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Chronica Horticulturae

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Chronica Horticulturae

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Cover photograph: This outstanding Japanese Black Pine (*Pinus thunbergii*) is regarded as one of the finest bonsai in Takamatsu. The tree is said to have been collected from a rocky mountain along the coast of the Seto Inland Sea and later planted in a pot. Its powerful, thick trunk and superb branch structure, together with the boldly fissured dark brown bark, create an imposing presence. The tree conveys a strong sense of elegance, dignity, and refined character. See article p.13.

› From the cockpit

Peter J. Batt, Editor, *Chronica Horticulturae*

› Peter J. Batt

Welcome back to this, our first edition of *Chronica Horticulturae* for 2026.

For 2026, we also welcome the Year of the Fire Horse – a year that promises great optimism and opportunity and where, with greater energy, things finally start to move forward. For ISHS, we've had a great start… After months of planning and a lot of hard work, the new website finally went live in mid-January. Not only does it look a little different, but it's also a lot easier to navigate. By now, you've probably also received the first of our electronic newsletters via email. These are being sent to both past and present members in an effort to drive membership, and to encourage and direct more people to the website, and to the many services and benefits that are available to members. While some of the benefits and services available – particularly to our Young Minds – are still under development, as a part of that membership drive, *Chronica Horticulturae* will no longer be available to the general public: you will now need to be a financial member to access the publication online. To increase our online presence and to attract new members, we're also more active on social media through our LinkedIn, Facebook and X pages.

For Team Japan, it's no longer a trot but indeed a gallop towards August and the 32nd International Horticultural Congress in Kyoto. In this edition, we feature two articles on the seedling industry within Japan and provide our readers with some interesting insights into the history and evolution of bonsai.

Although the origin of bonsai can be traced back to ancient China, it was first introduced to Japan during the Heian period (794-1185). In more recent times, a re-evaluation of traditional culture and rising national consciousness has resulted in a rapid increase in the popularity of cultivating bonsai. Bonsai strongly reflects traditional Japanese aesthetics such as 'wabi-sabi'. Wabi-sabi is a Japanese philosophy that finds beauty in imperfection, impermanence and simplicity, emphasizing the appreciation of natural objects and how they are moulded by the forces of nature. Beauty is found not in perfect symmetry or splendour, but rather in nature's irregularities and the appearance of having withstood decades of exposure to extreme weather events.

Within Japan, the seedling production industry plays a foundational role, encapsulated by the ancient Japanese saying "nae-hansaku" (seedlings are half the crop). With the introduction of plug seedling trays from the United States in the 1970s, this method of production has now become mainstream, particularly for high-profit-per-unit area operations like floriculture and greenhouse vegetables, where uniformity and mass production within a small area are critical. One of the key features of horticulture in Japan is the extensive use of F_1 hybrids. On this topic, Nakata, Miyoshi and Shigyo san provide us with some valuable insights into the processes involved in producing F_1 hybrids.

For the first time at an IHC, our Japanese hosts have provided a slot in the program to accommodate a Young Minds workshop. This workshop has been designed to address the critical interface between academia and industry. By providing a platform where early-career researchers can present innovative ideas, engage with corporate leaders and discuss practical applications of their work, the workshop aims to expose young and emerging scientists to the industry and potential mentors. For all Young Minds attending IHC2026, put this event in your calendar NOW.

In 2024, ISHS established the Young Minds Committee (YMC). Comprised of 12 members – 2 from each of the ISHS regions – the mission of the YMC is to articulate the voices, needs and ambitions of young researchers while fostering a dynamic international community that supports peer exchange, mentorship, leadership development and career mobility. However, as not all members of the YMC have access to institutional funding, ISHS is actively looking for sponsors to facilitate the travel of the YMC members to participate in the workshop. Companies and individuals who wish to contribute are encouraged to donate to the recently established Jens Wünsche ISHS Young Minds Travel Fellowship Fund. Donations can be made through the website: https://ishs.org/donations/

In this edition we congratulate eight winners of the ISHS Young Minds Awards for their outstanding oral and or poster contributions to our symposia. On this occasion, the key theme that seems to tie most of the papers together is functionality. Gladys Njeri discusses the nutritional value and adaptation of indigenous African green leafy vegetables cultivated in the US. Meichun Zhou explores opportunities to utilise the fruits (rose hips) from roses as functional foods and natural health products. Methodius Shinyuy Lahngong looks at the potential of *Artemisia* for the control of malaria, while Hazel Schrader looks at the suitability of prairie willow (*Salix humilis*) as an ornamental plant for urban greenspaces. Sandra Medina-López looks at ways of extending the shelf life of tropical yams, while Dolly Autufuga looks at the chemical and physical indicators of maturity for breadfruit. Aika Kikuchi looks at how temperature affects the sugar/acid balance in satsuma mandarins. Finally, Sari Nurulita investigates the genetic origin of the many viruses that impact the yield of garlic in Indonesia.

While ISHS is not directly involved, we draw your attention to the global Fascination of Plants Day that will be held once again in mid May. If you would like to participate, we encourage you to contact the coordinator in your country or region.

Finally, all the way from New Zealand, Warwick Nelson discusses Aspire: an online decision-making tool for asparagus growers.

In concluding, I thank the many conveners and co-conveners for their symposium reports. These events really are the lifeblood of our organisation, enabling ISHS to bring scientific and technical professionals together to stimulate, facilitate and co-ordinate research and scientific activities on a global scale.

ISHS governance meetings at IHC2026: important announcements and information

In August 2026 we will meet in Kyoto, Japan, for the 32nd International Horticultural Congress. All ISHS Individual members of good standing are invited to participate in the Members' Forum where they will receive reports from the Board, learn about the plans and strategy for the future and be able to engage with the Society management. The following information includes announcements and invitations as required by the ISHS Statutes.

ISHS Members' Forum – invitation to the membership

The outgoing Board is looking forward to reporting on the developments of the Society over the last four years. This meeting also provides an opportunity for ISHS Individual members to review the activities of the Society and to voice their comments, concerns and suggestions, or make recommendations to the Society management.

The 2026 ISHS Members' Forum will take place at the Kyoto International Conference Center in Kyoto, Japan (where IHC2026 is taking place) on Wednesday, 26 August 2026, from 13.00-15.00.

The provisional Agenda for this meeting is as follows:

1. Opening by the President of ISHS
2. Board reports for the years 2022-2025 time period
3. XXXIII International Horticultural Congress (IHC2030) – Italy
   3.1. Inauguration of the President of IHC2030
   3.2. Information about IHC2030
4. Announcement of the date and place of the XXXIV International Horticultural Congress (IHC2034)
5. Awards to ISHS Fellows, Honorary Members and other awards
6. Installation of the new ISHS President and the Members of the Board 2026-2030
7. Other business
8. Adjournment

ISHS management meetings (*) at the time of the Congress

1. Meeting of the Board
   Tuesday, 18 August and Wednesday, 19 August 2026
2. Meeting of the Executive Committee and Board
   Thursday, 20 August 2026, Congress venue
   Thursday, 27 August 2026, 13.00-16.00, Congress venue
3. Joint Meeting of the Council, Executive Committee and Board
   Friday, 21 August and Saturday, 22 August 2026, Congress venue

(*) Exact details, time schedule and agenda to be distributed in due course.

Bids welcomed for future ISHS Congress hosts

The Council, at its next meeting in Kyoto this coming August, will evaluate proposals for the International Horticultural Congress to be held in 2034. Representatives of ISHS Country/Region Members interested in bidding for that Congress are invited to provide the ISHS Secretariat with a letter of intent. If interested, contact the Secretariat for more detailed information and instructions.

Miklos Faust International Travel Award for Young Pomologists to IHC2026

The Miklos Faust International Travel Award for Young Pomologists is soliciting applications for financial assistance to attend the 32nd International Horticultural Congress in Kyoto, Japan, from 23-28 August 2026 (www.ihc2026.org). Established by the American Society for Horticultural Science (ASHS) and the International Society for Horticultural Science (ISHS), the Award provides financial assistance to scientists involved in fruit science research to attend the quadrennial International Horticultural Congress (IHC), and the ASHS Annual Conference in years midway between the IHCs.

Preference is given to young scientists (under 40 years old) who have completed (or are actively pursuing) their doctoral degree. Preference is also given to scientists who will travel internationally following receipt of this Award. The amount of, and number of, awards for 2026 will be determined by the Faust Award Board of Directors depending on the availability of funds.

This Award honors Dr. Miklos Faust's significant contributions to the science and practice of fruit crops horticulture and it is intended to foster scientific exchange and collaboration within the world community of fruit crop researchers. Miklos Faust received a PhD degree in Pomology from Cornell University. He devoted his professional career with the U.S. Department of Agriculture, Agricultural Research Service to studies on fruit tree physiology that resulted in significant and lasting contributions to modern fruit science. A native Hungarian and a distinguished scholar, Miklos was keenly aware of the importance of international science exchange and cooperation for the advancement of modern fruit production, protection and genetic improvement.

The guidelines for applicants and an online application form are at: https://ishs.org/ishs-awards/

Applications will be received until 4 April 2026. Applicants will be notified by 15 April 2026.

Horticultural Science News

Aspiring to be relevant

Warrick R. Nelson

Introduction

The Aspire decision-support tool for asparagus growers was developed from a physiological crop model and was first released in 2002. It was received enthusiastically, but within 10 years, usage had dramatically declined.

In 2014, a review was done to explore the reasons for this decline and whether growers still saw value in the concept. As a result, the tool was further simplified, management costs were reduced, and it was ultimately released as an open-source, freely-available product through the Google Play Store for use on Android mobile phones. Uptake over the subsequent 10 years, particularly within New Zealand, has been consistently good.

Background to Aspire

Asparagus has a somewhat complex growth habit, where the roots store current-season carbohydrates that drive the early-season growth. This early growth is the spears that are harvested. Harvesting too much of this new growth results in poor growth later in the season and an inability to store sufficient reserves for the following cropping season. This has been known for more than 100 years (Barnes and Robinson, 1881).

New Zealand researchers pioneered the concept of monitoring carbohydrate content in asparagus roots to provide guidance on fern growth management (Wilson et al., 1999, 2000). This initiative was instigated through funding from the New Zealand (NZ) Asparagus Council and from the NZ Government via the Foundation for Research, Science and Technology. From the results, a physiological asparagus crop model was developed (Wilson et al., 2002b).

A narrower focus of this growth model was subsequently packaged into a web-based tool for use by growers, initially as AspireNZ (Wilson et al., 2002a) and subsequently, with modified algorithms and associated international funding, for release as AspireUK and AspireUS (Wilson et al., 2008; Wilson and Drost, 2008). Funding for maintenance of these tools was via an annual subscription paid by users.

This development provoked many articles and analyses of research relevance, especially in the context of financial viability. AspireNZ was noted as the world's first decision-support tool for a perennial crop (McEvilly and Heyes, 2002). A consulting group provided an interesting economic analysis, indicating significant economic returns to growers who used the tool, as well as revenues from subscriptions as a return on the research investment (Martech Consulting Group Ltd, 2005). Revenues from the sale or licensing of a product or service are commonly used to indicate successful research commercialisation (Markman et al., 2008; Wakeman, 2024) and the Aspire tools easily met this expectation.

Aspire was quickly adopted by the majority of NZ asparagus growers and later by growers in North America and Europe (Stone and Hochman, 2004). In a critical analysis of such tools, Aspire featured as an example of success, yet the question still remained whether AspireNZ would be "able to avoid the decline in subscriptions that so often follows" (Stone and Hochman, 2004). Just a few years later, this decline was almost complete (Drost, 2012).

Rebirth as Aspire Asparagus Lite

In 2014, the server providing the Aspire services was to be retired. This required a review of the value of porting the system to a new server. The investigation noted no active users in the prior few years, nor had the database of user inputs ever been interrogated. In early 2015, an international group of asparagus grower advisors expressed their interest in potentially taking over and reviving the Aspire tools. Ultimately however, they did not consider it to be a good investment and the Aspire services remained unavailable as the original server had been retired. Consequently, the NZ Institute for Bioeconomy Science Ltd decided to explore the option of reconfiguring Aspire as a mobile phone app. It was already evident that many growers were preferring mobile apps to those that required a computer.

To gauge the potential support for this idea, an informal email survey was conducted across a few growers and advisors in NZ, the UK and the US. They indicated that the changes in financial status of asparagus as a crop, and the relatively high-cost delivery system of the tool, were key reasons for the lack of users. User registration and requirement to use the tool on a full computer were also negatives. However, the concept and potential value to growers remained, and they supported the idea of delivery via a mobile phone app.

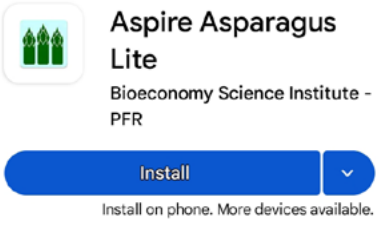

Figure 1. Aspire Asparagus Lite ready to be installed on an Android mobile phone.

The NZ Institute for Bioeconomy Science Ltd then developed a simplified tool for open release to industry, using the generic algorithm developed by Wilson et al. (2008). Furthermore, no user registration was required and no fees were payable. The code was released under the GPLv3 licence with source code lodged on GitHub. The Android environment was chosen as code development tools were available at no charge, and the Android system represented about 90% of registered mobile phones internationally.

The new app was released on the Google Play Store in 2016 under the name Aspire Asparagus Lite (Figure 1). As the term 'Aspire' is very commonly used for various weight loss and educational apps, the word 'Asparagus' was added to differentiate this app. An advantage of the Google Play Store environment is that statistics of installations by country and Android version are available. This allows for some determination of potential use in the absence of any specific tracking or registration system.

Aspire Asparagus Lite was introduced to members of the NZ Asparagus Council at their conference in 2016 (Nelson et al., 2016) and via an article in the December 2016 Vegetable Growers News (Drost, 2016).

Decisions made at the coding stage provided some other interesting benefits. With the new app not requiring user registration, the need to store any data, or even an internet connection during use, the coding was simplified, and grower use was streamlined. Compliance requirements were also greatly simplified, specifically as privacy, tax and financial data were not collected. By releasing under an open-source licence, the NZ Institute for Bioeconomy Science Ltd retained the right to maintain the app, but without an obligation to do so. Further, the GPL licence specifically allowed others to modify the code, for example to another phone operating system. The recent publication of a new crop model (TURION) for equatorial asparagus production (Romero-Vergel,

2023) indicated an opportunity to expand the software, as well as adding a Spanish language option in the future development of the app.

What of the future?

Following the 2016 conference presentation, several new installations were noted, all to NZ registered phones. Since then, the increase in use of the app has become obvious, although the bulk of installations remain within NZ (Figure 2). The bump in end-of-year installations reflects the need to know the health of the carbohydrate root reserves. This has allowed for extension of the traditional harvesting period to capture higher value fresh product sales, previously ceasing by Christmas but now often extending into February.

The extremely low direct cost of maintaining this system, considering that most services are currently provided free within the Google Play Store and GitHub, suggests a secure future for the maintenance of the current app.

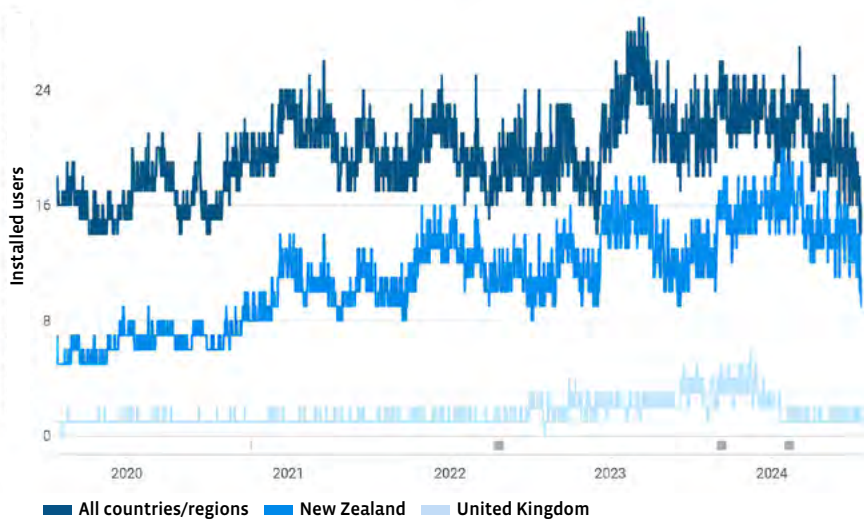

Figure 2. Daily installation numbers worldwide, and separately to NZ or UK registered mobiles. Note the distinct increase in installations over the NZ peak harvest periods each year.

As growers have been able to extend their harvest period with confidence and yields have increased, this represents the alternate value in commercialisation and return on Public Good research funding.

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About the author

› Warrick R. Nelson

Warrick R. Nelson graduated with an MSc in plant physiology following an undergraduate degree in general horticulture. His career began predominantly in horticultural product sales and marketing, especially vegetable seed and seedling nursery equipment. More recently, he joined the New Zealand Institute for Crop and Food Research (now the New Zealand Institute for Bioeconomy Science), spending 20 years in management before retiring in 2025. Throughout this time he maintained a keen interest in research across a wide range of fields. His publishing record includes plant physiology, forest nursery technologies, haplotyping of *Liberibacter*, and most recently, aspects associated with crop pollination. He continues to review scientific papers and reports. E-mail: Warrick.Nelson@plantandfood.co.nz

› ISHS Young Minds Award winner summaries

Below is a selection of research summaries from winners of ISHS Young Minds Awards for best oral and poster presentations at ISHS symposia. To view other exciting research summaries by other winners, please visit www.ishs.org/young-minds-award

Horticultural waste to edible resource: uncovering the nutritional potential of *Rosa* fruits

› Meichun Zhou

Meichun Zhou is a master's candidate supervised by Professor Chao Yu at Beijing Forestry University, China. Her work focuses on systematically exploring and utilizing the rich germplasm resources of the genus *Rosa* in China. As a modern distribution center for *Rosa* species, China possesses abundant wild species and cultivated varieties. However, their fruits, commonly treated as horticultural by-products or waste, remain underutilized.

The medicinal use of *Rosa* fruits has a long history in China. For example, *Rosa roxburghii* is recorded in the *Pharmacopoeia of the People's Republic of China*. Modern research confirms that these fruits are rich in various bioactive compounds such as vitamin C, polyphenols, flavonoids and carotenoids, with significant antioxidant activity. These fruit have great potential for development as functional foods or natural health products.

To systematically evaluate this potential, Meichun's team analyzed 80 *Rosa* accessions covering both subgenera and key sections. Comprehensive profiling of morphological traits (e.g., weight, color, edible rate) and nutritional components (e.g., vitamin C, phenolics, carotenoids) revealed exceptional diversity. Fruit weight ranged from 0.04 to 24.99 g, with a color spectrum from green to black classified using a CIRG-based index.

Nutritionally, the fruits exhibited remarkably high bioactive content. Average vitamin C reached 2,602 µg g^{-1} – far exceeding common fruits – with several accessions surpassing 6,000 µg g^{-1}. Multivariate analysis identified seven principal components related to size, color and antioxidant capacity, and grouped the germplasm into five distinct clusters with characteristic trait combinations.

Meichun Zhou won the ISHS Young Minds Award for the best oral presentation at the IX International Symposium on Rose Research and Cultivation in China in May 2025.

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Study of genetic variation of viruses infecting local garlic cultivars in Indonesia

› Sari Nurulita

Sari Nurulita is a lecturer from the Department of Plant Protection, Faculty of Agriculture, IPB University, Indonesia. Her current research project focuses on the study of viruses infecting garlic in Indonesia, particularly on molecular detection and genetic variation. Most locally available garlic cultivars in Indonesia are infected by viral complexes from the genera *Carlavirus* and *Potyvirus*. As garlic is vegetatively propagated, the viruses are readily transmitted from one generation to the next. The objective of this study was to investigate, identify and analyse the genetic variation of major viruses infecting garlic in Indonesia.

Four commercially available garlic cultivars ('Lumbu Hijau', 'Lumbu Kuning', 'Sangga Sembalun' and 'Tawangmangu Baru') were collected from two major garlic production areas (Sembalun, West Nusa Tenggara and Tawangmangu, Central Java). Next generation sequencing (NGS) and reverse transcription PCR (RT-PCR) were performed to detect and confirm the presence of virus, respectively. A *de novo* assembly analysis revealed nearly complete *Potyvirus*, *Carlavirus* and *Allexivirus* genomes. Onion yellow dwarf virus (OYDV), leek yellow stripe virus (LYSV) (member of genus *Potyvirus*), shallot latent virus (SLV) (member of genus *Carlavirus*), and garlic virus A, B, C, D and X (GarVA-D, -X) (member of genus *Allexivirus*) were successfully identified across the samples.

Complete polyprotein of OYDV shared 96% similarity to Chinese isolates; partial genome of LYSV shared 93% similarity to Chinese isolates; complete coat protein region of SLV shared 95% similarity to Chinese isolates; complete genome of GarVA, GarVB and GarVC shared 96, 97 and 99% similarity to Chinese, Chinese and Iranian, and Japanese isolates, respectively; while partial genome of GarVX shared 94.9% similarity to Australian GarVX isolate. In addition, a phylogenetic tree analysis based on partial coat protein classified Indonesian LYSV isolates into the S-type group and OYDV into the OYDV-O and OYDV-G groups. These findings provide deeper insights into the genetic variation of major viruses infecting garlic in Indonesia and their relationships with isolates from other countries, serving as a valuable basis for virus management in cultivating garlic in Indonesia.

Sari Nurulita won the ISHS Young Minds Award for the best poster presentation at the IX International Symposium on Edible Alliums in Indonesia in September 2025.

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Unraveling the potential of *Artemisia annua* and *Artemisia afra* as culturally sound alternative therapeutics for combating malaria

› Methodius Shinyuy Lahngong

Malaria remains a major global public health challenge, and natural products have long been explored as potential sources of antimalarial therapies. In Cameroon and other African countries, extracts from *Artemisia afra* and *Artemisia annua* are widely used in traditional healthcare practices to prevent and/or to treat malaria. However, these preparations are typically employed without standardized pharmacological quality control. This study aims to address these gaps by investigating the phytochemical diversity of *A. afra* and *A. annua* collected from different geographical regions of Cameroon during both the rainy and dry seasons, and to understand the impact of postharvest handling on the metabolite content. The goal is to identify differences in their antimalarial effects and define the optimal chemical composition for antiplasmodial activity.

Extracts prepared from plants collected from diverse regions in Cameroon during both the rainy and dry seasons were analyzed by TLC, HPLC and GC. Antiplasmodial activity was assessed on a chloroquine sensitive *Plasmodium falciparum* 3D7 strain.

The activity profiles of the extracts were strongly influenced by their environment, with each sample exhibiting distinct phytochemical compositions depending on its geographical origin and collection season. While traces of artemisinin were detected in some *A. afra* samples, *A. annua* consistently contained significantly higher concentrations, particularly in samples harvested during the rainy season. Independent of harvest time, sun-drying enhanced the metabolite profile, particularly improving terpene and polyphenol composition. This process increased the levels of artemisinin, chlorogenic acid and total polyphenols, resulting in greater pharmacological activity.

This study reveals that the selection of a suitable *Artemisia* sample for use as a potential antimalaria treatment should take into consideration its geographical origin and period of collection. These findings support sun-drying as an effective postharvest method and provide valuable insights into optimizing the use of *A. annua* and *A. afra* for malaria control.

Methodius Shinyuy Lahngong won the ISHS Young Minds Award for the best oral presentation at the International Symposium on Artemisia in Tanzania in October 2025.

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Preliminary characterization of morphology and growth attributes of *Salix humilis* (prairie willow)

› Hazel Schrader

Hazel Schrader is a PhD student in the Department of Horticultural Science's Applied Plant Sciences program at the University of Minnesota, Twin Cities, USA. Under the supervision of Dr. Brandon Miller, Hazel's research focuses on the development of novel woody plants for urban greenspaces. Prairie willow, an ornamentally attractive US native species, shows remarkable promise for application within urban greenspaces due to its adaptability and potential resilience to the challenging conditions of the built environment. However, prairie willow remains underutilized in horticulture due to production challenges and a general lack of background research. Hazel's work provides the first quantitative characterization of prairie willow growth and morphology in a managed field setting. Her measurements of whole-plant, leaf and stem dimensions, chlorophyll content, and other traits in both prairie willow (*Salix humilis* var. *humilis*) and dwarf prairie willow (*S. humilis* var. *tristis*), and comparisons to well-known close relative pussy willow (*S. discolor*), establish a foundation for the commercial development of prairie willow. Results indicate that prairie willow is smaller and more compact than pussy willow, and dwarf prairie willow displays distinctive traits such as shorter, narrower leaves with a hairy-gray pubescence. These population- and individual-level differences highlight significant opportunities for breeding and cultivar advancement. Hazel will continue advancing this work in the coming years, and she encourages readers to await prairie willow's emergence in the marketplace.

Hazel Schrader won the ISHS Young Minds Award for the best oral presentation at the X International Symposium on New Ornamental Crops in Greece in October 2025.

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Development of maturity index in three breadfruit cultivars

› Dolly Autufuga

Dolly Autufuga is a PhD candidate in the Department of Tropical Plant and Soil Sciences at the University of Hawai'i at Mānoa. Her research focuses on identifying physical and chemical indicators of breadfruit maturity throughout development, with the goal of identifying different maturity stages in order to improve harvest timing, enhance postharvest handling, and ultimately extend the shelf life of fresh breadfruit.

Breadfruit (*Artocarpus altilis*) is an underutilized yet essential staple crop across tropical regions, offering strong economic potential. Although it is highly productive with minimal input requirements, commercialization of fresh breadfruit remains challenging due to its rapid ripening and short postharvest life. To better understand these limitations, this study examined developmental changes in three cultivars: 'Ma'afala', 'Fiti' and 'Otea'. Fruits were tagged at a polar diameter under 3.5 cm, then sampled biweekly from week 5 to week 19. Measurements captured changes in size, color, weight, firmness, total and resistant starch, sugars, mineral composition, ethylene and respiration rates.

Results showed pronounced shifts in fruit characteristics as maturity progressed. The cultivars differed significantly in appearance and texture, with clear distinctions in color, fruit dimensions and firmness. Total starch shifted markedly across time, rising and stabilizing as fruits developed, while resistant starch remained relatively steady, showing no significant differences across cultivars and maturity stages. 'Ma'afala' accumulated more sucrose, 'Fiti' advanced through maturity more quickly, and 'Otea' retained greater firmness. Using partitioning analysis, the growth period was grouped into three maturity phases: an early stage (weeks 5-9), a mid-development stage (weeks 11-13), and a late stage (weeks 15-19), with week 15 emerging as a key point of stability for many traits.

Dolly Autufuga won the ISHS Young Minds Award for the best oral presentation at the IV International Symposium on Underutilized Plant Species in USA in October 2025.

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Genetic diversity, nutrition, and adaptation of African indigenous leafy vegetables in North Carolina

› Gladys Njeri

The growing demand for healthy, nutrient-dense foods has renewed interest in African indigenous leafy vegetables (AILVs) as promising crops for combating hunger and micronutrient deficiencies. These vegetables possess extensive but underexplored genetic diversity and are rich in vitamins, minerals, dietary fiber and bioactive compounds. However, their β-carotene content, an essential precursor of vitamin A, remains insufficiently studied. This study was conducted at the NC State University Horticulture Field Lab to evaluate the genetic diversity, nutritional value, and adaptation of two key AILVs, amaranth (*Amaranthus*) and African nightshade (*Solanum nigrum*), under North Carolina growing conditions. Seeds were sourced from USDA collections, Kenyan germplasm and U.S. seed vendors, resulting in 35 amaranth accessions and 8 nightshade accessions. Leaf samples were collected at week 4 and submitted to two analytical laboratories for β-carotene quantification and whole-genome sequencing (WGS). Leaf yields were recorded biweekly for two months, after which production declined due to flowering and seed set.

β-carotene analysis showed significant differences between species ($p<0.05$), with amaranth averaging 224.87 μg g^{-1} (n=35) and nightshade 231.6 μg g^{-1} (n=8). Although within-species variation was observed, it was not statistically significant, likely due to the tight physiological regulation of carotenoids in leaves. One Kenyan landrace, amaranth AK6, exhibited notably high β-carotene levels (286.44 μg g^{-1}), indicating potential for targeted selection and breeding. Yield performance varied significantly among accessions, possibly influenced by rising temperatures as summer approached, which reduced the production of high-quality leaves. Genetic diversity assessment using genotyping-by-sequencing (GBS) single nucleotide polymorphisms (SNPs) revealed distinct clustering patterns in both species. In amaranth, wild and cultivated accessions grouped into established subpopulations, while nightshade genotypes clustered according to leaf morphology and geographic origin.

This study highlights the nutritional potential of AILVs, particularly their β-carotene richness, and provides critical baseline information on their genetic diversity and agronomic performance in North Carolina. Evaluating stability of β-carotene expression and yield across diverse environments in North Carolina and Kenya will be the next steps to support future breeding, selection, and promotion efforts for these valuable crops.

Gladys Njeri won the ISHS Young Minds Award for the best poster presentation at the IV International Symposium on Underutilized Plant Species in October 2025 in the USA.

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This space is for you

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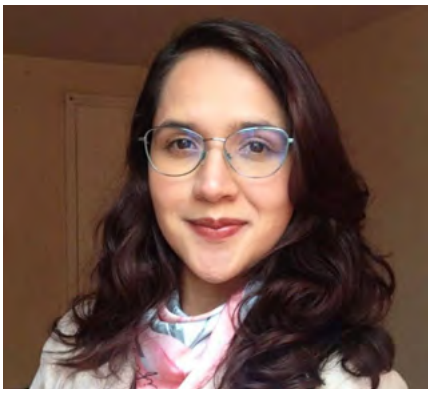
We would like to hear from you – what issues concern you – do you have things you would like to say – or contributions you might wish to make on articles we have presented.

By email, please submit your comments and contributions to **peterjbatt@gmail.com**, Editor of *Chronica Horticulturae,* or **kelly.vandijck@ishs.org**, Associate Editor of *Chronica Horticulturae*.

Upon receipt, we will direct your correspondence to the appropriate member of the Board, but we reserve the right to exercise appropriate editorial control over all submissions received.

In publishing your contributions – and our response – we will identify you only by using your first name and country, unless you request otherwise.

Antioxidant and starch dynamics during postharvest storage of an underutilized tropical yam



› Sandra V. Medina-López

Postharvest research has historically focused on fruits, while roots and tubers – despite their relevance for food security and their contribution to local and regional economies – remain comparatively understudied, more so in the case of neglected and underutilized species. For these crops, postharvest losses, physiological deterioration and quality instability are persistent challenges. Understanding storage-driven biochemical changes is essential to design preservation strategies that are not only linked to shelf life, but also nutritional and functional quality.

This research, developed as part of her doctoral studies, examined postharvest changes in antioxidant capacity and starch composition in purple yam (*Dioscorea trifida*), a native South American tuber of growing interest. Both components are central to tuber physiology and food applications, yet their joint evolution during storage remains poorly documented.

Freshly harvested tubers were stored under ambient conditions and evaluated over time to capture natural metabolic trends. In parallel, two simple postharvest technologies – a heat treatment and an edible coating – were studied for their capacity to modulate biochemical changes during storage. Antioxidant responses were evaluated using global reducing capacity and radical scavenging approaches, while starch was characterized through its main fractions.

During storage, clear biochemical shifts were observed. Progressive starch depolymerization was consistent with reserve mobilization, while antioxidant capacity declined, most likely associated with endogenous oxidative stress. When postharvest technologies were applied, these trends were partially modified. Heat treatment favored antioxidant retention, suggesting moderation of degradative enzymatic activity, whereas the edible coating showed a stronger effect on starch behavior, particularly in preserving amylose content. Responses were compound-specific, with different antioxidant metrics and starch fractions showing distinct sensitivities to storage and treatments.

Overall, the results indicate that simple, scalable postharvest interventions can influence biochemical quality in tubers when aligned with specific preservation goals. Integrating physiological insights with low-complexity technologies may support quality-oriented value chains and contribute to the sustainable use of underutilized tropical crops.

Sandra V. Medina-López won the ISHS Young Minds Award for the best oral presentation at the VI International Conference on Postharvest and Quality Management of Horticultural Products of Interest for Tropical Regions in Colombia in November 2025.

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Effect of temperature on sugar and organic acid metabolisms in cultured juice sacs of Satsuma mandarin

› Aika Kikuchi

Aika Kikuchi is a master's student in the Graduate School of Integrated Science and Engineering at Shizuoka University's Faculty of Agriculture, Japan, studying under the guidance of Professor Masaya Kato and Associate Professor Gang Ma. Her research focuses on elucidating how temperature affects the accumulation of sugars and organic acids in citrus fruits, as well as the underlying mechanisms driving these changes. In citrus fruits, Brix and acidity are among the most critical factors affecting taste. Prior work has demonstrated that pigments and ascorbic acid accumulate at lower temperatures. Sugars, such as sucrose, glucose and fructose, and organic acids, including citric acid and malic acid, are metabolized in plants through the glycolytic pathway and the citric acid cycle, respectively. However, the mechanisms by which temperature influences their accumulation are complex and are not fully understood. The objective of her research is to investigate how temperature affects citrus quality. In the award-winning presentation, juice sacs of citrus were excised from Satsuma mandarin fruit and planted on MS medium, then grown under various temperature treatments ranging from low to ambient temperatures. Results revealed that total sugar content and total organic acid contents were higher at low temperatures. Furthermore, biosynthetic genes for each component showed higher expression levels, whereas metabolic genes exhibited lower expression levels. This study demonstrates that low temperatures during the growth stage of Satsuma mandarin positively influence the accumulation of sugars and organic acids at the transcriptional level. Aika plans to expand her research to a wider range of temperatures, including high-temperature conditions, and to examine multiple citrus varieties to identify temperature-responsive genes. These findings are expected to be broadly applicable to citrus fruits and to contribute to the production of higher-quality fruit in the future.

Aika Kikuchi won the ISHS Young Minds Award for the best poster presentation at the VI Asia Symposium on Quality Management in Postharvest Systems in Japan in November 2025.

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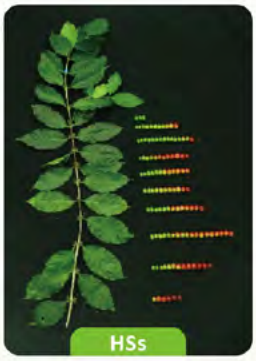

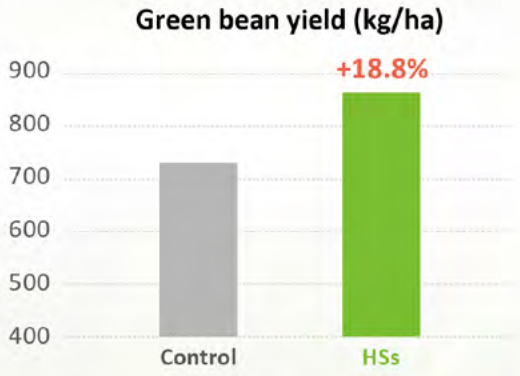

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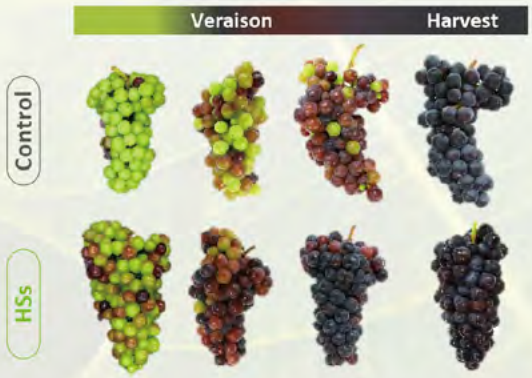

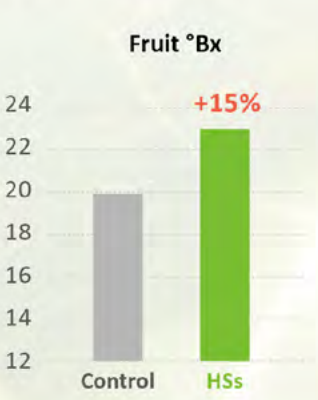

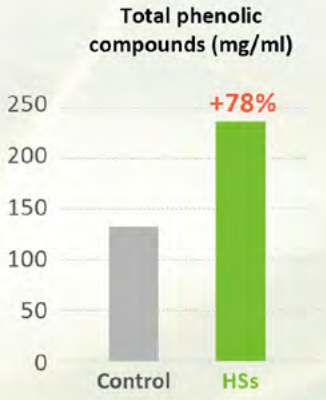

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The diversity of horticulture in Japan – bonsai

Yoshiki Matsuda and Masayoshi Shigyo

Bonsai, as suggested by the characters 'bon' (shallow pot) and 'sai' (to cultivate), is a unique and traditional Japanese horticultural practice that expresses natural landscapes and beauty within the confines of a small container. Its appeal lies in the expressive power created by the harmony of the tree, pot, soil and arrangement. The sight of a tree that has lived for decades or even centuries in a space merely tens of centimeters wide allows the viewer to feel the grandeur of nature and the passage of time.

Cultivating bonsai involves an extensive amount of time, communicating with nature and tending to the tree daily through watering and pruning, gradually guiding it towards an ideal shape. Bonsai is said to teach the value of "patience," which today is often lost in busy modern society. Furthermore, it contributes to spiritual healing and improved concentration.

Bonsai strongly reflects traditional Japanese aesthetics such as 'wabi-sabi'. Wabi-sabi is a Japanese philosophy that finds beauty in imperfection, impermanence and simplicity. Wabi-sabi emphasizes the acceptance of transience and the appreciation of natural objects, and how they are molded by the forces of nature. Beauty is found not in perfect symmetry or splendor, but rather in nature's irregularities and the appearance of having withstood decades of wind and snow. However, domestically in Japan, the industry is facing challenges such as a decline in the bonsai-loving population, a shortage of successors, and aging customers. In contrast, overseas, the popularity of bonsai is surging, especially among younger generations. This paper examines the history of bonsai, its aesthetics and techniques, the current situation and challenges in Japan, and the spread and future potential of bonsai culture globally.

Origin and development

The origin of bonsai can be traced back to "penjing," an art form born in ancient China around the 3rd century BC. This was an art form that sought to recreate natural scenes by arranging stones, gravel, plants and trees in a tray, with "penzai" (tray mountains). This penjing culture was introduced to Japan during the Heian period (794-1185) by Japanese envoys returning from China.

After arriving in Japan, bonsai underwent a unique development. During the Heian period, it was referred to as "Hachi no Ki" (potted trees) or "Hachiue" (potted plants), and ornate, extravagant pieces were enjoyed by the nobility. With the spread of Zen Buddhism from the Kamakura to Muromachi periods (12th to 16th centuries), the Zen philosophy of "eliminating the unnecessary and focusing on the essence" was applied to bonsai, emphasizing the expression of the tree's inherent beauty and natural form. In the Muromachi period, alongside arts such as the tea ceremony (chado) and Noh theater, it was refined as an art form embodying the aesthetics of wabi-sabi.

During the Edo period (1603-1868), it spread to the common people, and unique bonsai cultures developed across various regions of Japan, with many related books being published. Even after the modernization of the Meiji era and beyond, bonsai attracted international attention. During the Taisho era (1912-1926), bonsai exhibitions were held worldwide in places like Paris and New York, and its beauty and techniques gained widespread recognition. In the post-war Showa era (1926-1989), it became a common hobby in Japan and was frequently introduced at international events showcasing Japanese culture. In the Heisei (1989-2019) and Reiwa (2019-present) eras, bonsai techniques and designs have further evolved, creating diverse styles. The emergence and evolution of the internet has facilitated the easy sharing of information and techniques globally.

Historical transitions of bonsai

Although bonsai originated in China, it underwent unique development in Japan during the Edo period. During this time, styles such as "Tako-zukuri" (Octopus style) and "Bonzan" (Tray mountain) became popular. Modern bonsai emerged toward the end of the Edo period, influenced by the Chinese taste for sencha (steeped green tea). In the Meiji era, it spread as a hobby among politicians and business figures.

However, in the latter half of the Meiji period, a reevaluation of traditional culture advanced alongside rising national consciousness, and bonsai became part of this process. By incorporating elements of the tea ceremony and ikebana (flower arrangement), bonsai adopted the guise of a traditional culture. In this period, the concept of "kokufūka" (nationalization) was advocated, asserting that "bonsai was a unique art that expressed natural beauty rooted in the Japanese climate".

A large-scale bonsai boom occurred in the early Showa period and many people became bonsai enthusiasts. By this time, the artistry of bonsai had been widely recognized. However, the challenging conditions at the end of World War II and the post-war turmoil led to a stagnation period of about 10 years. The main factor cited for this stagnation was the difficulty in maintaining large bonsai.

The bonsai hobby began to flourish again around 1955 (Showa 30). During this resurgence, the "miniaturization" of bonsai (Mame, Komono and Shohin bonsai) progressed. This is thought to have arisen because of generational shifts, space issues in residential environments, and changes in production volume, resulting from propagation methods like seeding, cutting, layering and grafting. Smaller bonsai were preferred as "a size that could be created in one generation".

The core of aesthetics

The aesthetics of bonsai are based on unique Japanese sensibilities such as wabi-sabi, harmony with nature, condensation of time, and spatial composition. For instance, in seeing a pine tree over a hundred years old in a pot, the passage of time is condensed, evoking within the viewer a deep emotion. Furthermore, the "margin" (yohaku) and "space" (ma) within the pot stimulate the viewer's imagination, creating a worldview that extends into silence. Bonsai possesses not only deep aesthetics that go beyond mere plant cultivation, but also the advanced techniques to realize them (Figure 1; Table 1).

Important concepts cherished in bonsai include "expressing the tree's vitality," "the beauty of subtraction, eliminating the unnec-

Table 1. Evaluation criteria and aesthetic value of bonsai in Japan.

Evaluation item	Content	Notes
Tree age	Bonsai nurtured over long periods hold higher value	Pines over 100 years old are rare
Tree shape	Fusion of natural and artistic beauty. Symmetry and branch flow are emphasized	"Right-angled branches" and "well-balanced curvature" are ideal forms
Labor/skill	Embodies the skill and time of the artisan in pruning, repotting and pot selection	The history of cultivation and meticulous management are also evaluated
Pot/container	The quality, history and craftsmanship of the pot influence the bonsai's value	Shigaraki ware and *Kowatari* (old imported) pots are highly valued
Variety rarity	Some varieties are difficult to cultivate, increasing rarity and value	However, "rare" does not necessarily mean "expensive"

essary," "the passage of time enriching the expression," "an incomplete art," and "prioritizing overall harmony". These concepts embody traditional Japanese spiritual principles related to "nature worship," "Zen," and "wabi-sabi". As bonsai culture gains attention globally, this spirituality is emphasized in addition to its artistry.

Fusion of technique and art

Techniques such as pruning, wiring and watering are indispensable in the creation of bonsai. These techniques are integral in "making a work of art," not just simple cultivation. Bonsai is also referred to as a "living sculpture", for it is an art piece that changes over time. For example, the technique of adjusting branch direction with wire to create a tree shape mimicking a natural landscape is an advanced skill based on the artisan's aesthetic sense and experience. Conversely, if the technique is too obvious, the evaluation can drop because the "intentionality" is too strong. Therefore, the ideal is to follow the principle of "intention without intentionality", finishing the branch arrangement naturally without leaving traces of the wire. Highly skilled artisans possess the ability to achieve the ideal form through pruning and nurturing alone, often without relying on wire.

Tree species and types

Bonsai are classified by tree species, by style and by size. By tree species, the representative types are:

- Shōhaku (pine and conifer) bonsai. This refers to conifers like pine, cedar, cypress (*Hinoki*) and *shinpaku* (Chinese juniper). They are evergreens that can be enjoyed year-round and are robust, making them ideal for beginners.
  - Black Pine (*Kuromatsu*) is prized for its strong needles and rough trunk bark;

Figure 1. A masterpiece Black Pine representing Takamatsu bonsai.

  - Five-Needle Pine (*Goyomatsu*) is a hardy species resistant to severe cold and is recommended to beginners due to relatively easy maintenance;
  - The appeal of Chinese juniper (*Shinpaku*) lies in the artistry woven by the white, deadwood parts called *shari* (dead wood sections) and *jin* (dead branches).
- Zōki (deciduous and broadleaf) bonsai. This type uses deciduous and broadleaf trees like maple (*Momiji*), zelkova (*Keyaki*) and beech (*Buna*). These allow enjoyment of seasonal changes: spring new growth, summer deep green, autumn foliage and winter branch structure.
- Flower bonsai (*Hanamono*) includes species like plum (*Ume*), cherry (*Sakura*), wisteria (*Fuji*) and azalea (*Tsutsuji*). These are appreciated for their beautiful flowers and fragrance.
- Fruit bonsai (*Miminono*) includes species like persimmon (*Kaki*), apple (*Ringo*) and pomegranate (*Zakuro*), which are enjoyed for the bearing of fruit and savoring the process of transformation from flower to fruit.

Bonsai shapes are diverse, inspired by and expressing the forms of trees in nature (Figure 2).

- Chokkan (formal upright): the trunk grows straight upwards;
- Moyogi (informal upright): the trunk rises with a gentle curve;
- Kengai (cascading): the trunk droops below the rim of the pot, imitating a tree growing on a sheer cliff;
- Shakan (slanting): the tree leans over from the starting position;
- Kabudachi (clump style): several trunks rise as a clump from the ground level, appearing like independent trees;
- Yose-ue (group planting): a style where multiple tree species or grasses are planted in one pot, expressing a forest or grove scene;
- Bunjingi (literati style): this is characterized by a slender trunk, few lower branches and tall stature, exuding an elegant and refined atmosphere.

Bonsai may also be classified by the height from the rim of the pot to the top of the tree.

- Daihin (large bonsai): 50-60 cm or more;
- Chūhin (medium bonsai): 20 to 50-60 cm;
- Shohin (small bonsai): 20 cm or less;
- Mini bonsai: 10 cm or less;
- Petit bonsai: 5 cm or less;
- Mame (micro bonsai): 3-4 cm or less.

Medium to mini sizes are recommended for beginners.

Major bonsai producing regions in Japan and their characteristics

Major bonsai producing regions in Japan include Kagawa, Aichi, Chiba and Tochigi Prefectures, with Kagawa Prefecture's Takamatsu City and Saitama Prefecture's Omiya Bonsai Village being the most well-known and recognized areas.

Figure 2. Tree shape styles in bonsai.

Takamatsu City, Kagawa Prefecture

The Kinashi and Kokubunji areas of Takamatsu City, Kagawa Prefecture, are known to global bonsai enthusiasts as sacred ground and are Japan's top producers of pine bonsai (Figure 3). Approximately 80% of the pine bonsai produced domestically in Japan come from Takamatsu City.

The history of Takamatsu bonsai dates back about 200 years to the Edo period when pines naturally growing in the fields and mountains were repotted and sold as souvenirs for visitors to Kotohira-gū Shrine.

Takamatsu is suitable for pine cultivation due to the mild climate of the Seto Inland Sea, characterized by warmth, low rainfall and small temperature differences between summer and winter, and the well-drained granite soil. Furthermore, the stable production of high-quality pine bonsai has been made possible by a unique cultivation method starting from seedlings and the meticulous refinement of grafting and pruning techniques by skilled artisans and producers. The three major varieties of Takamatsu bonsai are Black Pine, Five-Needle Pine and Nishikimatsu (Brocade Pine), the latter of which originated in Takamatsu.

To broaden the base of bonsai enthusiasts and promote its appeal both domestically and internationally, Takamatsu City opened the "Takamatsu Bonsai no Sato" in April 2020. This facility exhibits and sells 10,000 bonsai from about 60 bonsai gardens in the Kinashi and Kokubunji areas. Beginners can receive advice on selecting and cultivating bonsai from experts, and moss ball making experiences are also available.

Amid rising international interest in bonsai, the export of Takamatsu bonsai is thriving. The "Asia Pacific Bonsai and Suiseki Convention (ASPAC)" held in Takamatsu City in 2011 saw 76,000 visitors from about 30 countries/regions in attendance. The Takamatsu Bonsai Export Promotion Association was established in 2013 to expand exports through direct transactions with overseas buyers. The lifting of restrictions on Black Pine exports to EU member states in October 2020 is expected to further boost exports.

Locally, efforts are being made to promote bonsai as a rooted regional culture through activities such as teaching bonsai to local elementary school students and hosting related events. Experience programs combining bonsai with traditional Japanese culture, such as "The First Bonsai Experience" developed by the Takamatsu Chamber of Commerce and Industry, are also offered.

Saitama City, Saitama Prefecture

The Omiya Bonsai Village in Saitama City, Saitama Prefecture, is also known as sacred ground for bonsai, attracting enthusiasts from all around the world. The Omiya Bonsai Art Museum displays about 120 bonsai, including many famous works.

Previously, many of the horticulturists who created gardens for the Edo period daimyo residences lived around Dangozaka in Tokyo (Sendagi, Bunkyo Ward), and specialized bonsai artisans emerged there after the Meiji era. However, after the Great Kanto Earthquake in 1923 which devastated Tokyo, many of the bonsai growers suffered significant damage and they moved away to re-establish themselves in Saitama City. The Omiya Bonsai Village was born in 1925 as their self-governing community. At its peak around 1935, there were about 30 bonsai gardens.

Bonsai production volume

Japan is a major producer of bonsai, but there are no official statistics detailing the types and quantities produced. A 2015 survey conducted by the Ministry of Agriculture, Forestry and Fisheries (MAFF), with the cooperation of industry stakeholders, targeted 473 bonsai gardens nationwide. The results of this survey provide a snapshot of domestic production.

At that time, around 111,000 bonsai pots were produced, which were worth some JPY 800 million. Exports amounted to 44,000 pots, generating sales worth JPY 400 million.

Kagawa Prefecture, a major pine bonsai production area, publishes trends in bonsai cultivation area and shipment volume. In 2023, the cultivation area was 11.4 ha, with approximately 60,000 pots produced and sales of JPY 200 million, primarily from Takamatsu City.

Bonsai producing regions are seeing a rapid weakening of their industrial base due to long-term price stagnation. Concerns also include a shortage of successors and a lack of bonsai seedlings. Consequently, bonsai production in the future is unlikely to increase.

Growing international popularity of bonsai

Bonsai is now a global term, with the number of enthusiasts rapidly increasing in Europe, America, Asia and Oceania. The "World Bonsai Convention" (WBC), which began in 1989, has been held in many countries, including Japan, the US, South Korea and Germany.

Figure 3. A) Bonsai under cultivation, B) Bonsai Garden Exhibition and Sales Event at Takamatsu-city.

This event serves as a platform for bonsai enthusiasts worldwide to gather and share techniques and aesthetics.

The spread of bonsai overseas was largely driven by its introduction at world expositions from the late 19th to early 20th centuries and was popularized by soldiers returning home after being stationed in Japan after World War II. In the United States, the number of bonsai enthusiasts is estimated to be in the hundreds of thousands. Numerous bonsai clubs and associations (such as the American Bonsai Society and state clubs) exist across the US, hosting active bonsai-related events and exhibitions. Europe also exhibits strong interest, with hundreds of thousands of enthusiasts in Germany, France, Italy, the UK and Spain. These countries have active bonsai clubs and associations (like the European Bonsai Association and individual national associations), with bonsai and related materials sold in specialized stores, garden centers and online shops. In China, Taiwan and Southeast Asia, demand for high-end bonsai and penjing has expanded in recent years, centered on affluent individuals and collectors. Exhibitions and auctions are flourishing, with some pieces being sold for several million yen.

Japan's Ministry of Agriculture, Forestry and Fisheries (MAFF) has formulated the "Basic Policy for the Promotion of the Flower Industry" (which includes ornamental plants like bonsai) and is actively promoting exports. Based on the "Action Plan for Expanding Exports of Agricultural, Forestry, Fishery Products and Foods," MAFF is supporting the development of overseas markets and branding for bonsai. To streamline quarantine and export procedures for bonsai, efforts are being made to strengthen the quarantine system and develop manuals to meet the quarantine requirements of destination countries (e.g., root washing, soil removal). Additionally, export consultation desks have been established to provide advice on procedures and market information to producers wishing to export.

Support for overseas market development is also provided by the Ministry of Economy, Trade and Industry, and JETRO (the Japan External Trade Organization), including the organization of business matching events with local buyers. Local governments also support the export of bonsai. Takamatsu City (in Kagawa Prefecture) and Saitama City (in Saitama Prefecture) are both conducting overseas promotions, such as holding bonsai exhibitions and fairs abroad, and inviting local buyers.

Following efforts by Kagawa Prefecture, Takamatsu City and JETRO that led to the lifting of export restrictions on Black Pine bonsai to the EU (in the fiscal year 2020), further efforts are underway. For example, in 2024, the prefectural governor and the mayor of Takamatsu submitted a request to MAFF regarding the lifting of export restrictions to the US.

Potential for bonsai culture succession and promotion

Bonsai is a traditional Japanese artform that receives high acclaim both domestically and internationally. However, in Japan, the aging of producers, the shortage of successors, and the decline in the horticultural population are major challenges. Conversely, overseas demand is expanding due to heightened interest in Japanese culture and the bonsai boom.

Various initiatives are being undertaken in different producing regions to connect bonsai culture and its production base to the next generation. The following are examples from Takamatsu City, Kagawa Prefecture:

The Takamatsu Bonsai Training "Bonsai no Takumi" (Bonsai Master) started in January 2020 to promote bonsai techniques and to foster successors (Figure 4). It is a training program where participants can learn techniques directly from bonsai artisans in the historic production area of Takamatsu City. The training focuses on fundamental bonsai care and flexible instruction tailored to the skill level of the trainees, using Shōhaku (pine and conifer) species characteristic of Takamatsu bonsai (Black Pine, Nishikimatsu, Shinpaku and Five-Needle Pine). It serves as a place for advanced and intermediate bonsai enthusiasts to improve their skills, and for young professionals engaged in bonsai as a career to hone their craft. Beginners who have just started growing bonsai are also welcome. Furthermore, due to the increase in bonsai exports and the rising popularity of bonsai overseas, international enthusiasts and instructors have frequently visited bonsai gardens in Takamatsu City for technical training. A feature of "Bonsai no Takumi" is the inclusion of accommodation facilities, allowing domestic and international trainees to stay for short to long periods to learn bonsai techniques.

The Bonsai☆Girls Project is an initiative formed by female students of Kagawa University, with the aim of preserving the history of Takamatsu bonsai and promoting awareness. The project was launched in 2012 by economics students studying regional revitalization. Its activities aim to broaden the base of enthusiasts by emphasizing the accessibility for female students and communicating the charm they perceive as "cute" and "stylish". Members gain knowledge of cultivation and management at bonsai gardens in the Kinashi area of Takamatsu City, a major pine bonsai production region. Their activities primarily target young people and women, including hosting workshops for elementary through high school students, creating free papers and disseminating information via social media.

The Regional Circle "Bonsai Club Caming" was established in 2025 by a female third-

Figure 4. A) "Bonsai no Takumi" (Bonsai Master), B) training facility at Takamatsu-city Kokubunji-district. https://takamatsubonsai-takumi.com/

year high school student from Kinashi-chō, Takamatsu City. With a strong commitment to local bonsai culture, the club aims to pass on and popularize the traditional culture of bonsai among the younger generation. Operating as a "regional circle" open to all Takamatsu citizens, with cooperation from organizations like JA Kagawa, members engage in authentic skill acquisition and artwork creation in collaboration with local bonsai producing areas and artisans (takumi). They organize bonsai events for youth, disseminate information via SMS and conduct PR activities to promote the local bonsai charm nationwide. These initiatives are highly regarded as a practical approach to addressing the challenges of declining youth interest and market shrinkage.

Elementary schools in the Kinashi and Kokubunji areas of Takamatsu City host "Bonsai Experience Classes," where children experience basic techniques like pruning and repotting with local bonsai artisans serving as instructors (Figure 5). This initiative has been introduced as an educational program using bonsai as a subject, integrated into comprehensive learning about local nature and culture. The goal is for children to foster an understanding of plants and an attachment to their local community by growing bonsai themselves. Furthermore, by creating a place for cultural succession that integrates the school and the community through public classes and exhibitions open to parents and local residents, the initiative aims to strengthen community ties. This is connected not only to the transmission of techniques, but also to the formation of regional identity and sustainable cultural education.

Bonsai is a traditional artform with intangible cultural heritage value. As its popularity grows internationally, it is essential for Japan to recognize its value and sustain its inheritance. Efforts are being made by national and local governments, the private sector and others through multifaceted approaches – including regional industrial promotion, educational collaboration, acceptance of trainees and dissemination of bonsai culture information – to ensure bonsai culture is passed onto the next generation.

Future research topics include international comparisons of bonsai culture, technical characteristics specific to each production area, and a quantitative analysis of educational effects. Academic consideration based on these points is expected to contribute to the sustainable development of bonsai culture.

Bonsai is not merely horticulture: it is a cultural asset that embodies the Japanese view of nature and spirituality.

Figure 5. Children's Bonsai Exhibition (Takamatsu Municipal Kinashi Elementary School).

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The diversity of horticulture in Japan – seed and seedling production

IHC 2026 Kyoto
www.ihc2026.org

Eijiro Nakata, Seiichi Miyoshi and Masayoshi Shigyo

Supporting the highly diverse horticultural sector in Japan are two highly specialized industries that embody unique Japanese expertise and technical capabilities: the seed industry and the seedling production industry.

The seed industry in Japan boasts a long history, with some companies operating since the Edo period (from 1603 to 1868). The industry exhibits remarkable diversity in form, ranging from large corporate firms to small business enterprises engaged in breeding, production and sales.

Unlike staple crops, the development and variety improvement of vegetables and flowers are primarily driven by private breeding companies and individual breeders. A key feature is the extensive development and utilization of F_1 hybrid varieties, which offer significant advantages such as hybrid vigor, high yields and uniform growth. However, producing high-quality seeds requires meticulous pest and disease management, and in order to manage risks like floods or droughts, production usually occurs in diverse locations all around the world.

The seedling production industry plays a foundational role, encapsulated by the ancient Japanese saying “nae-hansaku” (seedlings are half the crop). The stable supply of high-quality seedlings is directly linked to improved productivity and crop quality. Since the introduction of plug seedlings (cell-formed seedlings) from the United States in the 1970s, this method of production has become mainstream, particularly for high-profit-per-unit area operations like floriculture and greenhouse vegetables, where uniformity and mass production within a small area are critical.

History and form of the Japanese seed industry

The seed industry in Japan exhibits various forms: some companies handle breeding, seed production and sales, while others only handle sales, and some specialize solely in production. The members of the Japan Seed Trade Association (JASTA) exceed 800, encompassing diverse entities from large corporations to small and medium-sized enterprises. Most companies are specialized by crop, with some focusing on specific crops, while others handle many items. Some deal exclusively with vegetables, while others primarily focus on flowers. This highly diverse and differentiated situation includes companies operating globally, as well as those specialized in specific regions.

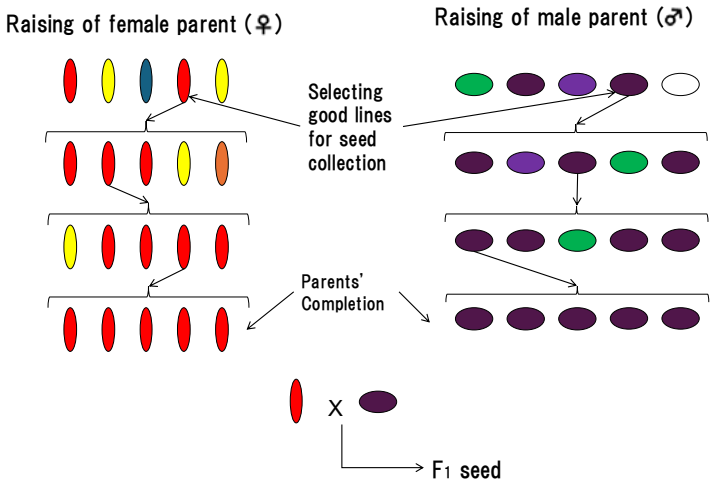

Figure 1. Schematic diagram of F_1 breeding process.

F_1 hybridization of vegetables and flowers

Seed production in Japan includes F_1 hybrids, open-pollinated (OP) types, and vegetatively propagated forms (Table 1).

Research on F_1 hybridization in Japan began in the 1920s at agricultural experiment stations. Subsequently, F_1 hybridization technology was transferred to the private sector, leading to the development of F_1 varieties for many crops.

An F_1 hybrid variety is created by developing multiple parent lines for the target crop and crossing them (filial first) (Figure 1). Parental lines are generally strains that are relatively uniform. The degree of fixation varies by crop: for strongly self-pollinating crops, parental lines can be fixed close to pure lines through methods like self-crossing. Some crops allow for the creation of pure lines by producing haploids via anther culture, microspore culture or ovule culture, and then doubling them. Conversely, in strongly cross-pollinating crops, repeated self-crossing can lead to pronounced inbreeding depression, resulting in abnormalities, reduced pollen quantity and failure to set seeds in subsequent generations. In such cases, self-crossing may be reduced and the process transitioned to mass crossing in earlier generations. This requires more generations to establish the parental lines. Ultimately, seed production feasibility, based on commercial economics, is a crucial factor in variety improvement.

The useful attributes of F_1 hybrid varieties include hybrid vigor, leading to superior growth and higher yields. Indeed, the parental lines of F_1 varieties often appear much weaker and slower growing than the F_1 variety itself. Furthermore, F_1 hybrids often exhibit better uniformity of growth.

Specifically, OP varieties of strongly cross-pollinating crops must be maintained in a genetically diverse state to prevent inbreeding depression that occurs if self-crossing is perpetuated. Due to these characteristics, choosing F_1 hybrids often benefits producers. Varieties referred to as landraces (or native varieties) are also utilized. These are typically OP varieties bred locally and often possess unique characteristics in taste and color.

Seed production technology for vegetables and flowers

The seed production techniques used vary depending on the crop and are determined by plant characteristics and economics. For OP seeds, the process often involves simply planting and harvesting the seeds produced without further manipulation. On the other hand, F_1 seed production involves multiple production methods (Table 2).

Some F_1 hybrids utilize wind pollination, such as corn and spinach. For F_1 seeds, some manipulation is necessary to prevent the production of self-pollinated seeds. In the case of corn, which is monoecious (separate male and female flowers on the same plant), the male flowers of the seed parent are removed before flowering, ensuring that only pollen from the desired male parent is used for pollination. Because spinach is dioecious (separate male and female plants), F_1 seeds can be obtained by roguing out male plants from the seed-parent population.

Insect pollination is also frequently used, often involving honeybees, but sometimes alfalfa leafcutter bees or hoverflies are utilized, depending on the crop. Similar to wind pollination, measures are necessary to prevent the self-pollination of the female line, often utilizing self-incompatibility or male sterility. Self-incompatibility, the phenomenon where a plant's own pollen fails to fertilize the ovule, has been widely used in cruciferous vegetables like cabbage and Chinese cabbage. However, it is important to note that self-incompatibility can sometimes

Table 1. Examples of seed production methods by crop.

	Grains	Vegetables	Flowers	Oilseed crops
Mainly F_1 varieties	Corn	Tomato, cucumber, pumpkin, eggplant, broccoli, cabbage	Pansy, petunia, eustoma, sunflower	Canola, sunflower
Mainly OP varieties	Rice, wheat, soybean	Lettuce, burdock root, edamame	Aster, zinnia, sweet pea	Sesame, soybean
Mainly vegetatively propagated varieties	Potato, sweet potato	Garlic, strawberry	Lily, tulip, chrysanthemum, rose, carnation	Olive (woody plant), camellia

Table 2. Example of pollination methods for F_1 seed production.

Wind pollination	Insect pollination	Hand pollination
Corn, spinach, Swiss chard	Cabbage, broccoli, Chinese cabbage, sunflower, ornamental cabbage (kale)	Tomato, melon, pansy, petunia, eustoma

be overcome depending on the stage of plant growth and environmental conditions.

Among male sterility systems, cytoplasmic male sterility (CMS), where the male sterility factor resides in the cytoplasm, is frequently utilized. In the CMS system, since the cytoplasm often originates from the female parent, a line containing the male sterility factor in the cytoplasm (A-line) is created, along with a B-line that is genetically identical to the A-line except that it has normal cytoplasm (Figure 2). The B-line is necessary to maintain the A-line (as the A-line cannot produce pollen) and is thus called the maintainer line. For F_1 varieties using CMS, a male parent line (C-line) must also be developed.

For the commercial production of F_1 seeds (A × C), the A-line is used as the female parent and the C-line as the male parent: only seeds harvested from the A-line are F_1 hybrids. Although the C-line may produce self-pollinated seeds, these are not harvested to prevent contamination (the C-line is often mowed down once the A-line has finished fruiting and pollen supply is no longer needed). The A-line is maintained by crossing A × B, and the seeds harvested from this cross are all A-line. B-line and C-line are maintained through self-pollination or sib-crossing. This system is highly efficient and is being utilized for many crops. In this case, the A × C F_1 hybrid does not produce pollen. While this is not usually an issue for vegetable and flower crops, if the crop uses the seed product (e.g., cereals like rice, or oil crops like sunflower, where F_2 seeds are consumed or pressed for oil), the absence of pollen means seeds cannot be harvested. For such crops, the solution is to introduce a pollen fertility restoration gene into the C-line, allowing the F_1 hybrid to produce pollen.

For crops grown in open fields, isolation is necessary. If multiple F_1 (or OP) varieties are grown for seed production in close proximity, there is a risk of cross-pollination. When crossing is done by honeybees, a minimum isolation distance of about 1 km is required. If multiple seed companies operate in one area, they sometimes coordinate in advance which crops are to be grown in which fields. Isolation can also be achieved by using islands or valleys, or by exploiting differences in flowering times between strains.

As many crops do not have male sterility or self-incompatibility, these require hand pollination. However, this method is more costly than wind or insect pollination. Hand pollination is often used for crops that yield many seeds per cross, such as fruit vegetables like tomato, melon and bell pepper, and floricultural crops like petunia, lisianthus and pansy.

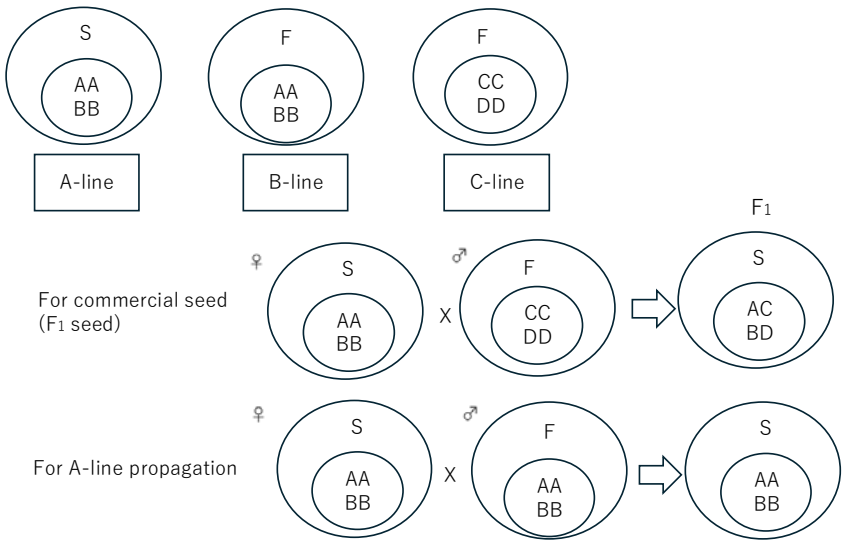

Figure 2. Schematic diagram of CMS principles. The A-line possesses sterile cytoplasm (S), and its nuclear genotype is identical to the B-line. The C-line is from a different parental line and possesses fertile cytoplasm (F) to utilize pollen.

However, there are still many crops where F_1 hybridization is difficult due to technical, economic or biological constraints. This category includes crops lacking male sterility or self-incompatibility, where hand pollination is not economically viable such as legumes, cereals, lettuce and other *Compositae* family vegetables, and many flowers.

Seed production regions

Seed harvesting has historically been carried out in almost every country that practices agriculture. In Japan, seed harvesting has long been conducted by farmers in various regions. However, Japan's climate, which is often hot and humid and includes a rainy season (tsuyu), is not ideal for seed harvesting. While some companies and agricultural cooperatives still produce seeds domestically, many commercial seed companies now utilize overseas locations.

Producing high-quality seeds requires appropriate climate and facilities. Although standards vary by crop, producers demand seeds with high germination rates. Furthermore, the presence of pests or diseases on seeds intended for sale is a major issue, so production is preferably done in areas with minimal pest and disease incidence. The optimal location varies by crop: for example, spinach requires long-day conditions for flowering, but prefers a cool climate, making high-latitude regions (in the US, Denmark or the Netherlands) more suitable for seed production, while other crops require short-day conditions.

Seed production, especially in open fields, faces risks such as floods, droughts and typhoons. Risk management dictates production in multiple locations and multiple countries. Since seed production takes nearly a year for many crops, risk management also involves having production sites in both the northern and southern hemispheres.

In Japan, the seed production location must be specified on the seed packet. While varying by crop, a quick examination shows many countries listed as production sites, including the USA, China, India, Chile, Australia, Turkey and South Africa. However, the country-of-origin issue is becoming a major risk, as some countries restrict the import of seeds produced in other countries due to rigorous plant quarantine regulations. Since transferring seed production technology involves human resources, time and a significant capital investment, it is difficult to start quickly.

Purity testing and seed processing technology

Commercial seeds are usually processed after harvesting before being sold. Seeds harvested from the field often contain soil

Figure 3. Situation immediately after sowing and shipping.

Figure 4. Irrigation work being done by waterman.

or plant debris, which must first be removed through cleaning. Various processing techniques are then applied depending on the use, either internally or by specialized seed processing companies. One such technique is pelleting, where seeds are coated with a clay-like material to improve sowing efficiency (e.g., enabling machine sowing) for minute seeds. Germination promotion treatments are also used for crops like lettuce and carrots, which prefer cool climates and where high temperatures inhibit germination.

Furthermore, seeds are inspected for pathogen contamination and germination rate. F_1 seeds are often subject to purity testing. Since the variety of seeds often cannot be determined by appearance alone, newly harvested seeds are grown simultaneously with seeds known to be the correct variety for comparison. However, actual cultivation takes time and is expensive. Today, DNA analysis enables rapid variety identification for many crops.

Seedling production in Japan

Horticulture in Japan is maintained at a world-class level, ably supported by advanced technical capabilities and cultivation management adapted to a diverse climate. The foundation of this is seedling production. A stable supply of high-quality seedlings is directly linked to improving the productivity and quality of horticultural crops.

In the past, the cultivation of seeds in Japan was mainly done by sowing in flats or direct sowing in the field. In the 1970s, plug seedlings – first developed in the United States – were introduced to Japan, and their use spread widely, primarily in floriculture. In 1985, T.M. Ball Laboratory, Inc. (now M&B Flora Co., Ltd. Production Division), a specialized plug seedling nursery company with capital from the American Ball Horticultural Company, was established. Since then, the number of nursery companies handling plug seedlings has increased, and cultivation methods using plug seedlings have become mainstream in Japan.

Furthermore, in the field of grafting, the Zen-Noh method for grafting young seedlings using plug seedlings was developed in 1990 by the ZEN-NOH Agricultural R&D Center.

Characteristics of plug seedlings

The greatest feature of plug seedlings is the ability to grow a large number of seedlings in a small area. What makes this mass cultivation possible is the systematization (mechanization through standardization) of the nursery process. Sowing is carried out by machines such as drum seeders, which complete the task instantaneously. Seeds sown in cells with the same amount of soil can be grown uniformly according to a cultivation program (fertilization management, nursery duration, etc.) tailored to each variety. Additionally, it is possible to supply more uniform seedlings by replacing cells that did not germinate or have poor growth. Although its adoption in Japan is still limited, a "gapping machine" that automatically performs this replacement is often used in the Netherlands.

Growing seedlings in plug trays is an excellent method for uniformly cultivating small seedlings. However, for open-field crops like vegetables, the labor required to transplant a vast number of plug seedlings is significant. Therefore, the adoption of plug seedlings has primarily advanced in greenhouse horticulture. They have been widely incorporated and popularized in high-profit-per-area greenhouse flower and vegetable production.

In Japan, especially for cut flowers, there are demand periods called "monobi". Whether or not farmers are able to produce crops to coincide with these periods greatly affects their income. Hence, there is a strong demand for uniformly grown seedlings at the desired planting time. In this respect, plug seedlings, which can be uniformly mass-produced, are superior.

The production of plug seedlings combines mechanized lines with human skill to enable the production of high-quality seedlings (Figure 3). Activities such as soil filling using a soil filling machine and compaction, or sowing using a drum seeder, where a large quantity of seed can be sown in a short time and then passing them through a water tunnel, are often automated.

On the other hand, there are tasks where human involvement is essential. For example, while misting systems or booms can be used for watering, the degree of dryness among the many plug trays varies depending upon their location. Also, within the same tray, the drying speed differs between the center and the periphery. The fine adjustments required to make them uniform are difficult to mechanize, therefore necessitating manual watering (Figure 4).

From vegetative to generative propagation

The propagation methods for horticultural crops can be broadly divided into vegetative propagation, which uses methods like division or cuttings, and generative (seed) propagation. Vegetative propagation is used for many plants because it allows for the easy multiplication of identical individuals. On the other hand, it requires maintaining mother stock, and its multiplication rate is significantly lower than that of seed propagation. For this reason, breeding efforts are actively underway to transition from vegetative to seed propagation.

One example is the emergence of seed-propagated strawberries. Conventional strawberry varieties are propagated vegetatively using runners. However, in 2017, 'Yotsuboshi' was registered as the first practical

seed-propagated variety in Japan. In 2021, the first privately-bred seed-propagated varieties, the Berry Pop series 'Haruhi,' 'Suzu' and 'Sakura,' were announced by Miyoshi & Co., Ltd. This has made it possible to produce strawberries using plug seedlings, enabling a stable supply of the desired seedlings at the required time (Figure 5).

While the use of plug seedlings has become widespread in Japan as a nursery method for seed-propagated plants, the trays are also used for vegetatively propagated plants such as carnations. In Japanese agriculture, which is facing an aging population and labor shortages, plug seedlings – which are easy to mechanize – are expected to become more important as a means of propagating plants.

On the other hand, Japanese agriculture often involves cultivating a wide variety of items (or varieties) in small quantities on small plots of land. This makes it difficult to benefit from the advantages of mechanization and presents a challenge in reducing costs. It will be crucial to develop a Japanese-style nursery system that can accommodate a wide variety of products in small quantities while still promoting mechanization.

Figure 5. A) Strawberry seed, B) strawberry plug seedling.

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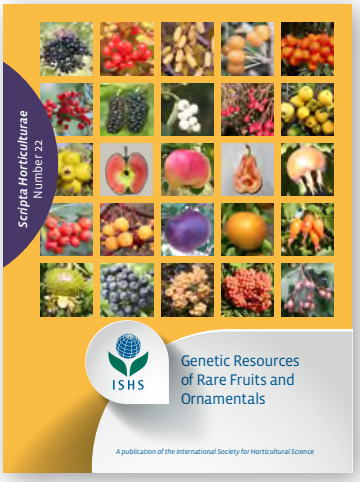
› New books, websites



Mezhenskyj, V., and Mezhenska, L. (2025). Genetic Resources of Rare Fruits and Ornamentals. *Scripta Horticulturae* 22 (International Society for Horticultural Science). pp.350. ISBN 978-94-6261-445-1. € 50. https://ishs.org/scripta-horticulturae/genetic-resources-of-rare-fruits-and-ornamentals/

Plant genetic resources play an important role in ensuring the food, economic, environmental and social security of humankind. They are an integral part of agricultural biodiversity. Fruit crops and some of their wild relatives have valuable traits and are important sources of nutrients for people. In many fruit growing regions of the world, crop production has been drastically impacted by abiotic and biotic stress. New cultivars of traditional crops, rare fruits and their wild relatives can help improve food resources and many provide aesthetic satisfaction to people.

The translation of this book into English will greatly improve our knowledge of these rare genetic resources. The initiative to translate the original text belongs to Dr. Kim Hummer, a retired research leader, genebank curator and well-known expert in the fields of horticulture, plant breeding and genetic resources. We are grateful to her for donating her time, knowledge, experience and hard work to ensure the production of what is essentially a new book.

Within the book, the descriptions of the accessions have been arranged in alphabetical order of the Latin names of the families and species for each crop. English species names and the etymology of cultivar names have been added where appropriate.

We hope that this publication will provide a useful reference text for both professional and amateur horticulturists.

› Courses and meetings

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

Hands-on course in Process- and Data-Driven Modelling in Crop Science, 11 May - 3 July 2026, Wageningen, The Netherlands (online or in-person). Info: https://event.wur.nl/174011/home?version=latest

Join the International "Fascination of Plants Day" around May 18, 2026 – a global celebration of plants!

Fascination of Plants Day May 18th 2026

The European Plant Science Organisation (EPSO), together with over 50 National Coordinators across the globe, proudly announces the launch of the eighth edition of the Fascination of Plants Day (FoPD), scheduled to take place on and around May 18, 2026. A celebration of the captivating world of plants, FoPD invites individuals of all ages to engage in plant-based interactive events and activities organised by scientific institutions, universities, botanical gardens, museums, schools, farmers, and companies worldwide.

Since its inception in 2012, FoPD has gained global recognition. In 2024, over 670 events were held in 65 countries. Working with National Coordinators and hundreds of plant enthusiasts as event organisers, this coordinated effort is a testament to the enduring significance of plant science in addressing social, environmental, and economic challenges. The FoPD covers all plant related topics, including basic plant science, agriculture, horticulture, forestry, plant breeding, plant protection, food and nutrition, environmental conservation, climate change mitigation, smart bioproducts, biodiversity, sustainability, renewable resources, plant science education and art.

Anyone who would like to contribute to the FoPD is welcome to join. Please contact your National Coordinator (click on "countries" at www.plantday18may.org) to discuss and get access to all the supporting materials.

EPSO coordinates the FoPDs. EPSO is at the forefront of advancing plant science, advising policy makers, promoting collaboration, and fostering awareness of the crucial role plants play in our lives. Learn more about EPSO at http://www.epsoweb.org

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Division Precision Horticulture and Engineering #ishs_deng
Division Landscape and Urban Horticulture #ishs_durb
Division Vegetables, Roots and Tubers #ishs_dveg
Commission Agroecology and Organic Farming Systems #ishs_cmor

The International Symposium on Advanced Technologies and Management for Sustainable Greenhouse Systems – GreenSys2025, which was held in Almería, Spain, from 22 to 27 June 2025, attracted 377 delegates from 41 countries.

Over five days, participants contributed 196 oral and 159 poster presentations, under six thematic topics, each introduced by a keynote speaker. In the first invited lecture, "Practical uses and impacts of AI on horticulture research: what could be the role of ISHS?", the President of ISHS, Dr. François Laurens, addressed the integration of artificial intelligence (AI) into horticultural science, highlighting emerging tools and methods for data analysis, modelling and decision support. The second keynote lecture, "Controlled environment precision and smart horticulture: an overview", was delivered by Dr. Irineo Lorenzo López-Cruz (Universidad Autónoma Chapingo, Mexico), who discussed the components of precision agriculture (PA), including big data analytics, the Internet of Things (IoT), smart devices and sensors, robotics and autonomous machinery. In the third invited lecture, "The role of information and communication technology (ICT) for sustainable CEA systems and its development direction", Dr. In-Bok Lee (Seoul National University, South Korea) highlighted the importance of controlled environment agriculture (CEA) as a key technological response to global megatrends such as climate change, population growth and urbanisation. Dr. Stefania De Pascale (University of Naples Federico II, Italy) presented her lecture on "Unveiling the biostimulant potential of plant-derived protein hydrolysates: mechanisms, efficacy and field validation", demonstrating how biostimulants have emerged as effective tools to enhance crop tolerance to abiotic stress and improve yields. In the fifth invited presentation, "Light and energy in controlled environment agriculture systems", Dr. Feije de Zwart (Wageningen University & Research, The Netherlands) provided an overview of anticipated developments in crop responses to advanced lighting strategies, their effects on light-use efficiency and overall energy consumption. Dr. Fátima Baptista (University of Évora, Portugal) addressed the transversal theme "Sustainable greenhouse production: a view for the future of modern greenhouse production". Finally, in the lecture "60 years of innovation

› Prof. Dr. Diego Luis Valera Martinez (right) and Prof. Dr. Francisco Domingo Molina Aiz (second from right) receiving the ISHS certificates as symposium conveners from Dr. François Laurens, ISHS President (second from left) and Prof. Dr. In-Bok Lee, Chair of ISHS Division Precision Horticulture and Engineering (left).

for more sustainable agriculture in Almería", Mr. Roberto García Torrente, Director of Sustainability and Agri-Food Development at Grupo Cajamar (Spain), reviewed the technological evolution of greenhouse production in the province of Almería.

During the first two days of the symposium, five thematic workshops were organised. The "FAO workshop: experiences from the global south on climate and water management" was coordinated by Mr. Melvin Medina Navarro (FAO Sub-Regional Office for the Caribbean) and Dr. Nazim Gruda (University of Bonn, Germany). The workshop "Automation and AI in agriculture: realistic pathways to industry?" was coordinated by Dr. José Luis Guzmán Sánchez and Dr. Jorge Antonio Sánchez Molina (University of Almería, Spain). The workshop "How can the integration of artificial intelligence with computational fluid dynamic modelling advance microclimate analysis in agricultural production systems?" was coordinated by Dr. Hicham Fatnassi (PSH-INRAE, Avignon, France). Dr. Esteban José Baeza Romero (CIT COEXPHAL, Almería, Spain) coordinated the workshop "How to establish the right metrics to quantify the environmental sustainability of greenhouse systems?". The final workshop, "How can we create sustainable and climate-resilient CEA systems?", was coordinated by Dr. Leo Marcelis, Dr. Silke Hemming and Dr. Ep Heuvelink (Wageningen University & Research, The Netherlands), conveners of the upcoming GreenSys2027 symposium in Wageningen.

Technical tours included visits to commercial (Agrícola Vasán S.L., Las Norias de Daza) and research greenhouses (UAL-ANECOOP Experimental Farm, Almería; Las Palmerillas Cajamar Experimental Station, El Ejido; IFAPA Centre, La Mojonera) cultivating pepper, tomato, eggplant, zucchini, papaya and pitahaya.

At the closing ceremony, a tribute was paid to Dr. Sasan Aliniaeifard, a member of the Scientific Committee who passed away on 21 March 2025, including a minute of silence and a presentation prepared by his colleagues from the University of Tehran (Iran) and

› Ms. Isabella Righini (centre) receiving the ISHS Young Minds and the special "Dr. Sasan Aliniaeifard" Awards for the best oral presentation from Dr. Francois Laurens (left), Prof. Dr. Francisco Domingo Molina Aiz (second from left), Prof. Dr. Diego Luis Valera Martinez (second from right) and Prof. Dr. In-Bok Lee (right).

› Visit to a pepper greenhouse in the Cajamar Experimental Station "Las Palmerillas".

› Participants of the symposium.

Dr. Leo Marcelis. With the approval of the Scientific Committee and the ISHS Board, the Organising Committee of GreenSys2025 announced the creation of the special "Dr. Sasan Aliniaeifard Award" for the best oral presentation by a young researcher. The ISHS Young Minds Award for the best oral presentation, together with the Dr. Sasan Aliniaeifard Award, was awarded to Ms. Isabella Righini for her research entitled "CO_2 of the future? Assessing the potential of direct air capture for greenhouse horticulture". Ms. Righini is a PhD candidate at Wageningen University (The Netherlands). The ISHS Young Minds Award for the best poster presentation was awarded to Ms. Ioanna Chatzigeorgiou, a PhD candidate at Aristotle University of Thessaloniki (Greece), for her work entitled "Pansies under the spotlight: light-driven enhancements in yield, quality and energy-use efficiency of edible flowers (*Viola* × *wittrockiana*)".

The International Symposium on Smart and Sustainable Greenhouse Systems – GreenSys2027 will be held in Wageningen, The Netherlands, from 6-10 June 2027 (https://ishs.org/symposium/854/). We look forward to your participation.

Francisco Domingo Molina Aiz and Diego Luis Valera Martinez

› Ms. Ioanna Chatzigeorgiou (second from right) receiving the ISHS Young Minds Award for the best poster presentation from Prof. Dr. In-Bok Lee (left), Dr. Francois Laurens (second from left), Prof. Dr. Francisco Domingo Molina Aiz (centre) and Prof. Dr. Diego Luis Valera Martinez (right).

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› II International Symposium on Growing Media, Compost Utilization and Substrate Analysis for Soilless Cultivation

Division Greenhouse and Indoor Production Horticulture #ishs_dgip
Division Vegetables, Roots and Tubers #ishs_dveg

The II International Symposium on Growing Media, Compost Utilization and Substrate Analysis for Soilless Cultivation (Growing Media 2025) was held from September 7-12, 2025, at Weihenstephan-Triesdorf University of Applied Sciences in Freising, Germany. This event, under the aegis of the International Society for Horticultural Science (ISHS) and in cooperation with the International Peatland Society (IPS), brought together more than 200 participants from over 30 countries. The symposium provided an excellent platform for scientists and industry experts in the field of growing media to present their latest findings and to exchange knowledge.

The symposium started with a plenary workshop designed by Beatrix Alsanius from the Swedish University of Agricultural Sciences, Alnarp. The workshop addressed the shift from peat to peat-free growing media and from linear to circular production systems as a global challenge. Speakers from the Netherlands, the United States, Germany, and the United Kingdom presented their countries' strategies for the future development of growing media. This was followed by in-depth discussions in several working groups aimed at addressing key concerns related to the sustainability and resilience of the growing media sector. The participants identified priority areas to achieve transformation, as well as the threats, compounding and/or cascading risks, vulnerabilities and

› Participants of the symposium.

adaptive capacities. The outcomes of the working groups were then presented and discussed in the plenum. In the afternoon of the first day, about 70 posters provided valuable insights into recent research on the characterization of growing media, new growing media constituents, the development of peat-reduced horticultural production systems, as well as the optimization of nutrient and water management in soilless cultivation.

In the following days, individual aspects of these topics were discussed in 48 oral presentations, divided into twelve sessions. Each day started with a keynote presentation on a particular topic, which was further addressed in the following oral session. Three keynotes were presented by Jane Debode from the Flanders Research Institute for Agriculture, Fisheries and Food (Belgium), Leon Wienbeck from Meon Carbon Solutions (Germany), and Dimitrios Savvas from the Agricultural University of Athens (Greece). They gave insights into current research on the rhizospheric microbiome for the control of root pathogens in sustainable growing media, a methodology for the sustainable assessment of growing media constituents and the new international certification system HORTICERT, and current trends and challenges in the nutrition of soilless cropping systems, respectively.

› Graeme Smith (left), Vice-Chair of ISHS Division Greenhouse and Indoor Production Horticulture, and Elke Meinken (right), Convener and head of the ISHS Young Minds Awards jury, presenting the ISHS Young Minds Awards to Camille Voegeli (second from left) for the best oral presentation and to Eleonora Itri (second from right) for the best poster presentation.

In addition, four parallel full-day technical tours took place in the middle of the symposium, covering growing media production, vegetable cultivation and logistics, ornamental plant production, and urban greening. All tours provided interesting insights and opportunities for fruitful discussions. This was also the case during a campus tour at the Institute of Horticulture and during the social events such as the Bavarian evening at

› Participants during an oral (A) and a poster (B) session.

› Technical tour: A) visiting tomato production at Scherzer Gemüse near Nuremberg, B) inspecting wood fiber at Rosenheimer Erdenwerk.

the traditional Bräustüberl Weihenstephan, the original location of the oldest brewery in the world, and the final gala dinner at the historic Benedictine Abbey of Scheyern.

Among the participants, 25 scientists applied for the ISHS Young Minds Awards. A jury awarded Camille Voegeli from the University of Neuchâtel, Switzerland, with the best oral presentation. She presented her work on the detection of peat in growing substrates based on testate amoeba communities. Eleonora Itri from Weihenstephan-Triesdorf University of Applied Sciences, Germany, received the award for the best poster entitled "Natural Alginate based hydrogel as an alternative hydroponic substrate for indoor farming systems".

The conveners would like to thank the sponsors, especially the German Research Foundation (DFG) for their financial support, all poster authors and oral presenters for their interesting presentations, as well as all the participants for their insightful discussions. The upcoming III International Symposium on Growing Media, Compost Utilization and Substrate Analysis for Soilless Cultivation will be hosted by Dimitrios Savvas and Georgia Ntatsi from September 27-30, 2027, at the Agricultural University of Athens in Greece (https://www.ishs.org/symposium/838).

Elke Meinken and Dieter Lohr

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› III International Symposium on Tropical and Subtropical Ornamentals

Division Ornamental Plants **#ishs_dorn**
Plant Genetic Resources, Breeding and Biotechnology **#ishs_dbio**

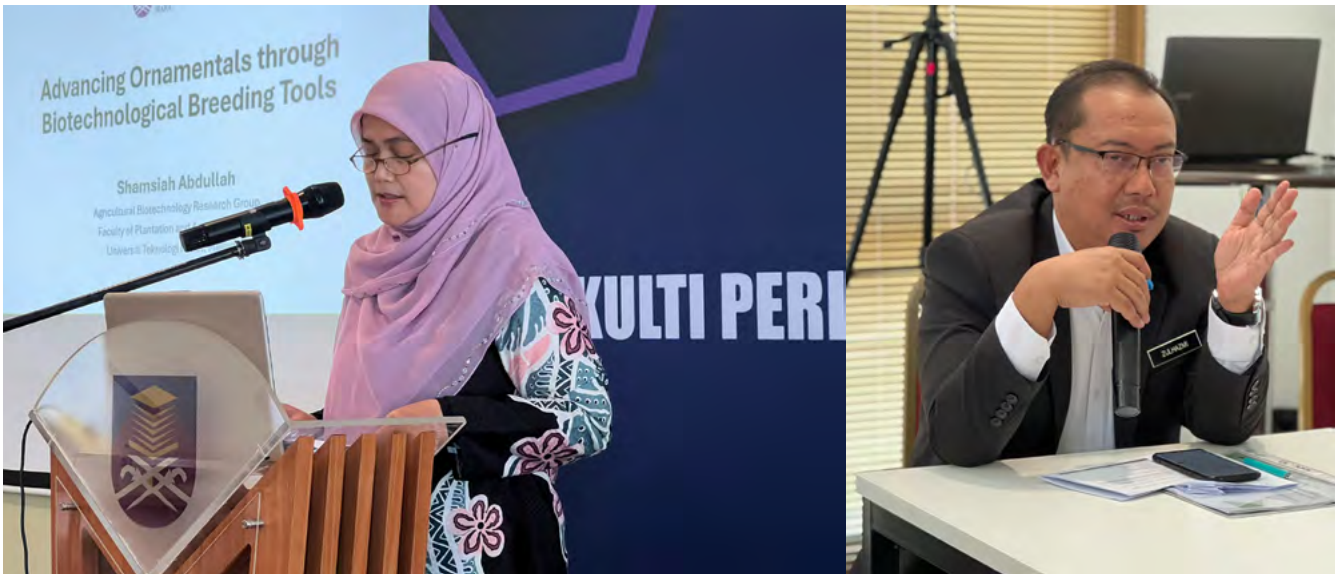
The III International Symposium on Tropical and Subtropical Ornamentals (TSO2025) was convened from 8-9 July 2025 in a hybrid format, on-site at Universiti Teknologi MARA (UiTM), Jasin Campus, Melaka, Malaysia, and virtually via Zoom. The symposium was organized under the aegis of the International Society for Horticultural Science (ISHS) and brought together international experts to share research, foster collaboration, and explore innovative practices in ornamental horticulture.

Focus and emerging scientific themes

TSO2025 focused on breeding, biotechnology, conservation, and climate resilience in tropical and subtropical ornamental plants. Presentations highlighted strategies for developing ornamentals with improved traits through mutation breeding, micropropagation and biotechnological tools.

Keynote speakers addressed climate impacts, advanced breeding technologies and molecular innovations.

- Dr. Zulhazmi Sayuti from the Malaysian Agricultural Research and Development Institute (MARDI) discussed "The impact of climate change on ornamental plants: Malaysia scenario," stressing the need for adaptive strategies;
- Prof. Dr. Syarifah Iis Aisyah from the IPB University, Indonesia, shared advances in mutation breeding for tropical ornamentals;
- Prof. Dr. Kanchit Thammasiri from the Chinese Academy of Sciences, China,



› Keynote sessions followed by active engagement and questions from participants.

presented on orchid utilization and cryopreservation;
- Prof. Ming-Tsair Chan from the Academia Sinica, Taiwan, discussed "Genetic mechanisms of temperature-induced spike initiation and floral maturation in *Phalaenopsis*", highlighting molecular regulation for flowering precision;
- Assoc. Prof. Ts. Dr. Shamsiah Abdullah from UiTM, Malaysia, presented "Advancing ornamentals through biotechnological breeding tools," exploring modern genomics, transformation technologies, and gene editing potential for ornamental crop enhancement.

These keynotes set a progressive tone, urging researchers to consider functional genomics alongside conventional breeding.

Scientific highlights

Several presentations demonstrated innovative directions in ornamental research:

- Prof. Zhiqiang Cheng from the University of Hawaii at Manoa, USA, presented effective chemical and biological strategies to manage coconut rhinoceros beetle (*Oryctes rhinoceros*), a major pest affecting ornamental palms;
- Vichai Puripunyavanich from the Thailand Institute of Nuclear Technology shared progress on the research and domestication of Thai tropical tulips, a crop gaining popularity for its aesthetic and economic potential;
- Prof. Dewi Sukma from the IPB University, Indonesia, highlighted the "Current achievements and prospects of Indonesian native *Dendrobium* section *Spatulata*", underscoring conservation efforts and breeding strategies for regionally significant orchid species;
- Prof. Ts. Dr. Asmah Binti Awal from UiTM, Malaysia, discussed "Optimising mutation breeding in sterile *Begonia* × *hiemalis*", a study combining gamma irradiation with in vitro organogenesis to produce stable and desirable mutants.

These presentations reinforced the applied and translational direction of current ornamental research, connecting genetics, trade, pest control, and mutation technologies.

ISHS Young Minds Awards

To recognize and encourage emerging talent, the ISHS Young Minds Awards were presented to:

- Aliff Ihsaan Bin Akmal Shukri (UiTM, Malaysia): best oral presentation entitled "Gamma irradiation effects on flowering time of aromatic rice MRQ104: implications for agronomic performance and ornamental potential."
- Theerawat Chantakot (Suranaree University of Technology, Thailand): best poster presentation entitled "Effects of phloroglucinol and indole-3-butyric acid on

› Prof. Ts. Dr. Asmah Binti Awal (right), Symposium Convener, and Prof. Dr. Kanchit Thammasiri (center), ISHS representative, presenting the ISHS Young Minds Awards to A) Aliff Ihsaan Bin Akmal Shukri for the best oral presentation, B) Theerawat Chantakot for the best poster presentation.

root induction and growth in *Dendrobium* 'Earsakul'."

Their contributions demonstrated promising advances in floral trait enhancement and propagation methods.

Post-symposium tour

The symposium ended with a post-symposium tour featuring local ornamental gardens and conservation initiatives in Bandaraya Melaka. With its rich technical content, strong international collaboration and youth engagement, TSO2025 reaffirmed the importance of ornamental horticulture in tropical and subtropical regions.

ISHS business meeting

The symposium also hosted the ISHS business meeting, during which Prof. Dr. Kanchit Thammasiri (ISHS representative) announced the hosting institutions for TSO2027 and TSO20. Speeches were delivered by Veera Klaipuk, a representative for the IV International Symposium on Tropical and Subtropical Ornamentals on 19-22 January 2027 in Udon Thani province, Thailand, and Associate Professor Chen Yen Ming, a representative for the V International Symposium on Tropical and Subtropical Ornamentals in 2029 in Taiwan.

This meeting underscored the commitment to continuity, knowledge transfer and regional rotation of hosting responsibilities, fostering broader engagement within the ISHS ornamental community.

Asmah Binti Awal and Zaiton Sapak

› Future TSO hosts: A) Veera Klaipuk from Thailand (virtual) and B) Yen-Ming Chen from Taiwan share their enthusiasm and plans for organizing the 2027 and 2029 symposia, respectively.

› Post-symposium tour to the beautiful ornamental gardens and fruit orchards of Melaka.

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› Closing ceremony of TSO2025, officiated by Prof. Datuk Dr. Shahrin bin Sahib @ Sahibuddin, Vice Chancellor of UiTM (3rd from right), together with Prof. Ts. Dr. Asmah Binti Awal, Symposium Convener (left); Prof. Dr. Kanchit Thammasiri, ISHS representative (2nd from left); Prof. Ts. Dr. Norazah Abdul Rahman, Deputy Vice Chancellor (Research & Innovation) (3rd from left); Prof. Ts. Dr. Mohd Rasdi Zaini (2nd from right); and Assoc. Prof. Ts. Dr. Shamsiah Abdullah, Dean, Faculty of Plantation and Agrotechnology, UiTM (right).

X International Symposium on New Ornamental Crops

Division Ornamental Plants #ishs_dorn
Division Greenhouse and Indoor Production Horticulture #ishs_dgip
Division Landscape and Urban Horticulture #ishs_durb
Division Plant Genetic Resources, Breeding and Biotechnology #ishs_dbio

The X International Symposium on New Ornamental Crops was held from 13 to 16 October 2025 in Kalamata, Greece, under the auspices of the International Society for Horticultural Science (ISHS), Division Ornamental Plants and Working Group New Ornamentals, with support from Division Greenhouse and Indoor Production Horticulture, Division Landscape and Urban Horticulture and Division Plant Genetic Resources, Breeding and Biotechnology. The event was convened by Professor Anastasios Darras from the University of Peloponnese. More than 50 participants attended the symposium, including scientists, breeders, horticulturists, students and industry professionals from various countries.

The symposium was organized by the Department of Agriculture of the University of Peloponnese. Sponsors of the event included the Captain Vasili and Karmen Konstantakopoulou Foundation, MDPI, Scientact, the University of Peloponnese, and the Athens grower association.

The central theme of the symposium was innovation and sustainability in new ornamental crop production, addressing challenges posed by climate change, global trade dynamics, and the growing demand for urban greening and ecological services. The scientific program was structured around several key topics such as Sustainable production of new ornamental plants, Genetic resources and propagation, Growth, development and flowering physiology, Landscape architecture applications, and Plant protection and pest management.

The symposium featured keynote lectures, oral presentations and poster sessions that showcased cutting-edge research. Among the most notable highlights:

- Flower longevity as a breeding driver: Professor Antonio Ferrante (Scuola Superiore Sant'Anna, Italy) delivered a keynote on how flower longevity can guide the selection of new ornamental plants, linking aesthetic value with sustainability goals.

› Professor Antonio Ferrante (Sant'Anna School of Advanced Studies, Pisa, Italy) giving his talk during the first day of the symposium.

- Adaptation to climate stress and deficit irrigation strategies: the research team for the Laboratory of Floriculture and Landscape Architecture (Dept. of Agriculture, University of Peloponnese, Greece) discussed how deficit irrigation applied to *Echium candicans* enhances drought resistance, offering practical solutions for sustainable landscaping in arid regions.
- Breeding and propagation innovations: Associate Professor Henrik Lutken from the University of Denmark delivered a keynote talk on "Quality and conservation aspects for roseroot (*Rhodiola rosea* L.) in Greenland: the potential of *Rhizobium rhizogenes*-transformation", highlighting novel approaches in new ornamental plant transformation and hybrid production. Presentations from the Laboratory of Floriculture and Landscape Architecture (Dept. of Plant Production, Agricultural University of Athens, Greece) and from the Laboratory of Floriculture (Dept. of Agriculture, Aristotle University of Thessaloniki, Greece) included breeding strategies using wild species and in vitro propagation optimization for *Ebenus sibthorpii*, aiming to improve germination and seedling vigor through biostimulant priming.

› Participants of the symposium.

› Prof. Anastasios Darras (left), Symposium Convener, Dr. Margherita Beruto (second from left), Chair of ISHS Division Ornamental Plants, and Dr. Rodrigo Barba Gonzalez (right), former Chair of ISHS Working Group New Ornamentals, presenting the ISHS Young Minds Award for the best oral presentation to Hazel Schrader.

› Exchanging ideas during the focus group “New ornamental plants - cultivation and utilization”.

- Landscape architecture: Professors and new scientists delivered talks on native species and their ornamental potential to support biodiversity and ecological landscaping, whilst in parallel, dealing with climate change. Dr. Nikos Krigas and his team presented work focused on the evaluation and utilization of native Mediterranean plant species as new ornamentals for sustainable landscaping, highlighting their resilience to drought and climate stress. The study highlighted propagation techniques and conservation strategies to integrate these plants into horticultural markets, promoting ecological sustainability and reducing water use in urban and rural landscapes.

The findings presented at the symposium have far-reaching implications for the ornamental plant industry:

- Sustainability and resource efficiency: techniques such as deficit irrigation and species selection for drought tolerance can significantly reduce water consumption, aligning ornamental horticulture with global sustainability goals;
- Climate adaptation: breeding programs targeting resilience to heat and water stress will help ornamental crops thrive in changing climates, ensuring their continued role in urban greening and ecological services;
- Urban and landscape design: research on native species and their ornamental potential supports biodiversity and ecological landscaping, contributing to healthier urban ecosystems;
- Economic opportunities: introducing novel species adapted to Mediterranean and similar environments could open new markets and diversify ornamental plant portfolios.

Hazel Schrader, an MSc student from the University of Minesota, USA, received the ISHS Young Minds Award for the best oral presentation. Her research entitled “Preliminary characterization of morphology and growth attributes of *Salix humilis* (prairie willow)” addressed advanced physiological responses of ornamental species under climate stress, offering solutions for resilient crop development. Panagiota Ntanti, from the University of Peloponnese, Greece, received the ISHS Young Minds Award for the best poster presentation entitled “Improving rooting of cuttings and seed germination of *Salvia fruticosa*, Taygetus Mt native plant with great ornamental and aromatic potential”.

Participants had the opportunity to visit Ancient Messene, which is the most significant historical attraction in Peloponnese and one of the most important in Greece. Most of the ruins have been archaeologically excavated in recent years, while others have been partly restored or preserved for study and public viewing.

During the ISHS Business meeting, Professor Anastasios Darras was elected as the new Chair of ISHS Working Group New Ornamentals. The XI International Symposium on New Ornamental Crops will be held as part of the I Latin American and Caribbean Horticultural Congress in October 2028 in Colombia.

Anastasios Darras

› Symposium participants sitting on the marbles of the ancient theater, located at the premises of Ancient Messene.

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› IV International Symposium on Underutilized Plant Species

Division Plant Genetic Resources, Breeding and Biotechnology

#ishs_dbio

› Participants of the symposium.

Underutilized plant species represent a rich source of biodiversity for thriving and resilient agroecological systems. ISHS has addressed their importance through symposia held in Tanzania (2008), Malaysia (2011), India (2015) and, most recently, through the IV International Symposium on Underutilized Plant Species hosted by ECHO in Fort Myers, Florida (USA) on 20-24 October 2025. Conveners of the Florida-based symposium were Dr. Tim Motis (ECHO), Dr. Carlos Iglesias (North Carolina State University), and Dr. Arun Jani (California State University, Monterey Bay). With 73 participants, the event featured keynote, oral and poster presentations, tours and workshops at ECHO's North America Regional Impact Center, and excursions to surrounding agricultural sites. ECHO is a faith-based, nonprofit, technical-resourcing organization that strengthens the capacity of a diverse global network (www.ECHOcommunity.org) to defeat hunger and improve lives.

Presentations included overviews of ISHS (Dr. Byoung Ryong Jeong, Chair of ISHS Working Group Plant Genetic Resources) and ECHO (Dr. Abram Bicksler, President/CEO), 6 keynote talks, 30 oral presentations, and 22 posters. Keynote plenary speakers addressed food plant diversity in a changing world (Dr. Colin Khoury), the cultural roots and modern relevance of underutilized plants (Dr. Carrie Waterman), the inclusion of underutilized species like amaranth in national seed policies (Meng. Ndèye Awa Gueye), the role of underutilized species for rural and industrial development (Dr. Carlos Iglesias), underutilized crops for the conversion of marginal Mediterranean lands into productive agroecosystems (Dr. Katerina Grigoriadou), and an analytical approach to identifying underutilized species for southern Florida (Dr. Zachary Brym).

› Interactive discussion during a general session.

Posters were displayed on unique bamboo hangers. Each poster presenter gave a five-minute oral summary of their research during formal poster sessions. Fifteen-minute oral presentations were grouped under four themes: 1) human nutrition and post-harvest processing; 2) crop management considerations; 3) plant breeding and genetic resources; and 4) environmental requirements and adaptation. While many of the crops featured in the symposium were tropical species (e.g. *Artocarpus altilis*, *Corchorus* spp., *Moringa oleifera*, and *Trichostigma octandrum*), species from temperate (e.g. *Asimina triloba* and *Juglans nigra*) and Mediterranean (e.g., *Salicornia* spp.) climates were also represented.

Dedicated times for interactive discussion between speakers and participants were a key element of the symposium. Topics of discussion ranged from aspects of growing specific crops to national and global issues around neglected and underutilized plants. Access to diverse, culturally preferred, nutritious foods emerged as a recurring theme throughout the symposium. The level of access people have to desired food and plant

› Activities at ECHO in Florida, including a grafting workshop (A) and tours of plantings (B) in the demonstration gardens.

resources is linked to the availability of quality seed and sound production practices.

ISHS Young Minds Awardees were selected by two university professors with broad international experience and presented by Dr. Tim Motis. Dolly Autufuga (University of Hawai'i at Mānoa, USA) received the award for the best oral presentation entitled "Development of maturity index and shelf life assessment in three breadfruit varieties." Gladys Njeri (North Carolina State University, USA) received the award for the best poster presentation entitled "Genetic diversity, nutrition, and adaptation of African indigenous leafy vegetables in North Carolina."

The day at ECHO featured tours of demonstration gardens showcasing underutilized plants and cultivation practices relevant to agroecological zones such as semi-arid, rainforest, and tropical highlands. Participants also toured a forage bank and the ECHO Global Seed Bank, gaining insights on plants for livestock, and technologies and practices for multiplying and storing seeds of diverse species. Workshops were held on agroecology, cooking with underutilized plants, grafting methods for tropical fruit trees, uses and applications of perennial greens, moringa leaf powder production, and urban gardening. A farm-to-table lunch incorporated plants grown at ECHO. Field excursion options on the final day were 1) a tour of the Tropical Research and Education Center (University of Florida/Institute of Food and Agricultural Sciences), home to a wide variety of tropical and subtropical plants; 2) an in-depth botanical tour of underutilized plants at ECHO; or 3) a tour of area home gardens with mixed plantings of underutilized plants.

› Dolly Autufuga, winner of the ISHS Young Minds Award for the best oral presentation.

› Dr. Tim Motis (left), Symposium Convener, presenting the ISHS Young Minds Awards for the best poster to Gladys Njeri (right).

Together with scientific presentations and reports, the tours/workshops and excursions advanced both the scientific understanding and practical know-how to better incorporate underutilized plants in agricultural systems. Thank you to ISHS, co-conveners, ECHO staff, and symposium participants for their support and engagement.

Tim Motis

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XV International Symposium on Plant Bioregulators in Fruit Production

Division Plant-Environment Interactions in Field Systems #ishs_dphy

The XV International Symposium on Plant Bioregulators in Fruit Production was convened in Chicago, IL, USA, June 23-26, 2025. Seventy-five participants from six continents attended the symposium. Sixty presentations were organized into seven sessions: molecular biology and genetics; application technologies and environmental regulation of bioregulator penetration; dormancy; floral induction, flowering and fruit set biology; vegetative growth and development; fruit maturity; and postharvest biology. Most reports pertained to temperate-zone, perennial tree fruit species, though research on citrus and other subtropical fruit, blueberries, nuts and annual vegetable crops were also presented.

The opening lecture by P. Petracek detailed the research vision and career of National Academy of Sciences member, Dr. John Bukovac (*in memoriam*) for his pioneering work on plant growth regulation and cuticular penetration of plant growth regulators. Other notable presentations included S. Culter who spoke on nascent research on plant-based sense-and-response modules as living sensors for the regulation of traits and optimization of precision agriculture; Z. Singh on the status of jasmonate-enhancement for color development and mitigation of postharvest chilling injury for diverse fruit species; and Y. Teng for a comprehensive overview of the molecular regulation of tree fruit dormancy.

The symposium expanded the past focus solely on preharvest bioregulator use by devoting an afternoon to ripening fundamentals, led by I. El-Sharkawy, and postharvest biology, with a focus on ethylene biology and the use of ethylene inhibitors during postharvest storage led by R. Beaudry. For his excellent communication and compelling research on the ripening biology of blueberry, Claudio Ponce from Kyoto University, Japan, received the ISHS Young Minds Award for the best oral presentation. The title of Claudio's presentation was "Role of endogenously produced ethylene in highbush blueberry (*Vaccinium corymbosum*) fruit ripening".

There were many reports highlighting the efficacy and global potential of the new plant growth regulator, ACC, now commercially available in several countries to thin pome and stone fruit, enhance surface color development, and promote floral induction. This body of work was supported by presentations on the CO_2 and temperature-dependency of ACC-induced ethylene production and action by J. Larson and B. Sopcak, respectively. Several presentations reported on climate change-induced shifts in dorman-

› Group photo with conveners from left to right, Steve McArtney, Pete Petracek, Todd Einhorn and Randy Beaudry.

› Convener Todd Einhorn (left) presenting the ISHS Young Minds Award for the best oral presentation to Claudio Ponce (right).

cy, vegetative and reproductive bud fate, and the timing of anthesis. Several reports from mild-winter climates in northern regions of the southern hemisphere discussed novel strategies to initiate branching, while perspectives on the importance of the carbohydrate economy on dormancy biology and fruit set of peach and apple were also discussed.

The symposium was sponsored by the research program of Dr. Todd Einhorn (Michigan State University), the Martin and Judith Bukovac Endowment for Tree Fruit Physiology (Michigan State University), Valent BioSciences Corp, Fine Americas, MIRtech Inc., Shandong Aoweite Biotechnology Co., Nutrien, the Michigan Apple Committee, and the Michigan State University Department of Horticulture.

During the ISHS Business meeting, Tripti Vashisth was elected as the new Chair of ISHS Working Group Bioregulators in Fruit Production. The XVI International Symposium on Plant Bioregulators in Fruit Production will be held in Lleida, Spain, in June 2029.

Todd C. Einhorn (Convener) on behalf of Co-Conveners Randy Beaudry, Steve McArtney and Pete Petracek

› Contact

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› VI Asia Symposium on Quality Management in Postharvest Systems

Division Postharvest and Quality Assurance **#ishs_dphq**

The Asia Symposium on Quality Management in Postharvest Systems (ASQP) was first held in 2012 at King Mongkut's University of Technology Thonburi (KMUTT), Thailand, under the aegis of the International Society for Horticultural Science. Since then, symposia have been conducted in Laos PDR (2013), Cambodia (2015), Korea (2017), and again in Thailand in 2021. From 11-13 November 2025, the VI Asia Symposium on Quality Management in Postharvest Systems (ASQP2025) was held in Shizuoka, Japan, under the theme "Innovative Technology for Sustainable Production and Preservation".

Growing concerns over global food security, population growth, climate change and environmental sustainability have underscored the urgent need to reduce food losses along the supply chain, particularly during the postharvest handling and distribution of fresh horticultural produce. Postharvest losses not only reduce food availability but also result in significant economic losses and environmental burdens. These challenges have driven increasing research efforts aimed at improving postharvest management through advances in postharvest physiology, postharvest pathology, biochemistry, molecular biology, and innovative technologies for quality assessment and preservation. In response to these global challenges, ASQP2025 offered a valuable opportunity to bring together leading experts, researchers, young and emerging researchers, as well as undergraduate and postgraduate students from Asia and other regions, to present research innovations, share ideas and knowledge, and discuss future perspectives on postharvest systems.

› Prof. Giancarlo Colelli (right), Chair of ISHS Division Postharvest and Quality Assurance, awarding the ISHS Medal and Certificate to the Convener, Prof. Dr. Masaya Kato (left).

The symposium program included special lectures, oral presentations, poster sessions, and discussions on postharvest technology, physiology, biochemistry, pathology, and supply chain management of fruits, vegetables and flowers. A total of 150 participants (64 domestic and 86 international attendees) from 18 countries and regions including Japan, Thailand, China, South Africa, Korea, Taiwan, Italy, Australia, United States, United Arab Emirates, Malaysia, Canada, Philippines, Indonesia, United Kingdom, France, Peru and India, attended the symposium. The wide geographical representation reflected the growing international interest in postharvest quality management and sustainable horticultural systems. The scientific program comprised 64 oral and 66 poster presentations.

The symposium highlighted recent advances in postharvest physiology, biochemistry, molecular biology and distribution systems,

› Participants of the symposium.

as well as practical applications in quality enhancement, long-term storage, transportation, growth regulator-based quality control, edible coatings and non-destructive detection techniques. Many presentations emphasized the integration of fundamental research with practical applications for industry and supply chains. In addition, emerging topics such as climate change, disease-resistant varieties, crops with improved storability and cultivars enriched with functional compounds were addressed.

ASQP2025 provided an important platform for young researchers to present their ideas, knowledge and research expertise, as well as to interact with leading scientists in the postharvest community. ISHS Young Minds Awards were presented to Ms. Nahar Ashrafun (Gifu University, Japan) for the best oral presentation entitled "Metabolomics-based identification of freshness markers in coriander leaves for quantitative evaluation of packaging performance", and to Ms. Aika Kikuchi (Shizuoka University, Japan) for the best poster presentation entitled "Effect of temperature on sugar and organic acid metabolisms in cultured juice sacs of Satsuma mandarin".

At the ISHS business meeting, Prof. Dr. Masaya Kato was elected as the new Chair of ISHS Working Group Postharvest in Developing Countries. Taiwan was elected to host the next ASQP2029. Associate Prof. Dr. Yen-Chou Kuan of National Taiwan University, Taiwan, will serve as the convener of the next symposium in this series.

Masaya Kato

› Contact

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› Prof. Dr. Masaya Kato (left), Symposium Convener, and Prof. Giancarlo Colelli (right), Chair of ISHS Division Postharvest and Quality Assurance, presenting the ISHS Young Minds Awards to A) Nahar Ashrafun (best oral presentation), B) Aika Kikuchi (best poster presentation).

› Participants visiting a citrus farm for mandarin orange picking.

X International Cherry Symposium

Division Temperate Tree Fruits #ishs_dfru

› Participants of the symposium.

The X International Cherry Symposium was held under the aegis of the International Society for Horticultural Science in Richland, Washington, USA, between June 1-5, 2025, with 215 attendees from around the world. In the quarter century since the global cherry community last gathered in Washington State (for the IV International Cherry Symposium), this region has become the nation's fruit basket producing more than half of all USA cherries, a situation which would not be possible without the region's natural edaphic and climatic advantages nor, of equal importance, the industry's commitment to invest in research and extension. Sustainable cherry production in this region is underpinned by constant innovation and collaboration, foremost being the enduring partnerships between industry professionals and the research community.

Representatives from 21 countries presented their research highlights across key disciplines including breeding and genetics, environmental stress and climate change, tree physiology, postharvest handling and storage, and new production strategies to improve fruit quality. Over three days of scientific sessions there were 52 oral presentations and 36 poster presentations. Keynote presentations were delivered on climate change effects (Dr. Berta Gonçalves), new breeding tools (Dr. José Quero Garcia), and covered production systems (Dr. Marlene Ayala). In addition, recently retired US cherry research and extension specialists Lynn Long and Dr. Greg Lang gave a presentation that reflected on their 60+ years of combined experience.

The winners of the ISHS Young Minds Awards were Francisco Maldonado (University of Talca, Chile) for his oral presentation on effects of plant growth regulators, and Julian Nick Bauer (University of Bonn, Germany) for his poster on integrating dormancy-breaking agents into blossom models.

› Francisco Maldonado, winner of the ISHS Young Minds Award for the best oral presentation.

› Matthew Whiting (left), Symposium Convener, and Luca Corelli Grappadelli (right), Chair of ISHS Division Temperate Tree Fruits, presenting the ISHS Young Minds Award for the best poster to Julian Nick Bauer (center).

A symposium highlight for all was the full day of orchard visits – an upclose look at innovative commercial cherry orchards in Washington State – and the candid discussions among participants on the challenges facing growers around the world. Attendees saw new cultivars and rootstocks being implemented in high efficiency production systems (Y-trellised UFO, Tatura) as farmers in Washington State described their key challenges related to orchard productivity and the escalating costs of production.
In the end, it was clear that attendees' time in Washington was inspiring, rich in insight, generous in discourse and debate, and will yield new and enduring partnerships.

Matthew Whiting

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› Participants at a commercial orchard during the field day.

› I International Symposium on Temperate Tree Nuts: from Agroecologically Sustainable to Organic Production

Division Temperate Tree Nuts #ishs_dnut
Commission Agroecology and Organic Farming Systems #ishs_cmor

The First International Symposium on Temperate Tree Nuts: from Agroecologically Sustainable to Organic Production marked a significant milestone for international research and collaboration in the nut sector. Held from August 25 to 31, 2025, the event took place under the aegis of the International Society for Horticultural Science (ISHS) in two prime Italian locations – Naples in the south and Alba in the north – symbolizing the link between Mediterranean and continental nut-growing regions, and reflecting Italy's agricultural diversity.
The symposium, which brough together around 80 participants from eleven countries, included researchers, industry professionals and students, creating a vibrant platform for scientific exchange and cooperation. The event was convened by Prof.

› Participants of the symposium.

Roberto Botta, Prof. Tiziano Caruso and Prof. Chiara Cirillo, with Prof. Giulia Marino, Chair of ISHS Division Temperate Tree Nuts, representing ISHS.

The first part of the symposium, hosted at the Partenope Conference Center in Naples, featured two days of intensive scientific exchange.

Day 1 included 25 presentations across three main themes: Genetics and breeding for the selection of resilient genotypes; Environmental assessment for sustainable and organic cultivation; and Propagation techniques and nursery management for sustainable/organic plant production. Invited speaker Dr. Vera Pavese opened the first session with an overview of breeding innovations aimed at enhancing nut species' resilience in a changing climate. The Genetics and Breeding session explored modern molecular tools – such as genome editing, RNA-based technologies and molecular markers – to improve stress tolerance and sustainability in almond, chestnut and pistachio. The Environmental Assessment session emphasized biodiversity, soil health and agroforestry, highlighting advances in precision agriculture, organic amendments and intercropping. The Propagation and Nursery Management session addressed the production of disease-free, stress-tolerant plants and the adoption of circular economy models in nurseries. The day concluded with a business meeting promoting new international collaborations.

Day 2 featured 31 presentations on Plantation systems for sustainable and organic orchard management; and Advances in pest and disease control for sustainable/organic production. Invited speaker Prof. Daniela Farinelli discussed new cultivation models for sustainable hazelnut orchard management, illustrating innovations in orchard design, irrigation, soil enhancement, and the use of grafted or micro-propagated plants to mitigate heat stress and boost yield and quality. Presentations also examined physiological and agronomic responses of nut trees to environmental stress and cultivation practices. The Advances in Pest and Disease Control session, introduced by Prof. Houston Wilson with a review of sustainable pest management in California tree nuts, addressed emerging strategies for pest and disease control in organic orchards. Topics included biological control, plant defense mechanisms, microbial-based treatments against pests such as *Ectomyelois ceratoniae* and *Halyomorpha halys*, and the use of predictive models and molecular tools for pathogen monitoring and diversity assessment.

The strong participation of young researchers reflected the vitality and future promise of this scientific field. The ISHS Young Minds Awards were presented by Prof. Giulia Marino, Chair of ISHS Division Temperate Tree Nuts. Federica Fulcini (Catholic University of the Sacred Heart, Italy) received the award for the best oral presentation entitled "Effect of bioactive compounds on spring frost tolerance in hazelnut tree (*Corylus avellana* L.)". Valeria Imperiale (University of Palermo, Italy) received the award for the best poster entitled "Water stress effect on ecophysiological parameters of pistachio trees".

› Prof. Giulia Marino, Chair of ISHS Division Temperate Tree Nuts, and the conveners presenting the ISHS Young Minds Award to A) Federica Fulcini for the best oral presentation, B) Valeria Imperiale for the best poster.

The second part of the symposium featured four thematic tours across Italy, providing participants with first-hand insights into sustainable practices and innovations within the nut sector.

- "Sustainable development in nut production: integrating tradition and innovation in Campania" showcased southern Italy's nut industry through visits to Padula Farm (pistachio cultivation), Tenuta Vannulo (organic buffalo farming and circular production), and the 'Tonda di Giffoni' hazelnut groves, where traditional knowledge meets modern technology.
- "South to north: bridging distances, sharing ideas" symbolized interregional collaboration, with a visit to Azienda Agricola Maccarese near Rome – one of Italy's largest farms – highlighting advanced almond production and certified sustainable management that align large-

› Participants during their visit to Ferrero Company (A) and to the Regional Center of Chestnut Conservation (B).

› From left to right: Symposium conveners, Prof. Roberto Botta, Prof. Tiziano Caruso, Prof. Chiara Cirillo, with Prof. Giulia Marino, Chair of ISHS Division Temperate Tree Nuts.

scale agriculture with environmental responsibility.

- "Langhe in a nutshell: a hazelnut experience" explored Piedmont's excellence in hazelnut cultivation. Visits included the Ferrero Company in Alba, an emblem of Italian innovation and global success, and La Corylicola Farm in Arguello, where 'Tonda Gentile Trilobata' hazelnuts are grown with a focus on tradition and sustainability.
- "In the shade of chestnut trees: exploring Piedmont's castaniculture" concluded the program with a visit to the Regional Center for Chestnut Conservation of Piedmont, home to one of the world's largest chestnut genotype collections. Participants also toured local orchards where centuries-old chestnut groves represent biodiversity, resilience and the deep cultural heritage of Piedmont's rural landscape.

In summary, the symposium successfully connected scientific innovation with practical sustainability, highlighting how global collaboration and local traditions can together shape the future of temperate nut production toward more resilient, organic and environmentally conscious systems.

Aurora Cirillo

› Contact

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› XIV International Mango Symposium

Division Tropical and Subtropical Fruit and Nuts #ishs_dtro

The XIV International Mango Symposium, held from May 28-31, 2025, in Mazatlán, Sinaloa (Mexico), was organized by the Chapingo Autonomous University under the aegis of the International Society for Horticultural Science and brought together more than 400 participants from 28 countries, reaffirming its position as the most important global scientific event dedicated to mango research and innovation. In addition, Radio Chapingo streamed the opening ceremony and several interviews with speakers and distinguished guests. Under the theme "The mango industry: adaptation and mitigation to address climate change," the symposium emphasized the growing challenges imposed by climatic variability on mango physiology, production systems, postharvest quality and market competitiveness.

Scientific focus and key themes

The central scientific discussions revolved around the interaction between climate change and mango ecophysiology, particularly the impacts of rising temperatures, irregular rainfall, drought and extreme weather events. Several plenary and oral presentations highlighted the consequences of high temperatures on photosynthesis, reproductive processes and flowering induction. Research presented by Pérez-Barraza and Aron demonstrated how heat stress affects RUBISCO activity, hormonal regulation and the synchronization of flowering, resulting in reduced fruit set and highly irregular phenology.

In parallel, work by Irihimovitch and collaborators revealed advances in understanding molecular pathways involved in fruitlet abscission, including the role of IDA-like genes and the potential application of NaHS to reduce fruit drop during heat events. These studies underscore the need for integrated physiological and molecular approaches to improve resilience.

Climate-related challenges were also explored from an ecophysiological modeling perspective. Unsupervised machine learning was presented as an emerging tool to classify physiological responses of mango trees under variable environmental conditions.

› Mango producers from several countries.

› Audience at the symposium.

Other studies showed the usefulness of growing degree-day (GDD) modeling, canopy imaging and near-infrared spectroscopy to predict fruit maturity and optimize harvest decision-making.

Advances in crop management and orchard technologies

Several sessions addressed innovations in orchard design and management. High-density and ultra-high-density systems were reported to enhance yield efficiency and reduce labor requirements. Studies from Brazil demonstrated the benefits of applying proline and *Ascophyllum nodosum* extracts to stimulate antioxidant defense systems and mitigate abiotic stress, particularly in semi-arid conditions.

Research on shade-net technologies from Israel showed substantial reductions in sunburn incidence – up to 100% in some cultivars – along with modest cooling effects that may help counter heatwaves. Additional presentations highlighted strategies for nutrient management, pruning, pest monitoring, regulated deficit irrigation and the agronomic manipulation of flowering to expand harvest windows.

Genetics, breeding and germplasm diversity

Breeding programs received significant attention across multiple sessions. Presentations emphasized the urgency of developing climate-resilient cultivars with improved tolerance to heat, diseases and inconsistent flowering. The symposium showcased work on phenotypic and molecular characterization of segregating populations, the use of global germplasm collections, and the integration of molecular markers to accelerate selection processes. Discussions suggested that genomic-assisted breeding will be central to the next generation of mango improvement.

Postharvest and supply chain innovations

The postharvest sessions addressed key issues such as anthracnose, chilling injury, irradiated fruit quality and the use of non-destructive optical technologies to evaluate internal quality attributes. A notable highlight was the presentation of PixFruit®, an AI-based decision-support system capable of estimating yield, fruit distribution, and maturity levels using machine vision and deep learning. This technology is currently being tested in several countries and offers promising applications for producers, exporters and supply chain operators.

Regional perspectives and sectoral impacts

Mexico, the world's leading mango exporter, contributed several studies that illustrated the country's climatic challenges, including drought, heatwaves, stenospermocarpy,

› Didiana Galvez-Lopez, winner of the ISHS Young Minds Award for the best oral presentation

› Dr. Karin Hannweg (right), Chair of ISHS Division Tropical and Subtropical Fruit and Nuts, presenting the ISHS Young Minds Award for the best poster presentation to Thelma Guadalupe Valdés-Reyes (left).

and atypical flowering patterns in key producing regions such as Nayarit and Sinaloa. Research also addressed improvements in forced production techniques, pest management and producer-academic partnerships to enhance technology transfer.

A recurrent theme throughout the symposium was the need for stronger integration between research, production systems and market dynamics. The participation of industry organizations – including the National Mango Board, EMEX and various private-sector partners – facilitated discussions on market trends, sustainability requirements and consumer demand in high-value markets.

ISHS Young Minds Awards

The best oral presentation was awarded to Didiana Galvez-Lopez (Universidad Autónoma de Chiapas, Mexico) for her paper on *PAL* and *CHS* gene expression in mango native from Soconusco, Chiapas, Mexico.

The best poster presentation was awarded to Thelma Guadalupe Valdés-Reyes (Chapingo Autonomous University, Mexico) for her paper on fungicidal activity of Mexican oregano (*Lippia graveolens*) extract against *Colletotrichum* species associated with mango anthracnose.

Conclusion

The XIV International Mango Symposium demonstrated a strong global commitment to addressing the scientific, technological and commercial challenges posed by climate change. The event successfully integrated cutting-edge research with practical innovations and fostered new collaborations among researchers, producers and industry leaders. Its outcomes contribute to a clear forward-looking agenda focused on climate resilience, genetic improvement, sustainable production and advanced technologies that will shape the future of the mango industry.

During the ISHS Business meeting, Dr. Ian Bally was elected as new Chair of ISHS Working Group Mango. The XV International Mango Symposium will be held in India in June 2028.

Sergio Roberto Márquez-Berber

› Dr. Sergio Roberto Márquez-Berber (left), Symposium Convener, and Dr. Ping Lu (center), former Chair of ISHS Working Group Mango, presenting the ISHS flag to Dr. Sunil Pareek, Convener of the next International Mango Symposium in India in 2028.

› Visit to a mango orchard.

› Contact

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› IX International Symposium on Edible Alliums

Division Vegetables, Roots and Tubers #ishs_dveg

› Participants of the symposium

The IX International Symposium on Edible Alliums took place from September 16-19, 2025, in Bogor, Indonesia. Organized under the auspices of ISHS Division Vegetables, Roots and Tubers and ISHS Working Group Edible Alliums, and hosted by the Center for Tropical Horticulture Studies (PKHT) and the Faculty of Agriculture at IPB University, the event brought together over 160 participants from 20 countries. This event marked a welcome return to a fully offline format overcoming many of the challenges faced by the previous symposium in Pula (Croatia) that was conducted virtually, due to COVID-19.

The symposium, dedicated to the theme "Sustainable alliums for a bio-based future," was positioned to address two major contemporary challenges: climate change and the urgent need for sustainable intensification. Holding the event in Indonesia – where the shallot is a crop of significant cultural and economic value to smallholder farmers – placed a necessary focus on applied research relevant to tropical production. The opening session started with a presentation on ISHS by Prof. Ferdinando Branca, Chair of ISHS Division Vegetable, Roots and Tubers, and an introduction from Prof. Masayoshi Shigyo, former Chair of ISHS Working Group Edible Alliums, and Prof. Awang Maharijaya, Symposium Convener. Prof. Maharijaya paid tribute to Dr. Sjaak Van Heusden, whose pioneering work in onion genetics laid the groundwork for much of the advanced breeding research presented.

A key shift noted in the presentations was the move away from purely descriptive agronomic studies toward genomics-assisted solutions and integrated systems. Another

› Prof. Ferdinando Branca (left), Chair of ISHS Division Vegetable, Roots and Tubers, and Prof. Masayoshi Shigyo (right), former Chair of ISHS Working Group Edible Alliums, presenting the ISHS Convener award to Prof. Awang Maharijaya (second from right), Symposium Convener, and the ISHS Young Minds Awards to Seung Woo Jin (second from left) for the best oral presentation and Sari Nurulita (center) for the best poster presentation.

significant development was the increased involvement of seed industry professionals as speakers, indicative of a strategic effort to bridge the gap between academic research and commercial application. The 13 invited speakers delivered work with high potential for future research. In the session on Breeding and genetic resilience, the focus was highly technical: presentations covered cytogenetic research on tropical shallots, the identification of male sterile lines in Indian onions via marker-assisted techniques, and detailed genetic diversity studies on local Indonesian cultivars like shallot 'Rubaru' and 'Sumenep' using molecular markers. The goal is to accelerate the development cycle, delivering climate-smart varieties to farmers faster than traditional breeding allows.

The session on Integrated systems underpinned much of the discussion on plant health and production systems, promoting integrated pest management (IPM) as the standard. This theme was further highlighted during a special session dedicated to Smart agriculture for alliums, which demonstrated how high-resolution data and remote sensing were now being applied to phenotyping to accelerate breeding. Disease management solutions were specific, detailing the use of nano-biopesticides for *Spodoptera exigua* control, low-risk fungicide alternatives against Fusarium basal rot, and the application of biocontrol agents for suppressing shallot twisted disease. Furthermore, the

molecular track included detailed reports on phylogenetic analysis and next-generation sequencing (NGS) techniques for identifying the complex of viruses infecting garlic in Indonesia. This strong consensus on bio-based inputs and precision agriculture signals a clear trajectory toward reducing the industry's environmental footprint.

Crucial work in the postharvest and socio-economic impact track addressed the highly perishable nature of alliums, focusing on solutions to minimize losses in transit and storage. Research included fine bubble technology for promoting allium bulb germination and detailed analyses of how drying conditions affect the quality characteristics of sliced shallots. This research intersected with the socio-economics track, which examined policy and market interventions required to empower smallholder farmers. Discussions emphasized stronger vertical integration, powerfully highlighted by the industry perspective from Adriyanita Adin (PT East West Seed Indonesia – Ewindo). This practical focus was reinforced by the post-symposium field trip to the Research and Development Center for Vegetable Crops Modernization/Innovation in Lembang and the Ewindo Shallot House in Rumah Bawang.

Outstanding young talent was recognized through the ISHS Young Minds Awards. The prize for the best oral presentation was awarded to Dr. Seung Woo Jin (Leibniz Institute of Plant Genetics and Crop Plant Research, Germany) for his presentation on "Exploring genetic diversity in garlic gene-bank accessions; foundations for high-quality garlic in organic agriculture." The best poster presentation award was assigned to Dr. Sari Nurulita (Department of Plant Protection, Faculty of Agriculture, IPB University, Indonesia) for her work on "Phylogenetic analysis and genetic diversity of viruses infecting garlic in Indonesia."

The symposium was proudly supported by key sponsors including PT Meroke Tetap Jaya, LUPIC, and Ewindo.

During the ISHS Business meeting Prof. Awang Maharijaya was elected as the new Chair of ISHS Working Group Edible Alliums. The X International Symposium on Edible Alliums will be held in 2028 in India.

Awang Maharijaya

› Participants at the shallot house of PT Ewindo.

› Contact

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› Participants visiting the demonstration plot of shallot, leeks, spring onions, and chives.

From the Secretariat

› New ISHS members

ISHS is pleased to welcome the following new members:

New Individual Members

Afghanistan: Theresa Beutel; **Australia:** Prof. Olufemi Akinsanmi, Ms. Chrysanthea Budiman, Mr. Christian Bugajim, Ms. Virajinee Bulathsinhalage, Assist. Prof. Peter Crisp, Dr. Hong Tham Dong, Ms. Khushboo Fulara, Dr. Karli Goves, Prof. John Hornbuckle, Ms. Wafa Qaiser Khan, Mr. Liangwei Li, Ms. Ni-Jung Lin, Dr. Katie O'Connor, Mr. Shri Hari Prasad, Imas Rita Saadah, Georgie Stephan, Ms. Xinhang Sun, Assoc. Prof. Milos Tanurdzic, Dr. Leena Thung, Mr. Samuel Wakefield, Mr. Michael Walker; **Austria:** Dr. Jose Carlos Herrera, Dr. Daniel Podmirseg; **Belgium:** Ms. Letizia Manzoni; **Brazil:** Sandra Cruz, Prof. Dr. Adao Felipe Santos; **Canada:** Mr. Khaled Abed, Beatrice Amyotte, Mr. Vincent Coulombe, Prof. Charles Goulet, Ms. Jessa Hughes, Aleena Massenet, Ms. Sandra Spudic, Ms. Sahar Ziedi; **Chile:** Veronica Arancibia, Dr. Paulina Ballesta, Dr. Mauricio Ortiz; **China:** Prof. Ailiang Chen, Ou Chen, Dr. Meisong Dai, Dr. Lifang Geng, Ms. Ying Huang, Prof. Dr. Xingguo Lan, Mr. Jiaxing Li, Dr. Yitong Li, Tao Lin, Ziyan Liu, Dr. Xiaoguang Sheng, Prof. Lihua Song, Dr. Kai Wang, Dr. Qing Wang, Shengyuan Wang, Wenjun Wang, Prof. Dr. Yu Wang, Prof. Dr. Zhiwei Wang, Du Wenting, Dr. Yanxu Wu, Shu Xiang, Zhecheng Xie, Dr. Xiaodi Xu, Shuzhi Yuan, Dr. Jingyi Zhang; **Chinese Taipei:** Mr. Kuo-Cheng Chang, Prof. Dr. Pi-Fang Linda Chang, Wei-Hsun Chao, Ms. Hsiang Hua Chen, Hsiang-Shun Chen, Ms. Li Yun Chen, Su-Yi Chen, Yu-Jung Cheng, Dr. ShengChi Chu, Ms. Bi-Shuang Gao, Mr. Chinchin Hsu, Yang-hsin Hsu, Chiao-Wen Huang, Ms. Wei Hsuan Huang, Chien Chih Kuo, Mr. Jui-Sheng Lai, Mr. Bei Jung Li, Yen-Jung Li, Dr. MengJin Lin, Yu-Heng Lin, Yi-Ting Lu, Kai-Zhi Ma, Dr. Lukas Pawera, Dr. Rung Yi Wu, Ting Chia Wu, Ms. Yi-Fang Xie; **Cyprus:** Mr. Chrysanthos Eliades; **Czech Republic:** Ms. Lucie Plecitá; **Finland:** Ms. Satu Hult, Katerina Zitkova; **France:** Ms. Amandine Arnal, Mr. Mathieu Bernardini, Dr. Matthieu Chabannes, Aurélien Devillars, Mr. Bastien Fulachier, Prof. Dominique Mazier, Dr. Julie Sardos, Michel Schlosser, Dr. Kodjo Tomekpe, Prof. Joan Van Baaren; **Germany:** Fernanda de Candido de Oliveira, Lino Miguel Dias, Mr. Jany Dino, Dr. Carolin Rebecca Dodt, Ms. Anastasia Gosch, Panpan Jiang-Rempel, Florian Just, Liane Kahlert, Dr. Stefan Karlowsky, Katie Larson, Dr. Adriana Lugaresi, Dr. Burawich Pamornnak, Mr. Moritz Stengel, Mr. Frederic Top, Felix Wirth, Dr. Christian Zupanc; **Greece:** Ms. Panagiota Ntanti; **Hungary:** Tamas Gal, Kata Kepes, Dr. Hanna Szemzo; **India:** Ms. Linu Choorakunnan, Dr. Anil Dhake, Ms. Pasham Sahithi Reddy, Ms. Spoorti Tirki, Mr. Abhay Vedwan; **Indonesia:** Dr. Citra Bakti, Assoc. Prof. Nono Carsono, Dr. Farida Damayanti, Dr. Zumi Saidah, Dr. Fitri Widiantini, Prof. Dr. Eliana Wulandari; **Ireland:** Ms. Ziwei Yang; **Israel:** Tamar Avin-Wittenberg, Khadijah Ayarnah, Dr. Lior Blank, Dr. Yael Grunwald, Dr. Lior Gur, Dr. Joshua Schmidt, Dr. Edward Sionov, Gal Wittenberg; **Italy:** Dr. Andrea Anselmi, Dr. Oscar Bellon, Maddalena Cappello Fusaro, Ms. Diletta Cavalieri, Luca Ciccarello, Aurora Cirillo, Assoc. Prof. Rachele Falchi, Ms. Gresheen Garcia, Lucia Giordano, Dr. Ornella Incerti, Dr. Matteo Mezzano, Ms. Francesco Nicolí, Antonio Panella, Mr. Niuccolo Papi, Mr. Carlos A. Perez Garcia, Mr. Alessandro Piva, Ms. Giulia Remolif, Fabio Sbolci, Fabio Scotto di Covella, Lorenzo Stagnati; **Japan:** Mr. Abdi Abdi, Assist. 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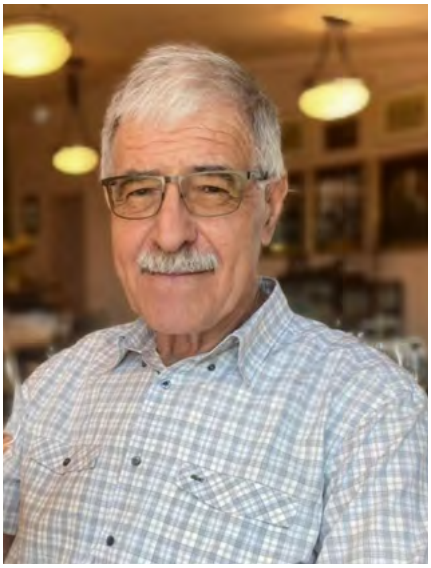
› In memoriam

Athanasios Manganaris (1948-2026)



Prof. Athanasios Manganaris passed away on January 17, 2026, surrounded by all his close family members. He had been dealing with a chronic illness for the past few years. He faced that with courage and stamina. He was privileged to have constant support from his family and exceptional medical supervision from a team of unique doctors who were applying evidence-based treatments, including some new novel approaches.

Prof. Manganaris received his bachelor degree from the School of Agriculture at Aristotle University of Thessaloniki, Greece (1966-1971). He conducted breakthrough research on apple genetics at the East Malling Research Station, University of London, from where he received his doctoral degree in 1989. His thesis dealt with the use of isozymes as molecular markers in the genetic improvement of apple. He then went on to pursue postdoctoral research at Cornell University (New York State Agricultural Experiment Station).

Over his long career he published many articles in highly esteemed journals of plant genetics, including Theoretical and Applied Genetics, Euphytyica and the Journal of Heredity. His initial research into molecular markers was central in the creation of the first apple chromosome map in 1994.

Until his retirement in 2014, Athanasios Manganaris was Professor of Pomology (Plant Genetics) at the Department of Plant Sciences at the International Hellenic University (1998-2014). He was senior researcher at ELGO-Dimitra, ultimately reaching the position of Director within the Department of Deciduous Fruit Trees, Institute of Plant Breeding and Genetic Resources (1981-1997). He was also the first faculty member in the field of Pomology at the University of Thessaly (1993-1994) to be promoted to Assistant Professor.

I consider myself fortunate, having had the opportunity to both meet and to work with Professor Athanasios (Sakis) Manganaris at the beginning of my career. I deeply appreciated not only his outstanding scientific insights, but also his humanity and kindness. At that time, many senior scientists were rather self-focused and not particularly open to others, but Sakis was the complete opposite: he was open-minded, warm and always smiling. I shall always remember him as an exemplary scientist and as one of the first members from Greece to join ISHS, his example is one we should all strive to follow.

François Laurens, ISHS President

› Calendar of ISHS events

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Year 2026

- March 15-20, 2026, Skukuza (South Africa): **IV International Symposium on Beverage Crops.** Info: Prof. Dr. Olaniyi Fawole, Postharvest & Agroprocesing Research Centre, Department of Botany & Plant Biotechnology, University of Johannesburg, APK Campus, South Africa. E-mail: olaniyif@uj.ac.za Web: https://bevcrops2026sa.carlamani.com/
- April 28-30, 2026, Abu Dhabi (United Arab Emirates): **VIII International Date Palm Conference.** Info: Prof. Dr. Abdelouahhab Zaid, Date Palm Research & Dev. Programme, UAE University, PO Box 81908, Al Ain, United Arab Emirates. Phone: (971)3 7832334, Fax: (971)3 7832472, E-mail: abdelouahhabz@diwan.gov.ae
- May 3-7, 2026, Lleida (Spain): **IX International Symposium on Almonds and Pistachios.** Info: Dr. Xavier Miarnau, IRTA-Fruitcentre, Parc Agrobiotech, Parc de Gardeny, 25003 Lleida, Spain. Phone: (34)675788825, E-mail: xavier.miarnau@irta.cat or Dr. Joaquim Bellvert Rios, IRTA Fruitcentre, Parc de Gardeny, 25003 Lleida, Spain. Phone: (34)669012747, E-mail: joaquim.bellvert@irta.es Web: https://www.almondpistachio2026.com/
- May 17-21, 2026, Chania, Crete (Greece): **X Southeastern and Eastern Europe Symposium on Vegetables and Potatoes.** Info: Dr. Dimitrios Savvas, Agricultural University of Athens, Laboratory of Vegetable Production, Iera Odos 75, 11855 Athens, Greece. Phone: (30)2105294510, Fax: (30)2105294504, E-mail: dsavvas@aua.gr or Assist. Prof. Georgia Ntatsi, Agricultural University of Athens, Laboratory of Vegetable Crops, Iera Odos 75, 11855 Athens, Greece. Phone: (30)2015294532, E-mail: ntatsi@aua.gr or Prof. Dr. Nazim Gruda, University of Bonn, INRES Horticultural Sciences, Auf dem Hügel 6, 53121 Bonn, Germany. E-mail: ngruda@uni-bonn.de Web: http://10seevp2026.maich.gr/
- May 18-22, 2026, Lofthus, Ullensvang (Norway): **VIII International Symposium on Postharvest Pathology.** Info: Dr. Jorunn Børve, Norwegian Institute of Bioeconomy Research, Ullensvang Research Center, Lofthus 5781, Norway. E-mail: jorunn.borve@nibio.no E-mail symposium: isphpp2026@nibio.no Web: https://nibio.pameldingssystem.no/isphpp2026
- June 7-10, 2026, Monterey, CA (United States of America): **XVIII International Symposium on Processing Tomato - XVI World Processing Tomato Congress.** Info: Dr. Luca Sandei, SSICA, Tomato Department, Viale f.Tanara 31/a, 43121 Parma (PR), Italy. Phone: (39) 0521795257, Fax: (39) 0521771829, E-mail: luca.sandei@ssica.it or Zach Bagley, PO Box 2437, Woodland CA 95776, United States of America. Phone: (1)53-04059469, E-mail: zach@tomatonet.org or Dr. Brenna Aegerter, Univ of California Coop Extn., UCCE San Joaquin County, 2101 E Earhart Ave. Ste 200, Stockton, CA 95206, United States of America. E-mail: bjaegerter@ucanr.edu E-mail symposium: symposium@worldtomatocongress.com Web: https://www.16thworldtomatocongress.com/
- June 22-24, 2026, Iksan, Jeonbuk (Korea (Republic of)): **XVI International Asparagus Symposium.** Info: Prof. Dr. Yang Gyu Ku, Department of Horticulture Industry, College of Agriculture and Food Sciences, Wonkwang University, Iksan-city, Korea (Republic of). Phone: (82)638506672, Fax: (82)638507308, E-mail: ygku35@wku.ac.kr or Prof. Dr. Young Yeol Cho, College of Applied Life Sciences, Department of Horticultural Science, Jeju National University, Jeju, Korea (Republic of). Phone: (82)647543325, Fax: (82)647254905, E-mail: yycho@jejunu.ac.kr or Prof. Dr. Jong Hyang Bae, Department of Horticulture Industry, College of Agriculture and Food Sciences, Wonkwang University, Iksan-city, Korea (Republic of). Phone: (82)638506671, Fax: (82)638507308, E-mail: bae@wku.ac.kr or Prof. Dr. Young Rog Yeoung, Department of Plant Science, College of Life Science, GangneungWoju National University, Gangwon-Do, Korea (Republic of). Phone: (82)336402356, Fax: (82)336402909, E-mail: yryeoung@gwnu.ac.kr E-mail symposium: secretariat@ias2026.org Web: https://ias2026.org/
- August 23-28, 2026, Kyoto (Japan): **XXXII International Horticultural Congress: IHC2026.** Info: Prof. Dr. Ryutaro Tao, Lab. Pomology, Fac. Agric., Kyoto University, Kitashirakawa Oiwake-cho, Sakyo-ku Kyoto 606-8502, Japan. Phone: (81)757536053, Fax: (81)757536497, E-mail: tao.ryutaro.8c@kyoto-u.ac.jp E-mail symposium: p-ihc2026@convention.co.jp Web: https://www.ihc2026.org/

Symposia at IHC2026

- August 23-28, 2026, Kyoto (Japan): **IHC2026: International Symposium on Horticultural Genetic Resources and their Usefulness for Breeding.** Info: Dr. Sandra Correia, Dept Life Sciences, University of Coimbra, Calcada Martim de Freitas, 3000-456 Coimbra, Portugal. E-mail: sandraimc@uc.pt or Dr. Nobuko Mase, Citrus Research Station, Institute of Fruit, Tree and Tea Science, NARO, 485-6 Okitsunaka-cho, Shimizu, Shizuoka City, Shizuoka 424-0292, Japan. E-mail: mase.nobuko909@naro.go.jp or Dr. Yoichi Kawazu, Inst. of Vegetable & Floriculture Sci. NARO, 360 Ano, Tsu, Mie, Japan. E-mail: kawazu.yoichi958@naro.go.jp E-mail symposium: p-ihc2026@convention.co.jp Web: https://www.ihc2026.org/symposia/s01/
- August 23-28, 2026, Kyoto (Japan): **IHC2026: International Symposium on Challenges and Perspectives on Innovative Technologies for Breeding of Horticultural Crops.** Info: Prof. Byoung-Cheorl Kang, Seoul Natl. Univ., San 56-1, Sillim 9-dong, Gwanak-gu, Seoul 151-742, Korea (Republic of). E-mail: bk54@snu.ac.kr or Prof. Isobe Sachiko, University of Tokyo, Bunkyo 1-1-1, Yayoi, Tokyo, 113-8657, Japan. E-mail: sisobe@g.ecc.u-tokyo.ac.jp E-mail symposium: p-ihc2026@convention.co.jp Web: https://www.ihc2026.org/symposia/s02/
- August 23-28, 2026, Kyoto (Japan): **IHC2026: International Symposium on Innovative Technologies and Production Strategies for Smart Greenhouse.** Info: Prof. In-Bok Lee, Lab. of Aero-Environmental Engineering, College of Agric. and Life Science, Seoul National University, San 56-1, Silim-dong, Gwanak-Gu, Seoul, Korea (Republic of). E-mail: iblee@snu.ac.kr or Dr. Tadahisa Higashide, National Agric. & Food Res. Organization, 3-1-1, Kannondai, Tsukuba, Ibaraki, 305-8519, Japan. E-mail: ton@affrc.go.jp E-mail symposium: p-ihc2026@convention.co.jp Web: https://www.ihc2026.org/symposia/s03/

- August 23-28, 2026, Kyoto (Japan): **IHC2026: II International Symposium on Advances in Vertical Farming.** Info: Prof. Dr. Qichang Yang, Institute of Urban Agriculture, CAAS, No. 36, Lazidong Street, Shuangliu District, Chengdu, Sichuan, China. E-mail: yangqichang@caas.cn or Prof. Dr. Eiji Goto, Graduate School of Hort.,Chiba University, 648 Matsudo, Matsudo, Chiba 271-8510, Japan. E-mail: goto@faculty.chiba-u.jp or Prof. Dr. Naoya Fukuda, Inst. Life Environ. Sci., T-PIRC, University of Tsukuba, Tennodai 1-1-1, Tsukuba city, Japan. E-mail: fukuda.naoya.ka@u.tsukuba.ac.jp E-mail symposium: p-ihc2026@convention.co.jp Web: https://www.ihc2026.org/symposia/s04/
- August 23-28, 2026, Kyoto (Japan): **IHC2026: International Symposium on Sustainable Plant Production in Greenhouse Horticulture and Protected Cultivation.** Info: Dr. Silke Hemming, Wageningen University & Research, Business Unit Greenhouse Horticulture, Droevendaalsesteeg 1, 6708 PB Wageningen, Netherlands. E-mail: silke.hemming@wur.nl or Dr. Yasunaga Iwasaki, 2060-1 Kurokawa Asao ward, Kawasaki city 2150035, Meiji University, Faculty of Agriculture, Japan. E-mail: iwasakiy@meiji.ac.jpE-mailsymposium:p-ihc2026@convention.co.jp Web: https://www.ihc2026.org/symposia/s05/
- August 23-28, 2026, Kyoto (Japan): **IHC2026: International Symposium on Modeling and Digital Approaches to Explore the Diversity of Crop Physiology and Management in Field Conditions.** Info: Dr. Evelyne Costes, INRA UMR AGAP, Avenue Agropolie, 34398 Montpellier Cedex 5, France. E-mail: evelyne.costes@inrae.fr or Takayoshi Yamane, 2-1 Fujimoto, Tsukuba 3058605, Japan. E-mail: yamane.takayoshi156@naro.go.jp or Dr. Koji Sugahara, 3-1-1 Kannondai, Tsukuba 3058519, Japan. E-mail: sugahara.koji783@naro.go.jp E-mail symposium: p-ihc2026@convention.co.jp Web: https://www.ihc2026.org/symposia/s06/
- August 23-28, 2026, Kyoto (Japan): **IHC2026: International Symposium on Developmental and Molecular Responses of Horticultural Plants to Abiotic Stress, including Temperature.** Info: Dr. Erika Varkonyi-Gasic, PFR, Private Bag 92169, Auckland mail Centre, 1142 Auckland, New Zealand. E-mail: erika.varkonyi-gasic@plantandfood.co.nz or Prof. Dr. Nobuhiro Kotoda, Fruit Science lab, Saga University, 1 Honjo-machi, Saga 840-8502, Japan. E-mail: koto@cc.saga-u.ac.jpE-mailsymposium:p-ihc2026@convention.co.jp Web: https://www.ihc2026.org/symposia/s07/
- August 23-28, 2026, Kyoto (Japan): **IHC2026: International Symposium on Advances in Postharvest Biology and Technology of Horticultural Crops.** Info: Assoc. Prof. Kietsuda Luengwilai, Dept. Horticulture, Fac. Agriculture at Kamphang Saen, Kasetsart University, Kamphang Saen campus, Kamphang Saen 73140, Thailand. E-mail: kietsuda.l@ku.ac.th or Prof. Eriko Yasunaga, 3-5-8 Saiwai-cho, Tokyo University of Agriculture and Technol, Fuchu 183-8509, Japan. E-mail: erikoy@go.tuat.ac.jp or Dr. Yasuo Suzuki, Faculty of Agriculture, Meijo University, Shiogamaguchi 1-501, Tenpaku-ku, Nagoya 468-8502, Japan. E-mail: yasuosuzuki@meijo-u.ac.jp E-mail symposium: p-ihc2026@convention.co.jp Web: https://www.ihc2026.org/symposia/s08/
- August 23-28, 2026, Kyoto (Japan): **IHC2026: XI International Symposium on Human Health Effects of Fruits and Vegetables - FAVHEALTH2026.** Info: Prof. Mariusz Piskula, Wadowskiego 15, 10-761 Olsztyn, Poland. E-mail: m.piskula@pan.olsztyn.pl or Prof. Kaeko Murota, 1060 Nisikawatsu-cho, Matsue 690-8504, Shimane, Japan. E-mail: murota@life.shimane-u.ac.jp or Dr. Kentaro Matsumiya, Graduate School of Agriculture, Kyoto University, Kitashirakawa-Oiwakecho, Sakyo, Kyoto 606-8502, Japan. E-mail: matsumiya.kentaro.6w@kyoto-u.ac.jp E-mail symposium: p-ihc2026@convention.co.jp Web: https://www.ihc2026.org/symposia/s09/
- August 23-28, 2026, Kyoto (Japan): **IHC2026: International Symposium on Medicinal, Aromatic Plants and Natural Colorants - incl. ISSBT2026.** Info: Prof. Dr. Mahmoud A. Sharafeldin, National Research Centre, Egypt. E-mail: sharafeldin99@yahoo.com or Dr. Po-An Chen, No. 3, Aly. 35, Ln. 191, Jiannan Rd., Pingtung City, Pingtung County 900, Taiwan, 900 Pingtung, Chinese Taipei. E-mail: chenpoan@mail.atri.org.tw or Assist. Prof. Ryosuke Munakata, Lab. Plant Gene Expression, RISH, Kyoto Uni, Uji, Japan. E-mail: munakata.ryosuke.3z@kyoto-u.ac.jp or Assist. Prof. Toshiyuki Waki, Aramaki Aza Aoba, Aoba-ku, Tohoku University, Sendai 9808579, Japan. E-mail: waki@tohoku.ac.jp E-mail symposium: p-ihc2026@convention.co.jp Web: https://www.ihc2026.org/symposia/s10/
- August 23-28, 2026, Kyoto (Japan): **IHC2026: XVII International People Plant Symposium and IV International Symposium on Horticultural Therapies (HortTherapy2026).** Info: Prof. Dr. Sin-Ae Park, Konkuk University, 225 Life and Environment Science building, 05029 Seoul, Korea (Republic of). E-mail: sapark42@konkuk.ac.kr or Takuya Kenmochi, Awaji Campus, University of Hyogo, 954-2 Nojimatokiwa, Awaji 656-1726, Japan. E-mail: takuya_kenmochi@awaji.ac.jp or Assoc. Prof. Fumie Tazaki, Awaji campus, University of Hyogo, 954-2 Nojimatokiwa, Awaji 656-1726, Japan. E-mail: fumie_tazaki@awaji.ac.jp E-mail symposium: p-ihc2026@convention.co.jp Web: https://www.ihc2026.org/symposia/s11/
- August 23-28, 2026, Kyoto (Japan): **IHC2026: II International Symposium on Urban Horticulture for Sustainable Food Security: Toward Food-Secure Cities (UrbanFood2026).** Info: Dr. Giuseppina Pennisi, University of Bologna, Viale Giuseppe Fanin 44, 40127 Bologna, Italy. E-mail: giuseppina.pennisi@unibo.it or Mr. Masakazu Yamada, 1-1 Owashi, Tukuba 3058686, Japan. E-mail: yamadam0172@jircas.go.jp or Dr. Sayuri Teramoto, University of the Ryukyus, 1 Senbaru, Nishihara, Okinawa, 9030213, Japan. E-mail: teramoto@cs.u-ryukyu.ac.jp or Yasuhiko Koike, Tokyo University of Agriculture, 1737 Funako Atsugi, Kanagawa 243-0034, Japan. Phone: (81)462706527, E-mail: koike@nodai.ac.jp E-mail symposium: p-ihc2026@convention.co.jp Web: https://www.ihc2026.org/symposia/s12/
- August 23-28, 2026, Kyoto (Japan): **IHC2026: IV International Symposium on Greener Cities: Re-imagining Urban Landscapes (GreenCities2026).** Info: Prof. Dr. Luis Pérez-Urrestarazu, Agro-Forestry Engineering, Universidad de Sevilla, ETSIA Ctra. Utrera km.1, 41013 Sevilla, Spain. E-mail: lperez@us.es or Assoc. Prof. Tomoko Takeuchi, 648 Matsudo, Matsudo-shi, Chiba, 271-8510, Japan. E-mail: tomoko_takeuchi@chiba-u.jp or Assoc. Prof. Shoko Hikosaka, 648 Matsudo, Matsudo city 271-8510, Japan. E-mail: s-hikosaka@faculty.chiba-u.jp E-mail symposium: p-ihc2026@convention.co.jp Web: https://www.ihc2026.org/symposia/s13/
- August 23-28, 2026, Kyoto (Japan): **IHC2026: International Symposium on Evaluating the Impact and Scaling of Innovations for Sustainable Horticulture.** Info: Dr. Melinda Knuth, NC State University, 2721 Sullivan Drive, Campus Box 7212, Raleigh, NC 27695, United States of America. E-mail: mjknuth@ncsu.edu or Prof. Dr. Shusuke Matsushita, Kitashirakawa Oiwake-cho, Sakyo-ku, Kyoto, Japan. E-mail: matsushita.shusuke.7z@kyoto-u.ac.jp E-mail symposium: p-ihc2026@convention.co.jp Web: https://www.ihc2026.org/symposia/s14/
- August 23-28, 2026, Kyoto (Japan): **IHC2026: II International Symposium on Agroecology and Systems Approaches for**

Sustainable and Resilient Horticultural Production. Info: Prof. Dr. Maria Claudia Dussi, Universidad Nacional del Comahue, Facultad de Ciencias Agrarias, CC 85 (8303) Cinco Saltos, Rio Negro-Patagonia, Argentina. E-mail: mcdussi@yahoo.com or Prof. Rachel Bezner Kerr, 262 Warren Hall, Department of Global Development, Cornell University, Ithaca, NY 14853, United States of America. E-mail: rbeznerkerr@cornell.edu or Prof. Dr. Rie Miyaura, Tokyo University of Agriculture, 1-1-1 Sakuragaoka, Setagaya 156-8502, Japan. E-mail: mia@nodai.ac.jp E-mail symposium: p-ihc2026@convention.co.jp Web: https://www.ihc2026.org/symposia/s15/

- August 23-28, 2026, Kyoto (Japan): **IHC2026: II International Symposium on Innovations in Ornamentals: From Breeding to Market.** Info: Prof. Junping Gao, China Agricultural University, Beijing, 100193, China. E-mail: gaojp@cau.edu.cn or Dr. Kenichi Shibuya, 2-1 Fujimoto, Tsukuba 305-0852, Japan. E-mail: shibuya.kenichi573@naro.go.jp or Dr. Masafumi Yagi, Ins. of Vegetable and Floriculture Science, NARO, 2-1 Fujimoto, Tsukuba, Japan. E-mail: yagi.masafumi967@naro.go.jp E-mail symposium: p-ihc2026@convention.co.jp Web: https://www.ihc2026.org/symposia/s16/
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- August 23-28, 2026, Kyoto (Japan): **IHC2026: International Symposium on Vegetable Breeding for Sustainable Field and Greenhouse Production through Modern Selection Techniques and Molecular Tools (BreedVegs2026).** Info: Prof. Dr. Yuling Bai, WUR, Drovendaalsesteeg 1, 6700 AJ Wageningen, Netherlands. E-mail: bai.yuling@wur.nl or Dr. Pasquale Tripodi, Via Cavalleggeri 25, 84098 Pontecagnano Faiano, Italy. E-mail: pasquale.tripodi@crea.gov.it or Prof. Dr. Masayoshi Shigyo, Faculty of Agriculture, Yamaguchi University, Yoshida 1677-1, Yamaguchi 753-8515, Japan. E-mail: shigyo@yamaguchi-u.ac.jp E-mail symposium: p-ihc2026@convention.co.jp Web: https://www.ihc2026.org/symposia/s18/
- August 23-28, 2026, Kyoto (Japan): **IHC2026: International Symposium on Diversification of Vegetable Production and New Growing Techniques for Sustainable Farming Systems (GreenVegs2026).** Info: Assoc. Prof. Francesco Di Gioia, The Pennsylvania State University, Shortlidge Road, Tyson Building 207, University Park PA 16802, United States of America. E-mail: fxd92@psu.edu or Dr. Megumu Takahashi, 3-1-1, Kannondai, Tsukuba 3058519, Japan. E-mail: takahashi.megumu000@naro.go.jp or Dr. Fumio Sato, Kannondai 3-1-1, Tukuba 3058519, Japan. E-mail: sato.fumio525@naro.go.jp E-mail symposium: p-ihc2026@convention.co.jp Web: https://www.ihc2026.org/symposia/s19/
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- August 23-28, 2026, Kyoto (Japan): **IHC2026: International Symposium on Sustainable Production Systems in Temperate Tree Crops.** Info: Prof. George Manganaris, Anexartisias 57, PAREAS Building, P.O. Box 50329, 3603 Lemesos, Cyprus. E-mail: george.manganaris@cut.ac.cy or Hideki Murayama, Faculty of Agriculture, Yamagata University, 1-23 Wakabamachi Tsuruoka, Yamagata 997-8555, Japan. E-mail: mhideki@tds1.tr.yamagata-u.ac.jp E-mail symposium: p-ihc2026@convention.co.jp Web: https://www.ihc2026.org/symposia/s22/
- August 23-28, 2026, Kyoto (Japan): **IHC2026: International Symposium on Application of Genetics and Breeding Approaches to Improve Temperate Tree Crops.** Info: Prof. Dr. Fabrizio Costa, Via Mach 1, 38098 San Michele all"Adige, Trento, Italy. E-mail: fabrizio.costa@unitn.it or Dr. Atsushi Kono, 2-1, Fujimoto, Tsukuba, Ibaraki 305-8605, Japan. E-mail: kono.atsushi993@naro.go.jp or Dr. Miyuki Kunihisa, Fujimoto 2-1, Tsukuba, Japan. E-mail: kunihisa.miyuki700@naro.go.jp or Dr. Norio Takada, Institute of FruitTree and TeaScience, NARO, Fujimoto 1-2, Tsukuba, Ibaraki 305-8606, Japan. Phone: (81)298386464, E-mail: takada.norio513@naro.go.jp E-mail symposium: p-ihc2026@convention.co.jp Web: https://www.ihc2026.org/symposia/s23/
- August 23-28, 2026, Kyoto (Japan): **IHC2026: International Symposium on Bridging Science and Practice for Tropical and Subtropical Fruits and Nuts.** Info: Prof. Dr. Zora Singh, Edith Cowan University, Horticulture, School of Science, 270 Joondalup Drive, Joondalup 6027, Western Australia, Australia. E-mail: z.singh@ecu.edu.au or Assoc. Prof. Shu-Yen Lin, 1, 4th sec., Roosevelt Road, Da-an district, Dept. of Horticulture, National Taiwan University, Chinese Taipei. E-mail: sylin@ntu.edu.tw or Dr. Naoko Kozai, Kagoshima University, Korimoto 1-21-24, Kagoshima, Kagoshima 890-0065, Japan. E-mail: nkozai@agri.kagoshima-u.ac.jp or Dr. Shingo Goto, 2-1 Fujimoto, Tsukuba, Ibaraki 305-8605, Japan. Phone: (81)29-838-6474, E-mail: goto.shingo184@naro.go.jp E-mail symposium: p-ihc2026@convention.co.jp Web: https://www.ihc2026.org/symposia/s24/
- August 23-28, 2026, Kyoto (Japan): **IHC2026: XIII International Symposium on Banana: Exploring Banana Diversity for Improved Livelihoods.** Info: Dr. Sebastien Carpentier, Bioversity International, Willem de Croylaan 42 - bus 2455, 3001 Heverlee, Belgium. E-mail: sebastien.carpentier@biw.kuleuven.be or Assoc. Prof. Yasuaki Sato, Global Humanities and Social Sciences, Nagasaki University, 1-14 Bunkyo, Nagasaki 852-8521, Japan. E-mail: y-sato@nagasaki-u.ac.jp E-mail symposium:

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- August 23-28, 2026, Kyoto (Japan): **IHC2026: International Symposium on Innovation in Horticulture, via Fundamental Science on Reproductive Biology of Annuals and Perennials.** Info: Prof. Avi Sadka, ARO, The Volcani Center, Department of Fruit Trees Sciences, 68 HaMaccabim Rd., P.O. Box 15159, Rishon LeZion 7528809, Israel. E-mail: vhasadka@volcani.agri.gov.il or Prof. Hisayo Yamane, Laboratory of Pomology, Graduate School of Agriculture, Kyoto University, Kyoto 606-8502, Japan. E-mail: yamane.hisayo.6n@kyoto-u.ac.jp or Prof. Dr. Masahiro Kanaoka, Prefectural University of Hiroshima, Nanatsuka5562 Shobara 7270023, Japan. E-mail: mkanaoka@pu-hiroshima.ac.jp E-mail symposium: p-ihc2026@convention.co.jp Web: https://www.ihc2026.org/symposia/s27/ NEW
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- November 18-20, 2026, Kathmandu (Nepal): **V International Orchid Symposium.** Info: Prof. Dr. Bijaya Pant, Central Department of Botany, Tribhuvan University, Kathmandu Nepal, Research Director, Annapurna Research Center, Kathmandu, Nepal. Phone: (977)9801203357, E-mail: b.pant@cdbtu.edu.np E-mail symposium: orchidsymposiumnepal@gmail.com Web: https://www.annapurnaresearch.org/internationalorchidsymposium NEW
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- January 19-22, 2027, Udon Thani (Thailand): **IV International Symposium on Tropical and Subtropical Ornamentals.** Info: Mr. Rapibhat Chandarasrivongs, Department of Agriculture, 50 Phaholyothin Rd., Chatuchak 10900, Thailand. Phone: (66)25790583, E-mail: interudonexpo2026@gmail.com E-mail symposium: info.tso2027@gmail.com Web: https://www.doa.go.th/TSO2027/
- January 31 - February 4, 2027, Ghent (Belgium): **VertiFarm2027: IV International Workshop on Vertical Farming.** Info: Dr. Bruno Gobin, Schaessestraat 18, 9070 Destelbergen, Belgium. Phone: (32)93539480, Fax: (32)3539495, E-mail: bruno.gobin@viaverda.be or Annelies Christiaens, Viaverda vzw, Schaessestraat 18, 9070 Destelbergen, Belgium. E-mail: annelies.christiaens@viaverda.be E-mail symposium: info@vertifarm2027.com Web: http://www.vertifarm2027.com
- March 8-11, 2027, Cartagena (Spain): **VI International Conference on Fresh-Cut and Minimally Processed Produce.** Info: Prof. Francisco Artés-Hernández, Postharvest & Refrigeration Group, Universidad Politécnica de Cartagena, Paseo Alfonso XIII, 48, 30203 Cartagena, Murcia, Spain. E-mail: fr.artes-hdez@upct.es or Dr. Ginés Benito Martínez Hernández, Universidad Politecnica de Cartagena, Paseo Alfonso XIII, 48, 30203 Murcia Cartagena, Spain. Phone: (34)968325754, E-mail: ginesbenito.martinez@upct.es E-mail symposium: freshcut@upct.es Web: https://freshcut2027.org/
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- May 3-7, 2027, Murcia (Spain): **II International Symposium on Apricot and Plum.** Info: Dr. David Ruiz, Departemento de Mejora Vegetal, CEBAS (CSIC), Campus de Espinardo, P.O. Box 164, 30100 Murcia, Spain. Phone: (34)968396237, Fax: (34)968396213, E-mail: druiz@cebas.csic.es or Dr. Manuel Rubio, CEBAS-CSIC PO box 164, 30100 Espinardo Murcia, Spain. E-mail: mrubio@cebas.csic.es Web: https://www.apricotplum2027.org/ NEW
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- June 6-10, 2027, Wageningen (Netherlands): **GreenSys2027 - International Symposium on Smart and Sustainable Greenhouse Systems.** Info: Dr. Silke Hemming, Wageningen University & Research, Business Unit Greenhouse Horticulture, Droevendaalsesteeg 1, 6708 PB Wageningen, Netherlands. Phone: (31)317 4 86921, E-mail: silke.hemming@wur.nl or Prof. Dr. Leo F. M. Marcelis, Wageningen University, Horticulture & Product Physiology, Droevendaalsesteeg 1, 6708 PB Wageningen, Netherlands. Phone: (31)317485675, E-mail: leo.marcelis@wur.nl or Dr. Ep Heuvelink, Greenhouse Crop Physiology and Modelling, Wageningen University, Droevendaalsesteeg 1, 6708 PB Wageningen, Netherlands. Phone:

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- June 7-10, 2027, Coimbra (Portugal): **XXVIII International EUCARPIA Symposium Section Ornamentals - From Biology to Bioeconomy.** Info: Prof. Dr. Jorge Canhoto, Department of Life Sciences, University of Coimbra, Calçada Martim de Freitas, 3000-456 Coimbra, Portugal. Phone: (351)917859860, E-mail: jorgecan@ci.uc.pt

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- June 16-18, 2027, Torino (Italy): **VIII International Chestnut Symposium.** Info: Prof. Dr. Gabriele Loris Beccaro, Università degli Studi di Torino, Dept. Agric., Forestry & Food Sci., Largo Paolo Braccini 2, 10095 Grugliasco, Torino, Italy. Phone: (39)0116708802, E-mail: gabriele.beccaro@unito.it or Prof. Roberto Botta, DISAFA - University of Torino, Largo Paolo Braccini 2, 10095 Grugliasco (TO), Italy. Phone: (39)0116708800, Fax: (39)0116708658, E-mail: roberto.botta@unito.it E-mail symposium: info@ics2027.com Web: https://www.ics2027.com/

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Ioannis Daskalakis, Pinelopi Tselepi, Danai Gavriil Athanasopoulou, Marialena Mitrakou, Despoina Bouza, Katerina Biniari, and Maritina Stavrakaki. (2025). How grape position on the vine impacts the quality parameters of grapes and must of *Vitis vinifera* L. cv. Agiorgitiko. https://doi.org/10.1079/ejhs.2025.0030

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› *Chronica Horticulturae* author information

Chronica Horticulturae is the quarterly publication of the International Society for Horticultural Science (ISHS) and is received by all members of the Society and numerous libraries throughout the world. Members and non-members are urged to contribute articles for consideration. However, it needs to be understood that *Chronica* is not to be construed as a scientific journal that publishes original research. Research articles appropriate for the *European Journal of Horticultural Science* (eJHS) or *Acta Horticulturae* are usually inappropriate for *Chronica*. We seek horticultural articles of interest to a broad audience composed of ISHS members and the horticultural, scientific, and academic communities.

Chronica Horticulturae is currently made up of as many as nine sections as follows:

News & Views from the Board. This section is usually confined to editorials from Board Members as well as general announcements of the Society.

Issues. Articles of a broad focus that often involve controversial topics related to horticulture, including broad social issues and economic development, are appropriate for this section. These articles are intended to stimulate discussion. Often, guest writers are invited to contribute articles.

Spotlight on Honoured ISHS Members. ISHS Fellows and Honorary Members complete an interview on how they started and progressed in their careers, what affected their decisions and attitudes and how their involvement with the ISHS assisted them. In addition, they are invited to comment on how they see the future of horticultural science for young people. Articles in this section are by invitation only.

Horticultural Science Focus. This section is intended for in-depth articles on a topic of horticulture that is generally, but not always, scientific in nature. Many articles are mini-reviews and will provide up-to-date information on current topics of interest to the horticultural community. We encourage these articles to be illustrated.

Horticultural Science News. Shorter articles about current topics including horticultural commodities and disciplines are welcome.

History. This section includes articles on the history of horticulture, horticultural crops, and the ISHS.

The World of Horticulture. Articles in this section highlight horticultural industries and research institutions of particular countries or geographic regions throughout the world. Illustration with figures and tables is extremely helpful and highly advised. This section also includes book reviews that are requested by the Editor. Members who wish to recommend a book review should arrange for a copy of the book to reach the Secretariat.

Symposia and Workshops. Meetings under the auspices of ISHS are summarized, usually by a participant of the meeting. These articles are arranged by the symposium organizers.

News from the ISHS Secretariat. This section contains information on membership, memorials of deceased ISHS members, and a calendar of ISHS events. Brief memorials (up to 500 words) should be sent to the Secretariat.

Authors who wish to submit articles for publication in *Chronica* should contact ISHS headquarters and their request will be transmitted to the Editor. Authors should be aware that most articles should have a broad international focus. Thus, articles of strictly local interest are generally unsuited to *Chronica*. Illustrated articles are usually 1500 to 5000 words long. There are no page charges for *Chronica Horticulturae*. Photographs submitted should be of high resolution (≥ 300 pixels per inch). Send articles or ideas for articles to:

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