Chronica Horticulturae

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Magazine of the International Society for Horticultural Science

Symposia and Workshops

Pollination • Design and Environmental Control of Greenhouses • Persimmon

Horticultural Science News

Ontario and the XXVI IHC • Spotlight on Korea • Ornamentals in Turkey

ISHS

In this Issue

Viewpoints

The ISHS invites you to express yourself!

The Viewpoints section of Chronica Horticulturae was created as a regular feature for ISHS members to express their views on current issues in Horticultural Science or on any Society related topic in general.

ISHS members who do wish to publish an article in this or any other feature of Chronica Horticulturae are requested to send their material to the ISHS Secretariat, preferably in electronic format.

Bringing news to the Membership

Dear ISHS member,

No, you are not holding in your hands a magazine of another Society. This issue of Chronica is indeed your familiar ISHS magazine, very much different from previous editions but still Chronica Horticulturae. During its last meeting (November 2000), the ISHS Council decided that the Society's magazine needed a twofold change: first of all it was suggested that more emphasis was needed on the reporting of ISHS meetings, symposia and workshops, and other issues related to the ISHS and second Chronica was in need of a more contemporary outlook. The responsible person on the ISHS Board for publications, A. Monteiro, and your Secretariat started searching for editors to assist us with this job and started consulting with the ISHS printers to develop a new Chronica outlook.

We were lucky to find Dr. (Ms) Petra Becker, stationed in Germany (Stuttgart) currently active as professional journalist in the field of agriculture and horticulture. Petra will from now on make sure that the content of the Chronica issues is more balanced, that contacts are made with people that are holding interesting information from the world of horticulture and that the material is coming to you in a pleasant to read format. In addition to Petra we approached Dr. Gerard Weststeijn retired as researcher and stationed in the Netherlands (Doorwerth). Gerard accepted to ensure the contacts with the conveners of ISHS symposia and the journalistic link to the chairpersons of ISHS sections and commissions. Gerard is familiar to many ISHS members and other scientists as he was the secretary of the scientific committee of the last IHC-Congress and in that capacity had contacts with many of you. Gerard will in future have 'Chronica'-contacts with the conveners to have good 'Chronica'-reporting before and after the ISHS symposia. Both editors can be contacted at petra.becker@ishs.org and at gerard.weststeijn@ishs.org. We hope that you will submerge them with you comments and articles.

You also will notice that we tried to develop a clear distinction in the regular features such as 'Members Forum', 'News from the Board', 'Sections and Commissions', 'Insight', 'From the Secretariat', 'Calendar of Events' and 'Acta Horticulturae', features that should be visited in each issue of Chronica, and a cut in the various topics that are discussed under each of these features. Needless to say, that for some of these features we are counting on you, the members, to keep us posted. More in particular the feature 'Members Forum' should grow into a vivid marketplace for discussing the life, policy and achievements of ISHS, as experienced by the members. The world should notice that we are a group of enthusiasts in horticultural research. More elaborated articles on research and on general horticultural science you might want to publish in Chronica Horticulturae will find a home under 'Insight'. Give it a go and do contact us.

From this number on, we will be building a series of articles around horticultural research in Canada. These articles will bring us in the mood to attend the next International Horticultural Congress in Toronto 2002. More specific news on the Congress can be found at http://www.ihc2002.org/. The Congress program was approached in a total different way than the way we are used to from past congresses. Starting from a series of keynote speakers with world fame, the ISHS Congress offers a set of specialized symposia giving ample of room for many of our various specialists. Do therefore not call this Congress a general meeting. In this Chronica number there is again an article on Korean Horticulture. Our Korean colleagues are firm and want to get you to attend not only the Congress in Toronto in 2002 but also the Congress in Seoul in 2006. See you first in Toronto!

Last but not least the ISHS is working hard to further extend the functionality offered through our website http://www.ishs.org, offering you online access to every single Acta Horticulturae article ever published! We soon will be launching our new website, bringing the entire virtual Acta Horticulturae library just a few mouse clicks away. This new ISHS service will cater Acta Horticulturae articles to your needs. More on this in the next issue of Chronica. For now just make sure to check out http://www.ishs.org and stay in touch with the world of horticultural science!

Jozef, ISHS Executive Director

ISHS Board Meeting in Iceland

The Board recently held its biannual meeting in Iceland following an invitation received from the horticultural sector in this country. As was said by Mr. Gudmundur B. Helgason, Permanent Secretary to the Icelandic Ministry of Agriculture during an official function on June 5th, the horticultural sector is extremely important for the future development of agriculture in Iceland. He hoped that this development could be nurtured in further close cooperation with the International Society for Horticultural Science, benefiting from the worldwide contacts that our scientific society can offer. In his acknowledgement, the President of the ISHS, Dr. Christopher Brickell, praised the achievements of Icelandic horticultural research and thanked Iceland for its continuous role as an active and longstanding Country member of the Society.

During the last meeting in Cairo (November 2000) an invitation to meet in Iceland, had been extended to the ISHS Board by Dr. Grétar Unnsteinsson, ISHS Council representative for his country. The Board discussed the management, administration and policies of the ISHS. Reports were received from the President and from the other members of the Board. The financial results for the year 2000 were evaluated and the reports from the External Auditors (Ernst&Young) and the Internal Audit Committee (Dr. W. Müller and Dr. U. Avermaete) were accepted and acknowledged. The Board agreed to the opening of a bank account with the HSBC bank in Hong Kong to facilitate payment of individual Asian membership dues from some countries. The Treasurer, Dr. Richard Zimmerman, reported an amount of 100,000- Euro excess of income over expenditures for the year 2000. The Board had previously agreed to provide an additional loan of 50,000- US$ to the Organizing Committee of the XXVIth Congress to ensure that there was sufficient funding available for possible cash flow problems; the remaining 50,000- Euro was added to the ISHS investment account.

Dr. Antonio Monteiro, Board member responsible for ISHS publications, reported to the Board the intensive work that had been carried out by the ISHS Publications Committee on re-formatting the Instructions for Authors (for Acta Horticulturae articles) and the Guidelines for Conveners of ISHS symposia. The final drafts of these documents were approved and will soon be implemented. The draft of the new website with Acta Horticulturae articles on-line was discussed and approved by the Board. The launch of this new project is expected a month from now and will be reported fully in the next issue of Chronica. The Board was very enthusiastic about the new design, layout and structure for Chronica Horticulturae. It is hoped that the efforts to improve Chronica will be appreciated by the membership and the Board looks forward to receiving comments and suggestions from members for the 'Members Forum' column.

Dr. Norm Looney reported on progress in the preparation of the International Horticultural Congress, Toronto, 2002. An impressive array of keynote speakers has been arranged. The new format, with a number of themed symposia running throughout the Congress, was felt to be a milestone in the history and development of the Society's Congresses. Updates of the programme can now be followed on the Congress website at www.IHC2002.org.

After the meetings members of the Board visited nurseries specialising in tomato production, mushroom and rose growing and also went to various scientific institutes and colleges as well as the botanical garden in Reykjavik. Various farmers and scientists had the occasion to interact with the Board to discuss today's challenges for horticulture in Iceland. The professional part of the visit was concluded with a tour of the Geothermal Power Plant at Nesjavellir. The possibility of organising, in the near future, a symposium on the usage of geothermal heat in horticultural production was discussed. The ISHS Board members expressed their profound admiration of the beauty of the natural environment of Iceland and the friendliness and professionalism in the approach of the Icelandic Government and citizens to improve and safeguard the heritage of their country.

The Board extends its' warmest thanks to Dr. Grétar Unnsteinsson for the excellent organisation of the visit and also to his colleagues and other Icelanders who contributed so much to the overall success of the visit.

ISHS Board

Fruit Section

VIII International Pollination Symposium

The VIIIth world conference on pollination ecology Mosonmagyaróvár, Hungary, July 10-14, 2000, is part of a series of international symposia held under the auspices of the *International Commission of Plant Bee Relationships (ICPBR)*, a scientific member of the International Union for biological Sciences and co-sponsored by the International Society for Horticultural Science. The meetings were organized in various countries: first in Copenhagen, Denmark (1960), thereafter in London, UK (1964), Prague, Czechoslovakia (1974), University of Maryland, USA (1978), Versailles, France (1983), Tilburg, The Netherlands (1990), Lethbridge, Alberta, Canada (1996)

The opening of the Symposium in the main aula of the Faculty of Agricultural Sciences, Mosonmagyaróvár.

The 8th International Pollination Symposium was hosted by the Faculty of Agricultural Sciences, West-Hungarian University, it was a sign of recognition of the pollination research being made in Hungary. It was a great pleasure to us that the *International Society for Horticultural Science (ISHS)* has also accepted the Symposium as its official scientific meeting.

The history of the Faculty goes back to 1818 when its legal predecessor, the Agricultural Private Institute of Mosonmagyaróvár was founded by Albert Casimir, Prince of Saxonia and Teschen. The Faculty integrates 8 university institutes and 31 departments. There are some 1000 students at the Faculty. The Faculty is entitled to award MSc degree in agriculture and university graduates can join courses for PhD degrees.

The theme of the Symposium was *"Pollination: integrator of crops and native plant systems"*. This attracted the interest of those researchers around the world who were involved in scientific and applied aspects of pollination ecology and of interactions between crop and native plant species and their pollinators.

There were three distinct patrons of the Symposium: Dr. K. Tamás under-secretary of state, Ministry of Agriculture and Rural Development, Dr. Á. Kiss, deputy under-secretary of state, Ministry of Education, and Prof. Dr. J. Koloszár, rector, West Hungarian University. There were 5 members of the Scientific Advisory Committee: Prof. I.H. Williams (UK), Dr. J.-N. Tasei (France), Dr. K.W. Richards (Canada), Dr. A. van de Ruijter (The Netherlands) and Prof. P. Benedek (Hungary). The national Organising Committee was made by Prof. P. Benedek (chairman), Prof. J. Nyéki and Prof. V. Ördög.

Some 90 scientists attended the Symposium from over 30 countries all around the World. Europe had a higher representation than other continents; with delegates from 15 European countries taking part in the meeting. Participants came from 5 countries of Central and South America, 4 from Asia, 3 from the Australian-New Zealand region, 2 from the Middle East, 2 from North America and 1 from Africa. The most populous delegations arrived from the Netherlands and Israel. The Hungarian delegation included 11 participants. The most distant countries of origin of the participants were New Zealand, Tasmania, Australia, Japan, Korea, Nepal, Argentina, Brazil and Chile.

The scientific program contained some 90 scientific presentations (some 60 oral lectures and 30 posters). This offered a very good opportunity for the international community to present and discuss their new research results in pollination ecology. The lectures were organised into sessions and there were invited keynote lectures as well offered oral presentations at each of the sessions. The themes of the oral sessions were as follows:

Theme 1. Pollen, including advertisement, availability, stigma interactions, nutritional aspects
Theme 2. Nectar, including production, quality, preferences
Theme 3. Pollen flow, including hybrid crops, transgenic crops, wild plant conservation, gene flow, genetic markers
Theme 4. Pollinator diversity including non-Apis bees
Theme 5. Pollination in landscape management systems

A group of the participants in front of the building for the poster session.

Theme 6. Pollination in plant genetic resource conservation
Theme 7. Pollination in sustainable agro-ecosystems including conservation of and competition between pollinators
Theme 8. Managing wild bees for pollination

A general meeting of the ICPBR was also held during the symposium and a special meeting was organised on the conservation of pollinating bees on the request of an international FAO project. It was emphasised that pollinator diversity is a general condition to conserve the diversity of insect pollinated plants.
A one-day official professional tour was organised during the Symposium to get the delegates to be acquainted with the research activity of Bee Department at the Research Institute for Small Animal Husbandry (Gödöllõ) and to see the Bee keeping Museum at the same site.
The chairman of the Organising Committee had the impression that both the organisation and the scientific level of the Symposium have met the satisfaction of the participants. A short evaluation was expressed at the closing of the Symposium on behalf of the Council of the ICPBR and the ICPBR/ISHS Pollination Working Group.

Pal Benedek, council member of ICPBR, Chairman of the Organising Committee

International Symposium on Design and Environmental Control of Tropical and Subtropical Greenhouses

This meeting on Design and Environmental Control of Tropical and Subtropical Greenhouses was held in Taichung, Taiwan from 15-18 April 2001. It was the first meeting on this increasingly important topic that has been sponsored by the International Society for Horticultural Science (ISHS).

Participants of the Taichung Meeting.

Dr Tzay-Fa Sheen, (Taiwan Seed Improvement and Propagating Station) Chaired the Organising Committee and Dr Wei Fang (National Taiwan University) was the Symposium Secretary. The meeting was co-sponsored by the National Science Council, Council of Agriculture, Ministry of Education, Taiwan Agricultural Research Institute, National Taiwan University, National Chung-Hsing University, National Chiayi University, National Pingtung University of Science and Technology, National Ilan Institute of Technology, the Rural Development Foundation and the Agricultural Association of Taiwan. There were 180 participants from 14 countries in Asia, America, Australia and New Zealand, and Europe.

The first day of the Symposium consisted of 14 keynote lectures by invited speakers. These were grouped into sessions on the Past, Present and Future of Controlled Environment Agriculture, Environmental Control, and Crop Production. Professor Merle Jensen presented a world review of Controlled Environment Agriculture showing that the total area of protected crops is now approaching 600,000 ha. While the greenhouse areas in countries with well established protected crops industries have generally been stable there have been dramatic 6-fold increases in China and Korea over a ten year period.

On the second day there were 37 presentations of papers in two parallel sessions and a poster session. The sessions included Innovative Design, Environmental Control; IPM and Fertigation; Controlled Environment Crop Production; Monitoring, Control and Decision Support; and Simulation.

A technical tour on the final day included visits to Dai's Biotechnology Co. (automated production of golden mushrooms), Sunrise Biotechnology Co. (plant factory producing orchids and calla lilies), Taiwan Flower Biotechnology Co. Ltd. (hypericum cut flower production) and Taiwan Sugar Co. (bulb production). The tour ended with a very enjoyable meal sponsored by the New Taiwan Greenhouse Company with the project leader of the design team that erected the impressive Tropical Rainforest Greenhouse in the Taichung Botanical Garden which had been visited during the Symposium.

The Organising Committee is to be congratulated for arranging an excellent Symposium which ran very smoothly. Also the substantial funds raised in sponsorship made a significant contribution to the success of the Symposium and to its enjoyment by the participants. The Engineering Commission held a Business Meeting during the Symposium and this resulted in an offer to stage a second symposium on this topic in Malaysia.

Wei Fang and B.J. Bailey

II International Symposium on Persimmon

Participants of the II International Persimmon Symposium.

The Second International Symposium on Persimmon was held at Twin Waters, Queensland, Australia from 10-13 September 2000, following the first such symposium in Pattaya, Thailand in 1996.

The Symposium was very well attended, especially considering the distance many delegates had to travel. More than one hundred delegates from 12 countries made the trip to beautiful Queensland, and some stayed on to attend the Sydney Olympics, which started just two days after the Symposium finished. The location at Twin Waters resort on Queensland's Sunshine Coast was ideal. Not only is this region home to Australia's premier sub-tropical fruit research institute, the Maroochy Horticultural Research Institute, but it is also the region in which some of Australia's first non-astringent persimmons were grown commercially some 30 years ago.

The Symposium welcomed delegates at a traditional Australian 'barbecue on the beach' under the moonlight, but the next morning they got down to the serious business of papers and posters. The Symposium's official opening was performed by the Mayoress of the Maroochy Shire, the Director of the Queensland Horticulture Research Institute, and the Chair of the ISHS Persimmon Working Group, Professor Akira Sugiura. Then the scientific sessions began.

Over the three days of the Symposium, a total of 30 papers were delivered, and about 30 posters presented. The Symposium theme, "Science Meets the Markets" was reflected in three days of presentations, each day with its own theme. The concept was to start the programme with important basic science, then progress through innovation in production systems to the role of marketing and consumers. Day one addressed 'Advances and Productivity', day two 'Innovation and Profitability', and day three 'Meeting the Markets'.

Papers on day one focused on breeding, biotechnology and physiology, and included contributions from scientists from Japan, South Korea, Italy and new Zealand. Day one concluded with a grand 'Australiana Dinner' overlooking the lake. The highlight was the traditional singing from each country represented at the Symposium, led by the irrepressible Professor Suranant from Thailand, whose beautiful wife Panee sings much better than he does.

Day two's presentations turned the focus to innovation, with sessions on product improvement and production systems, and a visit to review work at the Maroochy Horticultural Research Institute. It ended with another typically Australian experience, a walk along one of the region's most beautiful beaches and dinner at the Mooloolaba Surf Livesavers Club.

The final day turned the attention to markets and marketing, with presentations on advances in postharvest, consumer research and industry development strategies. At the closing ceremony, much discussion centered around the question of 'where to from here'? The proposal from the South Korean delegation to hold the 2004 Symposium in their country was accepted with acclamation. A number of issues for more collaborative work were identified, with the intention of presenting results at the next Symposium.

This Symposium not only provided a chance to share the latest findings in persimmon research across many countries, but it also helped to forge new friendships and gave international visitors an experience of the beauty of Australia and the hospitality of its people.

Proceedings from the Symposium are currently being edited into a volume of *Acta Horticulturae*, a process unfortunately delayed by the ill-health of the editor.

Ray Collins, Chairman of the Organising Committee.

Horticulture in Canada –Spotlight on Ontario

Ontario represents well over half of the horticultural industry in Canada, with most of the major horticultural regions being located near the Great Lakes (Figure 1). The Niagara Peninsula, located along the south shoreline of Lake Ontario and bordered by the Niagara Escarpment and Niagara River, has a very unique microclimate, making it highly suitable for grape and tender fruit (apricots, cherries, nectarines, peaches, pears, and plums) production. The north shore of Lake Erie represents one of the largest vegetable (greenhouse and field) and apple producing regions in the province. The Georgian Bay region of Lake Huron is another large producer of apples, while the Holland-Bradford marsh (north of Toronto) represents the largest production of carrots, onions, and crucifer crops in the province. Various horticultural crops are also produced around the London area, as well as in the eastern part of the province along the north shore of Lake Ontario.

Table 1: Farm value (Canadian $) of commercial fruits and vegetables in Ontario (1999).

	Farm value ($ 000,000)
Fruits	
Apple	101.5
Grape	49.5
Peach	25.5
Strawberry	17.3
Pear	7.0
Other	25.1
Total	226.1
Vegetables	
Tomato – greenhouse	145.1
Mushroom	110.0
Cucumber – greenhouse	91.9
Tomato – field	68.7
Sweet corn	24.9
Carrot	17.4
Dry onion	19.6
Other	117.6
Total	595.2

Apple is the largest fruit crop produced in Ontario, with the major cultivars being 'McIntosh' (33%), 'Empire' (15%), 'Northern Spy' (14%), 'Delicious' (12%), and 'Idared' (6%) (1). Several large producer associations and storage co-operatives exist, from which apples are exported and marketed locally year around. Ontario represents close to half of the apple production in Canada, producing over 247,000 tonnes annually. Grape, peach, strawberry, and pear are other important fruit crops grown in Ontario (Table 1).

The Niagara region produces over 90% of the tender fruit (apricots, cherries, nectarines, peaches, pears, and plums) in Ontario, representing over 75% of the production in Canada1. Peach comprises close to half of the tender fruit industry in Ontario, of which approxi-

Figure 1. Map of Canada with an enlargement of the province of Ontario

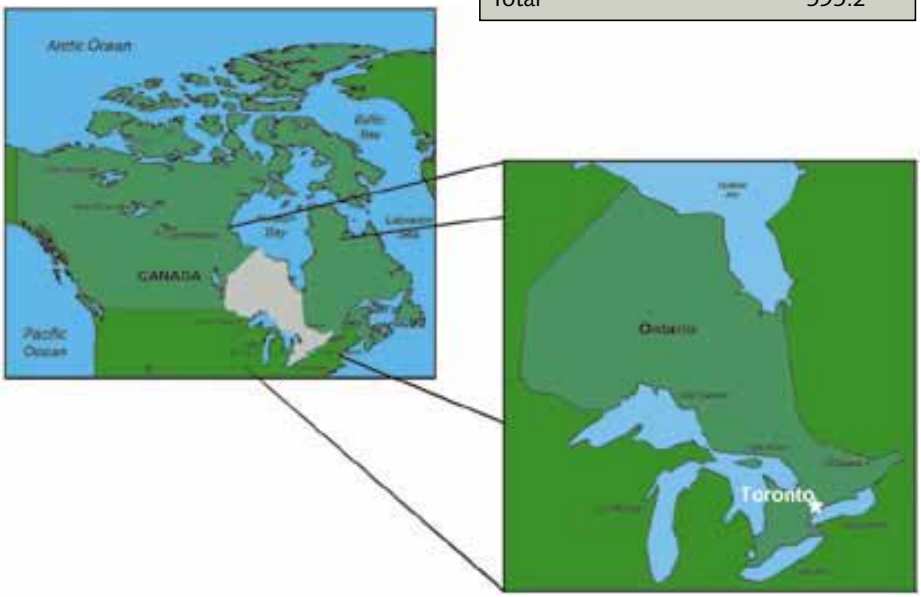


Plate 1: Ontario peaches for fresh market.

mately 75% is sold on the fresh market and the remainder processed primarily as a canned product. (Plate 1)

The Niagara region also produces 94% and 80% of the grapes grown in Ontario and Canada, respectively. Currently there are about 7,000 ha of bearing vineyards in Niagara producing around 56,000 tonnes of grapes. Approximately 80% of the grapes are fermented into wines by the 40+ wineries in the region. Canada is known as the world leader in supplying ice wine (Plate 2) Table grapes are increasing in production and popularity, with 'Sovereign Coronation' becoming a major cultivar.

The farm value of vegetable crops in Ontario is more than double that of fruit crops (Table 1). Tomato (greenhouse and field) has by far the largest production. Mushroom and greenhouse cucumber are other important vegetable crops, along with sweet corn, dry onion, and carrot. Total sales for greenhouse vegetables in 1999 were $249 million, which represents just over half of the sales in Canada (1).

The greenhouse industry of Ontario not only consists of vegetable production, but floriculture as well. (Plate 3) Floriculture can be divided into cut flowers, potted plants, and bedding plants. Total sales of flowers and plants in 1999 were $516 million, which also represents just over half of the sales in Canada1. Roses have the largest production in Ontario, followed by chrysanthemums, snapdragons, and lilies. Geraniums and chrysanthemums are the major potted plants produced, along with poinsettias and tropical, foliage and green plants.

Ornamental nurseries also represent a large horticultural industry in Ontario, for which total sales in 1999 were $237 million1. Potatoes, ginseng, turfgrass, maple products, honey and bees wax are other important crops produced in Ontario.

To support the large horticultural industry in Ontario, there are several federal and provincial research institutes and universities located throughout the province. Two research centres of Agriculture and Agri-Food Canada work on horticultural crops in Ontario. The Southern Crop Protection and Food Research Centre (SCPFRC) has its headquarters in London, with research facilities also located in Guelph, Delhi, and Vineland. The mandate of the SCPFRC is to develop alternative and environmentally acceptable technologies for the protection of tree fruits, vegetables, and ornamental crops against disease and insect pests, to develop alternative crops and sustainable management practices for coarse-textured soils, to determine the impact of sustainable agricultural practices on soil and water quality, and to conduct research on chemical and microbial food quality, and on the impacts of change toward more sustainable production and processing practices on food quality. The Greenhouse and Processing Crops Research Centre (GPCRC), which is located in Harrow, develops methods for improving the productivity of greenhouse and field

Plate 2: Vineyard ready to harvest ice wine grapes in mid-winter.

The Ontario Agricultural College of the University of Guelph is the oldest and largest agricultural college in Canada. In 1998, the Department of Plant Agriculture was created through the merger of the Departments of Horticultural Science and Crop Science with the Horticultural Research Institute of Ontario. The mission of the Department of Plant Agriculture, with regards to horticulture, is to discover, apply, and impart knowledge that promotes viable and sustainable horticultural industries and enhances understanding of horticultural crops, products and related technologies. The Department offers 2-year associate diplomas in horticulture (DHRT) with specialization in ornamental crops and in general agriculture (DAGR) with specialization in fruit and vegetable crop, as well as a 4-year undergraduate B.Sc. (Agr) degree with a major in horticultural science. Graduate degree programs (M.Sc. and Ph.D.) that emphasize horticultural science include crop production and management, postharvest physiology, and genetics, breeding, and biotechnology. In addition to the Guelph campus, facilities of the Department of Plant Agriculture emphasizing research and education in horticulture also may be found at the Muck Crops Research Station in

vegetable crops, as well as conducts research to develop the best management practices, to improve product quality, and to characterize physical and chemical attributes.

The Ontario Ministry of Agriculture, Food and Rural Affairs provides necessary technical advisory services to the horticultural industry, along with the liaison between research and industry. The Crop Technology Branch of the ministry is responsible for collecting, interpreting, and delivering research, technology, and information through seminars, workshops, Internet, research projects, demonstrations, trials, and commodity association and agri-business meetings.

Plate 3: Ontario greenhouse floriculture.

Plate 4: Sweet cherry bloom in Ontario.

Bradford and the Horticultural Experiment Stations in Simcoe and Vineland Station. Other horticultural research and educational resources associated with the University of Guelph are located at Ridgetown, Kemptville and Alfred Colleges.

The Cool Climate Viticulture and Oenology Institute was recently established at Brock University, located in St. Catharines, and offers a B.Sc. degree in oenology and viticulture. Niagara College (Glendale Campus) also offers a diploma in horticulture, as well as other related diploma programs, such as greenhouse or landscape technician. Niagara Parks School of Horticulture is recognized as having the best apprenticeship program for ornamentals in Canada. Niagara Parks also promotes several displays related to horticulture, including the Botanical Gardens and the Butterfly Conservatory. The Royal Botanical Gardens in Hamilton is the largest botanical garden in Canada and no other garden in the world has incorporated untamed and cultivated landscapes together so successfully. Also aiding the tourism industry, are the many blossom and harvest festivals held around Ontario each year(Plate 4)

A favorable climate and good soils allow the growers in Ontario to produce several horticultural crops. There has always been a high-quality fresh market, resulting in a loyal consumer following, as well as a strong processing industry for many years. Diversity has been the success of the Ontario horticultural industry in the past and will continue to be in the future.

References

(1) All statistics are from the Ontario Ministry of Agriculture, Food and Rural Affairs (www.gov.on.ca/omafra) and/or annual reports of the various Ontario marketing boards.

Jennifer DeEll and Ken Slingerland
Ontario Ministry of Agriculture, Food and Rural Affairs
4890 Victoria Ave N, Box 8000
Vineland Station, Ontario
Canada L0R 2E0
E-mail: JDeEll@omafra.gov.on.ca

Dennis Murr
Department of Plant Agriculture
University of Guelph
Guelph, Ontario
Canada N1G 2W1

Spotlight on Korea

Part 2: National Horticultural Research Institute (NHRI)

By way of introducing Korea's horticultural industry to the participants of the 27th International Horticultural Congress of the International Society for Horticultural Science (ISHS), scheduled in Seoul in 2006, we are delighted to present the National Horticultural Research Institute (NHRI).

Charting a clear, realistic and enduring research and development (R&D) direction for the Korean horticultural industry is the ultimate task of NHRI. Amid major changes in the global landscape that speaks of open market and competition, NHRI boasts of a strong and enhanced R&D capability that seeks to enable the industry to survive and compete in the new global arena.

Koreans are proud of their diet, quite varied and full of nutrition. It is richly endowed with fermented foods, grains, meat, fish, poultry, and notably many kinds of vegetables. About 100 different vegetables are used to prepare dishes including the classic 'kimchi', served at almost every Korean meal. Koreans consume more than 150 kg of cooked or raw vegetables in a year, an amount incomparable to any other country on the globe. Providing an ample year-round supply of such a large amount of vegetables to the people is an enormous task, considering that the country has long cold winter and hot humid summer seasons.

Vegetables are generally difficult to store especially for longer periods and have to be consumed fresh. Out of the regular growing season, supply is far less than the demand. Hence, to have a steady supply year-round, vegetables have to be grown during off seasons. NHRI is at the forefront of technology development as a capacitating intervention to enable the country to produce enough vegetables and fruits for its people year-round. At the same time, since the global arena has become more competitive and diversified, NHRI is now broadening its research scope to relatively new areas such as flower production.

BRIEF HISTORY OF NHRI

NHRI was founded in 1948 as the Institute of Korean Agricultural Science (IKAS) in Busan, the second largest city located in southern Korea. The first director of the Institute was Dr. N. U, who is famous for his research on the genome analysis in Brassica. IKAS has since been reorganized to become the NHRI, located at the center of the Korean peninsula. Said reorganization involved several relocations and modifications in the organizational setup, in an attempt to response to the demanding task of meeting the needs of a rapidly growing industry. In 1994, NHRI was again reorganized into its present form by merging the Horticultural Experiment Station and the Fruit Tree Research Institute. NHRI is one of the 10 research institutes under the umbrella of the Rural Development Administration (RDA) (see Chronica Horticulturae 40(4): 13-14).

ORGANIZATION

Currently, NHRI has 212 employees under its administration. Among them are 152 researchers, 13 administrative staff, and 47 technicians. The Institute has 10 divisions that include the Vegetable Breeding Division and others, two regional research institutes (Taegu Apple Research Institute and Naju Pear Research Institute), and a sub-station in Namhae.

FUNCTIONS

The primarily responsibility of NHRI is to take the lead in breeding new varieties of vegetables, fruit trees and flowers. Its functions also include improve-

Bongan.

ment of cultural practices for the open field and under structures, development of soil and pest management technology, and development of post-harvest technology.

NHRI's main directions in research and development are:

- On-site or farmer-participatory research to foster industry with cutting-edge technology so as to produce horticultural crops year-round;
- Development of new technologies to enhance international competitiveness under the free-trade environment for agricultural commodities;
- Development of environment-friendly agricultural technologies in preparation for the enforcement of the Green Round Treaty; and
- Dissemination of new technologies to the farmers, which is needed to supply safe foods to the consumers.

CURRENT RESEARCHES

1. Vegetable breeding and cultivation

The Vegetable Breeding Division carries out various programs to breed new varieties by traditional plant breeding method as well as new technologies such as genetic engineering. For the breeding program, genetic resources are collected, characterized, and maintained. The Division also keeps close ties with the Asian Vegetable Research and Development Center (AVRDC) in Taiwan in the implementation of a collaborative project on vegetable breeding of chili pepper, Chinese cabbage, and vegetable soybean. Researchers develop molecular markers in several crops to be used in the marker-assisted selection.

Among many varieties, NHRI has released the 'summer radish for lowland', a Chinese radish variety with heat-resistance that can be produced in the lowlands during hot months. For chili pepper, which is the most important vegetable commodity in Korea, requiring heavy labor during harvesting, NHRI breeders are trying to breed varieties suitable for once-over mechanized harvest. Other research programs of the Institute include breeding of watermelons with few seeds and development of cross breeding scheme for garlic.

In vegetable cultivation, research efforts are focused on development of stable production techniques for high quality vegetables and reduction of climatic disasters. The developed technologies are disseminated to farmers for their adoption and wide use.

Suitable nutrient solutions for several vegetable crops and different hydroponic culture systems have also been developed at NHRI. Integration of these technologies will enable low-cost year-round stable production of vegetable crops.

Intensive researches are conducted to develop technologies for the reduction of required manpower such as raising seedlings and transplanting for vegetable crops like chili pepper. Studies on physiological disorders and its countermeasures are being carried out. Research efforts are placed on enhancing productivity through establishing practical and economical cultivating system for vegetable crops.

2. Protected cultivation

Greenhouse system research team at NHRI developed a system of computerized environmental control for automation of greenhouse management for greenhouse cultivation. The team succeeded in developing automatic nutrient-solution supply system that in the past had to be imported from other

countries. Several standard designs for the construction of greenhouse were designed and released for the use by the farmers for cultivation of various crops in the greenhouse.

The NHRI research team has also developed various energy-saving techniques such as an effective temperature-reduction method in summer season for year-round production of horticultural crops; and various curtains for minimizing heating area for cost saving. The team concentrates their efforts in developing stable production techniques for high quality agricultural products. Minimization of energy input and development of technology-intensive techniques are some of the Institute's future research thrusts. The goal is to improve product quality and international competitiveness of greenhouse-based horticultural crops.

3. Fruit tree breeding and cultivation

In the area of fruit tree breeding, fundamental researches are going on to adopt genetic engineering technology, together with development of superior varieties and rootstock breeding. Six new varieties of apple, such as 'Hwahong' apple, with more vivid color than the 'Fuji' variety and 15 different good quality pear varieties, such as 'Hwangkeum' pear, were bred. For stone fruits, the breeding team had arrived at five different varieties of peach and an apricot variety. 'Tamnara' grape, 'Namhae No.1' citron, and 'Pook' kiwifruit are a few of the varieties of other fruit crops that resulted out of the work of the NHRI's fruit tree breeding team.

The breeding team of NHRI puts emphasis on the importance of extended cross-breeding and collection of native variation for breeding of high-quality and high-yield fruits. It explores the possibility of cross-breeding for dwarf rootstocks, suitable for low-height, high-density cultivation.

In the area of fruit cultivation, the Institute has developed numerous new cultivation techniques for apples, pears, peaches, and grapes suitable for local conditions. The research team was successful in developing the 'Y' shape tree training system to shorten period before the first harvest and to save labor during harvesting, especially for pear and peach.

Methods of using reflective film and colored bags have also been introduced to improve the fruit color and appearance. The team developed a fruit-skin color chart to predict the optimum harvest date. A 'leaf color chart' is being used to estimate the proper amount of fertilizer for different types of fruit trees.

Grafted Cacti.

NHRI's extensive studies were successful in determining the cause and cure of various physiological disorders of fruits such as the bitter pit of apple and the berry shattering phenomenon of grape tree. The research team has been trying to develop orchards with new concepts where sustainable production with least input is possible.

4. Floriculture

Recently, NHRI's breeding team developed and released five new rose varieties for cut flower. The varieties will substitute the foreign rose varieties grown at most farms in Korea. At the same time, it developed and released 13 varieties of chrysanthemum, 12 lilies, 9 carnations, 4 gerberas, 5 gladioli, and 3 native flower varieties. To meet the demand of flower seeds of annuals and biennials, the Institute has been trying to breed new varieties of herbaceous flowers like petunias and pansies.

Grafted cacti are one of the most important ornamental crops for export in Korea. Twelve varieties of cacti including 'Hongsil', a popular export item with its superior bulb shape and color, were bred and released by the Institute. Two varieties for rootstocks of roses have been selected for their thorn less character and resistance to root-knot nematode.

The research team developed a method for mass propagation of bulb crops in bio-reactor. Another technique developed at the Institute was the 'box-culture method' to enable triple cultivation per year in a greenhouse. These technologies will help to disseminate the newly bred varieties in a short time span.

Researches at the Institute are now focused on the following new and innovative techniques such as breeding of non-branching chrysanthemum, hydroponic culture system for flower production, in vitro culture system for mass-production of seedlings, manipulation of flowering time, development of rapid propagation system for selected native flowering plants for commercialization, and refinement of cultivation practices for pot plant production like orchids and poinsettias.

5. Pest and soil management

NHRI's research thrust in the area of pest management includes diagnosis and control of insects and diseases of horticultural crops, establishment of protecting system, and screening methods against major diseases. The virus research team has developed and disseminated virus-free saplings of fruit

trees that could improve quality of fruits markedly. Testing kit developed for rapid diagnosis of viral diseases helps extension workers and farmers, and it contributes in saving foreign currency for overseas purchase orders.

In addition to disease prevention techniques on cash crops such as fruits and vegetables, the research team has also identified proper timing for leaf-blight prevention measures on lilies for export. Thanks to this, the income of the farming households has increased considerably.

A CD-ROM has been developed and distributed to farmers that enables them to easily detect damages from insects or diseases on fruit trees. A web page was developed to be served for the diagnose of pests through the internet, which contains advises for control measures against most of the problematic pests.

To ensure effective disease/insect control and reduce use of agricultural chemicals, accurate forecast of attack time of insects is performed utilizing pheromone trap and cumulative-temperature method. Pest controls utilizing natural enemies are also a major part of the Institute's integrated management on diseases/insects in fruit trees.

Research thrust in the area of soil management includes establishment of farming system for environment preservation and development of fertilization standards in preparation for the Green Round.

6. Post-harvest research

In the area of post-harvest research, the Institute has been working on the development of storage method by modification of gaseous ratios. Related studies with the development of storage are physiology of maturation and after-ripening of plants and fruits. The research team has likewise developed packing and storage materials to maintain freshness and easy handling of the produces during pre-cooling.

The team has also succeeded in brewing fermented liquor and distilled liquor, together with other processed products from low quality fruits.

Other researches being conducted in the area of post-harvest include: storage physiology and prevention of physiological disorders after harvest, and maintenance of freshness by controlling the respiration. The Institute is also undertaking studies on treatment before shipping, quality evaluation, and improvement of packing/ transportation systems to prevent physiological disorders taking place during transport. Studies are also being conducted on latest storage technologies such as ultra-low oxygen storage.

Wongyo G1 - 16.

KOREAN HORTICULTURE IN THE 21ST CENTURY

Agriculture will remain as important as the industrial sector for the Korean people. Major changes in the international sociopolitical landscape, however, have posed great challenges especially among the farming households who suffered from a deteriorating economy.

Korean farmers have been hard-hit by the GATT-WTO Uruguay Round. The subsequent economic crisis in the country made things even worse. Amid this predicament, the devaluation of the Korean currency and soaring interest rate pushed prices of oil and other farming materials up, burdening even more the toiling farmers.

However, with all these significant changes, the horticultural industry showed significant growth during the last three decades. In 1970, horticultural products occupied only 17% of total agricultural products in Korea. The share increased to 32.5% in 1999. It is expected that the horticultural sector will continue to grow in the new millennium, in concomitant with the changing diet habit of the people. While grain consumption per person has dropped to 152.9 kg in 1999 from 167.0 kg in 1990, fruit consumption increased from 41.7 kg to 55.7 kg and vegetable consumption also increased from 132.6 kg to 148.0 kg during the same period. Significant increases in export of cut flowers, fresh vegetables, and vegetable seeds have been achieved in recent years.

Through research and development, NHRI hopes to continuously make vast contributions to the growth of the horticultural industry, as well as to the overall socioeconomic and technological development of Korea.

For more information, please visit our web site: http://www.nhri.go.kr or contact: The Planning Team, National Horticultural Research Institute, RDA, 475 Imok-Dong, JangAn-Gu, Suwon 440-706, Korea, Phone: (82)312403550, Facsimile: (82)312403556.

Myoung Rae Cho and Dae-Geun Oh National Horticultural Research Institute, RDA, Korea

Ornamental Plant Production in Turkey

Ornamental plants production comprises both growing under outdoor and indoor conditions of all herbaceous and woody plants, cut flowers and pot plants. Especially cut flowers and pot plants have an important value in world trade. According to de Groot (1998), pot plants and cut flowers share 80% of world trade of ornamental plants.

Nursery of Ornamental Plants.

As in all European countries and especially in Germany and Holland, a remarkable increase in the consumption of flowers and consequently in the flower business after 2nd World War, could be noticed. At the same time new techniques have been developed in Holland, both in cultivation and in packaging and storage after 1960. Later on, developed countries started to cover their demand for flowers by importing from the less developed and other developing countries, suited with better climate and lower labour costs. For instance, the USA covers its demand with additional import from Colombia and Ecuador, Japan started buying in Asian and Pacific countries. Especially, cut flower subbusiness - production, consumption and marketing organisation - focuses in three centres: the USA for the American continent, Japan in the Far East and European Union in the European- African- Asian triangle (Aimone 1997, Özkan et al. 1998). In this process, the "Holland Flower Auction" became the centre of world flower trade.

Today there is a big competition in the world flower business, much depending on the changes in production and consumption. Developed countries reached a saturation in the high level of consumption; developing countries, mainly previous East Bloc countries, are establishing new markets. Especially Poland, Hungary, Slovakian and Ireland are marked as the fastest improving markets, having a 50 000 million USD world ornamental flower trade (Gürsan and Erkal 1998).

Based on its annual market projections, the Flower Council of Holland projects that Dutch flower and plant exports would rise to 4,600 million USD by the year 2003 and European pot plant consumption is expected to rise to 9 950 million USD by the year 2003 (Anonymous 2000). Consequently, it

Figure 1. Location of main producer cities in Turkey.

Table 1. Trends in Exports of Cut Flower Species in Turkey (USD) (Anonymous 1999)

Species	1994	1995	1996	1997	1998
Carnation	9 892 661	10 652 685	11 916 426	13 386 937	13 179 628
Rose	20 438	34 212	6 620	18 051	6 394
Chrysanth.	91 717	15 548	32 658	102 283	12 883
Orchid	15 404	1 846	20	1 187	0
Others	270 697	202 968	137 594	161 026	336 871
TOTAL	10 290 917	10 907 259	10 093 318	13 669 484	13 535 776

will be very useful to study these figures of new markets for both products and research.

In general, ornamental plants are evaluated in four groups, "cut flower production", "indoor ornamental plant production", "outdoor ornamental plant production" and "native flower bulbs".

Ornamental plant production in Turkey was oriented to a more commercial production after 1940s. In the beginning, flower business started around Istanbul and has developed into the western part of Turkey. After 1975, it started in the southern area of Turkey, especially in the provinces around Antalya. Small scale family companies were transformed into big and modern facilities by the time (Fig.1).

Intensive cut flower production in Turkey is leading in cities such as Istanbul, Yalova, Izmir, Antalya and Aydin. The flowers produced in Antalya are evaluated for export purpose; flowers produced in other regions are generally released for the domestic market. Carnations, roses, gladiolus, freesia, lilies, statice and chrysanthemum are mostly grown in the Yalova- Istanbul region, while roses, standard and spray carnations, gypsophila, chrysanthemum, gerbera, gladiolus, freesia and lilies are grown in the Izmir- Aydin region.

Cut flowers for export purpose are mainly cultivated in the Antalya vicinity. Antalya provides 87% of Turkey's cut flower production for export and plays an active role in production area, production quantity and marketing organisation. Turkish cut flower export consists mainly of a few varieties of spray carnations. In terms of amount, the spray carnation accounted for 97% of the total export volume in 1998. Roses, chrysanthemums, orchids and the other cut flowers follow carnations in terms

Cut Flower (Chrysanthemum sp.) Production in Greenhouse.

of volume of export (Anonymous 1999). Investigation on export related to species shows that (Table 1), while carnation export volume has been markedly decreasing since 1994, rose and chrysanthemum export decreased even more, orchid export volume has completely ceased today. According to the export figures in the years 1997-1999, Turkish cut flower export was for 65.4% oriented to the United Kingdom, 20% to Holland, 7.6 % to Japan and 7% to other countries (Anonymous 1999).

Indoor ornamental plants cultivation has been seen as a subdivision in floriculture. It consists of pot plants used in various forms in houses, hotels, factories and also the production material such as seeds, rhizomes and other plant parts. Indoor ornamental plants are usually called "pot plants".

Comparing the indoor ornamental plant production regions, the Marmara Region takes the first place by 49.0%, Aegean and the Mediterranean Regions follow Marmara with 34.7% and 15.4% respectively. The other regions take a very small place (0.9%) in indoor ornamental plant production (Aksu et al. 1996).

Companies growing indoor ornamental plants in Turkey, can be clasified in three groups:

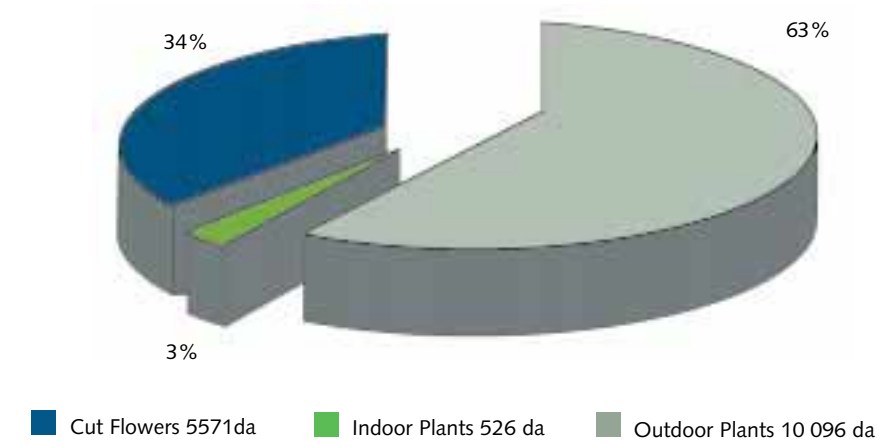
a) Those growing on their own the production material until sales size,
b) Those importing the production material and growing until sales size,
c) Those importing the plants and selling the product on short notice.

CURRENT PRODUCTION

The current status of ornamental plant production in Turkey was the subject of a survey that took place among the Directories of Agriculture in the majority of the cities (in total 77 cities). The collected data included total production area; cut flower production; pot plant (indoor ornamental plant) production and outdoor ornamental plant production.

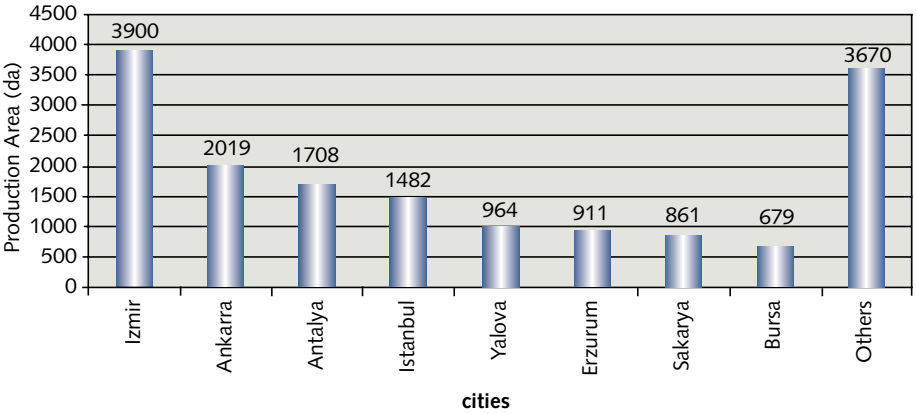
Results obtained from all the cities, showed today a total of 16 194 da (da= decares=1000 sqm or 0.2471 acre) ornamental plant production area in 41 cities in Turkey. Total production area of outdoor ornamental plants, cut flowers and indoor ornamental plants was

Figure 2. Distribution of total ornamental plant production



Bedding Plants in Greenhouse.

Figure 3. Production area of ornamental plants in main producer cities.



Pot Plants production.

determined as 63%, 34% and 3% respectively (Fig. 2).

Izmir has the maximum Production area (3 900 da) followed by Ankara, Antalya, Istanbul and Yalova (Fig. 3).

Meanwhile, the results show that there is a total of 5 571 da production area of cut flowers in 22 cities in Turkey, leaded by Izmir, Antalya, Yalova, Adana and Bursa (Fig. 4).

Indoor ornamental plants are produced in Turkey in 23 different cities with 526 da area and this value accounts for 3% of total ornamental production. The maximum production was found in Izmir with 157 da production area, followed by Yalova (152 da), Adana (52 da), Antalya (36 da), Bursa (32 da) and Istanbul (27 da) respectively (Fig. 5).

Outdoor ornamental plant production stands for 10 097 da in 37 cities of Turkey, which means 63% of the total ornamental plant production of Turkey. Ankara takes the first place of the total production with an area of 2010 da. Among the other 36 cities, Istanbul (1455 da), Izmir (966 da), Erzurum (910 da) are also important players (Fig. 6).

Figure 4. Production area of cut flowers in main producer cities.

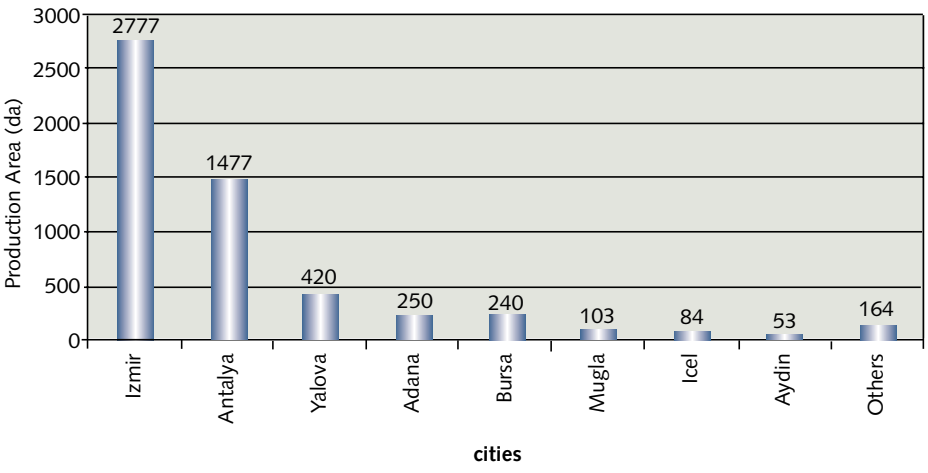


Figure 5. Production area of indoor plants in main producer cities.

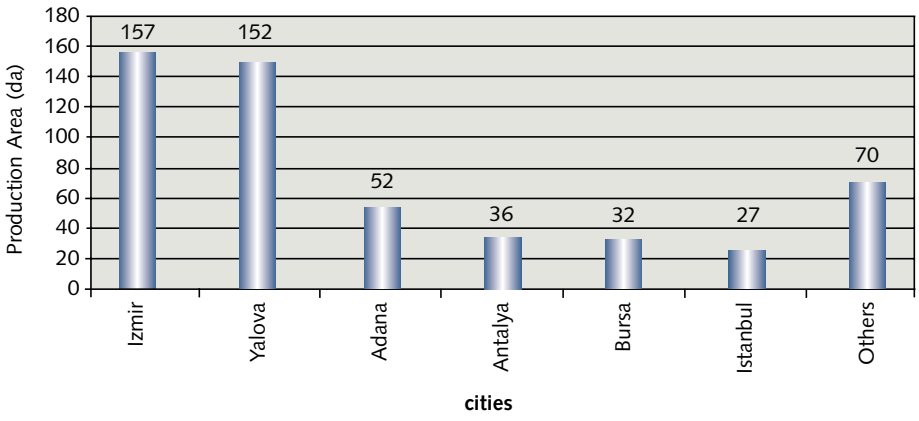
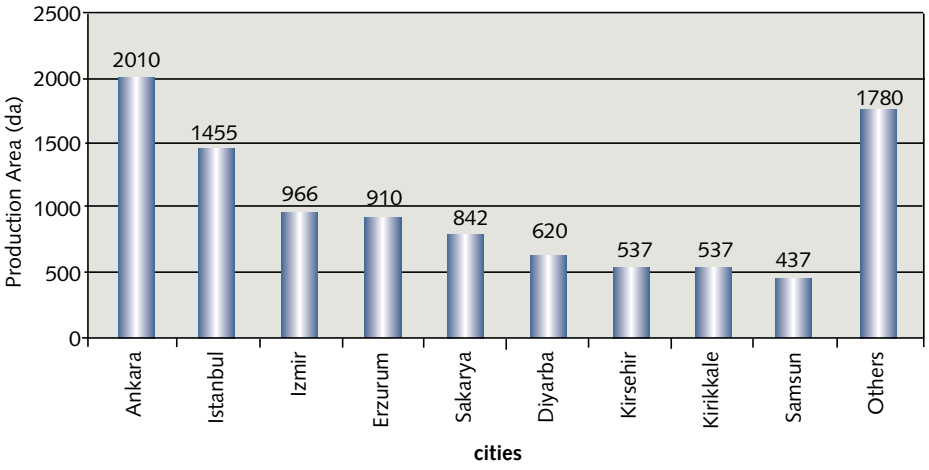


Figure 6. Production area of outdoor plants in main producer cities.



CONCLUSION

Ornamental plant production and trade has been developing well in Turkey in the last 20-25 years, and this being in line with the progress in the world.

According to the survey the cut flower production area in 1997-1998 accounted for 5 571 da. This result shows that total cut flower production area was reduced with approx.%17 within a 4-5 years period, compared with an area of 6,694 da in 1992-1993 (Ertan et. al 1996).

So far, Turkey has not reach the optimal export level in volume compare to its input of resources and this in spite of the progress made both in production for domestic and foreign markets. For instance, the cut flower export realised in 1998 was 13,535,776 USD.

Two factors might explain the reason for the reduction of cut flower production area in Turkey: one is the unstable conditions for export and the second is a better possibility for income from other ornamental crops. Turkey can only improve its market share in cut flower export by continuously developing and improving novelties and by adapting to changes in the sharp competition in the global economy of today.

In 1998 indoor ornamental plant production area was increased from 373 da to 526 da as can be seen from the values of Aksu et al. (1996) for 1993. The reason of the increase in production area can be explained from the higher income of indoor ornamentals, where the production can be valuated with higher prices.

Cultivation in this area starts from importing production material and grow them until sales size and/or importing sales sized plants and marketing them on short notice. Turkey's pot plant export is almost not existing (Aksu et al. 1996) due probably to a continuous increasing Domestic demand for pot plants day, while existing companies can only just satisfy this demand and where the total production is not big enough to compete with lower labour cost conditions in other countries.

The total production area for outdoor ornamental plants was 10 097 da in 1998 and was 528 da in 1989, as reported by Safak et al. (1989). There is a big increase in outdoor ornamental production, stimulated by a general desire to live in better home gardens, recreation areas, holiday villages, as a consequence of improving living standard.

Turkey must improve the production of all kind of ornamental plants by using more logically the resources and it must speed up its knowledge especially on foreign market, complete the organisation chain from production to marketing stage, improve research-development activities. It should become eager to gain a place in the world market of ornamental business.

REFERENCES

Aimone, T. 1997. International Statistics: How do United States Statistics Stack Up. Floraculture International, 7(11): 30-32.

Anonymous. 1999. Cut Flowers from Turkey. IGEME. Export Promotion Center of Turkey, Ankara, 8 p.

Anonymous. 2000. Flower Council of Holland, Market Data. Floraculture International 10(1):12-13.

Aksu, E., Erkal, S. and Görür, G. 1996. Report of Indoor Ornamental Plants (Salon Plants) (Turk.). State Planning Organisation- Report of 7th Five Years Progress Plan Working Group, Publ. No: DPT:2464- ÖİK:515,:38-52.

Ertan, N., Karagüzel, O., Kostak, S., Gürsan, K. ve Özçelik, A. 1996. Report of Cut Flowers (Turk.). (Ornamental Plant Group) State Planning Organisation- Report of 7th Five Years Progress Plan Working Group, Publ. No: ÖİK:515,: 63-81.

Groot, N.S.P. 1998. Floriculture, Worldwide Trade and Consumption Patterns. World Conference on Horticultural Research, Roma, 17-22 June 1998, Discussion Text: 75-79.

Gürsan, K. ve Erkal, S. 1998. Developments in Ornamental Plant Production and Trade in Turkey and in the World (Turk.). 1st National Ornamental Plant Congress. 6-9 October 1998. Yalova, :1-11.

Özkan, B., Karagüzel, O. ve Ortaçeşme, V. 1998. Production and Marketing Problems and Some Solution Proposals of Cut Flowers Export. (Turk.). 1st National Ornamental Plant Congress, 6-9 October Yalova,: Proceedings: 19-25.

Şafak, A., Erkal, S., Ergün, M.E., Yücel, B. and Uluğ, V. 1989. Economical Condition and Production and Marketing Problems of Pot Plants and Ornamental Herbs Producer Companies in Turkey (Turk.). Yalova, Atatürk Central Instutute of Horticulture. National Project., 17 p.

Ozlem Kucukahmetler and Atilla Eris
Uludag University, Faculty of Agriculture, Department of Horticulture, 16059 Bursa, Turkey
e-mail: atillaer@uludag.edu.tr

New Books

The books listed here are non-ISHS publications. For more details on ISHS publications on these and many other topics we refer to the ISHS website www.ishs.org or to the list of available Acta Horticulturae in this issue of Chronic Horticulturae

COMPOST UTILIZATION IN HORTICULTURAL CROPPING SYSTEMS

Edited by Peter J. Stoffella and Brian A. Kahn. Published 2001 by Lewis Publishers an imprint of CRC Press LLC, 2000 NW Corporate Blvd., Boca Raton, FL 33431, USA. One volume hardback, 414 pages, ISBN 1 56670 460 X. Compost Utilization in Horticultural Cropping Systems is the first book to establish a composite of the existing scientific knowledge on the use of compost in commercial horticultural enterprises and gives the reader a comprehensive review of the production, use and economics of compost. The book covers production methods, compost quality and the parameters associated with its measurement, and the biological, chemical, and physical processes that occur during composting.

Courses and Meetings

Courses and meetings listed here are not organised by ISHS. For a list of ISHS Meetings we refer to the ISHS Calendar of Events.

75th Anniversary of the Establishment of Dominion Herbal College and 30th Annual International Herbal Seminar, University of British Columbia, First Nations Longhouse, Vancouver, BC, Canada, 16-21 July 2001.
Info: Art Birzneck,herbal@uniserve.com, Fax. +1.604.526-1561

VI International Symposium on Fruit, Nut, and Vegetable Production Engineering. September 11-19, 2001, Potsdam (Germany). Info: Dr. M. Zude-Sasse, ATB, Max-Eyth-Allee 100, 14469 Potsdam, Germany.
Phone: (49)3315699619,
Fax: (49)3315699849,
e-mail: mzude@atb-potsdam.de
web: www.atb-potsdam.de/sympo-sium2001/

Hortec 2001. Techniques in Horticulture fair. September 20-22, 2001, Karlsruhe (Germany). Info: Messe Karlsruhe, Festplatz 9, 76137 Karlsruhe, Germany.
e-mail: info@messe-karlsruhe.de

Interamerican Meeting for Horticultural Science, Oaxtepec, Morelos, Mexico, 1-5 October 2001. Info: Juan Bustamante, inizacmo@jojutla.podernet.com.mx, Fax. +52-634-30230

XVIth International Witloof - Chicory Biennial, Brugge, Kampenhout, Herent, Belgium, 5-6 October 2001. Info: Patrick_Meulemeester@Boerenbond.be Fax: +32-51-260389

VIIth Meeting of the International Association for Plant Tissue Culture and Biotechnology, Australian Branch, University of New England, Armindale, Australia, 20-23 January 2002. Info: Acram Taji, ataji@metz.une.edu.au Fax. +61-2-6773-3238

I Congreso Latinoamericano de Fitoquimica and IV Reunion de la Sociedad Latinoamericana de Fitoquimica, Buenos Aires, Argentina, 8-10 May 2002. Info: Arnaldo L. Bandoni, abandoni@infovia.com.ar Fax +54-11-4812-6657

VIIIth International Working Conference on Stored Product Protection, York, North County, UK, 22-26 July 2002. Info: Helen Terre Blanche, iwcspp@icscs.co.uk www.york.icscs.co.uk/iwcspp20020

VIth Conference of the European Foundation for Plant Pathology, Prague, Czech Republic, 9-14 September 2002. Info: J. Polak, EFPP2002@vurv.cz
Fax. (420)2333-11592

Cucurbitaceae 2002 Conference, Naples, Florida, USA, 8-12 December 2002. Info: Don Maynard and Beth Miller-Tipton, bmiller-tipton@mail.ifas.ufl.edu
Fax: +1.352-392-9734

VIII International Congress of Plant Pathology (ICPP). February 2-8, 2003, Christchurch (New Zealand). Info: ICPP, PO Box 84, Lincoln University, Canterbury, New Zealand. Phone: (64)33252811ext8955
Fax: (64)33253840,
e-mail: shrewsbh@lincoln.ac.nz
web:
http://www.lincoln.ac.nz/icpp2003/

Annual Meeting of the Interamerican Society for Tropical Horticulture (ISTH). September 2-5, 2003, Fortaleza-CE (Brazil). Info: Dr. Ricardo Elesbao Alves, Embrapa Agroindustria Tropical, CP 3761, 60.511-110 Fortalza, CE, Brazil.
e-mail: elesbao@cnpat.embrapa.br
web: http://www.49isth.cjb.net

IVth Triennial Conference of the International Oak Society, Winchester, UK, 12-15 September 2003. Info: Ron Holley, 23crescent@supanet.com
Tel. +44-2392-585972

The Workshop on Environmentally Friendly Agriculture under Structure

The above workshop was held under the auspices of Science & Technology Agency and National Research Institute of Agricultural Engineering, Japan, on 4-5 December 2000 at Tsukuba International Congress Center. The official language was English. The invited speakers and their topics were as follows.

Engineering structures of greenhouses.

1) Low cost reinforcing method preventing damage by wind and snow for plastic greenhouses: Dr. N. Fujimoto (Nat. Res. Inst. of Agricultural Engineering, Japan)
2) Resource efficient open-roof greenhouses: Dr. W. J. Roberts (Rutgers, State Univ. of New Jersey, USA)
3) Insect exclusion for greenhouses: Dr. D. R. Mears (Rutgers, State Univ. of New Jersey, USA)

Environmental control

4) Current status and technological perspectives in greenhouse environment control under mild climate: Dr. S. Sase (Nat. Res. Inst. of Agricultural Engineering, Japan)
5) Effective environmental control for greenhouses: Dr. L. D. Albright (Cornell Univ., USA)
6) Optimal control of CO_2 enrichment in ventilated greenhouses: Dr. B. J. Bailey (Silsoe Res. Inst., UK)

Growing systems

7) Engineering aspect of innovative growing systems: Dr. G. A. Giacomelli (Univ. of Arizona, USA)
8) Soilless culture of single-truss tomato-A labor saving management system: Dr. K. Okano (Nat. Res. Inst. of Vegetables, Ornamental Plants & Tea, Japan)
9) Recirculation and disinfection of nutrient solution: Dr. E. A. Van Os (Inst. of Agriculture & Environmental Engineering, Netherlands)
10) Development and application of membrane disinfection system for nutrient solutioDr.T. Ohtani (Nat. Food Res. Inst., Japan)

Controlled environment agriculture

11) Object-oriented analysis for controlled environment agriculture: Dr. Kuan-Chong Ting (Ohio State Univ., USA)
12) Closed transplant production systems with artificial lighting: Dr. T. Kozai (Chiba Univ., Japan)

M. Iwata

Cultivation of Witloof - Chicory

Witloof chicory, *Cichorium intybus* L. var. foliosum is derived through selection from coffee chicory, *Cichorium intybus* L. var. *sativum* which in turn originates from wild chicory, *Cichorium intybus* L. var. *intybus*.

The vegetable witloof is the result of a regrowing of the central bud on chicory roots. By this a firm head of etiolated leaves, called chicory head, is produced.

Witloof chicory is produced in two stages. In the first stage the chicory root is grown in the field. In the second stage the harvested roots are forced to produce the chicory head which constitutes the vegetable.

The cultivation of the chicory root is similar to that of many other farm crops. Sowing is done in spring on a flat field or on ridges. Nowadays precision drilling machines are used which will reduce later thinning to a minimum. Since the thickness of the chicory head is largely influenced by the thickness of the root a regular distribution or spacing of the plants in the field is needed. Further crop care in the field, weed and pest contol are similar to those used with other crops.

The roots are harvested in late summer or autumn by means of highly-specialised harvesting machines. Deep undercutting during harvesting is necessary to obtain sufficiently long roots. On the other hand foliage leaves must be cut off in such a way that the growing point remains on the root. The root should not be cut blind at the top as it will then only produce thin lateral shoots in stead of one well-shaped chicory head. After harvesting the roots are sized, treated to prevent diseases and then stored in a refrigerated room.

Cooling of chicory roots is carried out for two reasons. On one hand early young roots are cooled for well over a week to allow further maturing and to make them more suitable for forcing. On the other hand roots for late or very late forcing are kept in cool stores to maintain their optimal production capacity.

The second stage in witloof chicory production is forcing. It is the process of artificially stimulating the root, mainly by heating, to produce a chicory head outside its normal growing season. Forcing methods however have been subjected to radical changes in the past thirty years.

1. Traditional forcing in the open air consists of placing the roots upright one next to another in the soil creating in this way thickly packed beds. The roots are subsequently covered with a more or less thick layer of soil. This covering layer protects the planted roots against adverse outside temperatures. The roots are, to a certain extent, stored in the forcing bed. In winter, the traditional forcing season, the different beds are heated

and forced one after the other, by means of simple, small movable heaters, or with a central heating system or even with electric soil heating. To protect those beds of roots against adverse weather conditions hay or straw is used as insulation material as well as semi-circular corrugated metal sheets placed over the straw layer.

2. Forcing in the open air is both difficult work and labour intensive and as a result forcing in a chicory shed was introduced. This is a large, closed building, preferably completely darkened. The roots are also set closely packed in the soil and are forced by means of various methods of soil heating. The chicory shed protects not only the grower but also the roots against unfavourable climatic conditions. Since the ambient temperature in a shed is normally higher than the outside temperature it is no longer possible to leave the roots in a state of dormancy as can be done in traditional forcing in the open air. The need for long, cool root storage arose with the introduction of chicory sheds.
3. A very remarkable and more radical change in the cultivation of witloof was the introduction of forcing in the absence of covering soil. Since the need for a covering layer has a number of inherent disadvantages cultivars were now needed which are capable of producing chicory heads of good quality without the need for a covering layer.
4. Forcing in soil is also labour intensive and moreover requires much space. Efforts were therefore made to develop an even more efficient method such like hydroponics. In this method movable watertight trays are used to hold the chicory roots. These trays are placed in a temperature and humidity controlled room and a nutrient solution is forced through the trays. By this method of forcing and the possibility of storing roots, the production of witloof takes place year-round. Nowadays, hydroponic forcing is the principal technique for the production of witloof chicory. The three most important "witloof" producing countries are Belgium (3700 ha of chicory roots), The Netherlands (4300 ha) and France (14000 ha).

As soon as the chicory heads are full-grown they are harvested or picked by breaking them off of the roots. As a result the root looses its growing point and is of no further use. The roots can then only be used as animal feed. The harvested chicory heads are then cleaned and fashioned into an optimal shape by removing the superfluous leaves. Finally the chicory heads are classified according to their quality class and packed in a suitable commercial pack ready for auction or sale.

Mia Demeulemeester, POVLT

Biophotonics - a method for holistic quality analysis in plant/vegetal raw materials and food

The consumer generally does not classify food or fruit and vegetables with the help of chemical analysis but by visual impression, i.e. with the naked eye. Without the use of technical procedures which help to make food look better, like colouring agents, the appearance would be one of the most reliable criteria for the quality of foods. The correlation between the optical "visiting card" of fruit and vegetables and their quality is described impressively by Diemeir ([1]).

The origin of this correlation is mostly unknown, although it can probably be explained by the fact that the plant itself lives off light and that during the evolution from plants to mammals light is and was one of the most important "nutrients". In mammal metabolism, sugar produced during photosynthesis is broken down into water and carbon dioxide and then excreted. The binding energy released during this process, which was added in form of the sunlight in the beginning, becomes the driving force for both functional and structural tasks of the plant metabolism. It cannot be denied that "light patterns" of food and their vegetal raw materials allow an objective evaluation of their quality to be made. This is only possible, however, if they are able to reflect the quality information precisely and that at the same time the correlations between visual reflexes and quality are sufficiently known. Another requirement is that the recognition and evaluation techniques lead to (statistically) significant results.

A method which provides both qualitative and quantitative features is biophotonics, which was introduced in Germany by Popp and his team from the International Institute of Biophysics in Neuss in 1990, since which time it has been improved upon continuously (3). At present, in many Asian and European countries the method is applied in co-operation with Popp. In particular in Japan, biophotonics is given considerable financial support by

the ministry of agriculture and the food industry.

In Japan, biophotonics is seen as a reliable instrument/ method for the early diagnosis of infestations in agriculture and horticulture and for the development of suitable protective measures. A co-operation between the Japanese government and the International Institute for Biophysics is trying to develop the potentials of this technique, which in the meantime has been patented in both Japan and Europe for different areas of application. The aim is to develop a holistic, fast and sure method of quality control ready to use in practice within the coming years. The Japanese contribution to the optimisation mainly consists of advanced optical technologies, although at the same time, the Japanese government is sponsoring agricultural and horticultural cultivation experiments and providing the necessary trial stations. The German team, led by Prof. Dr. Popp from Neuss and Prof. Dr. Matschke from Versuchanstalt für Pflanzenzüchtung in Münster-Wolbeck, is running the trials. The physics institutes of the following universities are also involved in the project: Catania University, Moskow State University, North Eastern Hill University in India, and the State University Utrecht.

The biophotonics method is based on "delayed luminescence" (DL), which was first observed by Strehler and Arnold in 1951 and whose physical causes have since been further investigated by Popp and his team. DL is understood to be the long-term afterglowing of biological systems after external influence through monochromatic and/or white light. In contrast to fluorescence and luminescence, the reemitted light emissions do not fade within nanoseconds or milliseconds, as the fading process can last for minutes or hours. This delayed luminescence is at least ten orders of magnitude smaller in its intensity than fluorescence. These quantum-optic phenomena cannot be interpreted without a profound knowledge of quantum physics.

Fluorescence and phosphorescence give evidence of the food compounds and their vegetal raw materials, whereas the relaxation kinetics of delayed luminescence reveal the internal structure of the matter observed. This is of importance especially for quality control in food. For example, freshness or germination capacity of grain or other seeds and differences in taste between fruit and vegetables stemming from different cultivation and processing methods can not only derived from chemical differences but from the more or less disturbed internal structure of the biological matter. Popp et al. have documented these facts in a series of studies (cf. 4-7)

Biophotonics is the first method that does not strictly distinguish between "good" and "bad" food, which is not likely in most cases. Biophotonics also allows the dimensionality to be defined, i.e. the number of independent factors necessary for making the description of quality possible at all. For example, the growth rate and digestibility of a plant or foodstuff made from are not necessarily positively correlated. These antagonistic quality features are revealed by biophotonics. The method makes a real quality optimisation of the proper use of fruit and vegetables possible. According to Popp, the much talked about "user-friendliness" can be seen as early as in the works of Erwin Schrödinger (Nobel Prize winner and physician), who had a holistic idea of quality which fitted the modern ideas of food quality. In particular in fruit and vegetables, quality should not be based on the results of the analysis of individual chemical compounds. Biophotonics does not intend to replace classical chemical food analysis. It should be applied in addition to chemical analysis as a holistic method that has to be seen in a wider context.

At present, possibilities of application are the following:

1. identity / variety purity testing through the principle of pattern recognition;
2. optimisation of cultivation methods, of stocking and of processing food;
3. detection of internal quality, e.g. contamination, irradiation, artificial additives, heat treatments, etc;
4. evaluation of external factors, e.g. the influence of soil, different fertilizers, climate, physical factors and microbe contamination;
5. holistic quality factors, e.g. freshness, taste, digestibility, quantitative evaluation of quality compared to similar products.

Biophotonics has already become an important method of non-invasive quality analysis on an international level.

References

1. S.Diemair (Hrsg.): Lebensmittelqualität. Ein Handbuch für die Praxis. Wissenschaftliche Verlagsbuchhandlung mbH. Stuttgart, 1990.
2. F.A.Popp: Die Botschaft der Nahrung. Fischer-Taschenbuch, Frankfurt. Neuauflage: Zweitausendeins, Frankfurt 2001.
3. F.A.Popp, K.H.Li and Q.Gu: Recent Advances in Biophoton Research and Its Applications. World Scientific, Singapore-London 1992.
4. F.A. Popp and K.H.Li: Hyperbolic Relaxation as a Sufficient Condition of a Fully Coherent Ergodic Field. Int. J. Theor. Phys. 32 (1993), 1573 - 1583.
5. F.A. Popp: About the Coherence of Biophotons. In: Macroscopic Quantum Coherence (F.Sassaroli, Y.Srivastava, J.Swain, and A.Widom, eds.), Proceedings of the International Conference (Northeastern University and MIT, Boston 1997), World Scientific, Singapore-New Jersey, 1998, pp. 130-150.
6. J.J. Chang, J. Fisch and F.A.Popp: Biophotons. Kluwer Academic Publishers, Dordrecht 1998.
7. D.V.Parkhomtchouk and M. Yamamoto: Super-Delayed Luminescence from Biological Tissues. J.Int.Soc.Life Info.Sci. 18 (2000), 413-417.

Petra Becker

In House

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Editorial Office
ISHS Secretariat
PO Box 500 - 3001 Leuven 1 - Belgium
Tel: (32) 16 22 94 27
Fax:(32) 16 22 94 50
E-mail: info@ishs.org

ISHS WEB-SITE

http://www.ishs.org

Inquiries, suggestions or remarks are to be sent to the ISHS Secretariat for the attention of the Executive Director.

EDITORIAL STAFF

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ERRATUM: 2001 ISHS MEMBERSHIP LIST

Please note that in spite of our continuous efforts to provide you with accurate information, unfortunately a printing error slipped into page 25 of the latest issue of the 2001 ISHS membership list. As a result the names and addresses of our Croat members were listed under the heading of Colombia instead of Croatia. We do apologize for the inconvenience this may have caused.

New ISHS Members

We are pleased to welcome the following new members to ISHS:

NEW ORGANISATION MEMBERS:

Alexandria Centre for Multimedia and Libraries, Att. Prof. Dr. Shawky Salem, Agricultural Section, PO Box 115, Al-Saray 21411, Alexandria, Egypt. Phone: (20)2035411109, Fax: (20)2035411742, email: acml@cns-egypt.com

Agricultural Research & Extension Unit, Mr. Sandrasagarren S. Naidu, 85 St. Jean Road, Quatre Bornes, Mauritius, Phone: (230)4660143, Fax: (230)4648809, email: areu@bow.intnet.mu

Asparagus BV, Mr. Pierre Lavrijsen, Veld Oostenrijk 13, 5961 NV Horst, Netherlands, Phone: (31)773979900, Fax: (31)773979909, email: plavrijsen@asparagus.nl

Centre for Vegetable Crops, Att. Dr. Zivoslav Markovic, Karadjordjeva St. 71, 11420 Smederevska Palanka, Yugoslavia, Phone: (381)26323170, Fax: (381)26323785, email: cfvcsp@eunet.yu

NEW INDIVIDUAL MEMBERS:

Australia: Mr. Tony Biggs, Mr. Mike Titley, Mr. Mickie Wild; **Belgium:** Katrien Janssen; **Brazil:** Dr. Lilia Willadino; **Canada:** Annette Anderson, Dr. Robert Bors, Dr. Sunghee Guak, Mr. Richard Vollebregt; **Chile:** Mr. Daniel Manriquez, Claudio Vergara Tagle; **China:** Prof. Zhidong Zhang; **Croatia:** Prof. Zlatko Cmelik, Mr. David Gluhic; **Denmark:** Dr. Torben B. Toldam-Andersen; **Estonia:** Dr. Ms. Margit Kleemann; **France:** Dr. Frederic Laigret; **Germany:** Dr. Isaac Ore Aiyelaagbe, S. Adesola Ajayi; **Greece:** Dr. Katerina Grigoriadou, Prof. Nikos Margaris; **Hungary:** Eszter Bognár, Szabolcs Fekete, Dr. Mária Hájos Takácsné, Dr. Mária Höhn, Boglárka Karner, Noémi Koczka, Katalin Kása, Dr. Attila Ombódi, Robert Romenda, Dr. István Varga, Rozalia Zsovakné Hangyál; **India:** Dr. G.P. Rao; **Italy:** Prof. Dr. Giancarlo Bounous, Dr. Ehab El-Shaer, Dr. Antonella Muroni, Fabio Pratelli, Dr. Paolo Sambo; **Japan:** Dr. Tomoko Abe, Dr. Masahiko Fumuro, Dr. Fumio Hashimoto, Norio Hayashi, Mr. Tatsuya Hayashida, Mr. Takuro Ishihara, Dr. Tatsuya Kubo, Dr. Seibi Oka, Mr. Andrés Torres, Hayashi Toshitaka, Dr. Kenji Ureshino, Hua-Lian Xu, Dr. Satoshi Yoshida, Mr. Kiminori Yoshikawa; **Korea:** Myoung-Kap Chang, Mr. Young Ryul Cho, Mr. Dong Chil Choi, Dr. Hee Chun, Mr. Dong Ho Jung, Dr. Nam-Jun Kang, Mr. Kyung Seok Park; **Netherlands:** Mr. Martin Brinkerhof; **New Zealand:** Mr. Narandra Patel; **Norway:** Ms. Jorunn Børve; **Philippines:** Calixto M. Protacio; **United Kingdom:** Mr. Mohamed Abdel Shafi; **United States of America:** Dr. Hesham Agrama, Ray A. Allen, Marvin Lee Baker, Darryl D. Barbadillo, Ken Brown, Elizabeth Dickson, Prof. Michael Gold, Mr. Wallace E. Heuser, Billy Jones, Kathy Kelley Anderson, Ms. Johanna Leos, Robert L. Morris, Mr. Manoj Potapohn, Nancy E. Roe, Jiang Zhongchun

In Memoriam

UMBERTO MENINI

Dr. U.G. Menini died in Rome on 6 June 2001, after a long illness.

Born in Verona, Italy in 1939, Umberto Menini earned his degree in Agricultural Science with specialisation in Tropical Agronomy from the University of Florence in 1961. He spent the next 14 years in Africa where he distinguished himself as an expert managing horticultural and agricultural research and development programmes in South Africa, Kenya, Zimbabwe, Madagascar, Togo and Tunisia. During the many years he spent in Africa, working with both private and public sector organisations, he built up a wealth of knowledge not only about tropical and subtropical agriculture, but also about the cultures of the people with whom he worked. He joined FAO as an agricultural expert in Togo, then became FAO's special adviser for agricultural development and planning to the Tunisian Minister of Agriculture. In 1975 he was called to FAO Headquarters and from then until 1991, he led FAO's programmes in horticultural development. During this time, he worked closely with FAO's Member Governments to build up a highly successful portfolio of development assistance programmes for the horticultural sector in countries spanning the globe. He also worked enthusiastically to promote North-South co-operation, and the collaboration agreements that the FAO developed with the International Society for Horticultural Science (ISHS), the International Society for Citriculture (ISC) and many, many national institutions, are a lasting testimony to his work in world horticulture.

In 1992 he was appointed Chief of FAO's Seed and Plant Genetic Resources Service where, through the nineties, he worked untiringly to develop, among other things, a viable system of inter-country crop related networks to provide sound technical and policy guidance to governments for the conservation and sustainable utilisation of plant genetic resources. He also led the process for building up a global policy and needs-driven programme for the improvement of seed production in developing countries. This latter proved to be an immense challenge which he met knowing that it held the key to ensuring access, for poor farmers everywhere, to useful crop genetic variability.

Umberto Menini pursued further education opportunities throughout much of his professional career, complementing his initial training with higher qualifications in agricultural economics and biometrics, rural extension, plant breeding and crop bioclimatology. Combining the fruit of formal learning with his extensive field experience he was able to provide sound guidance on agricultural development policy at the highest levels around the world. His distinction as an international agriculturist

was recognised in his honorary life membership of the ISHS and the ISC, whilst his own country honoured him by making him a pluri-Academician, of the Georgofili - the Italian Academy of Agriculture, of the Italian Vine and Wine Academy and of the National Olive Academy.

Umberto was a charismatic, engaging and generous personality. He initiated many agricultural professionals around the world to the United Nations and FAO's mission and freely shared with them his own experience and insights in the certainty that they would all be able, as an extended team, to help support the development of agriculture in the world's poorest countries.

I remember very well the day I met Dr. Menini, on the occasion of the XIII meeting of NORCOFEL in Puerto de La Cruz, Tenerife in 1983. As I finished a talk about cultural techniques and goals of mango production on a worldwide level, he approached me to offer me the possibility of cooperating with the FAO Plant Production and Protection Division in projects concerning tropical fruit development all over the world. From that time on our relationship continued even when his position changed within FAO to become Chief of the Seed and Plant Genetic Resources Service, where we started to develop several tropical fruit networks, such as MESFIN, RELAFRUT, WAFNET, REMUFRUT all over the world until the beginning of his illness which I happened to know when I was invited for dinner at his home in Rome at the end of 1999. We also cooperated very actively in many meetings of ISHS where he always helped the Commission of Tropical and Subtropical Horticulture to better realize its activities and also ISHS as it is reflected by his ISHS honorary life membership. During all this time I have learnt a lot by working with him, not only about horticulture, but especially regarding friendship and honesty. I have not doubts that with his generous and enthusiastic help, Tropical and Subtropical Horticulture is already starting to flourish in Heaven. But, UMBERTO, a man does not die as long as his memory persists in the memory of other people, and your work for the development of the Less Developed World was so great that it will last generations. What is more important, you will also remain in the hearts of the people who had the privilege of working closely with you and becoming your friends. Thanks UMBERTO for making your life an example to us.

Umberto is survived by his wife, Roulla, and his three children, Stefano, Florence and Laurent.

Víctor Galán Saúco
Chaiman of the Commission for Tropical and Subtropical Horticulture.

SÁNDOR BRÓZIK

Dr. Sándor Brózik passed away on 15th March 2001, at his age of 76.

Sándor Brózik was born in 1925 in Mezõtúr, a country town of the Hungarian plain. His father was a post-office clerk and his mother brought up the five children in difficult circumstances.

Sándor owed his methodical way of thinking to his father. In his childhood he had five different fruit collections that had greatly influenced his interest in fruit growing and breeding. Much later he became an expert in fruit variety classifications and he assembled unique fruit variety collections.

In 1946 Sándor started his studies at the Agricultural University, Faculty of Horticulture and Viticulture. He spent most of his time at the Plant Breeding Department, commenced as demonstrator, and from 1948 he was accepted as co-worker to the fruit-breeding program. His beloved master was Prof. György Mándy who taught Sándor the love for fruit species. After graduation from the university and in accordance with the practices applied at that time in Hungary, higher military and political positions were offered to him but Sándor remained committed to his first love in horticulture.

The Horticultural Research Institute (predecessor of the present Research Institute for Fruit Growing and Ornamentals) established in 1949, became in November 1950 the home of Brózik who entered the Department of Fruit Growing of this Institute as a research fellow. He was a committed man throughout his life and the passion for fruit breeding remained until his death.

In 1974 he became the head of the Breeding Section of the Department of Fruit Growing. Due to a heart attack in 1982, he had to take early retirement but from 1990 until March 15th he kept being involved as a retired senior researcher.

Sándor was active in the registration of mother trees and the collection of wild fruit species, pomological cultivars, Hungarian landraces, their subcultivars and clones, programs that had started around that period. As a result of this work, a unique pomological garden was developed between 1950 and 1960 on 100 ha's with more than 5000 accessions of 18 fruit species. This remarkable collection was the basis of the current scientific work of our institute.

From the 1970's Sándor took part in the activities of the Hungarian gene resource collection. The clonal selection of the most valuable, but self-fertile old Hungarian sour cherry cultivar 'Pándy' and its pollinator resulted in the first profitable commercial orchard models. Brózik selected also some sweet cherry cultivars from the 'Germersdorfi' (=Schneider's Späte Knorpel) population. He selected many pear, quince, medlar, sweet- and sour cherry, apricot, plum and almond cultivars from local varieties as well. Sándor investigated and introduced many foreign cultivars (sweet cherry, plum, peach, pear, apple, quince, medlar, strawberry). The most prominent is the peach sortiment lasting several months long harvesting season and became the basis of the Hungarian peach growing. Brózik had built close friendship relations with researchers both in research institutes from the former socialist countries as with colleagues from famous breeding institutions in Western Europe.

His life career was acknowledged by many awards, among them the well-known 'Rudolf Fleishmann Prize'. The death of Dr. Sándor Brózik is a great loss for his friends, colleagues and family and for the horticultural community.

E. Kállay and Zs. Békefi

Calendar of Events

Most ISHS events offer reduced registration fees for ISHS members. Make sure to mention your ISHS membership number or join copy of your ISHS membership card when registering.

YEAR 2001

- August 19-22 2001, Cheonju (Korea): **IX International Symposium on Plant Bioregulators in Fruit Production.** Info: Dr. Seon-Kyu Kim (Convener), Department of Horticulture, Chungbuk National University, Cheonju 361-763, Korea. Phone: (82)432612527, Fax: (82)432735404, e-mail: kimskyu@cbu.ac.kr
- August 20-24, 2001, Plovdiv (Bulgaria): **International Symposium on Plum and Prune Genetics**. Info: Dr. Vassiliy Djouvinov, Convener, 12, Ostromila Street. 4004 Plovdiv, Bulgaria. Phone: (359)32771349, Fax: (359)32670808, e-mail: vd298@plovdiv.techno-link.com
- August 25-29, 2001, Kurayoshi, Tottori (Japan): **International Symposium Asian Pears Commemorating 100th Anniversary of 'Nijisseiki' Pear.** Info: Prof. S. Iwahori (Convener): Fax: 81)298536617, e-mail: iwahori@sakura.cc.tsukuba.ac.jp or Prof. Dr. Kenji Tanabe, Fax: (81)857316749, e-mail: tanabe@muses.tottori-u.ac.jp
- August 26-28, 2001, Geisenheim (Germany): **Workshop on Rootstock Performance in Phylloxera Infested Vineyards.** Info: Convener Prof. Rühl, Workshop Secretariat, Forschungsanstalt Geisenheim, Fachgebiet Rebenzüchtung und Rebenveredlung, Eibinger Weg 1, 65366 Geisenheim, Germany. Phone: (49)6722502121, Fax: (49)6722502120, e-mail: ruehl.rz@geisenheim.fa.fh-wiesbaden.de
- August 30 – September 2, 2001, Niigata, (Japan): **X International Symposium on Asparagus.** Info: Convener: Prof. Hajime Araki, University Farm, Faculty of Agriculture, Niigata University, Muramatsu, Naka-kanbara, Niigata 959-1701, Japan. Phone: (81)250585737, Fax: (81)250587046, email: araki@agr.niigata-u.ac.jp, web: http://ias2001.riken.go.jp
- September 8-14, 2001, Alnarp (Sweden): **International Symposium on Growing Media and Hydroponics.** Info: Prof. Dr. Paul Jensén, Department of Horticulture, Division of Root and Substrate Research, Swedish University of Agricultural Sciences, Box 55, 230 53 Alnarp, Sweden. Phone: (46)40415365, Fax: (46)40465590, e-mail: paul.jensen@tv.slu.se
- September 10-14, 2001, Avignon (France): **International Symposium on Apricot Culture.** Info: Dr. J.M. Audergon, Convener, INRA, Domaine Saint Paul, 84143 Montfavet, France. Phone: (33)432722668, Fax: (33)432722662, email: Jean-Marc.Audergon@avignon.inra.fr
- September 11-15, 2001, Merano (Italy): **International Symposium on Foliar Nutrition of Perennial Fruit Plants.** Info: Prof. Dr. Massimo Tagliavini, Dipartim. di Colture Arboree, Universita di Bologna, Via Filippo Re 6, 40126 Bologna, Italy. Phone: (39)0512091499, Fax: (39)0512091500, e-mail: mtaglia@agrsci.unibo.it or Dr. W. Drahorad, Beratungsring, Via Chiesa 4, 39018 Terlano (BZ), Italy. Phone: (39)0471257490, Fax: (39)0471257800, e-mail: beratungsring.terlan@rolmail.net, web: http://www.agrsci.unibo.it/isfn
- September 19-22, 2001, Sani, Halkidiki (Greece): **I International Symposium on Acclimatization and Establishment of Micropropagated Plants.** Info: Prof. Dr. Athanasios Economou, Dept. of Horticulture, School of Agriculture, Aristotle University, PO Box 281, 54006 Thessaloniki, Greece. Phone: (30)31998671, Fax: (30)31998679, e-mail: aseconom@agro.auth.gr web: http://www.auth.gr/research/conf/aemp/1staemp.htm
- September 28 - October 1, 2001, Tsukuba, Ibaraki (Japan): **II International Symposium on Cucurbits.** Info: Prof. Dr. Shigeo Nishimura, Institute for Agriculture and Forestry, University of Tsukuba, 1-1-1 Tennodai, Tsukuba, Ibaraki 305-8572, Japan. Phone: (81)298536620, Fax: (82)298536620, e-mail: nshigeo@agbi.tsukuba.ac.jp, web: http://ns.icube-t.co.jp/isc2001/

NEW

- October 8-12, 2001, Napier (New Zealand): **IX International Workshop on Fire Blight.** Info: Dr. Christopher Hale, Hort Research, Private Bag 92169, Aucland, New Zealand. Phone: (64)98154200, Fax: (64)98154201, e-mail: chale@hort.cri.nz web: http://www.hortresearch.co.nz/confer.htm
- November 5-9, 2001, Taipei (Taiwan): **II Symposium on Biotechnology of Tropical and Subtropical Species.** Info: Convener Prof. Wei-Chin Chang, Institute of Botany, Academia Sinica, Taipei 115, Taiwan. Phone: (886)227899590 ext 120, Fax: (886)227827954, e-mail: wcc@wcc.sinica.edu.tw web: http://www.sinica.edu.tw/~wcchang2/2ndishs/
- November 6-9, 2001, Antalya (Turkey): **International ISHS Symposium on Sustainable Use of Plant Biodiversity to Promote New Opportunities for Horticultural Production Development.** Info: Prof. Dr. Yüksel Tüzel, Ege University, Faculty of Agriculture, Dept. of Horticulture, 35 100 Bornova, Izmir, Turkey. Phone: (90)2323881865, Fax: (90)2323881865, email: tuzel@agr.ege.edu.tr
- November 2001, Lima (Peru): **Sweet Potato Symposium.** Info: Dr. Patricio Malagamba, Centro International de la Papa, Apartado 1558, Lima 12, Peru. Phone: (51-1)317.5314, Fax: (51-1)317.5333, e-mail: p.malagamba@cgiar.org
- December 4-6, 2001, Mendoza (Argentina): **International Symposium on Irrigation and Water Relations in Grapevine and Fruit Trees.** Info: Dr. Hernán Ojeda, EEA Mendoza INTA, San Martin 3853, (5507) Lujan de Cuyo, Mendoza, Argentina. Phone: (54)2614960004 Ext2023 or 1019, Fax: (54)2614960469, email: h.ojeda@mendoza.inta.gov.ar or secretariat@irrigationsymposium.com.ar web: http://www.irrigationsymposium.com.ar
- December 9-13, 2001, Palmerston North (New Zealand): **II International Symposium on Applications of Modelling as an Innovative Technology in the Agri-Food Chain, MODEL-IT.** Info: Dr. Maarten Hertog, Phone: (64)63506176, Fax: (64)63505610, e-mail: model-it@massey.ac.nz web: http://model-it.massey.ac.nz/

YEAR 2002

- February/March 2002, Hawaii (USA): **International Protea Symposium.**
- March 23-26, 2002, Davis (USA): **XIII Crucifer Genetics Workshop.** Info: Carlos F. Quiros, University of California, Davis, CA 95616, USA.

- April 6-9, 2002, Cairo (Egypt): **International Symposium on the Horizons of Using Organic Matter and Substrates in Horticulture.** Info: Convener Prof. Dr. Ayman F. Abou Hadid, Dept. of Horticulture, Faculty of Agriculture, Ain Shams University, PO Box 296, Imbaba 12411, Giza, Egypt. Phone: (20)27490053, Fax: (20)27490053, e-mail: ruafah@rusys.eg.net , web: http://www.clac.edu.eg/orgmat/

- March 2002, Catania (Italy): **VI International Symposium on Protected Cultivation in Mild Winter Climates.** Info: Prof. G. La Malfa, Istituto Orticoltura e Floricoltura, Via Valdisavoia 5, 95123 Catania, Italy. Phone: (39)095355079 Fax: (39)095355079 e-mail: ishs.symposium@mbox.fagr.unict.it

- March 2002, Santa Catharina (Brazil): **II International Symposium on Banana in the Subtropics.** Info: EPAGRI, Gerência Regional de Joinville, Caixa Postal 37, 89201-270 Joinville, SC, Brazil. Phone: (55)474338267, Fax: (55)474338267, e-mail: arj@epagri.rct-sc.br

- April, 2002, Veracruz (Mexico): **IV International Pineapple Symposium.** Convener: Daniel Uriza Avila, Serapio Rendon 83, Col. San Rafael, Del Cuauhtemoc, 06470 Mexico, DF, Mexico. Phone: (52)551401612, Fax: (52)555469020, e-mail: lauckv@inifap2.inifap.conacyt.mx web: http://mx.geocities.com/fips2002mx/

- June 11-14, 2002, Zaragoza (Spain): **I International Symposium on Rootstocks for Deciduous Fruit Tree Species.** Info: Drs. Maria Moreno and Alvaro Blanco, Conveners, Department of Pomology, Aula Dei Experiment Station, PO Box 202, 50080 Zaragoza, Spain. email: mmoreno@eead.csic.es, web: http://www.iamz.ciheam.org/rootstocks-Zaragoza2002.htm

- August 11-17, 2002, Toronto (Canada): **XXVI ISHS INTERNATIONAL HORTICULTURAL CONGRESS.** Info: Dr. N.E. Looney, Pacific Agri-Food Research Centre, AAFC, Summerland, BC V0H 1Z0, Canada. email: looneyn@em.agr.ca See also the XXVI ISHS IHC pages on the ISHS website

- August 11-17, 2002, Toronto (Canada): **99th ASHS Annual Conference (and XXVI ISHS International Horticultural Congress).** Info: ASHS, 113 S.West Street, Suite 200, Alexandria, VA 22314-2851, USA. Phone: (1)7038364606, Fax: (1)7038362024, e-mail: meetings@ashs.org

- August 2002, (Brazil): **II Latin American Symposium on Products of Medicinal and Aromatic Plants and Condiments.** Info: Dr. Lin Chau Ming, Dept. Horticulture, Agronomic Sciences College, Sao Paulo State University, Botucatu, Sao Paulo, Brazil CEP: 18.603-970. Phone: (55)14.821.3883x172, Fax/ (55)14.821.3483, e-mail: linming@fca.unesp.br

- September 15-20, 2002, Wuhan - Hubei (China): **V International Symposium on Kiwifruit.** Info: Dr. Hongwen Huang, Wuhan Institute of Botany, The Chinese Academy of Sciences, Moshan, Wuchang, Wuhan 430074, China. Phone: (86)2787510546, Fax: (86)2787510251, e-mail: kiwi2002@public.wh.hb.cn

- September 2002, (Brazil): **VII International Mango Symposium.** Info: Dr. Alberto Carlos Queiroz Pinto, EMBRAPA, Centro de Pesquisa Agropecuaria dos Cerrados, BR 020, Km. 18, (PO Box 08223), 73301-970 Planaltina, DF, Brazil. Phone: (55)613889924, Fax: (55)613889859, email: alcapi@cpac.embrapa.br

- 2002, Davis, California (USA): **International Symposium on Vegetable Quality.** Info: Dr. Marita I. Cantwell, Mann Laboratory, Department of Vegetable Crops, One Shields Avenue, Davis, CA 95616-8746, USA. Phone: (1)9167527305, Fax: (1)9167524554, e-mail: micantwell@ucdavis.edu

YEAR 2003

- March, 2003, Brasilia, DF (Brazil): **International Symposium on New Ornamental Crops.** Convener: Dr. António Fernando Caetano Tombolato, Ist. Agronomico, Governo do Estado de Sao Paulo, Caixa Postal 28, 13001-970 Campinas SP, Brazil, Phone: (55)192315422, Fax: (55)192314943, e-mail: tombolat@cec.iac.br

- April 20-25, 2003, Beijing (China): **IV International Symposium on Edible Alliaceae.** Info: Convener Prof. Zhu Dewei, Chinese Society for Horticultural Science, 12 Zhongguancun Nandajie, Beijing 100081, China. Phone: (86)1068919531, Fax: (86)1062174123, email: ivfcaas@public3.bta.net.cn

- May 2003, Pisa (Italy): **Symposium on Managing Greenhouse Crops in Saline Environment.** Info: Prof. Tognoni, Dipartimento di Biologia delle Piante Agrarie, Viale delle Piagge n° 23, 56100 Pisa, Italy. Phone: (39)050570420, Fax: (39)050570421

- August, 2003 (The Netherlands): **International Symposium on Postharvest Physiology of Ornamentals.** Convener: Dr. U. van Meeteren, Mr. Van Rennesweg 29, 6871 GG Renkum, Netherlands. Phone: (31)317314926, Fax: (31)317484709, e-mail: uulke.vanmeeteren@users.tbpt.wag-ur.nl

- September 30 - October 4, 2003, Providence - Rhode Island (USA): **100th ASHS Annual Conference - Centennial Meeting.** Info: ASHS, 113 S.West Street, Suite 200, Alexandria, VA 22314-2851, USA. Phone: (1)7038364606, Fax: (1)7038362024, e-mail: meetings@ashs.org

- September 2003, Davis, California (USA): **IV International Symposium on Irrigation of Horticultural Crops.** Info: Dr. Richard Snyder, UC Davis, 1709 Palm Place, Davis, CA 95616, USA. Phone: (1)5307524628, Fax: (1)5307521552, e-mail: rlsnyder@ucdavis.edu

- October 2003 Nauni (India): **VII International Symposium on Temperate Zone Fruits in the Tropics and Subtropics.** Info: Dr. K.K. Jindall, Parmar University of Horticulture and Forestry, Nauni, Solan (HP) 173230 India. Phone: (91)179252315, Fax: (91)179252242, e-mail: dres@yspuhf.hp.nic.in or kkjindal@yspuhf.hp.nic.in

- October 2003, Vila Real, (Portugal): **III International Chestnut Symposium.** Info: Dr. Carlos Abreu, Universidade de Tras-Os-Montes e Alto Douro, Apartado 202, 5001 Vila Real Codex. Phone (351)59.323688 Fax: (351)59.325058

- 2003, (New Zealand): **Root and Tuber Crop Symposium.** Info: Dr. M. Nichols, Department of Plant Science, Massey University, Palmerston North, New Zealand. Phone: (64)6-3569099, Fax: (64)6-3505606, e-mail: m.nichols@massey.ac.nz

- 2003 or 2004 (Italy): **V International Walnut Congress.** Place, precise time to be determined.

- 2003, Jerusalem (Israel): **VI International Symposium on Chemical and non-Chemical Soil and Substrate Disinfection.** Info: Prof. J. Katan, University of Minnesota, C/O Dept. Of Plant Pathology, Borlaug Hall, St. Paul, MN 55108-0010, USA. Phone: (972)89481217, Fax: (972)89466794, e-mail: gamliel@agri.huji.ac.il

- 2003, Wageningen (The Netherlands): **Symposium on Greenhouse Crop Tolerance.** Info: Prof. Hugo Challa, Wageningen Agric. University, Sect.Agric.Engineering&Physics, Bomenweg 4, 6703 HD Wageningen, Netherlands, Phone: (31)317482397, Fax: (31)317484819, e-mail: hugo.challa@user.aenf.wau.nl

- 2003 Antalya (Turkey): **International Symposium on the International Cut Flower Chain.** Info: Dr. K.K. Jindall, Parmar University of Horticulture and Forestry, Solan, Nauni, India. Fax: (91)179252242, e-mail: Dr. Burhan Ozkan, University of Akdeniz, Faculty of Agriculture, Department of Agricultural Economics, 07058 Antalya, Turkey. e-mail: ozkan@agric.akdeniz.edu.tr

- 2003 or 2004, Bornova, Izmir (Turkey): **International Symposium on Protected Cultivation in Mild Winter Climates.** Info: Prof. Dr. Yüksel Tüzel, Ege University, Agriculture Faculty, Department of Horticulture, 35100 Bornova Izmir, Turkey. Phone: (90)2323880110ext1398, Fax: (90)2323881865, e-mail: tuzel@ziraat.ege.edu.tr

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Acta Horticulturae titles in Preparation - Soon to be released:

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556	V International Congress on Hazelnut
555	II International Symposium on Edible Alliaceae
554	World Congress on Soilless Culture
553	IV International Conference on Postharvest Science
551	IX International Symposium on Small Fruit Virus Diseases
550	XVIII International Symposium on Virus and Virus-like Diseases of Temperate Fruit Crops
542	VII International Symposium on the Processing Tomato

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