms. Shiori Takami, Mr. Fasil Tadesse Tewolde, Yoko Tsurunaga, Kai Yanagawa, Dr. Soojung Yang; **Korea (Republic of):** Prof. Dr. Jung Hae-woong, Ms. Irene Kim, Ki-Hwan Lee, Ms. SeongBok Oh, Mr. Youngjae Oh, Dr. Ilsheob Shin, Dr. Sun Hee Yim; **Malaysia:** Dr. Abd Rahman Abdul Rahim, Ms. Su May Lee, Ms. Shahida Mohd Sharif, Dr. Nam-Weng Sit, Mr. Ivan Ting, Wan Rozita Wan Engah, Tai Ee Yam, Rozlaili Zainol; **Mexico:** Mr. Salvador Corral, Sanam Esfahani, Dr. Sara Nahuat, Mr. Jaime Okhuysen Boehm; **Netherlands:** Arjen Alblas,

Lud Clercx, Walter De Wit, Mr. Rudolph Gevers, Ms. Gondy Heijerman, Mr. Johannes Middelburg, Mr. Jan Arie Nugteren, Arie Peterse, Mr. Abraham Van der Maas; **New Zealand:** Ken Breen, Mr. Damian Duggan-Jones, Ms. Gayani Gamage, Ms. Miriam Hall, Mr. Abdul Jabbar, Dr. L.H.J. Huub Kerckhoffs, Ms. Mo Li, Mr. Rod McDonald, Ms. Pilirani Pankomera, Munazza Saeed, Ms. Claire Scofield, Mr. Syd Solomona, Mr. Mike Steele, Dr. Claudia Wiedow, Mr. Vaughn Williams, K. Young; **Nigeria:** Mr. Yahya Usman Abdullahi, Ms. Rosemond Alagba, Dr. Kolawole Law-Ogbomo, Dr. Rabiu Musa Kwankwaso, Ms. Nneka Okoli; **Norway:** Susanne Friis Pedersen, Stine Huseby, Mr. Stanislav Strbac; **Pakistan:** Assist. Prof. Aneela Yasmin; **Palestine:** Prof. Ismail Abu-Zinada; **Papua New Guinea:** Mr. Robert Kiaprani, Ms. Maria Linibi, Dr. Sim Sar; **Peru:** Luis BURGOS, Assist. Prof. Luis De Stefano, Yerka Maurtua, Isaias Segovia; **Philippines:** Dr. Zenaida Gonzaga; **Poland:** Marek Belter, Dr. Piotr Salachna; **Portugal:** Prof. Dr. Ana Paula Ramos, Dr. Claudia Sánchez, Dr. Miguel Sousa; **Qatar:** Mr. Reda Hafidi; **Russian Federation:** Alexander Khovrin, Ms. Olga Moreva, Evgeniy Strelkov; **South Africa:** Mr. Brian Aitken, Ms. Helena Du Plessis, Ms. Irene Idun, Mr. Willie Kotze, Ms. Marieke Mendes, Dr. Stephanie Midgley, Mr. Tavagwisa Muziri, Prof. Roumiana Nikolova, Mr. Christo Strydom, Ms. Magriet van der Linde; **Spain:** Mr. Daniel Antón Cayuelas, Ms. Mayte Espiau, Mr. Pablo Lopez, Dr. Miguel A. Sánchez-Monedero; **Sweden:** Mr. Luis Fagundez, Karl-Erik Gustavsson, Dr. Johanna Persson, Mr. Karl Roos; **Switzerland:** Markus Ahr, Dr. Doris Engesser; **Tanzania:** Ngoni Nenguwo, Mr. Salim Sultan; **Thailand:** Assist. Prof. Chaleeda Borompichaichartkul, Korakot Chanjirakul, Ms. Wanida Duangkongsan, Assist. Prof. Pattana Srifah Huehne, Karnchana Rungruchkanont, Dr. Kanjana Saetiew; **Turkey:** Mr. Berken Cimen, Mr. Atakan Guneyli, Ergin Inal, Dr. Meral Incesu, Dr. Emel Kaal, Ms. Filiz Kara, Mr. Mehmet Koc, Ms. Nihan Sahin, Mr. Murat Sariyar, Ass. Prof. Ilknur Solmaz, Prof. Dr. Nurgul Fetiye Turemis, Mr. Ramazan Yasar, Assist. Prof. Bilge Yilmaz, Assist. Prof. Halal Abraham Oguz; **Uganda:** Mr. Richard Olowo; **Ukraine:** Dr. Olga Klymenko; **United Arab Emirates:** Mr. Sreeram Chellappa; **United Kingdom:** Dr. Maria Anastasiadi, Dr. Anthony Barker, Ms. Fern Carroll-Smith, Dr. Graham clarkson, Antje Fiebig, Ms. Siobhan Gardiner, Dr. Audrey Gerber, Dr. Sofia Kourmpetli, Mr. Simon Lee, Ms. Kelly Rogers, Mr. Joris Roulleau, Mr. Oliver Soper, Mr. Werner Strauss, Dr. Mary Taylor; **United States of America:** Ms. Theresa Arnold, Mr. Gregory Balla, Katherine Bass, Brent

Brodbeck, Dr. David Butler, Ricki Butti, Mr. Samuel Cannon, Darin Case, Dr. Jim Cervantes, Mr. M. Golam Ferdous Chowdhury, Morgan Cichon, Wenhao Dai, Maria Delgado, Dr. Carolyn DeMoranville, Bryan Denig, Steve Dunfield, Brittany Dunn, Jeb Fields, Dr. Calvin Finch, Dr. Alan Groff, Paul Hardej, Ms. Brenna Hardt, Mr. Heather Hava, Ms. Loys Hawkins, Richard Hilton, Dr. Nikolaus Horster, Brian Hostert, Mr. Steve Hunt, Ms. Nina Ivanova, Dr.

Wayne Jurick II, Mr. Raju Kandel, Dr. William Kazokas, Prof. Dr. Lelia Kelly, Dr. Han Suk Kim, Dr. David Koranski, Mr. Blake Lange, Dr. Karen Lapsley, Mr. Javier Lara, Mark McCaslin, moniece mckinney, Ms. Kathleen McNeely, Darren Midlane, Susan Miyasaka, James Murphy, Thong Teng Neo, Rose Ogutu, Patricia Osborn, Dr. Joseph Parse, Dr. Jeremy Pattison, Andy Pon, Dr. William Reid, Ronald Revord, Tony Reynolds, Dr. Cary Rivard, Mary Rogers,

Elizabeth Root, Mr. Paul James Sandefur, Carl Savitz, Catherine Schmidt, Duncan Smith, Zach Smith, Mr. Jonathan Stanton, Chad Steiner, Jonathan Tanouye, Mr. Stephen Tappert, Peter Toves, Assist. Prof. Yan Wang, Ms. Alicia Wiecko, Richard Wilson, Dr. Xiaohua Yang;
Vietnam: Dong Dang Van, Mr. Phi Hung Nguyen; **Zimbabwe:** Mr. Denzil Chalmers

In Memoriam

LILIYA KRASTEVA (1947-2014)

On the 31st March, 2014, Prof. Liliya Krasteva died in a tragic car accident on the Trakia motorway. She was one of the leading researchers in the field of vegetable production in Bulgaria. She was born into a fine family in 1947.



Liliya Krasteva

Professor Krasteva devoted her professional life to agricultural science. After completion of her agricultural education she began her scientific work at the Institute of Plant Genetic Resources "K. Malkov", Sadovo. She became an Associate Professor in 1988. After defending a DSc degree in agricultural sciences in 2002 she was promoted to the academic position of Professor. She spent her life and rich career at IPGR "K. Malkov", Sadovo. As a national curator of tomatoes, eggplant, garden beans, melons and watermelons she constantly worked to expand the plant genetic resources of these crops and to promote this genetic wealth. In many respects this collection can be considered a real treasure and is certainly her rich legacy to science in Bulgaria and Europe. Based on these collections she created five cultivars of tomato, two cultivars of eggplant and four cultivars of garden bean, which have all been widely taken up in agricultural practice.

Prof. Krasteva was a leader of many international projects and cooperated with countries

such as Korea, China, Sweden, Macedonia, and particularly with Israel, Italy, England and Germany. She was a member of expert committees, research councils, editorial boards of scientific journals and international organizations.

In 2008 she organized the IV ISHS Balkan Symposium on Vegetables and Potatoes.

From 2004 to 2012 Liliya Krasteva was Director of the Institute in Sadovo before becoming Director of the Institute of Rose and Essential Oil Cultures, Kazanlak.

Prof. Krasteva was an author of 230 scientific articles. She was a scientist with considerable international recognition. She was always down to earth and at ease with her colleagues, the public and farmers. She was a great woman who invested her life in the prosperity of Bulgarian agriculture. She will be missed by us all.

From the staff of IPGR "K. Malkov" Sadovo

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 2014

- September 17-19, 2014, Angers (France): **International Symposium on Carrot and Other Apiaceae**. Info: Mathilde Briard, INH, 2 rue le Nôtre, 49045 Angers Cedex, France. Phone:

(33)241225463, Fax: (33)241225515, E-mail: mathilde.briard@agro-campus-ouest.fr E-mail symposium: symposiumcarrot@angers-2014.fr Web: <http://www.symposium-carrot-apiaceae2014.fr/>

- September 18-22, 2014, Dujiangyan city, Chengdu (China): **VIII International Symposium on Kiwifruit**. Info: Prof. Dr. Hongwen Huang, Director South China Inst. of Botany, Chinese Academy of Sciences, Xingke Road #723, Tianhe District, Guangzhou 510650, China. Phone: (86)20-37252778, Fax: (86)20-37252711, E-mail: huanghw@scbg.ac.cn E-mail symposium: secretariat@kiwifruit2014.com Web: <http://www.kiwifruit2014.com>
- September 29 - October 2, 2014, Zagreb (Croatia): **VI Balkan Symposium on Vegetables and Potatoes**. Info: Dr. Bozidar Benko, Faculty of Agriculture, Department of Vegetable Crops, Svetosimunska 25, Zagreb 10000, Croatia. Phone: (385)12394058,



Fax: (385)12393616, E-mail: bbenko@agr.hr or Dr. Sanja Fabek, Svetosimunska 25, 10000 Zagreb, Croatia. Phone: (385)1 2394059, E-mail: sfabek@agr.hr E-mail symposium: 6bsvp@agr.hr Web: <http://www.6bsvp.org>

NEW ■ October 6-10, 2014, Medellin (Colombia): **60th Annual Meeting of the Interamerican Society for Tropical Horticulture (ISTH and ISHS) and V Colombian Congress for Horticulture**. Info: Prof. Diego Miranda Lasprilla, President, Sociedad Colombiana de Ciencias Hortícolas, Facultad de Agronomía, AA 14490 Bogotá, Colombia. Phone: (57)13165000x19041, Fax: (57)13165498, E-mail: dmirandal@unal.edu.co E-mail symposium: congreso horticultura2014@soccolhort.com

■ October 16-17, 2014, Rauscedo (Italy): **I International Symposium on Grapevine Roots**. Info: Dr. Diego Tomasi, Viale 28 Aprile 26, 31015 Conegliano (Treviso), Italy. Phone: (39)0438456733, E-mail: diego.tomasi@entecra.it E-mail symposium: root2014@entecra.it Web: <http://vit.entecra.it/grapevineroots2014/>

NEW ■ November 11-14, 2014, Shimizu, Shizuoka (Japan): **III International Symposium on Citrus Biotechnology**. Info: Prof. Dr. Shigeto Tominaga, Faculty of Agriculture, Kagoshima University, Korimoto 1-21-24, Kagoshima-city 890-0065, Japan. Phone: (81)99-2858552, Fax: (81)99-2858552, E-mail: tominaga@agri.kagoshima-u.ac.jp or Dr. Tokuro Shimizu, NIFTS, MAFF, Kaji Kenkyu Sho, Shimizu Okitsu Naka Cho 485-6, 424-0292 Shizuoka, Japan. Phone: (81) 543 697108, Fax: (81) 543 692115, E-mail: tshimizu@affrc.go.jp E-mail symposium: contact@isc-japan.sakura.ne.jp Web: <http://iscb2014-japan.org/>

■ December 8-11, 2014, Hochiminh City (Vietnam): **III Asia Pacific Symposium on Postharvest Research, Education and Extension: APS2014**. Info: Nguyen Duy Duc, SIAEP, 54 Tran Khanh Du, Tan Dinh Ward, District 1, Hochiminh City, Vietnam. Phone: (84-8) 38481151, Fax: (84-8) 38438842, E-mail: ducnguyen-duy2003@yahoo.com E-mail symposium: aps2014.vietnam@gmail.com Web: <http://www.aps2014.vn/>

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 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 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

■ May 1-4, 2015, Shiraz (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/>

NEW ■ 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, Via Leonardo Da Vinci 44, 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 Shuanghuayuan Rd., Beijing, Haidian District, China. Phone: (86)1051503998, Fax: (86)1051503996, E-mail: zouguoyuan@baafs.net.cn

■ May 21-25, 2015, Bursa (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

NEW ■ May 24-27, 2015, Cape Town (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

NEW ■ 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>

■ 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

NEW ■ 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

■ 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 or Dr. Penelope Perkins-Weazie, NC Research Campus, 600 Laureate Way, Suite 1329, Kannapolis, NC 28081, United States of America. E-mail: penelope_perkins@ncsu.edu E-mail symposium: rubusribes2015@newbeginningsmanagement.com Web: <http://www.rubusribes2015.com>

■ 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/>

■ 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@yahoo.com.cn

NEW ■ July 5-8, 2015, Jupiter's Gold Coast, QLD (Australia): **II International Symposium on Soilless Cultivation**. 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

■ 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>

■ 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

NEW ■ 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: chiara.cirillo@unina.it

NEW ■ September 7-11, 2015, Vienna (Austria): **International Symposium on Growing Media, Composting and Substrate Analysis**. 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.ages.at>

■ September 8-10, 2015, Abuja (Nigeria): **II International Symposium on Mycotoxins in Nuts and Dried Fruits**. Info: Dr. Anthony Ngedu, 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@rmdc.gov.ng

■ 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

■ 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 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

■ 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: rckewilliams3@bigpond.com or Dr. Lucy Tran-Nguyen, NTDPF, 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

NEW ■ 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: vcavero@unr.edu.ar Web: <http://www.alcachofa2015.com/>

NEW ■ 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

■ November 10-13, 2015, Agadir (Morocco): **V International Symposium on Saffron Biology and Technology: Advances in Biology, Production and Uses**. Info: Prof. Mohammed Badraoui, Institut National de Recherche Agronomique, Avenue Ennasr, BP 415 Rabat, Morocco. Phone: (212)537772654, Fax: (212)537770049, E-mail: mohamedbadraoui@gmail.com

NEW ■ November 19-22, 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/>

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NEW ■ 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: adelaboelsaoud@gmail.com E-mail symposium: 9ivchbegypt16@gmail.com

■ 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

■ June 28 - July 1, 2016, Kunming (China): **XII International Symposium on Flower Bulbs and Herbaceous Perennials**. Info: Prof. Ding Mu, No.12 Zhongguancunnandajie, Haidian District, Beijing city, 100081, China. Phone: (86)10-82105944, Fax: (86)10-62174123, E-mail: muding2011@126.com

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