Chronica Horticulturae

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Horticultural Highlights

Impact of the 2011 Earthquake and Tsunami on Japan's Horticultural Industry • The 1500th Anniversary (512-2012) of the *Juliana Anicia Codex*: An Illustrated Dioscoridean Recension • Apples in Tropical Highlands of Northern Ethiopia: Potentials and Challenges

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ISHS

CHRONICA HORTICULTURAE

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

Cover photograph: As part of the flower exhibit Royal Flora Ratchaphruek held in Chiang Mai, Thailand from 14 December 2011 to 14 March 2012, five ISHS symposia were held. Orchids were a key feature of the event with the hosting of the International Symposium on Orchids and Ornamental Plants. See article p. 23.

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ISHS

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Stand Up for Horticulture

Errol W. Hewett, Secretary of the ISHS Board, Responsible for Innovation, Industry and Insight

By now all members should have received their personal copy of the new publication "Harvesting the Sun," that ISHS has published as *Scripta Horticulturae* Number 14. In addition to the hard copy this material is freely available on line at **www.harvestingthesun.org**. As well as the book, an A2 sized brochure/poster is available for use as an educational aid. It is hoped that this will be used by students at school and that the cameos and case studies will be a rich source of stimulation for young people to further explore the rich and diverse tapestry that we all know as horticulture.

The purpose of the publication is to tell the world what we do in our profession and why it is important to humanity worldwide. We all need to use this book as a basis for a public relations exercise directed to influential people in our community and our country. Why not send a copy to your prime Minister/President and the Minister/Secretary of Agriculture to remind them how important this sector of primary production and plant-based community activities are to the health and economy of their constituents. It is essential that research, education, training and extension activities in horticulture and its associated scientific disciplines be maintained through appropriate courses and curricula at tertiary institutions through sustained and adequate rational funding decisions. It is essential that economic policies be implemented to ensure the continued profitability of all those in the supply chain from farm to fork. Otherwise, the current expectation that fresh fruit, vegetables, flowers and herbs, as well as parks and reserves, be available 365/24/7 will not be met.

Errol Hewett speaking at the launch of the ISHS publication "Harvesting the Sun" at the Second International Symposium on Horticulture in Europe (SHE2012), Angers, France, 3 July 2012. Photo by Giuseppe Pignata.

Too many people take horticulture for granted without appreciating the diversity, complexity and essential nature of all its products and services to society. Too often horticulture is lost under the general heading of agriculture. Too often society thinks of horticulture as simply being gardening. This attitude does an injustice to the intensive, people-oriented, health-directed, entrepreneurial sector that plays such an important role in the ongoing health and well-being of individuals and society. It is imperative that government leaders, policy makers, news editors, educators, funding agencies, parents and prospective students learn to appreciate that intensive horticulture comprises high value crops and community outputs that increase economic returns to both rural and urban societies. Each of us has a responsibility to ensure that every opportunity is used to influence family, friends, colleagues, our communities, our schools and politicians about the economic and social importance of horticulture. We all have an advocacy role to spread the message outside our professional community and we each have a responsibility to STAND UP FOR HORTICULTURE.

This book does not attempt to provide a prescriptive definition of the variety and complexity of horticulture. Rather it attempts to demonstrate the diversity, range and scope of horticulture across the world, using selected examples and cameos to make specific points about the huge number of plant types and environments with which we deal for essential food, nutrition, human health and well-being. The global nature of horticulture and its interaction with economics, trade and marketing is demonstrated, as is the vital importance of community and amenity horticulture in local and regional localities.

We all know that high value crops refer mainly to horticultural plants; they are crops that have a higher per unit value or a higher net value per unit land area than do staple food crops such as wheat and maize. Horticulture also includes

plants in community and open spaces that benefit health and well-being and have a high economic worth.

Horticulture has many perspectives and comprises many disciplines. An often-overlooked outcome of horticulture is its importance in strengthening the fabric of rural communities through its more intensive production requirements, the employment opportunities it offers and the enhancement of associated industries that are essential to horticulture. This applies to both developed and developing countries. The potential of horticulture to be a 'lead player' in economic development is often not recognized politically or socially. Fortunately this appears to be changing.

The World Bank Development Report 2008, "Agriculture for Development" (Anon, 2007), clearly recognized the value of agriculture to reduce poverty, to improve incomes and to enhance economic development to meet Millennium Development Goals (MDG). However, the specific role of horticulture was not a focus, in spite of the high value of such crops in terms of income and nutrition for smallholder rural and periurban farmers and urban dwellers with gardens. Disquiet has been expressed about the major strategic policies of the World Bank's approach to agriculture for development (Hausmann and Rodrik, 2003; Whitfield, 2012). In a recent paper (Hewett, unpublished), three case studies were examined in three continents where horticultural crops (including fruit, vegetables, flowers, herbs and aromatic plants) were the basis of the transformation projects; all three demonstrated the significant increase in income and livelihoods of farmers and communities following major investment in infrastructure, R&D and education and training of small farmers in developing countries.

So horticulture can be a potent driver for economic and social change in developed and developing countries.

This new book "Harvesting the Sun" was launched at the Second International Symposium on Horticulture in Europe (SHE2012) held in Angers, France, 1-5 July 2012, to an enthusiastic audience at the Gala Dinner held at the beautiful Collégiale Saint-Martin Museum. Overall, the response has been very positive, indicating that it is a timely addition to the diverse publications that are produced by our Society.

The book was produced for ISHS by Martech Consulting Ltd. (www.martech.co.nz) and Paradigm Associates Ltd. (www.paradigm.pl.net) with technical advice obtained from I.J. Warrington, E.W. Hewett and C.N. Hale.

References

Anonymous 2007. Agriculture for Development. World Development Report 2008. The World Bank, Washington DC, p.386.

Hausmann, R. and Rodrik, D. 2003. Economic development as self discovery. Journal of Development Economics 72(2):603-633.

Hewett, E.W. High value horticulture in developing countries: barriers and opportunities. CAB Reviews (under review).

Whitfield, L. 2012. Developing technological capabilities in agro-industry: Ghana's experience with fresh pineapple exports. Journal of Development Studies 48(3):308-321.

The following is the text that accompanied the pictorial presentation of the new book "Harvesting the Sun" in Angers, France. Both the presentation and the text (modified appropriately) will be available to Conveners of all ISHS meetings to use at their Symposia.

Stand Up for Horticulture
Harvesting the Sun Presentation

1. On the Brink
Earth is a fragile and mysterious place on which we live.

Man's impact on the natural environment of our planet is profound.

It is amazing how we have altered our planet over the last 200 years. Some believe that we are on a knife-edge: can we feed our exploding populations and protect our remaining biodiversity and ecosystems?

What has this got to do with Horticulture? Everything.

We have an image problem! Many people don't even know what horticulture means or its value to humankind!

2. Cultivate a Future
The process of sun, oxygen and water combining in photosynthesis to create plant life, keeps us all alive.

It is the one thing that makes this planet hospitable for humans.

It is part of our natural world that most people take for granted. Without it we are lost.

3. Bright Green Economy
Let me tell you where I live – on beautiful Waiheke Island in the Auckland harbour, New Zealand. This island is a shining light for horticulture, with organic food, a boutique wine industry and burgeoning olive groves contributing dramatic economic benefits.

Waiheke produces some of the highest value world-class wines in New Zealand. Our olive oil wins gold medals internationally. Horticulture is what has put this small South Pacific Island on the map.

Horticulture is a sustainable and profitable living.

4. Plants Make My Day
Even before I wake each morning, I benefit from global horticulture. My bedding is largely plant-based. The blue colour in my pajamas comes from indigo plants growing in Japan.

On my bedside table is a tonic with goji berries from China or pomegranate from Iran.

In the corner of my room is a peace lily from Central America, from a cultivar bred in Germany. It not only looks great, but also clears the air of many environmental contaminants.

Horticulture is cleansing for the environment, body and soul.

5. World Food Bowl
At breakfast, my muesli contains sunflower seeds from Russia, kiwifruit from New Zealand or Italy, mangoes from Peru, blueberries from Canada, Californian almonds, a banana from Ecuador.

This is followed by mushrooms on toast: the mushrooms from cultivars bred in Korea. My coffee is made from Costa Rican arabica beans.

My dinner of steak and pommes frites gives me my vitamin fix from homegrown broccoli, snow peas from Kenya, a Californian orange, and antioxidants from red grapes imported from Chile.

We take it for granted that tomatoes, strawberries, bananas and oranges will be available on the supermarket shelves 24/7, 365 days of the year. And these items have never been cheaper!

Horticulture includes high value crops that can reduce poverty, improve diets, and meet Millennium Development Goals in developing countries.

Horticulture is food, nutrition and human health.

6. All Walks of Life
On the table in my lounge is a bunch of tulips, bred in Holland and grown in Australia.

Out my window is the lawn, planted in Chewing's Fescue grass, originally from England, since masterfully bred in New Zealand for our conditions.

Our local streets are enhanced with titoki trees, the New Zealand Oak, propagated in a local nursery, and hebes, also native to New Zealand; yet the largest hebe nursery in the world is in Denmark.

Throughout the day, all of us, in all walks of life, are unknowingly benefiting from the diversity of horticulture every living moment.

My sports-mad neighbour benefits every day: playing golf on greens made possible by horticulture, drinking craft beer made possible by horticultural plant breeders, and watching football on fields made possible by horticultural turf specialists.

Horticulture is fun, fitness and health in the open air.

7. Sowing Global Seeds
There are widespread benefits from horticultural science around the globe, hidden behind and underpinning each of these products that we observe, interact with and consume every day.

From the researcher, to the educator, to the grower, to the distributor, to the retailer, to the consumer, people in every walk of life are supported by the infrastructure that is horticulture.

From my home, to my garden, to my street, to neighbouring vineyards, to my park, to my ferry journey to the mainland – horticulture, local and global, shapes my world.

8. A Smart Breed
The notion that horticulture is about only hard labour and is dependent on the vagaries of climate is today redundant.

Many people think of horticulture as simply being a pastime activity or hobby, like gardening. This common misconception devalues one of humanity's most significant scientific, economic, and aesthetic pursuits – horticulture and horticultural science.

Producers of fruit, vegetables, flowers, plants, and those who manage parks and community spaces, are highly qualified entrepreneurs, business men and women, and technologists using the latest science and hi-tech innovation to make a better and safer world. All are underpinned by some aspect of horticultural science.

From living walls to hydroponics to permaculture to biofuels, horticulture in the 21st century is a dynamic and technologically sophisticated industry that deserves its place in the sun.

***Horticulture is multidisciplinary with a myriad of career opportunities**.*

9. We Face Many Challenges
As the world faces environmental challenges that could take the human species to the very brink of survival, horticulture will be the critical activity that sustains us, feeds us, and nurtures us in the future.

Perhaps its simplicity and its ubiquitous nature have made us take growing things for granted. And this has contributed to horticulture's image problem.

In Europe, North America, Australia and New Zealand degree programmes in horticulture are decreasing. Research and development budgets are declining. World-renowned horticultural science departments are closing.

We must all inform students, parents, educators and politicians that horticulture is an imperative for people's livelihoods and health. Careers in horticulture are exciting and rewarding with a myriad of different avenues available.

We must all ensure that politicians, university managers and high level economic advisors understand the economic and social importance of the sustainable production of high value horticultural crops in their countries.

Today's students are tomorrow's leaders. We must champion horticulture to our students, as their support as tomorrow's leaders will be essential nationally and internationally for horticulture to thrive and grow, as it must.

Every one of us has a major responsibility to tell the world what we do and why it is so important to humankind, now and in the future.

We must all promote our profession, with its diversity, its economic, social and nutritional importance, using our knowledge, our experience, our passion and our love.

10. Harvesting the Sun
ISHS has prepared "Harvesting the Sun" to illustrate the diversity and dynamism of horticulture. Every ISHS member has received a free copy. It will be freely available to international agencies, such as FAO, the World Bank, the Asian Development Bank and others, as well as government leaders, educators, parents and children. It is freely available online.

I invite every one of you to become a champion for horticulture, to share your passion with all and promote the great benefits that accrue from harvesting something that we can rely on as sure as night follows day – the sun.

STAND UP FOR HORTICULTURE

www.harvestingthesun.org

Postcard

The positive image of fruits and vegetables is frequently used in food marketing to give products such as chocolates, ice-creams or yogurts a cool appearance, to attract consumers. How can we also use this appealing image to promote horticultural science and to link it to the availability of tasty, safe and reasonably priced fruits and vegetables?

The answer: "Harvesting the Sun", a colourful and attractive new *Scripta Horticulturae* just published by the ISHS to explain in simple language the diversity and the socio-economic value of horticulture to policy makers, economists and the general public. In this publication, the emphasis is placed on the explanation of the role played by horticultural scientists, growers, traders and many other key players along the fruit and vegetable supply chain.

ISHS members are encouraged to use this *Scripta*, or any other available tool, to advocate for horticulture. It is our responsibility to contribute to the recognition of our profession so that it becomes as highly valued and regarded as the products and services horticulture provides to society.

António Monteiro, President of ISHS

Issues

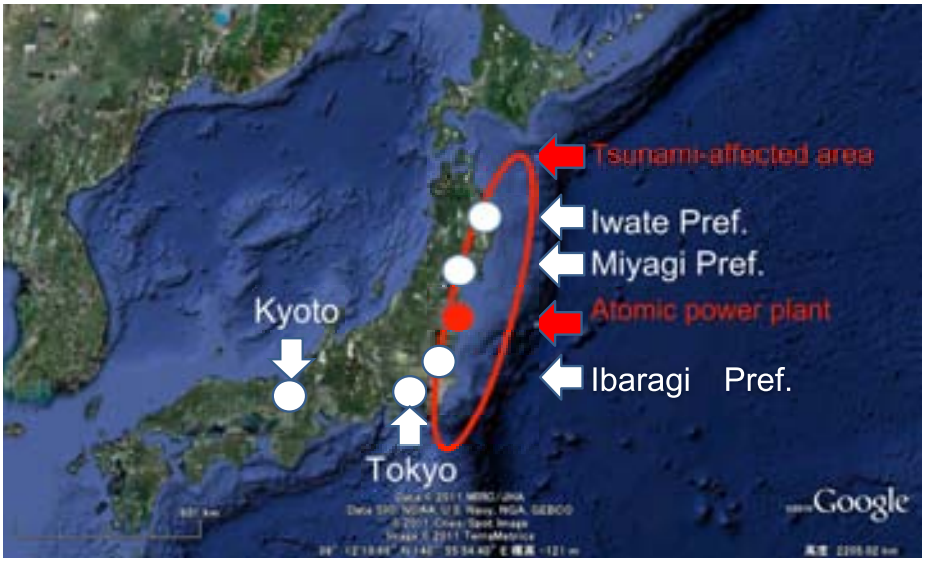
Impact of the 2011 Earthquake and Tsunami on Japan's Horticultural Industry

Koki Kanahama

A little more than a year ago, on March 11, 2011, Japan was hit by an immense earthquake and tsunami that caused an unprecedented amount of damage to the eastern half of the Japanese islands (Fig. 1). The hypocenter of the earthquake was located 130 km east of the center of the eastern half of the Japanese islands. My university, the Tohoku University, situated in Miyagi Prefecture, which lies at the center of the eastern section of the Japanese islands, suffered serious damage. Besides Miyagi, Iwate Prefecture lying to the north of Miyagi, and Fukushima Prefecture situated south of Miyagi, were also severely affected.

The earthquake caused massive damage to infrastructure, destroying buildings, roads, and railways, and brought to a halt all public utilities, such as electricity, gas, and water supply, and all modes of communication, such as telephones and internet, and means of public transport, including super express trains, the Shinkansen. The earthquake triggered a phenomenal tsunami, causing colossal destruction.

Figure 1. Tsunami-affected area on March 11, 2011.



This natural disaster occurred prior to the annual spring meeting of the Japanese Society for Horticultural Science (JSHS). The meeting was scheduled for March 20-21, 2011, at Utsunomiya city, capital of the Tochigi Prefecture, which lies to the south of Fukushima Prefecture. Immediately after the earthquake, JSHS decided to cancel the spring meeting, and informed its members accordingly, anticipating that many participants would not be able to attend, and apprehending that the organizing committee would find it difficult to ensure the safety of the participants under such circumstances. At the same time, JSHS decided to cancel the Second Meeting of the Asian Horticultural Congress, which was to be held on March 27-30, 2012 (AHC2012) at Tsukuba city in Ibaragi Prefecture lying to the south of Fukushima. This decision was taken not only because of the serious damage incurred to the meeting hall in Tsukuba city, but also because of the unexpected accident at Fukushima atomic power plant, which made the organizers concerned about the safety of the conference attendees. JSHS discussed with the International Society for Horticultural Science (ISHS) about the cancellation of the AHC2012, and finally decided to annul the event.

The magnitude of the March 2011 earthquake was 9.0. It ranks as the fifth largest earthquake registered in the world in the last 100 years. The most devastating earthquake occurred in Chile (M.9.5, May 22, 1960), the second in Indonesia (M.9.3, December 26, 2004), the third in Alaska (M.9.2, March 28, 1964), and the fourth in Aleutian Islands (M.9.1, March 9, 1957).

Figure 2. Greenhouse devastated by tsunami. (Photo by Mr. Atsushi Sasaki)

While the maximum seismic intensity during the 2011 earthquake reached only 7.0 on the mainland, the height of the tidal wave offshore reached 16.7 m, the maximum height of the turbulent wave on land rose to 40.0 m, and the land sank by almost 85 cm.

The total death toll from the tsunami was estimated at 15,854, and those missing at 3,155. Thus almost 20,000 people were killed by the tsunami. According to the detailed records provided by the National Police Agency (March 10, 2012), the number of deaths in each prefecture was as follows: 4,671 in Iwate, 9,512 in Miyagi, 1,605 in Fukushima, and 66 in other prefectures. This account confirms that Iwate, Miyagi, and Fukushima prefectures suffered the most extensive damage.

The prefecture of Iwate has a saw-toothed coastline with many long and deep bays. There, people live on narrow banks or on small hilltops close to the seashore, forming small village clusters. In these areas, the tsunami destroyed everything in its passage. Entering the narrow fjords the wave grew higher, resulting in a high percentage of casualties in this region. On the other hand, Miyagi Prefecture has a long beach bordering its wide flat stretch of land. As a larger area of flat land is available, the inhabitants of this region live in relatively bigger cities. In this region, the tsunami moved a greater distance inland across the wide landmass causing more deaths than in the Iwate Prefecture. Fukushima Prefecture, on the other hand, has a moderate coastline and the damage was less than that suffered in the Iwate and Miyagi prefectures.

The amount of damage caused to the production value in agriculture and forestry was estimated at US$10.9 billion on November 24, 2011, by the Ministry of Agriculture Forestry and Fisheries, based on the value of one US dollar being 100 yen. This value corresponds to 13% of Japan's total production value in agriculture and forestry, as recorded in 2009. Fishery production value suffered a loss of $12.5 billion, which is equivalent to 90% of Japan's 2009 total production value in fishery.

According to the data collected by the Geographical Survey Institute of Japan (April 18, 2011), the total area flooded by the tsunami was 561 km^2, including 200 km^2 of rice paddy fields and 34 km^2 of fields devoted to vegetables, fruit, and ornamental crops. Although the statistics obtained have not been analyzed in detail, it is reported that many greenhouses also underwent severe destruction caused by the earthquake and the tsunami (Figs. 2 and 3).

Misfortunes never come singly; the tsunami provoked severe destruction to the Fukushima Prefecture atomic power plants resulting in a nuclear disaster. Vast areas of land surrounding the atomic power plants were polluted by radioactive caesium. Although agricultural products polluted by radioactive caesium are sometimes harvested, the Japanese government is still surveying the polluted foodstuff and has not yet sanctioned its sale in the market. Until March 31, 2012, the maximum permissible concentration of atomic caesium in food products was regulated at 200 Bq/kg for drinking water, milk, and dairy products, and 500 Bq/kg for vegetables, cereals, meat, eggs, and fish. However, on April 1, 2012, this concentration was changed to 100 Bq/kg for general food products, 50 Bq/kg for milk and babyfood, and 10 Bq/kg for drinking water. This last value corresponds with WHO's critical acceptable level for drinking water.

To recover from the damage caused to Japan's agricultural production, many national projects have been commenced, mainly under the initiative of the Ministry of Agriculture, Forestry and Fisheries and the Ministry of Economy,

Figure 3. Greenhouse for strawberry production. (Photo by Mr. Atsushi Sasaki)

Figure 4. Farmer's sunken village; still now soaked with seawater. (Photo by Mr. Atsushi Sasaki)

Trade and Industry. They are planning not only to restore agricultural production, but also to implement higher innovative technologies such as a plant factory for vegetable production equipped with LED light, soil-less culture, and fruit harvesting robots in Miyagi Prefecture, as shown on the home-page of the National Agriculture and Food Research Organization[1]. Although the main agricultural industries in the tsunami-affected region (Fig. 4) are rice and animal husbandry, it is expected, that with further improved technologies, horticultural production could be expanded in the region.

After the natural disaster, JSHS received many letters of condolence from all over the world, especially from the President of ISHS, Prof. Dr. António Monteiro, who sent us encouraging letters several times. I would like to take this opportunity to convey my heartfelt thanks for the sympathy and help that we have received from the world. JSHS is making great efforts to recover from the damage caused by this natural calamity, and I believe that we will achieve our goals in the near future.

About the Author

Dr. Koki Kanahama is Professor of the Laboratory of Horticultural Science, Tohoku University, Japan and past President of the Japanese Society for Horticultural Science (2010-2011). He works on flower and fruit development of horticultural plants.
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Koki Kanahama

[1] http://www.youtube.com/watch?v=V4HnFgqvIKk

Horticultural Science Focus

Note to *Chronica Horticulturae*

I enjoyed reading Kim Hummer's recent "News and Views from the Board" on "Scientific Publications: Now a Marketing Decision?" (*Chronica Horticulturae* 52(1):3-5). It touched on many of the topical issues which are challenging the traditional model of unfettered funding for curiosity-led scientific research, then publishing the results in an established peer-reviewed journal (with or without page charges; open access or subscription-based). The impact factor (IF) data that Kim presented in Tables 1 and 2 confirmed what most of us already know, namely that specialist journals in general, and those focussed on horticulture in particular, attract limited citations and hence have low IF values. [Note that the most recent (2010) IF for the *Journal of Horticultural Science & Biotechnology* (0.546) was an anomaly caused by the first three issues (i.e., 50%) of Volume 85 (2010) not being delivered to Thomson-Reuters. The 5-year impact factor (0.769) is a more accurate reflection of the real world in which JHSB had IFs of 0.862 in 2008 and 0.839 in 2009.]

As the "ISHS-preferred" peer-reviewed journal for horticultural research papers, I fully endorse and encourage the suggestion made by Kim in her penultimate paragraph, targeted at those who present their basic or applied work at an ISHS Symposium. It may indeed be possible to expand and extend their paper with substantial new data, then submit it to the *Journal of Horticultural Science & Biotechnology*, or another journal, for peer-review. Related to this point, the Board of Trustees of JHSB and I are currently having discussions with ISHS, seeking ways by which the Convener/Editor of each approved ISHS Symposium/*Acta Horticulturae* volume could assist her/his participants still further. This might be achieved by identifying and selecting 5-10 contributions reporting substantially new work to which further new data might be added. The extended papers would then be externally reviewed, (hopefully) accepted, and grouped under the specific ISHS Symposium banner, in a single issue of JHSB. In part, this might address the problems identified by Kim regarding the non-IF status imposed on *Acta Horticulturae* by Thomson-Reuters. It may also overcome the reluctance of some potential key contributors to ISHS Symposia to present their most significant new data in a volume of *Acta Horticulturae*, which could later jeopardise or impede being able to (re)submit the work to a mainstream IF journal.

T. Michael A. Wilson, FSB FRSE
Editor, JHSB

The 1500th Anniversary (512-2012) of the *Juliana Anicia Codex*: An Illustrated Dioscoridean Recension

Jules Janick and Kim E. Hummer

The Greek herbal of Pedanios Dioskurides entitled Περί ύλης ιατρικής (*On Medical Matters*) was written about the year 65. It was destined to be one of the most famous books on pharmacology and medicine but is also rich in horticulture and plant ecology. The oldest surviving and most famous recension of this famous work, completed in Constantinople about 512, is a Greek version in an alphabetical arrangement that was prepared and presented to the imperial Princess Juliana Anicia (462-527), daughter of the Anicius Olybrius, Emperor of the Western Roman Empire. The bound manuscript stored in Österreichische Nationalbibliothek in Vienna is available in facsimile and is now referred to as the *Juliana Anicia Codex* (*JAC*) or the *Codex Vindobonensis*. The *JAC* contains 383 paintings of plants, including many horticultural crops. An analysis of the illustrations indicates that they were made by numerous artists of varying skills and it is probable that some were derived from earlier lost versions. A comparison of illustrations with modern photographs indicates surprising similarities with contemporary plants.

INTRODUCTION

The Greek herbal of Pedanios Dioskurides (latinized as Pedanius Dioscorides, 20-70 CE) entitled Περί ύλης ιατρικής (*PUI*) and known in Latin as *De Materia Medica* (*On Medical Matters*) was written about the year 65. Although non-scientific (Singer, 1927), the treatise was historically acclaimed as one of the most famous works in pharmacology and consisted of botanical descriptions of herbs, including horticultural crops, stressing their medicinal uses. This original non-illustrated work, no longer extant, contained medical information on about 600 plants, 35 animal products, and 90 minerals, along with brief descriptions. Dioscorides, in a preface acknowledging his teacher Areios, criticizes his predecessors for their organization of herbs, inaccurate procedures, and erroneous content. Subsequent revisions and recensions added illustrations.

Dioscorides hailed from Anazarbus, a small city northeast of Tarsus in the Roman Provence of Cilicia (now Turkey), and possibly served as a medical officer in the Roman legions. In his famous work he added details from personal experience based on his broad travels. He also included information that he learned from oral tradition and from previous texts. Included was a study of the 130 plants of the Hippocratic Collection and more than 11 plants from Crataeus, Greek physician to Mithridates VI Eupator, King of Pontus, and author of a lost herbal, *Agrimonia eupatorium*. At that time, codex parchment length dictated divisions, or books, for long documents (Collins, 2000). Dioscorides divided his work into five books based on drug affinity: (1) Aromatic Oils Ointments, Trees; (2) Living Creatures, Milk and Dairy Products, Cereals and Sharp Herbs; (3) Roots, Juices Herbs; (4) Herbs and Roots; and (5) Vines and Wines, Metallic Ores. Some subsequent recensions have reorganized his information and presented it alphabetically.

Throughout the centuries *PUI*, translated into Arabic, Persian, Latin and other languages, was widely shared between cultures and civilizations, and formed the basis for most herbals of the West. The Latin Herbal of Pier Andrea Mattioli, first edition in 1544, was entitled *Commentary on the Six [sic] Books of Dioscorides*. Max Wellmann (1906-1914) published a critical Greek edition in 3 volumes in 1906-1914. This version has been translated from Greek into English by Lily Beck (2005), replacing a 1655 version by John Goodyear that now resides in Magdalen College, Oxford, based on a lost Latin translation (Gunther, 1959). Singer (1927) and Blunt and Raphael (1994) summarize the historical lineages of many other Discoridean recensions.

Juliana Anicia Codex (*JAC*)

The oldest surviving and most famous recension of *PUI* was prepared and presented to the imperial Princess Juliana Anicia (462-527), daughter of Anicius Olybrius, Emperor of the Western Roman Empire. The bound volume, the most prized possession of the Österreichische Nationalbibliothek in Vienna, Austria, is available in facsimile and is now referred to either as the *Juliana Anicia Codex* (*JAC*) or the *Codex Vindobonensis*. This volume celebrates its sesquimillennial anniversary in 2012. The *JAC* is a magnificent, gloriously illustrated Byzantine version of *PUI*, completed in Constantinople about 512, reformatted in an alphabetical arrangement that also includes sections on fishing and bird catching. It contains 383 paintings of plants including many modern and ancient horticultural crops. Analysis of the illustrations indicates that they were made by numerous artists of varying skills. Some images were probably derived from earlier *PUI* versions now lost to history. The frontis section of the manuscript contains a portrait of Princess Juliana honored as a religious devotee and patron of the arts of the town of Honorata (Fig. 1). This is the earliest donor portrait in an extant manuscript illumination. There are also two paintings of Dioscorides (Fig. 2) and portraits of then famous physicians and philosophers. The tome is accessible in a two-volume facsimile edition with commentary

Figure 1. Dedicatory drawing of Imperial Princess Julian Anicia (center) in the Dioscoridean recension of 512 CE, flanked by personification of Magnanimity on her right who holds gold coins and Wisdom on her left with scroll or codex. The Cupid-like putto offers an open codex and a prostrate female represents craftsmen who restored the church in Honorata on the beneficence of the princess.

Figure 2. Frontpiece drawings: (A, B) Dioscorides with the nymph Heuresis, the personification of discovery and inspiration, holding a mandrake plant tied to a dying dog. The sketch (B) is by Singer (1927). The presence of the dog is based on the belief that the mandrake emits a deadly shriek when pulled out of the soil. To harvest mandrake the plant is tied to a starving dog tempted by food, sparing the attendant with muffled ears but causing the demise of the dog. (C, D) Crateuas (ancient herbalist and illustrator of Mithridates) painting a mandrake held by Epinoia (incarnation of thought and intelligence) while Dioscorides is absorbed with his book; (D) sketch by M. Breen (D'Andrea, 1982).

in German, *Der Wiener Dioskurides* (1998, 1999). No complete English translation of the *JAC* exists.

The provenance of the *JAC* has been examined by Singer (1927), Heyd (1963), Blunt and Raphael (1994), and Collins (2000). It was fully restored, foliated, and rebound in 1406 by the notary John Chortasmenos at the request of Nathaniel, a monk at the St. John Prodromos Monastery in Constantinople, who placed the cursive numberings on the plant paintings and the transcript of the plant titles and some descriptions in Greek minuscule. Subsequent owners added Arabic, Greek, and Hebrew plant names on the folia. The manuscript eventually became part of the private collection of Moses Hamon (ca. 1490-1554), a Jewish physician and favorite of the Ottoman Sultan, Suleman the Magnificent. The collection was valued at 5000 ducats at the time of Hamon's death who in his life declared that he had spent 8000 ducats on acquisitions (Heyd, 1963). The Dioscoridean manuscript was seen by Ogier Ghiselin de Busbecq (1522-1592), Flemish writer, herbalist and diplomat who served as ambassador to the Ottoman Empire in Istanbul. Busbecq was a collector of coins, manuscripts, curios and plant materials (he sent tulips to his friend Charles de l'Ecluse in Europe). Some of his correspondence was published in his *Turkish Letters* (1555-1562). A letter written in December 1562, stated that he acquired "whole waggonfuls, whole shiploads" of Greek manuscripts, perhaps many from Hamon's son. He mentioned a copy of Dioscorides containing drawings of plants and some fragments of Crateuas and a treatise on birds, but was deterred from purchasing it by the price (100 ducats), a sum "suitable for the imperial purse, but not mine." However, he pressed the Emperor Ferdinand I to purchase it and the manuscript was finally purchased by Ferdinand's son Maximillan II, and it arrived in Vienna about 1569 and was deposited in the Imperial Library in Vienna in 1592.

The purpose of this paper is to compare the illustrations of horticultural crops in the *JAC* with modern photographs or botanical illustrations. We include 11 examples (Table 1), listed in order of their presentation in *JAC*: blackberry, turnip, various allium species, arugula, English ivy, cultivated and wild brassicas, faba bean, rose, rhubarb, wild and cultivated carrot, and cowpea.

PORTRAITS OF CROP PLANTS

The *JAC* contains many of today's common crop plants. Identification of these crops was originally determined by Otto Mazal, editor of the facsimile edition (Table 1) although in some cases these are not definitive. Many illustrations are the earliest surviving representations of those plants. An analysis of the illustrations indicates that they were made by multiple artists of varying skills by at least four different hands (Collins, 2000). It appears that the paintings were made more or less in sequence with the alphabetic text. The seven paintings in the introductory part of the manuscript were obviously made by a single artist, while the first three paintings of plants, quite crude, seem to be copies of an ancient text by a separate artist also different from the ones who painted the subsequent images. Some of the paintings may have been copies of earlier extant works, and a few seem to have been made directly from

Figure 3. Blackberry (*Rubus tomentosa* of the European *Rubus fruticosus* aggr.): (left) *JAC* 83r; (right) photograph of blackberry (*Rubus armeniacus* also of the European *Rubus fruticosus* aggr.) by Kim E. Hummer, USDA ARS.

Table 1. Some crop plants in the *Juliana Anicia Codex* (*JAC*) with their Greek name, species as designated by Otto Mazel, editor of the facsimile edition, accepted botanical species (if different), and the English name. Plants in boldface are discussed in the text. Greek names are listed alphabetically in *JAC*.

JAC folio	Greek name	Species designation of Otto Mazal	Accepted nomenclature, if different	English name
27v	anethon	*Anethum graveolens* L.		dill
32v	aster attikos	*Aster amellus* L.		Italian aster
78r	borbos	*Muscari comosum* L.	*Muscari comosum* (L.) Mill.	grape hyacinth
81r	bromos	*Avena fatua* L.		wild oat
83r	**batos**	***Rubus tomentosa* Wild.**	***Rubus fruticosus* aggr.**	**blackberry**
85r	geranion	*Geranium tuberosum* L.		geranium
88r	gingidion	*Daucus gingidium* L.	*Daucus carota* L.	wild carrot
89r	**goggule**	***Brassica rapa* L.**		**turnip**
108v 306r	ereoselinon	*Apium graveolens* L.		celery
116v	**elaphoskordon**[1]	***Allium sativum* L.**		**garlic**
118r	**euzomon**	***Eruca sativa* L.**	***Eruca vesicaria* (L.) Cav. subsp. *sativa* (Mill.) Thell.**	**arugula**
122r	elaphoboskon	*Pastinaca sativa* L.		parsnip
128r	egilops	*Aegilops ovate* L.	*Aegilops neglecta* Req. ex Bertol.	goatgrass
129r	eduosmon emeron	*Mentha piperita* L.	*Mentha* × *piperita* L.	peppermint
132r	eduosmon agrion	*Mentha tomentosa* d'Urv.	*Mentha spicata* L. subsp. *condensata* (Briq.) Greuter & Burdet	horsemint
133r	emerokalles	*Hemerocallis fulva* L.	*Hemerocallis fulva* (L.) L.	orange daylily
136r	thridaks hemeros	*Lactuca sativa* L.		lettuce
147v	iris	*Iris germanica* L.	*Iris* × *germanica* L.	iris
148v	ion porpuroun	*Viola odorata* L.		violet
167v	kannabis hemeros	*Cannabis sativa* L.		hemp
170v	krotonekeki	*Ricinus cammunis* L.		castorbean
172v	kapparis	*Capparis spinosa* L.		caper bush
174r	**kissos**	***Hedera helix* L.**		**English ivy**
176v	krinon basilikon	*Lilium candidum* L.		madonna lily
182v	**krambe hemeros**	***Brassica oleracea* L.**		**cabbage, kale**
183v	**krambe agria**	***Brassica cretica* Lam**		**wild cabbage**
185v	**kromuon**	***Allium cepa* L.**		**onion**
189v	**kramos**	***Vicia Faba* L.**	***Vicia faba* L.**	**faba bean, horse bean**
190v	kolokunthis	*Citrullis Colocynthis* L.	*Citrullus colocynthis* L.	colocynth
192v	krokos	*Crocus sativus* L.		saffron crocus
208v	**lykoskordon**	***Allium Ampeloprasum* L.**	***Allium ampeloprasum* L.**	**wild leek**
235v	**moly**[2]	***Allium magicum* L. or *Allium nigrum* L.**		**black garlic**
250r	**ophioskordon**	***Allium Scordoprasum***	***Allium scorodoprasum* L.**	**giant garlic or sand leek**
278v	**prason chepaion**	***Allium Porrum***	***Allium porrum* L.**	**leek**
280r	perikslumenon	*Lonicera etrusca* Savi	*Lonicera etrusca* Santi	honeysuckle
282r	**rodon e roda**[3]	***Rosa centrifolia* L.**	***Rosa* × *centrifolia* L.**	**cabbage rose**
284r	raphanos kephaia	*Raphanus sativa* L.	*Raphanus sativus* L.	radish
284v	**ra oi de rion**	***Rheum rhaponticum* L.**		**rhubarb**
292v	strechnos melas kepaios	*Solanum nigrum* L.		black nightshade
298v	sikus (sikyus) agrios	*Ecballium Elaterium* Rich.	*Ecballium elaterium* (L.) A. Rich.	squirting cucumber
302r	seutron melan agrion	*Beta vulgaris* L.		beet
303r	sisumbrion	*Mentha aquatica*	*Mentha aquatica* L.	watermint
312r	**staphylinos chephaios**	***Daucus carota***	***Daucus carota* L.**	**carrot (cultivated)**
314v	**skordoprason**	***Allium descendens***	***Allium sphaerocephalon* L.**	**giant garlic or sand leek**
326v	staphis agria	*Delphinium Staphis agria* L.	*Delphinium staphisagria* L.	delphinium larkspur
357v	uakinthos	*Hyacinthus orientalis* L.		hyacinth
359v	physallis	*Physalis Alkekegni*	*Physalis alkekegni* L.	Jerusalem cherry
370v	**phasiolos**[4]	***Phaseolus Nanus* L.**	***Phaseolus vulgaris* L.**	**cowpea**
373r	chrysanthemone charkas	*Chrysanthemum coronarium* L.		garland chrysanthemum
376r	chondros or chrithe	*Triticum spelta* or *Hordium vulgare*	*Triticum aestivum* L. subsp. *spelta* (L.) Thell. or *Hordium vulgare* L.	spelt or barley
387r	okimon	*Ocimum basilicum* L.		basil

[1] Misidentified as *Allium sativus*, see text.
[2] Misidentified, not an *Allium*, either *Lilium* or *Fritillaria*.
[3] Most probably *Rosa gallica* L.
[4] Present designation is *Vigna unguiculata* (L.) Walp.

nature. Most images contain one plant per page but four pages contain two plants each. A comparison of illustrations from the *JAC* with either modern photographs or illustrations from *The New Oxford Book of Food Plants* (Vaughan and Geissler, 1997) is shown (Figs. 3 to 13).

Batos (Blackberry)

Folio 83r, labeled *batos* (Fig. 3), is the oldest surviving image of a *Rubus*, a blackberry in the European group, *R. fruticosus* aggr. The text, which was written in cursive style and transcribed after the image was painted, specifies medicinal uses of blackberries (*batos*) as well as raspberries (*batos ideaia*). The illustration that superficially appears quite naturalistic is one of the finest of the *JAC* and shows five stems painted with recurved prickles on petioles, petiolules, and pedicels. A rooting tip layer is depicted as well as a broken stem; this latter stylistic conceit is also found in one other illustration, 23r of *Artemisia abrotanum*, suggesting the same artist. Fruiting occurs on this stem, which suggests primocane fruiting, as well as another, which could be a biennial (two-year-old) cane. Although the leaves are drawn with painstaking detail there are botanical errors: the foliage is predominantly pinnately rather than palmate compound and the pediolulus of the basal leaflets are long rather than almost sessile. Flowers are in a raceme instead of a panicle-like cyme and have 6 and 7 petals instead of 5. There are no recurved prickles on the main mid vein of leaves. Intriguingly, in a very similar illustration of the *Codex Neapolitanus*, supposedly produced a century later, these errors are corrected, suggesting either that it was based on the *JAC* and corrected by a botanically astute copyist, or more likely, based on a similar lost archetype, being a sister image (Hummer and Janick, 2007). A photographic image made in Oregon shown on the right (Fig. 3) is similar to the *JAC* illustration.

Goggule (Turnip)

Dioscorides notes that the boiled root of turnip can be pickled and is nutritious, causes flatulence, and makes the flesh flabby. Seed and roots are also used for various remedies. The *JAC* illustration (Fig. 4) shows a yellow, globular root with characteristic deeply cut compound leaves along the long petiole. The appearance is remarkably close to a modern yellow turnip.

Elaphoskordon, Kromuon, Lykoskordon, Moly, Ophioskordon, Prasov Chepaion, Skordoprason (Garlic, Onion, Wild Leek, Giant Garlic, Ornamental Onion, Leek, Garlic Leek)

There are at least seven *Allium* species illustrated in the *JAC* but they are difficult to differentiate (Fig. 5). They have been identified by Otto Mazal, editor of *JAC* facsimile as follows: (A) 116v = garlic (*A. sativum*); (B) 185v = onion (*A. cepa*); (C) 208v = wild leek (*A. ampeloprasum*); (D) 235v = "a garlic" (*A. magicum* or *A. nigrum*); (E) 250v = giant garlic, sand leek, or rocambole (*A. scoroprasum*); (F) 278r = leek (*A. Porrum* = *A. ampeloprasum* Porrum Group); (G) 314v = *A. descendens* (garlic leek): garlic, wild leek, and "moly" illustrations from *JAC* show flowers, while giant garlic shows a head bulb and perhaps a loose membranous coat. The garlic bulb does not show distinctive cloves. Modern paintings of garlic in flower (H), onion (I), and leek (J) are from *The New Oxford Book of Plants* pictures. The text of *PUI* mentions the pungency of onion and wild and cultivated forms for alliums and various medicinal uses are listed.

In modern *Allium* classification, the name of garlic applies to both *A. sativum* (true garlic) and a large group of garlic-like plants, commonly known as "wild garlics." Several wild species of *Allium*, with garlic-like smell and taste (e.g., Chinese or Japanese garlic *A. macrostemon*, Naples garlic *A. neapolitanum*, ramsons *A. ursinum*, long-rooted garlic *A. victorialis*, Canada garlic *A. canadense*) are used as spices and green vegetables in different countries, but are not closely related to garlic (Kamenetsky, 2007). Elephant garlic is a form of leek (*A. ampeloprasum*), but it forms cloves resembling those of garlic, although the appearance and flavor predominantly resemble leek (Fritsch and Friesen, 2002). Most probably, in *JAC* name "garlic" was used in the larger sense, for a few garlic-like species. Thus, Fig. 5A presents garlic-

Figure 4. Turnip (*Brassica rapa*): (left) *JAC* 89r; (right) photograph by Shutterstock.

Figure 5. Alliums: (A) *JAC* 116v = "garlic" (*Allium* sp.); (B) *JAC* 185v = onion (*A. cepa*); (C) *JAC* 208v = wild leek (*A. ampeloprasum*); (D) *JAC* 235v = *A. magicum* or *A. nigrum*; (E) *JAC* 250r = giant garlic (*A. scordoprasum*); (F) *JAC* 278r = porrum onion or leek (*A. porrum* = *A. ampeloprasum*); (G) *JAC* 314 = garlic leek (*A. descendens*); (H) garlic, (I) onion, (J) leek, illustrations from *The New Oxford Book of Food Plants* (Vaughan and Geissler, 1997).

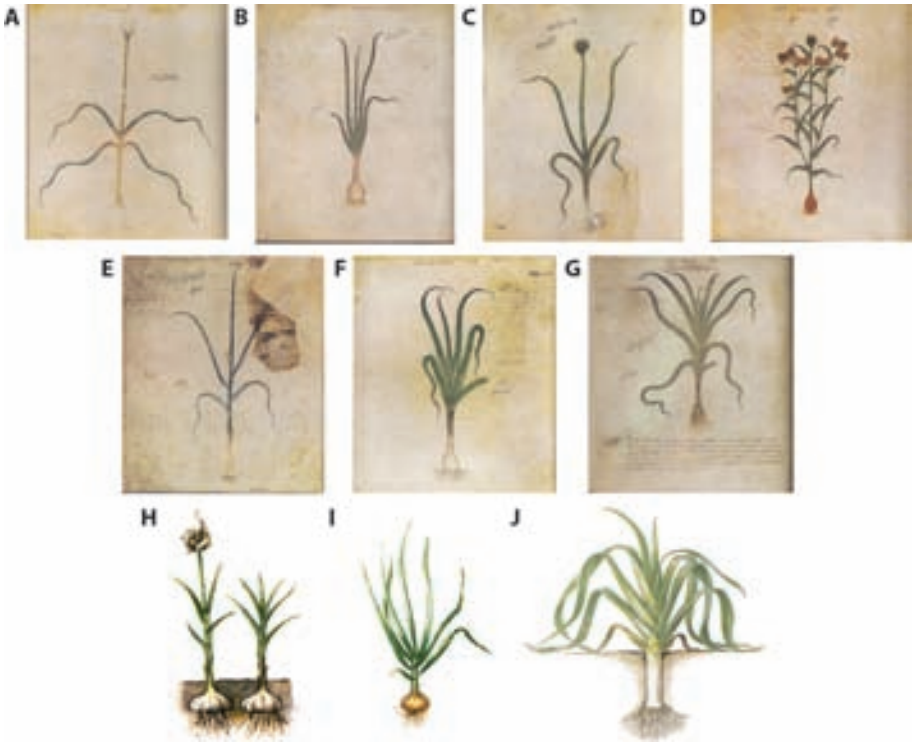

Figure 6. Arugula (*Eruca sativa*): (left) *JAC* 118r; (right) illustration from *The New Oxford Book of Food Plants* (Vaughan and Geissler, 1997).

Figure 7. English ivy (*Hedera helix*): (left) *JAC* 174v; (right) photograph, source unknown.

like wild Mediterranean species, most probably *A. neapolitanum* or *A. trifoliatum*, B presents young onion (*A. cepa*) plants, and C depicts *A. ampeloprasum*, wild species that was largely consumed as wild garlic as well. *A. ampeloprasum* has purple or off-white flowers, and small bulblets underground (depicted in this figure) serve for vegetative propagation of this species. D is certainly not *Allium* species, but might belong to *Lilium* or *Fritillaria*. Leaves, flowers and fruits of this plant are not characteristic to the genus *Allium*. E was identified by Otto Mazal as giant garlic, *A. scorodoprasum*. Philip Simon suggested that this might be *A. sativum* var. *ophioscorodon* (snake garlic or rocambole). However, it is difficult to identify this species from the image, since its inflorescence is not visible. F can be onion at the late stage of plant development. The bulb of this plant is not characteristic to leek, which, in modern horticulture, possesses of underground false stem. G was identified as *A. descendens* (garlic leek). This species is clearly not *A. descendens* (the old name of *A. sphaerocephalon*), which is a small dark purple flowered ornamental, called drumstick allium. Most probably this is sand leek *A. scorodoprasum*.

Euzomon (Arugula)

The *JAC* includes a fine illustration of flowering arugula (rocket) with deeply cut leaves and whitish flowers with four petals and is quite close to the depiction of arugula in *The New Oxford Book of Food Plants* (Fig. 6). The plant is certainly *Eruca vesicartia* (syn.= *Eruca sativa*) since the flowers of the wild rocket, *Diplotaxis tenuifolia*, are bright yellow. The text in *PUI* mentions the presumed aphrodisiacal properties, based on the common assumption that plants with spicy flavor generated lust, and this assumption led to banning of arugulas in some monasteries in medieval times. *PUI* mentions a wild rocket (perhaps *Diplotaxis tenuifolia*) that grows in the western part of Spain, in which the seed is used in place of mustard.

Kissos (English Ivy)

Three types of ivy (*Hedera helix*) are described in *PUI*: white (white fruit), black (black or saffron colored fruit), and spiral (fruitless with "delicate angular and graceful" leaves) suggesting that the latter were vegetative clones. Pharmaceutical properties were listed for leaves, petioles, berries, sap and roots. The illustration in *JAC* (Fig. 7) is very fine and shows five shoots coming off a common root piece including one that bears a flowering stalk, which is improbable, indicating that it is a composite depicting several plant stages simultaneously. Four of the nonflowering shoots show juvenile leaf forms with characteristic palmate lobing. The one of flowering shoots shows two mature leaves that are elliptic lanceolate (one is partially concealed). The photographed ivy is amazingly similar and shows one stalk with five inflorescences with two mature leaves and juvenile leaves below the inflorescence.

Krambe and Krambe Agrios (Cultivated and Wild Cabbage)

Dioscorides in *PUI* mentions many pharmaceutical effects for leaves, consumed raw or boiled, juice, seeds, flowers, or stalks of cabbage. The effects are often contradictory, for example the boiled leaves both ease the bowels and constipate. It is noted that the wild cabbage is more bitter than the cultivated. The illustrated cultivated cabbage is of a young plant with only four large leaves each with basal lobing (Fig. 8), while the wild cabbage with the same leaf types shows a double stem and yellow inflorescence with four petals. Both cultivated and wild cabbage show simple basal lobing at the base of the leaf, a trait found in some modern brassicas. The cultivated cabbage illustration is similar in style to that of turnip (Fig. 4), suggesting that the same artist drew both. However, the wild cabbage is cruder, resembling student work; the stem is thick and unnatural and the work is superimposed on a block-like form, a technique found only in a few illustrations. Leaves have lobes in each of the three illustrations.

Kramos (Faba Bean, Horse Bean, or Broadbean)

The flatulence caused by faba beans is discussed by Dioscorides in *PUI*, but medicinal values are ascribed. Interestingly, kramos is suggested to prevent genital development when plastered on children. A well drawn illustration of faba bean from *JAC* (Fig. 9) shows flowers and 12 pods in groups of three and is quite similar to the illustration in *The New Oxford Book of Food*

Figure 8. Cultivated and wild *Brassica* spp.: (A) cultivated (*Brassica oleraceae*) *JAC* 182v; (B) wild (*Brassica cretica*) *JAC* 183v; (C) photograph of a cultivated *Brassica* by Jules Janick.

Figure 9. Faba bean (horse bean, or broadbean) (*Vicia faba*): (left) *JAC* 189v; (right) *The New Oxford Book of Food Plants* (Vaughan and Geissler, 1997).

Plants, indicating little phenotypic changes over the millenia.

Radon (Rose)

PUI provides medicinal values for rose flowers and hips. The illustration in *JAC* (Fig. 10) shows a plant with six branches and five flowering stems. The red flowers, two fully opened, one partly opening, and three in bud, appear to have at least 10 petals and can be described as double flowered. There are suggestions of prickles on stem and calyx, but they are not drawn precisely. Leaves show six leaflets. It is likely that the rose species is *Rosa gallica*, which has three leaflets, rather than *Rosa centifolia* as suggested by Otto Mazal. A painting of *Rosa gallica* from the United States Dispensatory is close to the *JAC* image but the increased petals may reflect modern selection.

Ra (Rhubarb)

In *PUI* rhubarb (Ra) is also called *rheon* and is described as originating from lands above the Bosporus. The reddish-black roots are described as astringent and containing various medicinal properties. The *JAC* illustration is confined to a single large root identified as *Rheum rhaponticum* by Otto Mazal, but Beck (2005) identified the rhubarb as *R. officinale* or *R. ribes*. The thick root illustrated in *JAC* is not dissimilar to roots of *R. palmatum* (Fig. 11).

Figure 10. Rose (*Rosa gallica*): (left) *JAC* 282r; (right) modern painting of *R. gallica* from the United States Dispensatory, 1926.

Figure 11. Rhubarb (*Rheum* spp.): (left) *JAC* 284v; (right) photograph of *Rheum palmatum* var. *tanguticum*, courtesy of Danny L. Barney, USDA ARS.

Figure 12. Cultivated and wild carrot (*Daucus carota*): (A) cultivated carrot *JAC* 212r; (B) wild carrot (gingidion) *JAC* 88r; (C) photograph of modern carrot (courtesy of John Stolarczyk); (D) botanical print of wild carrot (Thomé, 1885, *Flora of Germany*, Plate 386).

Staphylinos (Carrot)

Diocorides in *PUI* describes both wild and cultivated carrot, noting that the cultivated is more edible. Many remedies are assigned to seeds, roots, and leaves. The illustration (Fig. 12) of cultivated carrot (*Staphylinos chephaios*) in *JAC* (A) shows a long orange swollen root with three small rootlets growing from the basal end. The rosette of leaves is pinnately decompound, and finely cut in many segments. The *JAC* illustration appears remarkably close to the photographed modern cultivated carrot, *Daucus carota* var. *sativus* (C). The orange color of the root in the 6th century is quite remarkable because in the Middle Ages and Renaissance, most carrots were purple and red, as a result of introductions from Central Asia following Arab conquests. The illustration of a wild carrot (B) called *Gingidium* (*Daucus gingidium*, a syno-

Figure 13. Cowpea (*Vigna unguiculata*): (left) *JAC* 370v; (right) *The New Oxford Book of Food Plants* (Vaughan and Geissler, 1997).

nym of *D. carota* var. *carota*) is almost identical to a 1885 print of wild carrot in the *Flora of Germany* (Thomé, 1885).

Phasiolos (Cowpea)

The *JAC* illustration clearly depicts cowpea, now *Vigna unguiculata*, but labeled *Phaseolus Nanus* by Otto Mazal, editor of the Dioscorides facsimile, while L.Y. Beck (2005) calls it *Vigna sinensis* (kidney bean). The Greek name *Phasiolos* has been now used as *Phaseolus* for other legume species including *Phaseolus vulgaris* (common bean) of the New World. Clearly, there has been confusion in the nomenclature. The illustration in the *JAC* (Fig. 13) portrays a quite thick stemmed legume with long, single or double pods, quite erect with green flowers, and axillary shoots. The trifoliate leaves are ovate. The plant shows axillary shoots. The modern cowpea is more slender and the suggestion has been made by Richard E. Fery that the *JAC* illustration could be from a ratooned plant, which would explain the thickness of the stem.

CONCLUSIONS

The *JAC* affirms the importance of plant illustration to depict plants. Indeed, plant illustration can be botanically useful by providing a representation of an entire plant during the course of yearly seasonal changes. It is difficult to accurately describe a plant with words despite the plethora of botanical terms.

The illustrations in *JAC* are mostly well drawn and appear to have been based on naturalistic drawings. However, it is unclear if they were drawn from nature *per se*, or copied from a lost archetypical volume that may have been owned by Theodosius II (401-450), great grandfather of Juliana Anicia (Collins, 2000).

A comparison of drawings with photographs or illustrations indicates great similarity between the images of the *JAC* to modern day crops, suggesting that changes in our crop plants over the last 1,500 years have not been extreme. The illustrations in the *JAC* formed the basis for many herbals in the 1000 years until the Renaissance brought about a new movement to naturalistic drawings, directly from nature. The stunning drawings of the *JAC* underscore the decline in botanical illustration during the next 1000 years.

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Apples in Tropical Highlands of Northern Ethiopia: Potentials and Challenges

Getachew Hruy, Negash Aregay, Yikunoamlak TekeleBirhan, Tom Deckers, Hans Bauer, Kassa Amare, Kindeya GebreHiwot, Jozef Deckers and Wannes Keulemans

Apple cultivation, a traditional activity in countries with a temperate climate, has been gaining importance in areas with sub-tropical and even tropical climatic conditions. Though the exact period is not known, it is believed that apple trees were first introduced to Tigray, northern Ethiopia, approximately 40 years ago. However, it is only in the last decade that apple production has started to increase in volume. Thus, apple is becoming a potential fruit crop for the highlands where fruit growing and consumption was for a long time not an important component of the farming system and diet of the people. However, most introductions so far have been made without regard to the adaptability/chilling requirement of the cultivars or to the specific growing conditions of the area. Moreover, as apple production is a new initiative, growers are confronted with many production and management constraints. This paper presents the major challenges and the potentials of apple cultivation in the Tigray highlands.

HORTICULTURE IN TIGRAY

Tigray is one of the nine administrative regions of Ethiopia and is situated in the most northern part of the country between the latitudes 12° 15′ N and 14° 50′ N and the longitudes 36° 27′ E and 39° 59′ E (Yazew, 2005; Fig. 1). The region covers an area of approximately 50,000 km^2 (Araya and Edwards, 2004) with a total population of more than 4.3 million, of which more than 85% live in rural areas and are highly dependent on agriculture for their subsistence, employment and income source (FDRE, 2008). Most of the area is highland (Araya and Edwards, 2004) and plateau interspersed with low lying hills and flat lands with an altitudinal variation ranging between 1500-3000 m a.s.l..

The production conditions in the region favor the cultivation of a wide variety of cereals, pulses, oilseeds and horticultural crops. Cereals are the most important field crops and the main element in the diet of the people, followed by pulses. A variety of horticultural crops has also been under cultivation in the region for decades, mostly by smallholder farmers and monasteries, but their production and consumption is relatively limited. According to unpublished data from Tigray Bureau of Agriculture and Rural Development (TBoARD), horticulture covered a total area of 90,902 ha in the cropping season of 2011/2012, which is 11% of total regional peasant crop production for the season. The area coverage for vegetables, fruits and spices for the season was 74,001, 13,618 and 3,283.5 ha, respectively. The area of horticultural cropping is expected to increase in the near future due to the fact that the regional government is focusing on conservation and agro-industry based, rain-fed and irrigation agriculture favoring horticulture.

Though there are no statistical figures on horticultural crops produced, marketed and consumed, use of fresh and processed horticultural produce apparently increased considerably. For example, in a not so distant past, fruit shops were found only at the gate of hospitals. These days one can witness the change by observing the fresh fruit and juice shops mushrooming in big towns, cities and even in rural districts. The consumption of horticultural produce is certainly keeping pace and probably out-stripping the increases in supply, and consumers are willing to pay a high price for available products. The demand for planting materials and production technologies is also growing. Thus horticultural crops are not only a welcome food but also an important source of income. After harvest, part of the produce is consumed by the farm family and part is transported to rural market centers for local consumers or is bought at the farm by neighbors. Some of the harvest is transported to bigger cities to be sold in supermarkets or fruit shops. It is also common to see horticultural products sold in open-air markets.

Figure 1. Location of the Tigray region in Ethiopia.

SOCIO-ECONOMIC ENVIRONMENT

As in other parts of the country, more than 85% of the inhabitants in the region reside in rural areas and engage in agricultural production as the major part of their livelihood. However, agricultural productivity is very low due to continuous farming on marginal soils, the low level of agricultural technologies, risks associated with weather conditions, diseases and pests, etc. Moreover, due to increasing population pressure, the land holding per household is declining, leading to a low level of produc-

Table 1. List of apple cultivars under cultivation in farmers' fields and in nursery trials.

Cultivars in farmers' fields		Cultivars in nursery trials	
Anna	Granny Smith	Top Red Delicious	Starking Delicious
Crispin	Golden Delicious	Gala Must	Salvador
Fuji	Royal Gala	Annurea	Lourdes
Princesa	Imperatore Dellago	Red Chief	Adelina
Bond Red	Dorset Golden	Rentta Blanca	
Jonagold		Ozark Gold	

Figure 2. Performances of 'Bond Red' (A) and 'Anna' (B) cultivars in farmers' fields in Alaje (2550 m a.s.l.) and Atsibi-Wenberta (2700 m a.s.l.), Tigray highlands, respectively.

tion to meet the consumption requirements of the household. The outlook for the mid to highlands of the region, in which the majority of the population lives and has practiced agriculture for over 2500 years (Nyssen et al., 2004), is more severe. Cultivatable land has already become a scarce resource. Rain-fed agriculture has expanded to marginal areas and farmers are forced to cultivate steeper slopes, often without the application of effective conservation measures. Throughout these areas, where living conditions are relatively favorable, the steady and cumulative pressure on land has had a disastrous impact on the environment and on the availability of food per capita. This is reflected in the severity of land degradation (Dubal, 2001; Nyssen et al., 2004) and low crop productivity (Dubal, 2001), which together mean that a family can feed itself for only 5-8 months of a year at best. For the remaining months, they must depend on performing casual labor, food-for-work projects, livestock production, and other small income generation activities. However, apparently both agricultural productivity and livelihood of the people are improving.

PRESENT SITUATION OF APPLE CULTIVATION

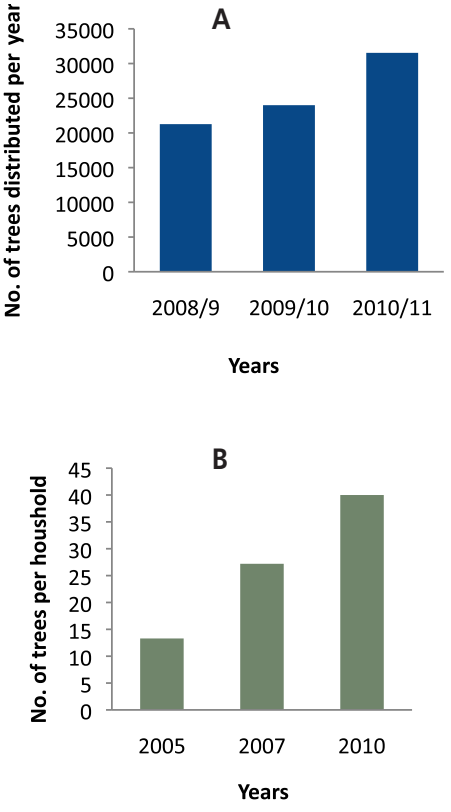
When we think of cultivation of temperate fruits in Tigray, our mind goes immediately to the highland parts of the region, where the problems of agriculture are many and complex. Though the exact period is not known, it is believed that apple trees were first introduced into Adigrat, eastern zone of Tigray, approximately 40 years ago by missionaries (Amanuel Gebru, Adigrat Diocese Catholic Secretariat, pers. commun., 2011). However, it is only in the last decade that apple production has started to increase in volume and is expected to increase as efforts are underway by various government and non-government organizations to integrate apple fruit production into the existing cereal based farming system of the region.

At the moment, 11 cultivars are being grown in farmers' fields and another 10 cultivars are in nursery trials (Table 1). Of these cultivars, 'Anna' and 'Bond Red' are most preferred by growers. Ten year old 'Bond Red' and four year old 'Anna' cultivars growing at farmers' fields are displayed in Fig. 2. These cultivars show a tendency to crop two times per year with a short period of dormancy after the main harvest (June-July) and the second harvest in January. This is in agreement with the experience in East Java, Indonesia, where two harvests are possible in one year (Verheij, 1985). 'MM106' and 'M9' are major rootstocks used with these cultivars. In our experience, 'MM106' is more vigorous in growth and produces better branches to be used in vegetative propagation than 'M9' (Fig. 3) and does not require support in orchards.

Data obtained from TBoARD show that there has been an increasing trend for apple tree distribution during the last three years (Fig. 4A). This is also confirmed by a preliminarily survey conducted in 2011 showing that the average number of trees that an individual 'apple-farm-

Figure 3. Performances of 'MM106' (A) and 'M9' (B) apple rootstocks at Hagere Selam nursery (2650 m a.s.l.), Tigray highlands.

Figure 4. Trends showing number of apple trees distributed to farmers in Tigray by TBoARD in 2008-2011 (A) and number of trees owned by an 'apple-farmer' since 2005 (B).



er' had in 2005, 2007 and 2010 was 13, 27 and 40, respectively (Fig. 4B). From Fig. 4A, it is clear that in 2010/11 there was an increase of 48% in apple trees distributed over that of 2008/09. Similarly, the average number of apple trees owned by an 'apple-farmer' in 2010 showed an increase of 200% over the apple trees owned during 2005 (Fig. 4B).

Moreover, other deciduous pome fruits like pear and stone fruits like plum, apricot and peach are under trial in the region and have shown promising results. For example, apricot trees imported from Italy in an FAO supported project, are under trial in Atsibi-Wemberta, Tigray. These trees are only three years old and have started to bear fruit (Fig. 5). This suggests that there is still much scope for the development of other temperate fruits and that their production could be an option for the highland areas if the right procedures are followed.

Figure 5. Fruitful three years old apricot trees at Atsibi-Wemberta nursery.

PRODUCTIVITY AND ECONOMIC BENEFITS OF APPLE

From a preliminary survey conducted during 2011, it was clear that more than 70% of the growers were able to produce apple fruits (Table 2). From all mature trees, productivity was estimated at an overall average of 4.13 kg/tree. Similarly, the total fruit harvested per farmer was 72.39 kg. These amounts did not include fruits consumed by the family, eaten by birds and stolen by theft, but marketed fruits only. In addition, productivity of 10 to 20 kg/tree was recorded on a few holdings where farmers employed better cultural techniques. As described above, it was also clear that farmers had a second harvest from low-chill cultivars like 'Anna' and 'Bond Red'. It would seem possible that the productivity of the trees and the total amount of fruits produced per farmer could be a bit higher than calculated. During our visit to some farmer's fields, we observed that some mature trees had virtually no yield due to negligence and mismanagement of the trees. From the amount of fruits sold at market, it was recorded that an individual farmer earned on average 3482 Birr[1] per season, with an average price of 26.5 Birr/kg of apple fruits (Fig. 6).

In years past it was rather exceptional to find fruits on a farmer's table. Fruit growing and consumption was, for a long time, not an important component of the farming system and diet of the people in the highlands. Today there is a dietary change due to the inclusion of horticultural crops, including apples, in the farming system (case study). This, in turn, will improve their nutritional balance and have a positive effect on their health. In addition to earning money and providing the household with fruit, farmers commented that apple trees are making the area more attractive for bees. This could support a bee-keeping enterprise.

Table 2. Mean values for number of mature trees, average fruit yield per tree and total fruit yield per farmer in six districts (unpublished data).

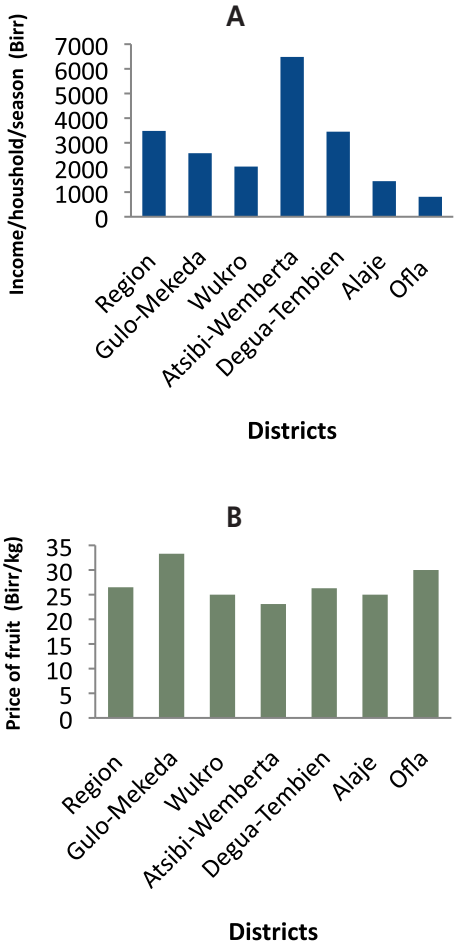
Name of districts	N[z]	Average no. of mature trees	Average yield/tree/year (kg)	Total yield per farmer/year (kg)
Ofla	12	7.3	2.0	14.5
Alaje	11	7.56	3.3	25.5
Degua-Tembein	19	21.4	5.0	114.9
Wukro	12	6.5	5.3	39.5
Atsibi-Wemberta	11	15.2	6.5	179.1
Gulo-Mekeda	14	19.4	2.6	45.6
Total	79	13.9	4.1	72.4

[z] Number of respondents with fruit bearing trees.

MARKETING

At present, the small farmers who produce apple fruits consume part of their produce at home and the remaining is either sold at farm level or transported to fresh fruit markets in nearby cities. The demand for apple is gradually increasing in urban markets and fruits are being imported to meet local demand. According to Timoteos (2008), Ethiopia imports about 350 metric tons of apple fruits annually to meet domestic consumption. 2011 data from a preliminarily market survey carried out in Mekelle supermarkets, capital city of Tigray, revealed that apples are imported from South Africa, France, China, Chile and the USA. These fruits are marketed under the name of the country from which they are imported, regardless of cultivar name. However, traditionally apples are marketed by cultivar names and according to strict standards of perceived quality (Jackson, 2000). Moreover, imported apples were sold at a price of 12 Birr per fruit or 108 Birr per kilo, regardless of the distance they had been

Figure 6. Income earned in one production season/household (A) and price of fruits per kilogram (B), all in Birr.



[1] One Birr is equivalent to US$0.058 (October 15, 2011, exchange rate at the Commercial Bank of Ethiopia).

CASE STUDY

Mr. GebreKiros Gebru is one of the farmers who benefited from apple production in Degua-Tembien. He was asked to comment on the contribution of apple fruit trees to his household economy. He said, "Many families in this area, including me, have started to benefit from apple fruit trees. I used to grow grains, but have found that apples are much more rewarding. Currently I have a total of 100 apple trees under production and another 204 apple trees that have not yet reached production. I was able to harvest 5-15 kg of fruits per tree in one season. In the 2009/2010 cropping season alone, I sold 150 kg of apple fruits at a price of 30 Birr per kg, my family ate about 10 kg and a few fruits were also eaten by birds. In 2010/2011, my production increased to more than 500 kg due to the fact that more trees started bearing fruits. All in all, I was able to supply my home and able to consume more apple fruits than any time before. On top of that, I was able to earn money by selling the fruits in Mekelle and Hagere Selam markets. With the money, I managed to purchase extra grains, pay back my loans, and was able to send my daughter to school. Now my neighbors and experts from the Office of Agriculture consider me to be a model farmer in the district. For all this, thanks to Mekelle University-Inter University Cooperation, Relief Society of Tigray and Bureau of Agriculture at Hagere Selam for providing the apple trees and the necessary training. Now I use my homestead intensively with a total of 304 apple trees." He was also asked, "What is your future plan?" "I have the plan to add more apple trees and increase my earnings as of the coming year. But I worry about the problem of birds and powdery mildew." His wife was also asked to comment on the benefits she got from apples. She started smiling and replied in one phrase: "For us this is a miracle crop that fetches better money."

Mr. Yikunoamlak TekeleBirhan interviewing Mr. GebreKiros Gebru's wife.

transported from their country of origin, while locally produced apples were sold at 50-60 Birr per kilo. The price for imported apples is more than twice that of domestically produced ones. Similarly, when we compared the farmer's selling price with that of the supermarket where their apples are sold, the mark-up was around 110%, suggesting the current marketing system is not particularly benefiting the growers in the region. With such artificially excessive prices for apples at the supermarkets, one can safely assume that this fruit is becoming a status symbol and would be accessible to only a few wealthy people who can afford to pay 12 Birr for a single imported apple or 50-60 Birr per kilogram for domestically produced apples. In most countries where apples are grown locally, they are very much a part of the local diet because domestic production slashes the cost making the fruit accessible to all. Hence, further strengthening the domestic production of apple in the Tigray region would generate substantial cash income to growers, improve the affordability of apples to the general population and save hard currency due to import substitution.

POTENTIAL FOR APPLE FRUIT DEVELOPMENT

The main strengths, weaknesses, opportunities and threats facing temperate fruit production in general, and apple fruit production in particular, in the Tigray region are presented in Table 3.

PROBLEMS AND LIMITATION TO APPLE ADOPTION

Even though apple cultivation has started to improve the socio-economic life of farmers in the highland parts of the region, its production is currently constrained by a number of factors. Generally, the constraints centre around lack of know-how, and natural and institutional related factors.

Know-How Related

Many of the constraints associated with apple production at farm level are related to lack of knowledge and skills in cultural practices. Such lack of know-how is not restricted to farmers. There is also a dearth of trained extension personnel who can disseminate the scientific and technical know-how to growers. Thus, the majority of apple growers receive limited advice from the extension personnel, and simply learn techniques through trial and error.

Natural Factors

Though the growing areas are situated in the highlands (2300-3000 m a.s.l.), these areas often lack sufficient cold temperatures to fulfil the chilling requirement of apples. This has resulted in prolonged dormancy, less foliation and irregularity of growth, and production of fewer fruits situated mostly at the terminal position (Fig. 7). Access to adequate water, especially from February to the end of May, is also a problem for most farmers. This period

Table 3. Summary of strengths, weaknesses, opportunities and threats facing apple fruit production in Tigray highlands.

Strengths	Weaknesses
• High value crop – income generation • Can be grown in highlands where tropical and subtropical fruits cannot • Nutritious and healthy crop • Conserves soil & water and counters erosion • Potential bee fodder	• Inherent chilling requirement • Poor shelf-life of low-chill cultivars • Lack of trained manpower and lack of know-how • Lack of coordination among different stakeholders • Poor marketing – seller and consumer bias towards imported fruits
Opportunities	**Threats**
• Availability of many highland areas that are not suitable for tropical/subtropical fruits • Possibility of double cropping or spreading harvest per year • Government policy towards horticulture • Improving diet & vast domestic market demand • Family labor availability • Interest in developing adapted cultivars for tropical climate by breeding • Introduction of drought resistant rootstocks	• High cost of production and lack of remunerative prices to farmers • Poor participation by private sector in nursery establishment & post-harvest infrastructure • Frequent droughts/moisture stress • Damaged fruits and leaves by hail storms • Vandalism and theft of produce • Fruit imports from other countries • Lack of disease management

Figure 7. Lack of chilling resulted in the presence of dormant buds, flowers and fruits on the same tree and at same time (A) and apple tree bearing fruits mostly on branches at the distal position (B). Pictures by Julie Tegenbos, MSc student in 2010.

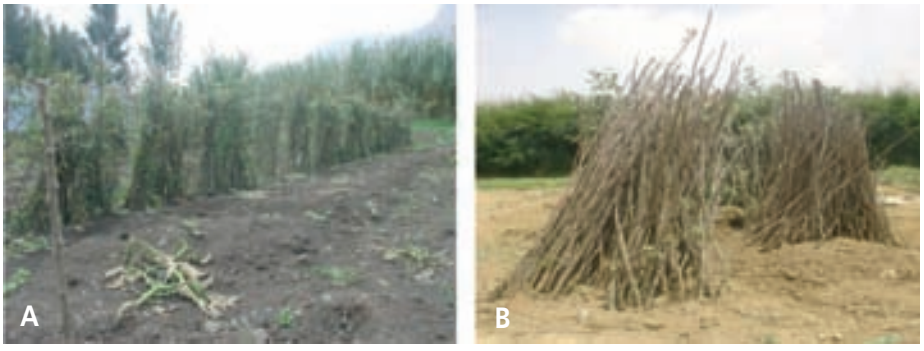
coincides with the time of bud break and active growth of the trees. Moreover, hail has the greatest impact on apple trees (Fig. 8). Though not a serious problem, some pests and diseases are also observed. The main diseases so far are powdery mildew (*Podosphaera leucotricha*) and root rot (*Phytophthora* sp). Pests observed include mainly aphids and termites. Until now, scab (*Venturia inaequalis*), the most serious apple fungal disease in temperate regions, has not been observed. Birds are a serious plague and incur additional costs for 3 to 4 months of the year.

Institutional Factors

Though growers are eager to obtain information on improved pomological practices, the information currently varies from one extensionist to the next and communication among them has not been well coordinated. Farmers are not getting the right cultivars at the right time and are not getting appropriate technical advice from trained personnel. Most trees have been introduced from Chencha (South Ethiopia) where the 'dormancy season' is June to September, while in the Tigray highlands it is November to February. These trees are usually transported during the end of their 'dormancy season' (September in Chencha) and when they arrive in Tigray, they are actively growing. Because the 'dormancy season' is just starting at that time in Tigray, the trees undergo a secondary dormancy. Hence, such trees are not immediately distributed to beneficiaries; instead they are placed in nurseries till the next rainy season (Fig. 9). It is probable that such trees exhaust their reserves during this extended dormancy period and therefore establish poorly by the time they are given to farmers. In many cases, the imported trees might also not be true-to-type. Moreover, such introductions could also be a potential source for spreading pests and diseases.

Figure 8. Apple fruits affected by hail at the end of June 2011, hanging on the tree but the majority fallen unripe at Degua-Tembien, Tigray region.

Figure 9. Trees from Chencha during September and/or October 2010 and placed at Alaje (A) and Atsibi-Wemberta (B) nurseries. Photo taken on June 2011.



RECOMMENDATIONS FOR FUTURE DEVELOPMENTS

Given the promising results of low-chill apple cultivars and the apparent fruitfulness of apricot trees, the Tigray highlands seem a likely niche not only for production of apples but also other temperate zone fruits. To expand and develop temperate fruits in the highlands of Tigray, the following recommendations are made:

- Initial indications are promising for low-chill cultivars; hence introduction and evaluation of low-chill cultivars should be a high priority.
- Spreading the harvest of fruit across the full normal harvest period would extend the availability of fresh harvested fruits over a longer period. A strategy for this harvest spread should be developed.
- There is a need to create awareness and make the farmers receptive to temperate fruit planting and aftercare through hands-on training. Training facilities with respect to growing temperate fruit crops and their propagation should be a high priority.
- As planting material from Chencha is not reliable, there is an urgent need to establish virus free mother trees and rootstock stool-beds in the Tigray highlands and to develop long-term low-chill deciduous crop breeding programs within the region.
- To facilitate training, marketing and other extension services, establishment of a Tigray Highland Fruits Production and Marketing Cooperative could be vital.
- There is a need for improved cooperation among stakeholders at local and international level to develop and encourage the use of adapted cultivars, rootstocks, methods of production and systems.
- Though pests and diseases are not yet severe problems, care must be taken during introduction of planting materials.
- Research is warranted to discover hail protection measures as hail storms seem to affect the fruit-growing areas annually, rendering fruit quality inferior and unfit for export.
- Post-harvest handling is also equally important.
- Closer evaluation of different cultivars and investigation of the climatic and cultural requirements for double cropping are required.

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New Books, Websites

BOOK REVIEWS

Harvesting the Sun: A Profile of World Horticulture. 2012. *Scripta Horticulturae* 14. A publication of the International Society for Horticultural Science. 72p. ISBN 978-90-6605-704-3. € 30. Available from the ISHS Secretariat (www.ishs.org/pub/scripta.htm).

Shedding Light on World Horticulture and Seeking Commitments for a Positive Future

Horticulture has an image problem. Most people – if they think about horticulture at all – think of the subject in small terms, as merely a pastime synonymous with gardening. This misconception devalues one of humanity's most significant scientific, economic, and aesthetic pursuits. Before you dismiss this as an exaggeration, *imagine your physical and mental health in a world without fruits and vegetables, parks and play fields, flowers and trees.* Consider some of the most pressing questions of this century: Can we feed 9 billion people by 2050 while conserving water, land, atmosphere, and habitat? Can we reverse the human and financial costs of an increasingly popular lifestyle that provides too many calories and too little fiber, vitamins, minerals, and exercise? In emerging countries, can we reduce poverty and improve nutrition by expanding crop production, increasing yields, managing supply chains more effectively, and limiting spoilage and wastage? In wealthier countries where costs for land, water, energy, and labor are high, can we sustain rural livelihoods and conserve open spaces by investing in economically and environmentally sustainable ways to grow fruit, vegetables, ornamental plants, and other specialty crops? *Horticulture has a key part to play in tackling each of these challenges, but to attract the necessary talent and resources this green industry must raise its public profile.*

Seeking to share horticulture's scope and value with a wide readership, the International Society of Horticultural Science (ISHS) has released **Harvesting the Sun: A Profile of World Horticulture**. This full-color, extensively illustrated, 70-page report examines how horticulture touches all of us. **Harvesting the Sun** traces the farm-to-table journey using simple language and informative graphics. It highlights innovations in crop breeding, production, and handling, presenting recent advances in how to control pests and diseases, promote food safety, and minimize post-harvest losses. It explores how horticulture offers myriad paths to economic growth, and offers insights into how the cultivation of plants nourishes the spirit as well as the body.

Horticulture encompasses a remarkable range of technologies, from sacks of soil that allow landless vegetable gardeners to enrich their diet and income, to the automated efficiency of controlled greenhouses, sorting machinery that can sense texture or color, and packaging that combats post-purchase waste by informing customers when produce is at peak ripeness. Horticulture, which offers employment and advancement opportunities at all educational levels, finds itself in a time of transformation. The need for knowledge workers like the 7,500 members of ISHS is growing, even as fewer students pursue academic training in horticulture in many universities around the world. And while the Government-funded extension programs that connect producers with horticultural experts are being cut back in many developed nations, the creation of distance learning networks is allowing farmers in developing countries, many of whom are women, to access global extension services via mobile phones. Like these evolving extension efforts, **Harvesting the Sun** brings the benefits of horticultural science to the attention of a wider audience.

ISHS hopes that its publication will spark new interest in the people and processes that coax fruits, roots, leaves, and flowers to yield health, wealth, and beauty worldwide. We trust that you can use this attractive publication (and the associated brochure) to promote the importance of horticulture and horticultural science to your colleagues, friends, educators, politicians, and policy makers. Their perspectives on your profession will influence future commitments to education, training, and both public and private investment.

This publication is available on line at **www.harvestingthesun.org** – contact ISHS for further information.

NEW TITLES

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

Ananieva, Anna, Gröning, Gert and Veselova, Alexandra (eds.). 2012. Gartenkultur in Russland. International Symposium, 9-11 May 2012, Zentrum für Gartenkunst und Landschaftsarchitektur (CGL), Leibniz Universität, Hannover, Germany. 119p.

Carr, M.K.V. 2012. Advances in Irrigation Agronomy - Plantation Crops. Cambridge University Press, Cambridge, UK. 360p. ISBN 9781107012479 (hardback). £65.00. Receive a 20% discount at www.cambridge.org/carr1

Céspedes L., Cecilia (ed.) 2012. Producción Hortofrutícola Orgánica. Boletín INIA No 232. Instituto de Investigaciones Agropecuarias, Chillán, Chile. 192p. www.inia.cl/link.cgi/Documentos/Biblioteca/5354

Kays, Stanley J. 2011. Cultivated vegetables of the world: a multilingual onomasticon. Wageningen Academic Publishers, Wageningen, The Netherlands. 828p. ISBN 978-90-8686-164-4 (hardback). ISBN 978-90-8686-720-2 (e-book in PDF). € 129. www.wageningenacademic.com/worldvegetables

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

Traditional Food International (TFI-2012) "Traditional foods: from culture, ecology and diversity, to human health and potential for exploitation" including Street Food Seminar "An international forum on street food – aspects and perspectives", 4-5 October 2012, Cesena, Italy. Info: Luigia Binetti – Ser.In.Ar., Email: TFI2012@criad.unibo.it, or Federico Ferioli – UNIBO, Phone: +39 0547 338154 / 338126 or +39 366 5441716, Web: www.tfi-2012.com

The Future of Plant Genomes. Harvesting Genes for Agriculture, 9-11 October 2012, Barcelona, Spain. Info: Dr. Jordi García Mas, Head of the Plant Genetics Department, Center for Research in Agricultural Genomics (CRAG), CSIC IRTA UAB UB Consortium, Campus UAB, Edifici CRAG, Bellaterra - Cerdanyola del Vallès, 08193 – Barcelona, Spain, Email: bdebate2012@cragenomica.es, Web: www.cragenomica.es/news/news.php?year=2012&month=10&id=16

Advanced Course on Olive Oil Marketing Strategies, 12-16 November 2012, Zaragoza, Spain. Info: Mediterranean Agronomic Institute of Zaragoza (IAMZ) – CIHEAM, Avenida Montanana 1005, 50059 Zaragoza, Spain, Phone: +34 976 716000, Fax: +34 976 716001, Email: iamz@iamz.ciheam.org, Web: www.iamz.ciheam.org

XII International Citrus Congress, 18-23 November 2012, Valencia, Spain. Info: Prof. Luis Navarro, President of the International Society of Citriculture and Chairman of the Congress, Email: lnavarro@ivia.es, and Technical Secretariat Citrus Congress 2012, Viajes El Corte Inglés S.A., División de Congresos, Convenciones e Incentivos, Gran Vía Fernando el Católico, no. 3 bajo, 46008 Valencia, Spain, Phone: +34.963.107.189, Fax: +34.963.411.046, Email: citruscongress2012@viajeseci.es, Web: www.citruscongress2012.org

1st International Symposium on Horticultural Insects Management (ISHIM 2012), 19-22 November 2012, Amman, Jordan. Info: The Regional Centre on Agrarian Reform & Rural Development for the Near East (CARDNE), PO Box 851840, Amman 11185, Jordan, Phone/Fax: +962 6 5924348 / 5934708, Email: ishim2012@gmail.com, Web: www.cardne.org

International Seminar on Present and Future of Mediterranean Olive Sector, 26-28 November 2012, Zaragoza, Spain. Info: Mediterranean Agronomic Institute of Zaragoza (IAMZ) – CIHEAM, Avenida Montanana 1005, 50059 Zaragoza, Spain, Phone: +34 976 716000, Fax: +34 976 716001, Email: iamz@iamz.ciheam.org, Web: www.iamz.ciheam.org

XVIII International Plant Protection Congress (IPPC) - Mission possible: food for all through adequate plant protection, 24-27 August 2015, Berlin, Germany. Info: www.ippc2015.de

Int'l Symposia held at Royal Flora Ratchaphruek 2011-12

Royal Flora Ratchaphruek 2011-12 International Horticulture Exposition: Greenitude – To Reduce Global Warming to Save Planet Earth and to Improve the Quality of Life was hosted by Thailand from 14 December 2011 to 14 March 2012. It was held to commemorate the auspicious occasion of His Majesty the King of Thailand Bhumibol Adulyadej's 75 Years of Kingship and His 84th Birthday Anniversary, and to celebrate the 80th and 60th Birthday Anniversaries of Her Majesty the Queen and His Royal Highness Prince Maha Vajiralongkorn. The figures, 84, 80, and 60 are significant in Thai culture; 84 is the 7th 12-year cycle, 80 has special significance as His Majesty's 80th Birthday Anniversary was celebrated during Ratchaphruek 2006, and 60 is the 5th 12-year cycle. The chosen theme, 'Greenitude', was conceptualized for this event to educate people about the effects of global warming and to let them participate in efforts to save planet earth and improve the quality of life. As part of Royal Flora Ratchaphruek 2011-12, five ISHS symposia were organized: the International Symposium on Banana, the International Symposium on Medicinal and Aromatic Plants, the International Symposium on Orchids and Ornamental Plants, the 3rd International Symposium on Papaya and the International Symposium on Tropical and Subtropical Fruits.

INT'L SYMPOSIUM ON BANANA

International participants of the symposium.

Scientists, agriculturists and industry players from different countries and regions gathered on 23-26 January 2012 for the "International Symposium on Banana," held in Chiang Mai, Thailand at Royal Flora Ratchaphruek 2011-12. The symposium was jointly organized by the Thailand Department of Agriculture, HSS-Thailand, ISHS, Bioversity CFL-Philippines, and the Banana Asia-Pacific Network (BAPNET). It aimed to promote the production of high quality bananas and plantains to gain leverage in the domestic and global markets.

In recent decades, food production has become increasingly complex with the rising food demand of the growing population, the rise in per capita consumption, the diminishing resource base and the limited or inaccessible supply of quality food for the majority of the population. The banana industry shares the same concerns.

Globally, banana is considered the most important food in terms of production value after rice, wheat and maize. More than 100 million tons of bananas are produced every year in 120 countries, 13% of which is exported while 87% is consumed where they are produced. Yet, despite its economic importance and potential in securing food especially for marginalized sectors, the industry is not spared from many production and marketing challenges that hinder the continuous productivity and sustainability of the industry.

The International Symposium on Banana was a fitting venue to heighten the global discourse on banana production and marketing. Dr. Stephan Weise, the Deputy Director General-Research of Bioversity International and one of

Opening program of the symposium. From left to right: Woragan Yokying, Vice Gov. of Chiang Mai Province; Virach Chantrasmi, Rep. of Hort. Society of Thailand; Mantana Miln, DDG of the Department of Agriculture, Thailand; Stephan Weise, DDG for Research, Bioversity International; Agustin Molina, Regional Coordinator / Sr. Scientist, Bioversity International - Musa, Asia Pacific and Suwit Chaikiattiyos, Director of the Horticulture Research Institute, Thailand.

The participants on a field trip to the Queen Sirikit Botanic Gardens. Explaining along the way was Dr. Narong Chomchalow of the Horticulture Society of Thailand.

Example of the multiple male budded *Musa* in Thailand, Kluai Roi Pli, found in the Queen Sirikit Botanic Gardens.

the event speakers, stated that the symposium would serve as a platform for exchange of information and knowledge and opened an opportunity to highlight the rich diversity of banana in the Asia-Pacific region and its trade potentials. Dr. Weise added that, "The fruitful collaborations that may arise from the meeting would be another achievement to look forward to in the relentless effort to improve the global banana industry, in the light of improved quality of life, agricultural sustainability and 'Greenitude'."

Thirty-six scientific papers were presented under varying sub-topics covering Climate change and banana production, Integrated pest management, Taxonomy, Molecular tools and breeding, Crop production and management, and Post-harvest.

A one-day field visit on the last day of the symposium punctuated the event with registered participants visiting three interesting sites: 1) Queen Sirikit Botanic Gardens in Chiang Mai, where a wide array of banana germplasm collections, both wild and cultivated varieties, were showcased; 2) Tweechol Botanic Garden, a privately owned botanic garden possessing beautiful and rare collections of ornamental and economic plants in the province; and 3) the Royal Flora Ratchaphruek Chiang Mai International Horticultural Exposition.

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INT'L SYMPOSIUM ON MEDICINAL AND AROMATIC PLANTS

Opening Ceremony. From left to right: Dr. Narong Chomchalow, Prof. Ian Warrington, M.L. Panadda Diskul, Governor of Chiang Mai Province, Mrs. Weena Pongpattananon, Deputy Director-General of Department of Agriculture, Mr. Niwat Sutemechaikul, Deputy Permanent Secretary of Ministry of Agriculture and Cooperatives, Mr. Virat Chantrasmi, Horticultural Science Society of Thailand (HSST), Prof. Ákos Máthé, Chair ISHS Section Medicinal and Aromatic Plants, Prof. Dr. Surapote Wongyai, Guest Speaker.

The picturesque city of Chiang Mai in Thailand has a special meaning for the medicinal and aromatic plant (MAP) profession. It was here that the first declaration for the protection of medicinal plant biodiversity was issued, in 1988. The so-called Chiang Mai Declaration with the motto "Save Plants that Save Lives" has marked a milestone and has made history.

Similarly, the series of horticultural events launched in 2006 under the title Royal Flora and aimed at honoring King Bhumibol Adulyadej's 80th birthday as well as the Diamond Jubilee of his accession to the Thai throne has made Chiang Mai known and famous all over the world.

The International Symposium on Medicinal and Aromatic Plants, organized by the Department of Agriculture, the Horticultural Society of Thailand and the ISHS on December 15-18, 2011, was another high ranking horticultural event held within the framework of Royal Flora Ratchaphruek 2011-12.

Lampang Medicinal Plants Community Hospital.

The symposium, which took place in the conference hall of the Convention Center of the luxurious Royal Empress Hotel, was well attended attracting some 200 participants from 21 countries. The scientific program was introduced by 4 invited keynote speakers. The first keynote presentation was given by Prof. Ákos Máthé (Chair of the ISHS Section Medicinal and Aromatic Plants) who reminded everyone of the importance of the Chiang Mai Declaration for the protection of MAPs. He summarized the main outcome of this declaration, and in particular its impact on environment protection, MAP utilization and research. Further keynote lectures dealt with the rich heritage of Thai medicinal plants (N. Chomchalow), their uses in cancer treatment (A. Itharat) and the important harmonization activities presently going on in the ASEAN countries in the regulation of medicinal products (S. Wongyai).

The subsequent 61 scientific presentations were arranged in the following themes: Natural production and processing technology (4 orals and 27 posters), Pharmacodynamics of natural substances (17 orals and 28 posters), Agriculture and production (40 orals and 22 posters).

In general, nearly all major aspects of MAPs were discussed to some extent, from the biological activity of MAPs, to their genetics, breeding and production. Similarly, natural substances isolated from MAPs were characterized for their chemical composition, antimicrobial and antioxidant activities. Ultimately, various further forms of utilization were discussed, e.g. aromatherapy, neuroprotection, and stress treatment.

Concluding remarks were made by Prof. Chomchalow, Chairman of the Scientific Committee, who provided a detailed survey of all presentations and highlighted the important role played by MAPs in traditional medicine.

The symposium was followed by a one-day field trip to the renowned Bee Product Industry at Lumphun, the Tweechol Botanic Garden at Chiang Mai, the Lampang Elephant Conservation Center at Lampang and Lampang Medicinal Plants Community Hospital. The participants visited medicinal plant processing facilities and a nearby botanic garden with a rich collection of lesser known medicinal plants from Thailand.

A view of the Royal Flora Ratchaphruek 2011-12.

The symposium concluded with a one-day visit to the magnificent flower exhibition of Royal Flora Ratchaphruek 2011-12, a testimony to the love and devotion of Thai people to the treasures of nature, horticulture and, within that, to their rich traditions in the use of medicinal and aromatic plants.

All in all, the International Symposium on Medicinal and Aromatic Plants proved to be a true celebration for the medicinal and aromatic plant profession. The convener is grateful to the organizers, to the Director General of the Department of Agriculture, and in particular to Ms. Peyanoot Naka and the staff from the Horticulture Research Institute, Bangkok.

Ákos Máthé

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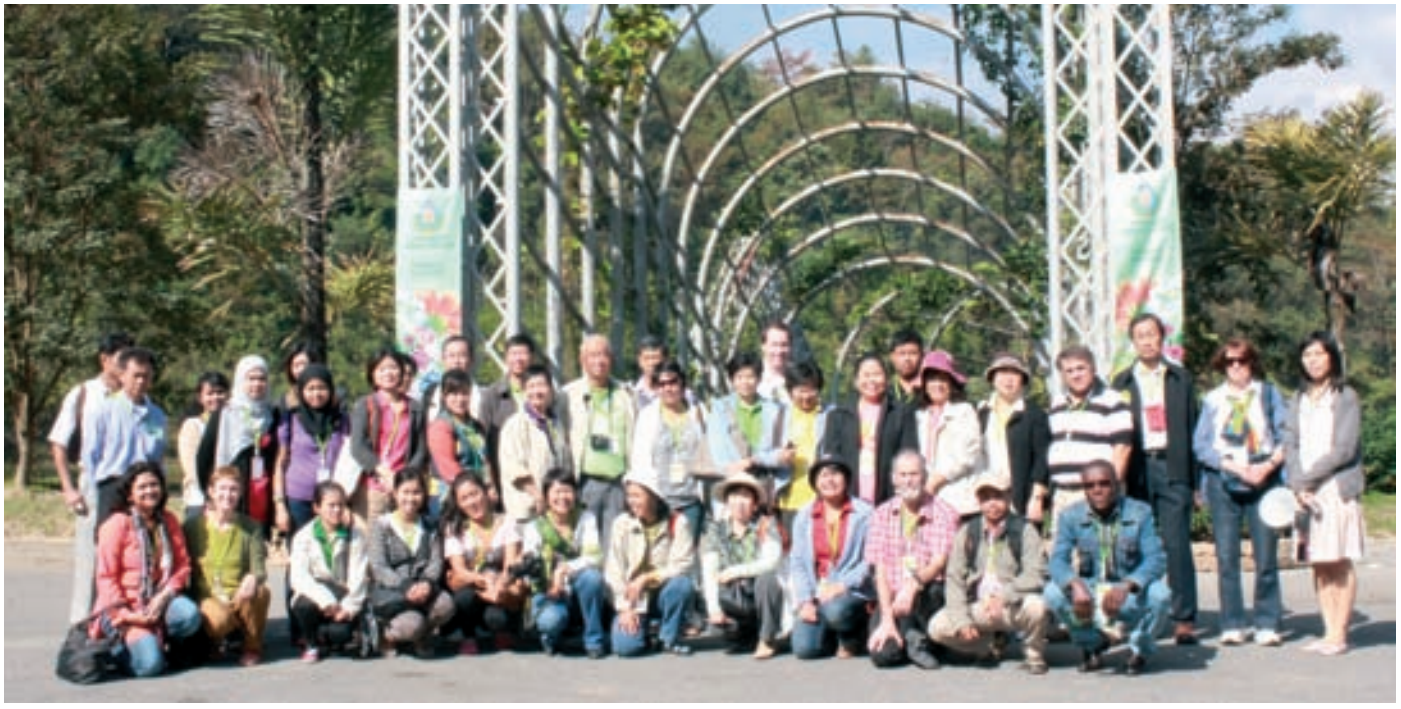
INT'L SYMPOSIUM ON ORCHIDS AND ORNAMENTAL PLANTS



Participants of the symposium.

The International Symposium on Orchids and Ornamental Plants was held on 9-12 January 2012 at the Imperial Mae Ping Hotel, Chiang Mai, Thailand as a side event of Ratchaphruek 2011-12. It was jointly organized by the Ministry of Agriculture and Cooperatives, the Department of Agriculture, and the Horticultural Science Society of Thailand, to share knowledge and experiences related to production and marketing of orchids and ornamental plants, to provide a forum to allow the exchange of valuable views and to provide an opportunity to introduce to people all over the world the rich diversity of orchids and ornamental plants in the region and their trade potentials.

The symposium was attended by 180 participants from Brazil, Indonesia, Iran, Israel, Japan, Malaysia, Myanmar, The Netherlands, Chinese Taipei, the USA and Thailand. It included 25 oral and 27 poster presentations. Notwithstanding the rather limited number of papers presented, the Organizers grouped keynote addresses, invited papers and contributed posters into three themes, namely, Physiology, plant protection and production, Propagation, and Breeding and biotechnology.

Among the many points covered during the meeting, 5 have retained our attention:

- The concept of righteousness and fairness in the conservation of wild tropical horticultural plants was covered and discussed at length.
- Six newly discovered plants that bear the name of HRH Princess Maha Chakri Sirindhorn of Thailand were described. These include three terrestrial orchid species of the new genus, *Sirindhornia*, one malvaceous species that has been merged into the new genus of *Thepparatia*, and two species with the specific epithet of *sirindhorniae*. Planting of the last group in Thailand and in three countries hosting the International Conference on Vetiver was reported.
- Biodiversity of flowering ornamental plants of Myanmar was characterized. Approximately

Opening ceremony.

Keynote and guest speaker.

11,800 species of trees, shrubs, herbs and climbers have been recorded. Flowering and ornamental plants are used for decorative, medicinal, dietary, and religious purposes. Researchers from this country are open to research collaboration.

- A report on biodiversity and the status of Thai native orchids was presented. *Orchidaceae* is the largest family comprising 176 genera and 1,157 species found in all types of habitats, many of which have become increasingly vulnerable. The future of Thai orchids should ensure a balance between conservation and trade demand.
- Advances in orchid improvement in Chinese Taipei were discussed. Economically important orchid genera, among them *Doritaenopsis, Phalaenopsis, Cattleya, Oncidium* alliance, and *Paphiopedilum*, are favoured by the orchid industry for both domestic and foreign markets. Pollen meiotic analysis may be a way to find a better strategy to overcome hybridization barriers in *Phalaenopsis* and *Doritaenopsis* orchids.

A field trip was organized to Queen Sirikit Botanic Gardens at Mae Rim District and Dasada Orchid Nursery at Mae Taeng District. Participants also had the opportunity to visit the Ratchaphruek 2011-12 International Horticultural Exposition, located over an area of 80 ha in the Royal Flora Ratchaphruek Park at Mae Hia Subdistrict, Mueang District, Chiang Mai Province.

Field trip to Queen Sirikit Botanic Gardens at Mae Rim District.

Peyanoot Naka, Narong Chomchalow and Veera Klaipuk

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THIRD INT'L SYMPOSIUM ON PAPAYA

Participants of the symposium at Royal Flora Ratchaphruek 2011-12.

The 3rd International Symposium on Papaya was held on 19-22 December 2011, at the Imperial Mae Ping Hotel in Chiang Mai, Thailand at Royal Flora Ratchaphruek 2011-12. The symposium was organized under the auspices of the ISHS, the Department of Agriculture, the Ministry of Agriculture and Cooperative and the Horticulture Society of Thailand. The symposium was attended by 101 participants from US, Mexico, Fiji, Kenya, Australia, India, Malaysia, Chinese Taipei, Philippines and Thailand.

Maureen Fitch, from the Hawaii Agriculture Research Centre, discussed the development of GMO papaya in the USA. Dr. Chan Ying

Discussion session.

Poster session.

Organizing Committee at the opening session. From left to right: Dr. Suwit Chaikiattiyos, Director of Horticulture Research Institute, Mr. Virach Chantrarasmi, representative from HSST, Dr. Manthana Miln, Deputy Director General of Department of Agriculture, Prof. Dr. Sisir Mitra, Chair ISHS Section Tropical and Subtropical Fruits representing ISHS, and Mr. Woragan Yokying, Vice Governor from Chiang Mai Province.

Kwok, Head of R&D at the Malaysian AgriFood Corporation Berhad, presented a detailed account of the successful production of hybrid papayas in Malaysia. Dr. Songpol Somsri from the Department of Agriculture in Thailand, presented an overview of the current status of papaya production in this country. The breakdown of transgenic resistance of papaya by super strains of *Papaya ringspot virus* and its solution was discussed by Professor Shyi-Dong Yeh of Chinese Taipei, while Prof. Sisir Mitra of India discussed the recent development in post-harvest technology of papaya.

During the next four days, oral and poster presentations dealt with papaya breeding, physiology, post-harvest and production technology. A tour was organized to visit papaya germplasm collections at the Royal Agricultural Research Centre, Doi Kum and the Triangle Seed Limited Partnerships responsible for the production of papaya seed at Lampun. The participants also enjoyed a visit to the Ratchaphruek 2011 International Horticultural Exposition, located over an area of 80 hectares in Royal Flora Ratchaphruek Park in Chiang Mai.

Peyanoot Naka, Narong Chomchalow, Veera Klaipuk and Sisir Mitra

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INT'L SYMPOSIUM ON TROPICAL AND SUBTROPICAL FRUITS

Invited speakers, Organizing Committee, Chiang Mai Province and ISHS representatives.

Invited speaker Dr. Songpol Somsri talking about tropical fruits in Thailand.

Participants during an oral session.

The International Symposium on Tropical and Subtropical Fruits was held on 19-22 December 2011 at the Imperial Mae Ping Hotel in Chiang Mai, Thailand at Royal Flora Ratchaphruek 2011-12. The symposium was organized under the auspices of ISHS, the Department of Agriculture, the Ministry of Agriculture and Cooperative and the Horticulture Society of Thailand. The symposium was attended by 198 participants from US, Australia, India, Malaysia, Indonesia, Japan and Thailand.

In the opening ceremony, Mr. Woragan Yokying, Vice Governor of Chiang Mai, welcomed the delegates, while the opening address was presented by Mr. Jirakorn Kosaisawe, Director-General of the Department of Agriculture.

After the inaugural session, a keynote lecture was presented by Professor Manshardt, USA, entitled "Advances in tropical and subtropical fruit biotechnology". Another invited lecture dealt with "Tropical and subtropical fruits and human health" by Professor Sisir Mitra, India. Dr. Somsri discussed "Tropical and subtropical fruits production in Thailand: GAP".

On the second day, Professor Robert Paull from the USA, presented a discussion on the "Recent advances in postharvest management of papaya". Over the two days, a total of 35 oral and 40 posters were presented under the themes physiology, plant protection, crop improvement, and post-harvest technology.

On the final day, participants visited the Mae Jo Longan Center, of the San Sai District in Chiang Mai and also a longan orchard in Doi Loh. The participants also enjoyed a tour to Royal Flora Ratchaphruek 2011-12 on the last day of the symposium.

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Fourth Int'l Symposium on Medicinal and Aromatic Plants (SIPAM 2012)

Participants of the symposium.

Since the official launch of the concept of regular regional symposia on medicinal and aromatic plants (SIPAM) by the Arid Land Institute (IRA) in 2004, three symposia have been successfully organized by IRA and its partners. These meetings were open to all those working in the field of medicinal and aromatic plants (MAPs) with the objective of promoting conservation and appreciation of the value of medicinal and aromatic plants, emphasizing the role to be played by them in sustainable economic development. These meetings also aimed to improve the exchange of information between different national and international stakeholders working in the field of MAPs.

H.E. Ing. Habib Jemli, State Secretary of Agriculture, officially opened SIPAM2012. From left to right: Ferjani Nabil, Governor of Médenine, H.E. Ing. Habib Jemli, Prof. Ákos Máthé, Chair of ISHS Section Medicinal and Aromatic Plants, Dr. Rachid Serraj, Regional Coordinator ICARDA North Africa Regional Program representative.

First scheduled to take place on March 24-26, 2011, the fourth symposium (SIPAM 2012) was postponed to March 22-24, 2012 because of the political situation in Tunisia. The symposium was co-organized by IRA and ISHS under the auspices of the Ministry of Agriculture (IRESA) and with the support of several sponsors.

Different issues on agro-ecobiology of MAPs were examined, including extraction and valorisation of natural compounds, commercialization and socio-economical aspects, and regulatory and normative requirements related to MAPs. Seventeen oral and 41 poster presentations were given by scientists and researchers from different parts of the world during the two days of the symposium.

The first day of the symposium was devoted to several presentations on the application and valueing of natural compounds in different industries, including the food industry, pharmacy, and cosmetics, and on reports of phytotherapy in traditional use of MAPs and in alternative medicine. A poster session was scheduled for

Poster session.

Post symposium excursion in Matmata Mountains (South East of Tunisia), a MAPs genetic reserve.

ISHS representative Prof. Ákos Máthé presented the ISHS medal to Prof. Houcine Khatteli (left) and Prof. Mohamed Neffati (right), Conveners of SIPAM2012.

the afternoon. The three best posters were selected and awards were presented during the closing ceremony.

The second day of the symposium was devoted to presentations on MAPs and animal health, MAP chain value, socio-economical and regulatory aspects, and normative requirements.

A field trip was organized during the third day of the symposium to selected stations in Matmata Mountains, which is the location of a unique MAPs genetic reserve. During the excursion, the participants were guided by a distinguished colleague who had a profound knowledge of the region.

Mohamed Neffati and Abdelkarim Ben Arfa

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Section Medicinal and Aromatic Plants

Int'l Symposium on Medicinal and Aromatic Plants: History of Mayan Ethnopharmacology

The International Symposium on Medicinal and Aromatic Plants that took place in Antigua, Guatemala on November 20-23, 2011 under the aegis of ISHS gave the participants the opportunity to increase their knowledge of medicinal and aromatic plants found in Central and South America. The opening ceremony started with short remarks delivered by Jalal Ghaemghami, President of SHMEN. Before dinner Armando Cáceres, Chair of the Scientific Committee, welcomed guests and dignitaries from various academic and government organizations. He then invited Enrique Acevedo, President of Guatemalan Academy of Sciences, to talk about the importance of medicinal plants and cultural heritage. Acevedo encouraged participants to get involved and to foster scientific interest of young scientists in Guatemala.

On Monday November 21, 2011 the symposium started with the welcoming speech of Jalal Ghaemghami, who stressed the importance of this kind of symposia that bring together international scientists. A total of 19 presentations on different topics such as ethnobotany, agrotechnology, phytochemistry and pharmacology of medicinal and aromatic plants of Latin America were given. The first, and one of the most interesting lectures, was entitled "Ancient Mesoamerica cosmetics: Plants for beauty and body care", given by Lucrecia Pérez

National participants and organizers.

International participants.

de Batres from Guatemala. She demonstrated the importance of the tropical flora of the New World and its day-to-day uses by the natives in cosmetology and health.

Joanna Michel from the University of Illinois in Chicago conducted her work in Livingston, Izabal, Guatemala, with the help of the NGO *Ak Tenamit*. She explained the importance of plant conservation and how to raise public awareness about medicinal and other uses of plants by education and information. She elaborated on the plants used for women's health and the difficulties encountered to conduct work in the communities.

Armando Cáceres was the second national lecturer who talked about the "Antioxidant activity and quantitative composition of extracts of *Piper* species from Guatemala with potential use in natural product industry". His presentation examined the endemic native species of the genus *Piper*. His research dealt with the whole plant, including both roots and leaves. The former contained significant quantities of piperine, and the next phase of his research will focus on the extraction and quantification of piperine in *Piper* in this organ.

Claudia Alvarez and Adriana Osorio, both from Colombia, presented an interesting discussion on vanilla. Using proteolytic microorganisms as potential biofertilizers and microbial inoculation, they reported increases in vanilla pod growth, which could have an impact on this crop, one of the most important aromatic plants in the world. They also explained that little is known in Colombia about the agronomical requirements and nutrient management of vanilla. They reminded us of the Central American botanical origin of this plant.

Carolina Valdez presented her research on the "Chemical and molecular evaluation of three species of genus *Phlebodium* and *Polypodium* from Guatemala", explaining the value of these ferns belonging to the *Polypodiaceae* family,

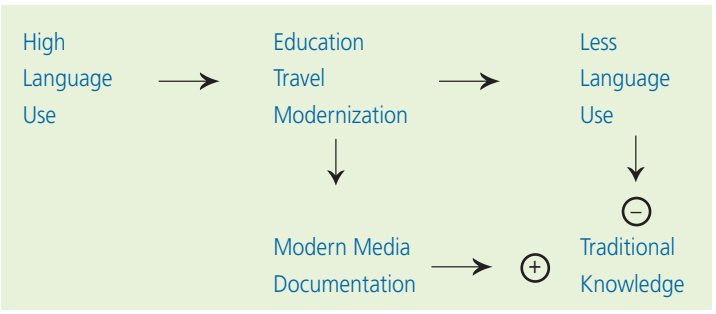
Dr. Jalal Ghaemghami (center) with invited speakers Dr. Nazim Mamedov (left) and Dr. Lyle E. Craker (right).

which are a non-woody forest resource with a long tradition of use in medicine.

Andrew Semotiuk introduced the idea that losing a language often means losing the knowledge and history of entire communities such as Q'eqchi' and Mopán Maya. They examined the literature available at the Academy of Mayan Language of Guatemala (Academia de Lenguas Mayas de Guatemala) and found a large number of dictionaries, but limited publications on the language pertaining to ethnobotany. Therefore, Semotiuk assessed how language use is changing in communities of Q'eqchi' and Mopán Maya and the importance of the indigenous language and culture in traditional medicine training, using the following model.

Other presentations focused on agrotechnology, phytochemistry and pharmacology of medicinal and aromatic plants from Latin America. Dr. Cáceres provided information about the antioxidant activity of 24 native Guatemalan plants. He was also involved in a research report that was provided by Nereida Marroquín, who investigated the presence of flavonoids and phenolic compounds in *Passifloraceae*. A copy of abstracts for these presentations was provided to all participants from 30 national and international research groups.

Many participants expressed their interest in partnering with the organizers of the symposium to spread their scientific network in Central America and neighboring regions. They were enthusiastic to join ISHS and wanted to participate in the next symposium in Quito, Ecuador. Topics, including developing a new series of symposia where newly established connections could be fostered and sustained, and developing new lines of research in multidisciplinary fields including veterinarian medicine, international law and environmental science, were also discussed during the symposium in Antigua. Professor Cáceres and Dr. Ghaemghami welcomed those proposals and convened a number of planning and business meeting sessions during the last day of the event. The preliminary report summarizing new objectives and goals for a series of symposia was shared with all



participants at the closing ceremony. The report included announcements of the following steps:

- Formation of a new working group within ISHS titled: Medicinal Plants and Natural Products.
- Proposing the next symposia be held in the following countries and time frame:
  - Quito, Ecuador December 2012
  - Montreal, Canada June 2013
  - Cuzco, Peru September 2013
  - Bogotá, Colombia March 2015
- Providing writing workshops in English to assure high quality manuscripts for publication in *Acta Horticulturae*.
- Offering short courses in natural sciences and horticultural technology.
- Integration of discussions and round-table sessions on medicinal plants, pharmacopeia and practical approaches to build collaboration among social science experts, historians and our colleagues with expertise in pharmacognosy.

The closing ceremony included a round-table conversation on the importance of creating multidisciplinary programs at each event in the future. The symposium was adjourned after delivery of appreciation gifts to students to acknowledge their valuable input and roles in producing the event.

Carlos Palencia, Mónica Montenegro and Keila Abdalla

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Quito, Ecuador December 3-6, 2012

Int'l Postharvest Symposia in Thailand

The Second International Conference on Quality Management in Supply Chains of Ornamentals (QMSCO), the First Southeast Asia Symposium on Quality Management in Postharvest Systems (SEAsia), the Asia Pacific Symposium on Postharvest Quality Management of Root and Tuber Crops (APS) and the First International Symposium on Postharvest Pest and Disease Management in Exporting Horticultural Crops (PPDM) were held at the Golden Tulip Sovereign Hotel, Bangkok, Thailand during 21-24 February 2012. These meetings were organized by the Division of Postharvest Technology, King Mongkut's University of Technology Thonburi (KMUTT), under the auspices of the International Society for Horticultural Science (ISHS). These symposia were postponed from December 2-5, 2011 due to the serious flooding crisis.

At the opening ceremony, Assoc. Prof. Dr. Bundit Fungtammasan, Vice President of KMUTT, welcomed 130 participants from more than 23 countries to the symposia. Prof. Dr. Errol Hewett, Secretary of the ISHS Board, Responsible for Innovation, Industry and Insight, gave an update on ISHS activities. Participants and accompanying persons were entertained at a welcome reception featuring a wide variety of wonderful Thai food and Thai classical music and dance, performed by graduate students from the Division of Postharvest Technology, KMUTT.

The proceedings of the symposia will be published as volumes of *Acta Horticulturae*.

SECOND INTERNATIONAL CONFERENCE ON QUALITY MANAGEMENT IN SUPPLY CHAINS OF ORNAMENTALS

In the first keynote presentation, Prof. Dr. Errol Hewett from Massey University, New Zealand, gave a perspective of "Postharvest Innovation to Contribute to Product Quality and Safety" and, hence, contributed to the future success of horticultural system production for both local and exporting markets. Dr. David Clark, University of Florida, USA, presented his paper on "Utilizing Consumer-Assisted Selection and Biotechnology to Deliver the Next Generation of Fragrant Flowers". Prof. Dr. Gianluca Burchi, CRA-VIV Landscaping Plants and Nursery Research Unit, Italy, delivered an address on his experience with "Preharvest Condition to Improve the Postharvest Quality of Flowers".

The conference brought together many eminent researchers and industry experts from several disciplines to discuss genetics and new varieties, state-of-the-art production systems, pre- and postharvest physiology, and the molecular genetics approach to improve quality for the ornamental industry. Consideration was also given to the potential of a molecular approach

Invited and oral presenters of the symposia.

to quality improvement of cut flowers and potted ornamental plants. The final day of the conference was comprised of a study tour of Thailand's orchid and leafy ornamentals industry at Samutsakorn and Ratchaburi Provinces.

This International Conference on Quality Management in Supply Chains of Ornamentals was highly valued, as exemplified by the attendance of internationally recognized scientists from many countries. This conference emphasized the need for quality management throughout the supply chain, and participants recognized the need for a conference of this sort focused on ornamentals.

FIRST SOUTHEAST ASIA SYMPOSIUM ON QUALITY MANAGEMENT IN POSTHARVEST SYSTEMS

The first three days of the First Southeast Asia Symposium on Quality Management in Postharvest Systems were devoted to 35 oral and 46 poster presentations on several topics. Prof. Dr. Robert E. Paull, University of Hawaii, USA, delivered his experience on quality management during postharvest handling and storage of tropical fruits and vegetables. Dr. B. Bruckner, Leibniz Institute of Vegetable and Ornamental Crops, Germany, gave a perspective of consumer oriented fruit and vegetable quality. Dr. S.J.R. Underhill, University of the Sunshine Coast, Australia, presented his paper on developing a horticultural quality management system in the Pacific region. There was considerable discussion among the symposium delegates on quality management and food safety, storage and transport technology, postharvest physiology and molecular biology, quality manipulation and monitoring in process, and logistics and distribution systems. Consideration was also given to automation technologies and agricultural product information in postharvest systems. The final day of the symposium was a study tour to the young coconut export-

Poster viewing at the symposia.

Prof. Dr. Chris Hale (left) representing the ISHS awarded the certificate for the best poster to presenter Dr. A. Dechakhamphu at the PPDM symposium.

Thai traditional dance at the welcome reception.

ing company in Samutsakorn province and to the wholesale market "TalaadSrimuang" in Ratchaburi province.

ASIA PACIFIC SYMPOSIUM ON POSTHARVEST QUALITY MANAGEMENT OF ROOT AND TUBER CROPS

For the Asia Pacific Symposium on Postharvest Quality Management of Root and Tuber Crops, the number of participants and papers was reduced because of the postponement of the meeting schedule due to the serious flooding crisis. However, the symposium was attended by 60 participants representing 15 countries, with 8 oral and 7 poster presentations. The scope of the symposium covered quality management, storage and transport technology, value addition and innovations in agro-processing, and market and distribution systems for root and tuber crops.

FIRST INTERNATIONAL SYMPOSIUM ON POSTHARVEST PEST AND DISEASE MANAGEMENT IN EXPORTING HORTICULTURAL CROPS

The First International Symposium on Postharvest Pest and Disease Management in Exporting Horticultural Crops was devoted to 26 oral and 27 poster presentations. Most presentations were about postharvest diseases, more so than postharvest pests or insects. The number of participants at this symposium was 148. Prof. Dr. Samir Droby, Agricultural Research Organization, The Volcani Center, Israel, delivered his research experience about the development and commercial application of yeasts as biocontrol agents of postharvest diseases of fruits and vegetables. Prof. Dr. Arnold Hara, University of Hawaii at Manoa, USA, gave a presentation on heat as a sustainable postharvest disinfestation treatment for export horticultural crops. Dr. Stephen Ogden, Market Access Solutionz Ltd., New Zealand, gave a presentation on innovation in horticultural market access. Prof. Dr. Tsuyumu Shinji, Shizuoka University, Japan, delivered his experience on molecular, biological and nano-technological studies on postharvest diseases. Mr. Pathom Taenkam, President of the Thai Fruit & Vegetable Producer Association, Thailand, shared his experience on postharvest management of fresh produce for exporting. For the poster session, all presenters had to make a brief oral presentation about their research for 3-5 minutes in front of the poster judges (keynote speakers, invited speakers and representative from ISHS) and the symposium participants, and answered questions from the attendees. The duty of the judges was to evaluate the quality of the research on the basis of benefits, attractiveness, and application. Three of the best posters received the ISHS certificate, which was signed by the symposium Convener and Prof. Dr. Chris Hale, Chair of the ISHS Commission Plant Protection. The symposium aimed to build the network between researchers and industry experts doing research to solve

Prof. Dr. Errol Hewett presenting the ISHS certificate and medal to Convener of QMSCO, SEAsia and APS symposia, Dr. Sirichai Kanlayanarat (left) and Convener of PPDM symposium, Dr. Pongphen Jitareerat (right).

Study tour of leafy ornamentals in Rachaburi province.

Study tour to Air Orchid & Lab (Wholesaler & Exporter) at Nakhon Pathom Province.

SUCCESSFUL HORTICULTURAL BUSINESS MANAGEMENT WORKSHOP

Participants attending the Horticultural Business Management Workshop in Bangkok, Thailand.

The ISHS Commissions Education Research Training and Consultancy, Economics and Management and Quality and Post Harvest Horticulture incorporated a successful "Horticultural Business Management Workshop" as part of the multiple international symposia on SEAsia2012, QMSCO2012 and PPDM2012, which were held from February 21-24, 2012 at the Golden Tulip Sovereign Hotel, Bangkok, Thailand. Twenty-five registrants participated in the workshop which was held on February 22, 2012. The workshop, facilitated by Dr. Peter Oppenheim (Chair, Commission Economics and Management), introduced the participants to a variety of business management concepts and techniques. Among the topics covered were: the need for growers to develop a business strategy, techniques used to analyze on-farm and off-farm opportunities, horticultural production planning and financial planning and control using whole farm budgeting methods. The workshop added value to the symposia and can easily be adapted to local conditions in countries around the world. Further information may be obtained from the Chair, Commission Education, Research Training and Consultancy, Adjunct Associate Professor David Aldous on dealdous@gmail.com

David Aldous

the problems of horticultural crops caused by postharvest diseases and pests in the future. The last day of the symposium was a study tour to visit the exporting company, Chatchawan Import, Export and Packaging Ltd., in the morning and Air Orchid & Lab (Wholesaler & Exporter) in the afternoon at Nakhon Pathom Province.

Sirichai Kanlayanarat, Mantana Buanong, Chairat Techavuthiporn and Pongphen Jitareerat

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Eleventh Int'l Symposium on Flower Bulbs and Herbaceous Perennials

Symposium participants on the stairs of the hotel venue.

The XIth International Symposium on Flower Bulbs and Herbaceous Perennials was organized and convened by Prof. Dr. Ibrahim Baktir of Akdeniz University on 28 March-1 April in Antalya, Turkey with ample support from a very efficient and friendly local committee. All attendees are especially grateful to Prof. Dr. Semra Mirici, who served as symposium secretary. The symposium was very well attended, with over 200 participants originating from 27 countries. Five invited speakers, 61 oral and 168 poster presentations were made overall.

The opening session of the symposium was combined with a meeting of The International Association of Horticultural Producers (AIPH) and the official beginning of preparations for the 2016 World Botanical Expo in Antalya. The Turkish Minister of Food, Agriculture and Live Stocks did the great honor of opening the symposium.

During the symposium, the presentations reported on recent advances and the most interesting topics relating to the development, production, disease prevention, disease control, and post-harvest of ornamental geophytes in different countries. The scientific reports and discussions certainly enriched our knowledge of plant biology, bulb production and ornamental horticulture in general. The main themes of the meeting were biology of geophytic plants (especially in areas of taxonomy and ecology), horticultural management (bulb production, forcing, post-harvest handling), molecular biology (especially as related to breeding), and breeding. Talks and posters were spread over 4 days, interspersed with professional tours.

About 25% of the oral program was devoted to reports on biology and horticulture of a broad range of Turkish native geophytic plants. Turkey represents a very special case in floriculture. For many years, only bulbs collected in the wild were exported but, after 1990, the Turkish government decided to limit bulb collecting from native populations, and now a significant proportion of bulb export is generated from commercial production. Turkey is very rich in natural resources of ornamental geophytes, some of which might be developed as new ornamental crops in the future.

The major single genus covered in the oral sessions was *Lilium* (ca. 20% of the talks), and presentations on breeding and genetics dominated. The fundamental advances in molecular breeding and the revolution in the world lily industry was presented by Jaap van

Prof. Dr. Ibrahim Baktir, Convener, gave flower bouquets to organization committee members for their excellent work for the symposium.

Visit to Geophyte Paradise of the Western Taurus Mountain at altitude of 1550 meter.

Visit to Batı Akdeniz (Western Mediterranian) Agricultural Research Institute, Antalya.

Tuyl from Wageningen. An interesting discussion on research funding was stimulated by Rina Kamenetsky and Hiroshi Okubo's presentation on "Current status of research in ornamental geophytes". This topic was prompted by the imminent release of a new book, "Ornamental Geophytes: From Basic Science to Sustainable Production". In total, it seems many more scientists are involved in flower bulb research in emerging production regions (e.g., Southeastern Asia, Chile, Brazil, Turkey), where horticulture is seen as a favorable avenue for economic development, and adequate research funding is available through many agencies.

Symposium participants enjoyed the excellent meeting facilities of the Rixos Downtown Antalya Hotel. Rooms overlooked the Mediterranean Sea, with snow-covered mountains in the near distance. There was an active art program as part of the meeting, with a variety of presentations, posters, and hands-on activities (Ebru) dedicated to floral art, especially centered on the tulip and its importance in Ottoman art and history.

Two professional tours were organized during the symposium. In the first, participants visited the Duden waterfall and enjoyed the impressive flow of water through a variety of natural and man-made channels. Afterwards, participants visited Aspendos Roman Amphitheatre (2nd century, capacity of 12,000 persons) and were wonderstruck by its size and splendor. Visits to a cut flower grower (roses and anthurium) and a producer of young plants allowed attendees to learn more about systems of protected floricultural cultivation in the Mediterranean climate.

In a second tour, participants visited a natural reserve of geophytic plants near Ibradi (ca. 1,500 meter elevation) where they saw *Crocus chrysanthus, Galanthus elwesii, Cyclamen coum* and *Eranthis cilicica* as wildflowers in the snow-shadow beneath juniper trees. Because of an unusually heavy snowpack, the participants had to clamber over 0.75-1 meter of snow, but were still amazed by the "wildflower bulb gardens". At the lunch function in Ibradi, which was hosted by the local government and dignitaries, the participants honored the careers of Antonio Grassotti (Italy) and Hiroshi Okubo (Japan), who are retiring this year. Both had convened international symposia through the WG and will be greatly missed at future symposia. Following lunch, the group toured local buildings that were constructed using traditional techniques, and a foundation that promotes traditional weaving and handicrafts. Perhaps the highlight, and certainly an unusual event for an ISHS symposium, was the rafting trip into the Altinbesik cave and the certainty that the majority of the world's flower bulb researchers would drown! In the end, all survived and many enjoyed their first rafting trip.

In the business meeting of the Working Group (WG), Dr. Rina Kamenetsky was elected Chair for the next 4-year term and Bill Miller "retired" after two terms as Chair. For the XIIth Symposium, delegates voted to accept the bid from China, presented by Dr. Mu Ding of the Chinese Academy of Agricultural Sciences, to host the meeting in Kunming (Yunnan) in the spring of 2016.

William B. Miller, Ibrahim Baktir and Rina Kamenetsky

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Tenth Int'l Symposium on Plum and Prune Genetics, Breeding and Pomology

Participants of the ISHS Tenth International Symposium on Plum and Prune Genetics, Breeding and Pomology, held at University of California, Davis (photo by Laurie Friedman, Friedman Fotography).

The Tenth International Symposium on Plum and Prune Genetics, Breeding and Pomology was a continuation of a series of symposia on plum sponsored by ISHS beginning in 1967. This meeting was held on May 20-25, 2012, on the campus of UC Davis and was jointly sponsored by ISHS and the Department of Plant Sciences, UC Davis. Previous symposia in this series largely focused on European plums/prunes and were all convened in Europe. With the increased international interest in *Prunus salicina* for the fresh market and the meeting venue in California, this meeting broadened the focus to include both Japanese and European plums. Participants appreciated the broader research coverage and felt that there were advantages to incorporating both plum species in the symposium.

The meeting was organized to coincide with a meeting of the International Prune Association (www.ipaprunes.org) and the two groups met together for a morning session that was dedicated to presentations addressing various scientific approaches for dealing with Plum Pox Virus and an afternoon field trip. Combining of the two groups provided a unique opportunity to have an international group of prune/plum researchers to interact with an international group of entrepreneurs focused on prune production, handling and marketing.

The two groups shared an afternoon together on a local tour that started off with lunch at the historical Wolfskill homestead site in Winters, California, now the current home of the UC Experimental Orchard Station and the USDA National Clonal Germplasm Repository of fruit and nut crops. They toured the station on tractor-pulled hay wagons, visiting the UC

Dr. Ted DeJong speaking on the history of the Wolfskill Experimental Orchard (photo by Carolyn DeBuse).

Touring Wolfskill Experimental Orchard, Winters, California by hay wagon (photo by Laurie Friedman, Friedman Fotography).

Mechanical fruit thinnig using an almond shaker at a commercial prune orchard near Winters, California (photo by Laurie Friedman, Friedman Fotography).

plum/prune breeding program orchard and the *Prunus* collection in the repository. After this the groups visited a prune orchard where mechanical fruit thinning was in progress and the afternoon ended with a stop at a commercial prune dryer.

While the attendance was lower than hoped for, eleven countries were represented and there were forty-five scientific presentations covering a broad range of topics including genetics, breeding, germplasm evaluation, pest and disease management, orchard management and postharvest handling. The scientific highlight of the meeting was the keynote address by Dr. Ralph Scorza on "Advances in the genetic improvement of *Prunus domestica* utilizing genetic engineering" and other talks regarding scientific progress made on combatting plum pox virus. As with most ISHS symposia, the meeting provided extensive opportunities for networking and this was particularly the case during this event since parts of the meeting were combined with the IPA group.

The three-day scientific symposium was followed by an optional two-day excursion to the major plum/prune production areas and research facilities in southern San Joaquin Valley. California grows more than 90% of fresh market plums and plums/prunes for drying that are produced in the United States. So, participants were provided the opportunity to see a broad array of nursery practices, commercial and university-run breeding programs, orchard management systems and research projects pertaining to fresh market plum and prune production as well as numerous other tree crops.

Ted DeJong and Carolyn DeBuse

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Section Tropical and Subtropical Fruits – Commission Plant Genetic Resources
Third Int'l Symposium on Guava and other Myrtaceae

The Third International Symposium on Guava and other Myrtaceae, held on 23-25 April, 2012 in Petrolina, Brazil, attracted 120 participants from eight countries (Brazil, Canada, India, Mexico, Spain, South Africa, Chinese Taipei and USA). The symposium was convened and organized by Embrapa Semiarido under the auspices of ISHS. The symposium was also co-sponsored by Pernambuco Science and Technology Funding Agency (FACEPE), Brazilian Science and Technology Funding Agency (CNPq), Secretaryship of Agriculture and Agrarian Reform for the Pernambuco State, Bank of Northeast of Brazil (BNB) and Federal University for the São Francisco River Valley (UNIVASF).

The opening ceremony was attended by Robert Coelho Correia (Embrapa Semiarido Head representative), Dr. Carlos A.F. Santos (symposium organizer), Professor Sisir Mitra (Chair, ISHS Section Tropical and Subtropical Fruits), Ebis Dias (Advisor for the Agricultural Secretary of Pernambuco State), Joao Santana Tosta (Codevasf, Juazeiro), Edios Ken Matsumoto (São Fransciso River Valley Fruit Chamber Coordinator) and Telio Nobre Leite (Univasf Vice Chair).

Participants enjoyed oral presentations, posters and professional tours during the three days of the symposium. There were a total of 57 papers (9 keynote lectures, 22 oral presentations and 26 posters), which were organized in five sessions:

- Session I: Myrtaceae Genetic Resources
- Session II: Myrtaceae Pests, Diseases and Nematodes

Participants of the symposium.

- Session III: Myrtaceae Plant Breeding and Post-harvest Management
- Session IV: Myrtaceae Biotechnologies and Genomics
- Session V: Myrtaceae Crop Management and Market

On day one, Dr. Padila Ramirez (INIFAP, Mexico) kicked off the meeting with an enthusiastic presentation entitled "International market of fresh and processed guava: Challenges and perspectives for the Mexican case". Dr. Ramirez highlighted many important issues to improve the outlook for the future of Mexican guava. Subsequently, Prof. S.K. Mitra (Chair, ISHS Section Tropical and Subtropical Fruits) delivered the lead lecture on "Taxonomy and importance of Myrtaceae", in which he suggested that some of the important species in genus *Eugenia, Syzygium* and *Feijoa*, other than *Psidium*, have enormous potential for exploitation. In another session on Pests, Diseases and Nematodes, Regina Maria (Embrapa, Brasil) presented "Major guava nematodes: Genetic control perspectives". The session highlighted the serious problem of guava nematodes, particularly in countries like Brazil and Mexico. Dr. Maritha Schoeman (South Africa) gave an overview of guava wilt diseases in South Africa and also suggested screening for resistance and improved management practices.

On day two, Prof. S.K. Mitra presented a key-note speech on "Post-harvest management of guava: Present status and future needs", which concluded that current technology can preserve fruit firmness for up to 2-3 weeks, which is considered adequate for domestic marketing. However, for export to distant markets, the existing technology needs to be improved. Celso Pommer (UFERSA, Brazil) made an exciting presentation on "Guava world-wide breeding: Major techniques and varieties and future

Poster session.

Participants visiting a guava orchard.

Medal award to Rebert Coelho, Embrapa Semiarido representative.

challenges". In the afternoon, Enrique Ritter (NEIKER, Spain) presented a detail account of "Guava biotechnologies and genomic achievements and future needs". Dr. Ritter stated that at this stage, there are only 58 nucleotide, 22 GSS and 9 protein sequences available for *P. guajava* and only a few more for other *Psidium* species. Continuous decrease in sequencing costs will certainly stimulate the generation of new genomic resources in the near future.

On the last day of the symposium, Dr. Léon-Étienne Parent (HRC, FSAA, Canada) presented a new nutrient balance model to facilitate interpreting relationships between plant, soil and management in guava production. Finally, participants boarded coaches to visit guava orchards and the processing factory of Jose Carlos Valente: Paluma Industria e Comercio Ltda, Petrolina, PE.

During the closing session, participants decided that the Fourth International Symposium on Guava and other Myrtaceae will be held in South Africa in 2015.

Sisir Mitra and Carlos A.F. Santos

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Section Tropical and Subtropical Fruits – Commission Education, Research Training and Consultancy

Fifth Int'l Symposium on Tropical and Subtropical Fruits

The symposium opening ceremony.

The 5th International Symposium on Tropical and Subtropical Fruits (ISTSF) was held in Guangzhou, China, on 18-20 June 2012. It was organized by the Institute of Fruit Tree Research, the Guangdong Academy of Agricultural Sciences (IFTR-GDAAS), the International Tropical Fruits Network (TFNet), the International Society for Horticultural Sciences (ISHS), the Hunan Agricultural University and the Guangdong Fruit Association.

A total of 230 participants from 25 countries attended the symposium, coming from Australia, Bangladesh, Brazil, China, Fiji, Italy, Malaysia, Sudan, Thailand and the USA. Participants hailed from renowned academic and research institutions, international organizations, government agencies and the private sector.

A total of 65 oral presentations were delivered at two concurrent sessions and 57 posters were displayed in the exhibition area. The oral and poster presentations were categorized into 6 major topics: germplasm, diversity and breeding; molecular biology and biotechnology; production technology and physiology; postharvest and processing technology; pest and disease management; and economics, marketing, and trade.

"The industry of tropical and subtropical fruits has become one of the most important pil-

Participants during the opening ceremony.

Sisir Mitra, Chair ISHS Section Tropical and Subtropical Fruits, leading the closing session.

lar industries in producing regions, having a huge market around the world," said GDAAS President Jiang Zongyong during his opening remarks. He added that as diseases and climate change threaten the industry, the symposium provided an avenue for stakeholders to exchange valuable information.

"The potential for development of tropical and subtropical fruits depends on continuous improvement in technology for production and postharvest management," said ISHS Section Tropical and Subtropical Fruits Chair, Sisir Kumar Mitra. He added that "Global partnerships are imperative to integrate scientific and technological innovation".

Other special guests in the opening ceremony included Malaysian Secretary General for Agriculture HE Dato' Mohd Hashim Abdullah, Liu Yan from the Chinese Ministry of Agriculture, Hunan Agriculture President Zhou Qingming, Cheng Ping from the Guangdong Department of Agriculture, Zhong Xiaoping from the Guangdong Department of Science and Technology, and TFNet CEO Yacob Ahmad. GDAAS Vice President and Convener Yi Ganjun chaired the ceremony.

FAO Senior Economist Kaison Chang chaired the first session that featured keynote papers dealing with "Challenges and Issues in Developing the Tropical and Subtropical Fruit Industry in China" by Deng Xiuxin, President of Huangzhong Agricultural University, China, followed by "A Systems Approach to Improve Research Outcomes in Tropical Fruit Production and Supply Chains" by Bob Williams, Director of the Australian Department of Plant Industries, the "Current Status of Huanglongbing (HLB) in China and Future Control Strategies" by Zhong Guangyan, Director of IFTR-GDAAS, and finally, "Crop Regulation for Tropical Fruit Production" by Sisir Kumar Mitra, Chair of the ISHS Section Tropical and Subtropical Fruits.

The symposium highlighted recent research and development in production and postharvest fruit technologies; discussed current issues on consumer demand, market access, and trade; provided a forum for information exchange among researchers, producers, academics, traders, policy makers, and other stakeholders in the tropical and subtropical fruit industry; and established and strengthened network linkages between the researchers, producers, traders, policy makers and other stakeholders in the tropical and subtropical fruit industry.

Participants were treated to a gala banquet and entertained with cultural performances on June 19.

After the sessions, the participants went on a field trip to a commercial organic banana farm managed by the Zengcheng Xianghui Banana Farmers' Cooperative, the Jiangnan wholesale fruit market, the Baiyun National Agricultural Science and Technology Park of Guangzhou, and the South China Agricultural Research and Innovation Center.

Ganjun Yi and Yacob Ahmad

Field trip to the Zengcheng Xianghui Banana Farmers' Cooperative project.

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Eighth Int'l Symposium on Artichoke, Cardoon and their Wild Relatives

The VIII International Symposium on Artichoke, Cardoon and their Wild Relatives, organized by Tuscia University in collaboration with ENEA under the auspices of the ISHS, took place in Viterbo, Italy, from 10-13 April 2012. It consisted of 5 sessions. The first session, "Biodiversity, genetic resources and utilization; genetics", chaired by Prof. S. Lanteri (Italy) and Dr. A.D. Bouthaina (Tunisia), featured a keynote lecture on the utilization of plant genetic resources delivered by Dr. A. Alercia (Bioversity International). The other seven oral presentations were on the different aspects of artichoke and cardoon utilization (from biomass to ornamental) and germplasm characterization. The second session, "Breeding and seed production", chaired by Prof. M.A. Pagnotta (Italy) and Dr. C. Jana Yala (Chile), started with a keynote address on the innovative strategy to obtain F_1 hybrids of globe artichoke delivered by Prof. F. Saccardo (Tuscia University, Italy). The other four oral presentations were on the innovative aspects of genetics and genomics. The third session, "Crop management: water, nutrient, diseases and pests", chaired by Dr. M. Barba (Italy) and Prof. J.A. Fernández (Spain), had a keynote lecture on irrigation strategies and water use efficiency delivered by Prof. D. Leskovar (Texas University, USA). Prof. Leskovar also attended the symposium as the ISHS representative. The four oral presentations in the session were on aspects related to resistance and tolerance to virus, *Verticillium*, salt and drought stresses. The fourth session, "Crop management: production technology", chaired by Drs. N. Calabrese (Italy) and M.S. Garcìa (Argentina), had a keynote lecture on the effects on plants of abiotic stress, delivered by Dr. A. Calatayud (Instituto Valenciano de Investigaciones Agrarias, Spain). The four oral presentations of the fourth session were on micropropagation techniques. They addressed the use of gibberellic acid, vegetative propagation in vitro, and the use of mycorrhiza. Finally, the fifth session, "Post-harvest and production quality", chaired by Drs. G. Sonnante (Italy) and M. Sharaf-Eldin (Saudi Arabia), had a keynote lecture on health-protecting compounds in dietary plants delivered by Prof. G. Maiani (La Sapienza University, Italy), followed by five oral presentations on different nutraceutical compounds present in *Cynara* and on the best methods for food conservation. All sessions started with a keynote lecture followed by selected oral presentations, which were 24 in total, while 85 posters were presented. The three best posters based on scientific content (experimental design and innovation), clarity (text, language) and esthetics (overall presentation), were selected by an international committee and awarded a certificate and pecuniary award during the Gala dinner. The winning posters were on (i) the exploitability of *Cynara cardunculus* L. as an energy crop, (ii) grafting of globe artichoke onto cardoon, and (iii) virus elimination methods utilizable in artichoke. Other ceremonies took place during the Gala dinner, in particular, Prof. Leskovar delivered the ISHS medal and certificate to the Conveners of the symposium, Professors Pagnotta and Saccardo.

Dr. Daniel Leskovar, Vice-Chair ISHS Section Vegetables (left), handing out an ISHS certificate and medal to symposium Conveners, Drs. Mario A. Pagnotta (center) and Francesco Saccardo (right).

Field visit to Tarquinia experimental field.

In addition to the 5 scientific sessions, a new innovative round-table was organized on "The *Cynara* state of the art in the world", in which colleagues from Italy, Spain, France, Portugal, Turkey, Tunisia, Morocco, Israel, South Arabia, USA, Argentina, and Chile, reported useful and updated information on the *Cynara* situation in their countries. These reports covered topics such as production, economic relevance, state of research utilization, problems (disease, economic), etc. The symposium was also attended by participants from The Netherlands, India, Iran, Brazil, Peru and South Korea.

During the second day of the symposium, the participants took part in a field trip to the ARSIAL (regional extension agency of Latium Region) experimental fields in both Cerveteri and Tarquinia. An extensive germplasm collection of artichoke clones and cardoon accessions, some agronomical trials with different density and time of sowing (direct sowing), and a soilless method of plant propagation were on display at the first farm, while several artichoke hybrids, virus affected versus virus free plants, and grafting trials were displayed at the second. On the way back to Viterbo participants visited an archeological Etruscan city.

One of the central points discussed during the symposium was artichoke hybrids, which are becoming increasingly important. Many private firms used the symposium as a platform to present their new commercialized hybrids. Another innovative trend discussed was the grafting of artichoke onto cardoon. This grafting is done to provide resistance to *Verticillium* diseases. Finally, the next symposium in the series will take place in Argentina in 2015.

Mario A. Pagnotta

Contact

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Sixth Int'l Symposium on Edible Alliaceae

Participants of the symposium.

The Sixth International Symposium on Edible Alliaceae was held on May 21-24, 2012 at ACROSS Fukuoka in Fukuoka, Japan. This symposium was organized under the patronage of ISHS and the Japanese Society for Horticultural Science (JSHS). Previous symposia with a specific focus on edible *Alliaceae* have been held since 1994. The theme of this sixth symposium was "Innovations in Agriculture and Food Science for Edible Alliaceae". The symposium was attended by 150 participants from 26 countries.

The symposium consisted of two and a half days of scientific sessions followed by one and a half days of technical tours. At the opening ceremony, Dr. Masayoshi Shigyo, Convener and Chair of the Organizing Committee, Dr. Claudio R. Galmarini, Chair of the ISHS Working Group on Edible Alliaceae, and Dr. Ikuo Kataoka, President of JSHS, welcomed the participants.

The plenary session was followed by five invited lectures. The first lecture was given by Dr. Shoich Ito, from Kyushu University, and was entitled "The Global Food Supply and Demand: The Current and Future from the Vegetable Point of View". The second lecture was delivered by Dr. Hong Park, from Hokkaido University, entitled "Allium Vegetables Food System in East Asia". The third, fourth and fifth lectures were respectively delivered by Dr. Tadayuki Wako, from the Institute of Vegetable and Tea Science, NARO, entitled "Technology Status of Production and Utilization of Allium Vegetables in Japan", by Dr. Michael J. Havey, from the USDA-ARS and University of Wisconsin-Madison, USA, entitled "Reflections from 20 Years of Onion Breeding and Genetics: Where Do We Go Next?", and by Dr. Rina Kamenetsky, from the Institute of Plant Sciences, ARO, The Volcani Center, entitled "Flowering and Seed Production in Garlic: Developmental Mechanisms and Barriers for Fertility".

Excursion to Saga.

A total of 48 oral presentations and 33 posters were included in the program. Eight oral sessions focused on: Molecular Genetics & Genome Science; Genetics & Breeding; Growth Physiology; Cultivation Techniques; Storage & Processing; Functional Compounds; Disease and Pest Management; Genetic Resources. Each session included one or two keynote lectures. Poster sessions took place on the second day.

A workshop entitled "Genomics to Metabolomics - Foresight of Comprehensive Approach of Molecular Dissection in Allium Crops" was held on the second day. During this activity Dr. Masayoshi Shigyo gave a lecture entitled "Strategic Japanese-New Zealand Cooperative Program on "Functional Food" - Development of a Metabolic Atlas of Allium

Banquet at Ishikurashuzou.

Vegetables to Enable Dissection of Functional Properties", which was followed by five other lectures.

A presentation on the next symposium in the series to be held in Turkey, 2015 was given by Dr. Ali Fuat Gokce, Uludag University.

During the symposium, the participants and accompanying persons enjoyed several social events. At the symposium banquet in Ishikurashuzou, everyone enjoyed Japanese traditional cuisine and a traditional stage performance, which included the spinning top "Hakata Koma" and the drum playing of "Hakata Kinjishi Daiko".

The last day and a half of the symposium was devoted to two technical tours. During a half day tour, the participants visited the Asakura City, near Fukuoka, where the production of Japanese bunching onion takes place. The participants also visited onion grading facilities in Shiroishi, Saga and Shiroishi Branch of Saga Prefectural Agriculture Research. They also visited the Kyushu Ceramics Museum in Arita town and Saga Castle History Museum.

A pre-symposium tour for a small group was organized. The participants gathered at Kitami, the largest onion producing area in Hokkaido, Japan. They visited Kitami Agricultural Experiment Station, the Greens Kitami Company, local food processing, onion storage and grading facilities of the local agricultural cooperative, JA Kita-Mirai and onion fields to see onion transplanting by a state-of-the-art high speed onion transplanting machine. A welcome party was held by the local onion industry. The participants were treated to warm hospitality, nice conversation and the taste of Hokkaido.

Kazumitsu Tsutsui, Tadayuki Wako
and Masayoshi Shigyo

Contact

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Dr. Tadayuki Wako, Vice-Chair of the Organizing Committee, NARO Institute of Vegetable and Tea Science, 360 Kusawa, Ano, Tsu, Mie 514-2392, Japan, email: twako@affrc.go.jp

Dr. Masayoshi Shigyo, Convener and Chair of the Organizing Committee, Yamaguchi University, 1677-1 Yoshida, Yamaguchi 753-8515, Japan, email: shigyo@yamaguchi-u.ac.jp

Commission Quality and Post Harvest Horticulture

Second Int'l Conference on Postharvest and Quality Management of Horticultural Products of Interest for Tropical Regions

The II International Conference on Postharvest and Quality Management of Horticultural Products of Interest for Tropical Regions was a technical-scientific event organized by the Instituto de Ciencia y Tecnología de Alimentos ICTA (Institute of Food Science and Technology) and the Facultad de Agronomía of the Universidad Nacional de Colombia, Bogotá, with the support of the Sociedad Hortifrutícola de Colombia-ASOHOFRUCOL (Hortifruticultural Society of Colombia), the Fondo Nacional de Fomento Hortifrutícola (National Hortifruticultural Development Foundation), and the International Society for Horticultural Science.

This conference sought to promote the exchange of experiences between producers, scientists, technicians and marketers of tropical and subtropical fruits in the Latin American region and created a space for analysis of key opportunities for the promotion of tropical fruit producers and the associated commercial chain. The conference was held from 2-4 November 2011 in the Centro de Alto Rendimiento (Center for High Yield) COLDEPORTES, Bogotá, Colombia. The meeting agenda was divided into three parts, each presented over one day of the event:

1. Knowledge of postharvest physiology of tropical species: A challenge for successful management in global markets.
2. Postharvest technology and innovation as possible alternatives in the competitiveness of perishable products of the tropics.
3. Marketing strategies and positioning of horticultural products in the domestic market and internationally.

One hundred and forty-seven participants attended the meeting, including students, teachers, researchers and representatives from companies in the private and public sectors interested in quality and postharvest management of horticultural products of interest in the tropics. Many national and international production and marketing companies from the tropical fruit sector also participated in the conference: Tecnas, Agroglobal S.A., Corpoica, Jardín Botánico, Jardines de los

Participants of the conference.

Andes S.A.S., INTAL, Brenntagla, Devenalsa S.A., Agrologística, and Syngenta. The institutions from the public and private sectors that support horticulture in the country were represented by participants from the Ministerio de Agricultura y Desarrollo Rural (Ministry of Agriculture and Rural Development), SENA, and ASOHOFRUCOL.

To promote attendance of undergraduate and graduate students from programs in the Agriculture, Science and Engineering departments of the Universidad Nacional de Colombia, Bogotá, scholarships were granted to 60 students covering their full registration payment and 39 were offered a 50% registration fee.

International keynote speakers with extensive postharvest experience participated from countries such as Italy, U.S., Spain, France, Brazil and Mexico. These speakers were linked to renowned institutions such as FAO, USDA-ARS, IVIA and prestigious universities like the University of Michigan (USA), the École Nationale Supérieure Agronomique (France), the University of Campinas (Brazil) and the Universidad de Diken (Mexico). Participants at the event were able to share experiences and research with Jorge M. Fonseca Laurent, Guy J. Hallman, Eva Almenar, Lawrence Zacharias, Jean Claude Pech, Janet Barbara Teruel and Marco Flores. Many nationale keynote speakers specializing in the areas of plant physiology, technology and marketing of horticultural products, from Institutions and Universities such as Corpoica, Agri-Food, Universidad Nacional de Colombia, Proexport and Intal were also invited. Other national distinguished lecturers like Pássaro Catarina Carvalho, Pedro Aguilar, Luz Marina Melgarejo, Jose Camero, Coralia Osorio, Shirley Gomez, Catalina Aristizabal, Anibal Hernandez and Maria Soledad Herrera were also invited to share their academic and commercial experiences and to analyze the strengths and weaknesses of the Colombian hortifruticulture industry.

Poster session.

The conference was attended by researchers from different universities and institutes of Colombia, who presented their research and recent developments on related topics. There were a total of 52 studies presented, 24 oral presentations and 28 poster presentations, with postharvest physiology the most represented topic (44%), followed by postharvest technology (42%) and finally marketing of horticultural products (14%). The high quality of the scientific program set the stage of the event which was intended to be a launching pad for innovation and development carried out at the Universidad Nacional de Colombia at both the academic and industrial levels, bringing together a good representation of the national postharvest school.

The new generation in postharvest handling.

The next meeting in this series will be held in 2013 in Trinidad Tobago at the University of the West Indies.

Maria Soledad Hernandez

Contact

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New ISHS Members

ISHS is pleased to welcome the following new members:

NEW INDIVIDUAL MEMBERS:

Argentina: Ms. Nadia Arias, Alicia Bobone, Silvina Garrido, Jose Antonio Portela; **Australia:** Simon Anstis, Karen Brock, Roberta De Bei, Mr. Binh Ho, Ms. Catherine Lech, Mr. John Lory, Mr. Colin Lye, Prof. Dr. Rodney Mailer, Mr. Robert McMahon, Peter Melville, Mr. Peter OConnell, Mr. Timothy Rival, Mr. Thomas Schreurs, Bruce Scott, Kevin Seaton, Ms. Jennifer Shillabeer, Andrew Skinner, Karl Sommer, Dr. Costas Stathopoulos, Mr. Stephen Welsh; **Austria:** Mr. Christoph Ertl; **Belgium:** Jef Helsen, Wendy Odeurs, Els Pauwels, Kim Rouges, Filip Rys, Bart Van Delsen, Dominique Van Haecke, Johan Vanderhaegen; **Brazil:** Jose Lincoln P. Araujo, José Mauro Castro, Maria Auxiliado Coêlho de Lima, Luiz Correa, Marcia Flores da S Ferreira, Prof. Dr. Antonio da Silva, AntônioHeribert de Castro Teixeira, Yanddrah M.L.S. 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AWARDS

Dr. Michael Raupp, a member of the ISHS, has been honored with the R.W. Harris Author's Citation in the International Society of Arboriculture (ISA) Awards of Distinction program, which is given to authors for sustained excellence in the publication of timely information related to arboriculture. Dr. Raupp was one of nine people chosen for Awards of Distinction this year. It is an honor to be selected from a potential field of more than 20,000 ISA members worldwide. In addition to his work as a professor in the Department of Entomology at the University of Maryland in College Park, Raupp is also an author of nearly 300 professional papers, journal articles, chapters and books, a researcher, and has an award-winning blog, www.bugoftheweek.com.

Calendar of ISHS Events

For updates and more logon to www.ishs.org/calendar. To claim the reduced registration for ISHS members make sure to mention your membership number when registering and ensure your ISHS membership is current. If in doubt: check your membership status online at www.ishs.org/directory/

YEAR 2012

- October 14-19, 2012, Aracaju (Sergipe) (Brazil): **III International Symposium on Medicinal and Nutraceutical Plants and III Conference of National Institute of Tropical Fruits.** Info: Prof. Dr. Narendra Narain, Departamento de EngenhariaCCET, Univ Federal de Sergipe, Cidade Universitaria, 49100-000 Sao Cristovao-Sergipe, Brazil. Phone: (55)79 2105 6677, Fax: (55)79 2105 6679 E-mail symposium: 3ismnp@gmail.com Web: http://www.3ismnp.com.br/index_en.htm
- October 15-18, 2012, Wageningen (Netherlands): **VII International Symposium on Light in Horticulture.** Info: Dr. Silke Hemming, Wageningen UR, Plant Research International, PO Box 16, 6700 AA Wageningen, Netherlands. Phone: (31)317 4 86921, Fax: (31)317 423110, E-mail: silke.hemming@wur.nl E-mail symposium: info@lightsym2012.com Web: http://www.lightsym2012.com/
- October 16-19, 2012, Porto de Galinhas, Pernambuco (Brazil): **X International Symposium on Postharvest Quality of Ornamental Plants.** Info: Prof. Fernando Luiz Finger, Depto. de Fitotecnia, UFV, 36570-000 Viçosa, MG, Brazil. Phone: (55)3138991128, Fax: (55)3138992614, E-mail: ffinger@ufv.br E-mail symposium: ispqop_2012@yahoo.com.br Web: http://www.ispqop2012.ufv.br/
- October 16-20, 2012, Yerevan (Armenia): **Eurasian Symposium on Vegetables and Greens.** Info: Dr. Alvina Avagyan, Fruit Armenia OJSCo, 74, Teryan Street, Yerevan, Armenia. Phone: (374)93 40415037, Fax: (374)10202834x121, E-mail: alvinaav@hotmail.com or Dr. Aleksandr Kalantaryan, Head of Development Division, Raed Piu, 37 Mamikonyants street. ap.49, 00010 Yerevan, Armenia. Phone: (374)94 237805, E-mail: alikjan@gmail.com E-mail symposium: info@armsvg.com Web: http://www.armsvg.com/
- October 20-26, 2012, Wuhan, Hubei Province (China): **V International Symposium on Persimmon.** Info: Prof. Dr. Zhengrong Luo, Department of Pomology , Key Lab of Horticultural Plant Biology, Huazhong Agricultural University, Shizishan, Wuhan, Hubei 430070, China. Phone: (86) 27 8728 2677, Fax: (86) 27 8728 2010, E-mail: luozhr@mail.hzau.edu.cn E-mail symposium: persimmon@mail.hzau.edu.cn Web: http://persimmon2012.hzau.edu.cn/english/
- NEW October 22-25, 2012, Srinagar (Kashmir) (India): **IV International Symposium on Saffron Biology and Technology.** Info: Prof. Dr. F.A. Nehvi, Sher-e-Kashmir Univ.of Agric., K.D. Research Station, Old Ariport - PO Box 905, GPO Srinagar, J&K, 190001, India. Phone: (91)1942305084, Fax: (91)1942305084, E-mail: f.nehvi@rediffmail.com or Dr. Shafiq Wani, Sher-e-Kashmir Univ.of Agric., K.D. Research Station, Old Ariport - PO Box 905, GPO Srinagar, J&K, 190001, India. Phone: (91)1942463255, Fax: (91)1942461103, E-mail: shafiqwani@gmail.com Web: http://www.ivinternationalsaffronsymposium.com
- November 4-6, 2012, Naples (United States of America): **XXI International Pepper Conference.** Info: Mr. Gene McAvoy, University of Florida, IFAS, PO Box 68, Labelle, FL 33975, United States of America. Phone: (1)8636744092, Fax: (1)8636744097, E-mail: gmcavoy@ifas.ufl.edu E-mail symposium: bmt@ufl.edu Web: http://www.conference.ifas.ufl.edu/pepper2012
- November 4-8, 2012, Nanjing (China): **HortiModel2012: Models for Plant Growth, Environmental Control and Farm Management in Protected Cultivation.** Info: Prof. Dr. Weihong Luo, College of Agriculture, Nanjing Agricultural University, No1 Rd Weigang, Nanjing, Jiangsu 210095, China. Phone: (86)25-84399100, Fax: (86)25-84399100, E-mail: lwh@njau.edu.cn E-mail symposium: hortimodel2012@njau.edu.cn Web: http://hortimodel2012.njau.edu.cn/
- November 12-16, 2012, Catania (Italy): **VI International Symposium on Brassicas and XVIII Crucifer Genetics Workshop.** Info: Prof. Dr. Ferdinando Branca, DISPA, Università di Catania, Via Valdisavoia 5, 95123 Catania, Italy. Phone: (39)095234307, Fax: (39)095234329, E-mail: fbranca@unict.it E-mail symposium: info@brassica2012.it Web: http://www.brassica2012.it/
- November 18-23, 2012, Valencia (Spain): **2012 International Citrus Congress.** Info: Prof. Luis Navarro, Head Tissue Culture Department, IVIA, Apartado Oficial, 46113 Moncada, Valencia, Spain. Phone: (34)961391000, Fax: (34)961390240, E-mail: lnavarro@ivia.es E-mail symposium: citruscongress2012@viajeseci.es Web: http://www.citruscongress2012.org/
- NEW November 18-20, 2012, Mymensingh (Bangladesh): **I International Symposium on Jackfruit and other Moraceae.** Info: Prof. Dr. Mohammad Abdur Rahim, Bangladesh Agricultural University,

Department of Horticulture, Mymensingh, Mymensingh 2202, Bangladesh. Phone: (880)9162714 or 9154703, Fax: (880)9155810 or 9162714, E-mail: marahim1956@yahoo.com or Prof. Dr. Masum Ahmad, Department of Entomology, Bangladesh Agricultural University, 2202 Mymensingh, Bangladesh. Phone: (880)9162714, Fax: (880)9161510, E-mail: masum_bau2006@yahoo.com Web: http://www.baugpc.org/index.php/News-Events/first-international-symposium-on-jackfruit-and-other-moraceae.html

- November 26-29, 2012, Strasbourg (France): **I World Congress on the Use of Biostimulants in Agriculture.** Info: Jean Pierre Leymonie, Editorial Director, New AG International, 12 rue du Hagueneck, 68000 Colmar, France. Phone: (33)3 89 30 51 20, Fax: (33)3 89 30 51 34 E-mail symposium: biostimulants@newaginternational.com Web: http://www.biostimulants2012.com/
- December 2-6, 2012, White River (Kruger National Park) (South Africa): **IV International Symposium on Lychee, Longan and Other Sapindaceae Fruits.** Info: Mr. Derek Donkin, SA Lychee Growers' Association, PO Box 866, 0850 Tzaneen, South Africa. Phone: (27)153073676, Fax: (27)153076792, E-mail: derek@subtrop.co.za E-mail symposium: ethne@goingafricaconferencing.com Web: http://www.lychee2012.com/
- December 3-6, 2012, Stellenbosch (South Africa): **X International Symposium on Integrating Canopy, Rootstock and Environmental Physiology in Orchard Systems.** Info: Prof. Karen I. Theron, Department of Horticulture, University of Stellenbosch, Private Bag X1, Matieland 7602, South Africa. Phone: (27)218084762, Fax: (27)218082121, E-mail: kit@sun.ac.za E-mail symposium: reventer@netactive.co.za Web: http://www.orchardsystems2012.co.za/
- December 3-6, 2012, Quito (Ecuador): **International Symposium on Medicinal Plants and Natural Products.** Info: Dr. Jalal Ghaemghami, PO Box 320172, West Roxbury, MA 02132, United States of America. Phone: (1)3393683868, Fax: (1)3393686838, E-mail: jalal@shmen.org E-mail symposium: antigua-ishs@shmen.org Web: http://www.ecuadorishs.org
- December 9-12, 2012, Baqa' (Jordan): **International Workshop on Good Agricultural Practices (GAP) for Greenhouse Vegetable Production in the Mediterranean Region.** Info: Dr. Muien Qaryouti, Nat'l Ctr. Agric.Res.& Technology Transfer, NCARTT, PO BOX 639, 19381 Baqa', Jordan. Phone: (962)64725071, Fax: (962)64726091, E-mail: qaryouti@ncare.gov.jo or Dr. Faisal Awawdeh, Nat'l Ctr.for Agric.Res.& Extension NCARE, Amman - Jerash Street, PO Box 639, 19381 Baqa', Jordan. Fax: (962)64726099, E-mail: director@ncare.gov.jo E-mail symposium: GAP-greenhousevegetables@ncare.gov.jo Web: http://www.ncare.gov.jo/MoenQar/Index.htm

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- NEW January 7-11, 2013, Dharwad (India): **V International Symposium on Human Health Effects of Fruits and Vegetables.** Info: Dr. Mahadev Chetti, University of Agric. Sciences, College of Agriculture, 58005 Dharwad, India. Phone: (91)9448495309, Fax: (91)8362445288, E-mail: mbchetti_uas@rediffmail.com Web: http://favhealth2012.org
- NEW February 24-26, 2013, Muscat (Oman): **International Conference on Agricultural Engineering: New Technologies for Sustainable Agricultural Production and Food Security.** Info: Dr. Yaseen Al-Mulla, P.O. Box 34, 123 Muscat Al-Khoud, Oman. Phone: (968)24-141201, Fax: (968)24-413418, E-mail: yalmula@hotmail.com Web: http://www.agengineeringconf.com/
- NEW March 26-28, 2013, Chiang Mai (Thailand): **IX International Symposium on Temperate Zone Fruits in the Tropics and Subtropics.** Info: Dr. Jirakorn Kosaisawe, Director General, Department of Agriculture, Chatuchak, Bangkok 10900, Thailand. Phone: (66)25799636, Fax: (66)29405412 E-mail symposium: tzfts2013@yahoo.com Web: http://www.ishs.org/calendar/TZFTS.pdf
- April 21-26, 2013, Santiago (Chile): **IX International Symposium on Grapevine Physiology and Biotechnology.** Info: Dr. Manuel Pinto, Instituto de Investigaciones Agropecuarias, Centro La Platina, Santa Rosa 11610, Santiago, Chile. Phone: (56) 27575164, Fax: (56) 27575164, E-mail: mpinto@inia.cl Web: http://www.grapevinechile2013.cl/en/
- NEW April 29 - May 2, 2013, Kusadasi (Turkey): **II International Symposium on Discovery and Development of Innovative Strategies for Postharvest Disease Management.** Info: Dr. Pervin Kinay, Ege University Faculty of Agriculture, Department of Plant Protection, 35100 Bornova IZMIR, Turkey. Phone: (90)232-388 4000, Fax: (90)232-374 48 48, E-mail: pervin.kinay@ege.edu.tr or Dr. Samir Droby, Aro, The Volcani Center, P.O.Box 6, 50250 Bet Dagan, Israel. E-mail: samird@volcani.agri.gov.il or Dr. Michael Wisniewski, Usda-Ars, 2217 Wiltshire Road, Kearneysville, WV 25430, United States of America. E-mail: michael.wisniewski@ars.usda.gov Web: http://www.pdm2013.org
- May 27-31, 2013, Murcia (Spain): **VI International Symposium on Almonds and Pistachios.** Info: Dr. Federico Dicenta, CEBAS-CSIC, PO Box 164, 30100 Espinardo (Murcia), Spain. Phone: (34)968 396 339, Fax: (34)968 396 213, E-mail: fdicenta@cebas.csic.es E-mail symposium: almond.pistachio.2013@cebas.csic.es Web: http://www.cebas.csic.es/almond_pistachio_2013/
- NEW June 2-7, 2013, Coimbra (Portugal): **VIII International Symposium on In Vitro Culture and Horticultural Breeding.** Info: Prof. Dr. Jorge Canhoto, Department of Life Sciences, University of Coimbra, Arcos Do Jardim, Ap. 3046, 3001-401 Coimbra, Portugal. Phone: (351)239855210, Fax: (351)239855211, E-mail: jorgecan@ci.uc.pt E-mail symposium: IVCHB2013@uc.pt Web: http://www.uc.pt/en/congressos/IVCHB2013/
- NEW June 3-7, 2013, (Dominican Republic): **X International Mango Symposium.** Info: Juan Jose Espinal, Jose Amado Soler No. 50, Ensanche Paraiso, Santo Domingo, Dominican Republic. Phone: 1 809-5655603, Fax: 1 809-5444727, E-mail: jespinal@cedaf.org.do E-mail symposium: xmango2013@gmail.com
- NEW June 3-7, 2013, Trani (Italy): **XI International Controlled and Modified Atmosphere Research Conference - CaMa2013.** Info: Dr. Giancarlo Colelli, Dip. Pr.I.M.E. Univ. Di Foggia, Via Napoli 25, 71100 Foggia, Italy. Phone: (39) 320 4394535, E-mail: g.colelli@unifg.it Web: http://www.cama2013.org
- NEW June 7-17, 2013, Nanchang (China): **XIII International Asparagus Symposium.** Info: Prof. Chen Guangyu, Jiangxi Academy of Agricultural Sciences, 330200 Nanchang, Jiangxi Province, China. Phone: (86)7917090308, Fax: (86)7917090001, E-mail: genebksh@hotmail.com E-mail symposium: asparaguschina@vip.sina.com
- June 9-14, 2013, Columbia, Missouri (United States of America): **I International Symposium on Elderberry.** Info: Mr. Andrew Thomas, Southwest Research Center, 14548 Highway H, Mt. Vernon, MO 65712, United States of America. Phone: (1)417-466-2148, Fax: (1)417-466-2109, E-mail: thomasal@missouri.edu Web: http://muconf.missouri.edu/elderberrysymposium
- June 13-16, 2013, (Turkey): **I International Mulberry Symposium.** Info: Prof. Dr. Sezai Ercisli, Ataturk University Agricultural Faculty, Department of Horticulture, 25240 Erzurum, Turkey. Phone: (90) 442-2312599, Fax: (90) 442 2360958, E-mail: sercisli@atauni.edu.tr E-mail symposium: sercisli@hotmail.com Web: http://www.mulberry2012.org

- June 17-19, 2013, Montreal, Quebec (Canada): **International Symposium on Medicinal Plants and Natural Products.** Info: Dr. Jalal Ghaemghami, PO Box 320172, West Roxbury, MA 02132, United States of America. Phone: (1)3393683868, Fax: (1)3393686838, E-mail: jalal@shmen.org or Prof. Dr. Alain Cuerrier, 4101, rue Sherbrooke Est, Montréal Québec, Canada. E-mail: alain_cuerrier@ville.montreal.qc.ca E-mail symposium: antigua-ishs@shmen.org

- June 17-20, 2013, Matera (Italy): **VIII International Peach Symposium.** Info: Prof. Cristos Xiloyannis, Dip. Scienze dei Sistemi Colt., For., Amb., Viale dell'Ateneo Lucano, 10, 85100 Potenza, Italy. Phone: (39)3293606262, Fax: (39)0971205378, E-mail: cristos.xiloyannis@unibas.it or Prof. Dr. Paolo Inglese, Department DEMETRA, Università degli Studi di Palermo, Viale delle Scienze, ED. 4, 90142 Palermo, Italy. Phone: (39)09123861234, Fax: (39)09123860820, E-mail: paolo.inglese@unipa.it Web: http://www.unibas.it/peach2013/home.html

- June 17-21, 2013, Leiden (Netherlands): **International Symposium on Growing Media and Soilless Cultivation.** Info: Erik Van Os, Aan de Rijn 2, 6701 PB Wageningen, Netherlands. Phone: (31)317483335, Fax: (31)317425670, E-mail: erik.vanos@wur.nl or Wim Voogt, Violierenweg 1, 2665MV Bleiswijk, Netherlands. Phone: (31)174 485687, E-mail: wim.voogt@wur.nl or Mr. Chris Blok, Wageningen UR Greenhouse Horticulture, Violierenweg 1, 2665 MV, Bleiswijk, Netherlands. Phone: (31)317485606, E-mail: chris.blok@wur.nl E-mail symposium: Grosci2013.symposium@wur.nl Web: http://www.grosci2013.wur.nl/

- NEW June 22-26, 2013, Plasencia (Spain): **VII International Cherry Symposium.** Info: Dr. Margarita López Corrales, SIDT, Finca La Orden, Guadajira, 06187 Badajoz, Spain. E-mail: margarita.lopez@juntaextremadura.net or Manuel Serradilla Sanchez, Centro Invest. Finca la Orden - Valdesequera, A-V KM 372, 06187 Badajoz, Spain. E-mail: manuel.serradilla@juntaextremadura.net or Dr. Maria Josefa Bernalte García, INTAEX, Carr. de Cáceres sn, 06074 Badajoz, Spain. Phone: (34)924012699, Fax: (34)924012674, E-mail: bernalte@unex.es E-mail symposium: cherrysymposium2013@gmail.com Web: http://www.cherry2013.com/

- NEW June 24-27, 2013, Orlando, Florida (United States of America): **IV International Symposium on Tomato Diseases: Economically, Environmentally, and Socially Sustainable Tomato Disease Management.** Info: Ass. Prof. Mathews L. Paret, Plant Pathology Department, North Florida Research and Education Center, University of Florida, 155 Research Road, Quincy Florida FL-32351, United States of America. E-mail: paret@ufl.edu Web: http://nfrec.ifas.ufl.edu/4istd/index.shtml

- July 1-5, 2013, St. Augustine (Trinidad and Tobago): **III International Conference on Postharvest and Quality Management of Horticultural Products of Interest for Tropical Regions.** Info: Dr. Majeed Mohammed, 22 Pine Drive, Homeland Gardens, Cunupia, Trinidad and Tobago. Phone: (1)868-671-2332, Fax: (1)868-645-0479, E-mail: mohd2332@hotmail.com

- NEW July 2-5, 2013, Zürich (Switzerland): **XIII International Workshop on Fire Blight.** Info: Dr. Brion Duffy, Agroscope Changins-Wädenswil, Schloss 1, Postfach, 8820 Waedenswil, Switzerland. Phone: (41)447836111, Fax: (41)447836341, E-mail: brion.duffy@acw.admin.ch

- NEW July 15-19, 2013, Beijing (China): **VI International Symposium on the Taxonomy of Cultivated Plants.** Info: Prof. Zhang Qixiang, National Engineering Research Center for Floriculture, Beijing Forestry University, No.35, Qinghua East Road-Haidian Dist., Beijing 100083, China. Phone: (86)1062338005, Fax: (86)1062336321, E-mail: zqx@bjfu.edu.cn or Dr. Xiaobai Jin, Institute of Botany, Chinese Academy of Sciences, 20 Nanxincun, Xiangshan, 100093 Beijing, China. Phone: (86)1062591431, Fax: (86)1062590348, E-mail: jinxiaobai@hotmail.com

- July 17-20, 2013, College Station, TX (United States of America): **I International Symposium on Pecans and Other Carya in Indigenous and Managed Systems.** Info: Dr. L.J. Grauke, USDA ARS , Pecan Breeding & Genetics, 10200 FM 50 Rd., Somerville, TX 77879-5764, United States of America. Phone: (1)979-272-1402, Fax: (1)979-272-1401, E-mail: lj.grauke@ars.usda.gov or Dr. Leonardo Lombardini, Department of Horticultural Sciences, Texas A&M University, College Station, TX 77843-2133, United States of America. Phone: (1)9794588079, Fax: (1)9798450627, E-mail: l-lombardini@tamu.edu

- NEW July 20-23, 2013, Taiyuan, Shanxi Province (China): **VII International Walnut Symposium.** Info: Prof. Jianbao Tian, Pomology Institute of Shanxi, Academy of Agricultural Sciences, Shanxi, Taigu, 030815, China. Phone: (86)0351-7073034, Fax: (86)0354-6215001, E-mail: tianjb-001@163.com Web: http://www.iws2013.org/English/en_index.aspx

- NEW July 28-31, 2013, Orlando, FL (United States of America): **XII International Symposium on Plant Bioregulators in Fruit Production.** Info: Dr. Steven McArtney, NCSU, 455 Research Drive, Mills River, NC 28759, United States of America. Phone: (1)8286843562x115, Fax: (1)8286848715, E-mail: steve_mcartney@ncsu.edu or Dr. Timothy Spann, University of Florida - IFAS, Citrus Research and Education Center, 700 Experiment Station Road, Lake Alfred, FL 33850, United States of America. Phone: (1)8639561151, Fax: (1)8639564631, E-mail: spann@ufl.edu

- August 5-8, 2013, Pattaya (Thailand): **I International Symposium on Tropical and Subtropical Ornamentals.** Info: Dr. Mantana Buanong, Division of Postharvest Technology, School of Bioresource and Technology, King Mongkut's Univ. of Technology Thonburi, Bangmod, Bangkok 10140, Thailand. E-mail: mantana.bua@kmutt.ac.th

- August 5-8, 2013, Pattaya (Thailand): **International Symposium on Quality Management of Fruit and Vegetables for Human Health.** Info: Dr. Sirichai Kanlayanarat, King Mongkut's University of Technology, Thonburi, Division of Postharvest Technology, Thungkhru, Bangkok 10140, Thailand. Phone: (66)2 470 7720, Fax: (66)2 452 3750, E-mail: sirichai.kan@kmutt.ac.th

- August 5-8, 2013, Pattaya (Thailand): **IV International Symposium on Ornamental Palms.** Info: Dr. Sirichai Kanlayanarat, King Mongkut's University of Technology, Thonburi, Division of Postharvest Technology, Thungkhru, Bangkok 10140, Thailand. Phone: (66)2 470 7720, Fax: (66)2 452 3750, E-mail: sirichai.kan@kmutt.ac.th

- NEW August 11-14, 2013, Fort Collins, Colorado (United States of America): **II International Symposium on Plant Cryopreservation.** Info: Dr. Steve Wallner, Colorado State University, Dept of Hort LA CSU, Ft. Collins CO, 80525-1173, United States of America. E-mail: swallner@colostate.edu or Dr. David Ellis, USDA-ARS, National Ctr. for Genetic Resources Preservation, 1111 South Mason St, Fort Collins, CO 80521-4500, United States of America. E-mail: david.ellis@ars.usda.gov or Dr. Maria M. Jenderek, USDA-ARS, NCGRP, 1111 S. Mason Street, Fort Collins, CO 80521, United States of America. Phone: (1)970 495 3256, Fax: (1)970 221 1427, E-mail: maria.jenderek@ars.usda.gov

- NEW August 19-21, 2013, Portland, OR (United States of America): **I International Symposium on Marketing and Consumer Research in Horticulture.** Info: Dr. Jennifer Dennis, 625 Agriculture Mall Dr., 320 Horticulture Building, West Lafayette, IN 47906, United States of America. Phone: (1) 765-494-1352, Fax: (1) 765-494-0391, E-mail: jhdennis@purdue.edu E-mail symposium: tgoodale@purdue.edu Web: http://www.hort.purdue.edu/fruitveg/events/ismcrh1announce.pdf

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