One Strawberry One World

Takeaways from the 10th International Strawberry Symposium

Sandy Shaw, Berry Industry Development Officer, SA & Victoria

The International Society for Horticultural Science held their tenth International Strawberry Symposium (ISS) in March of 2025 in Yancheng, China with the theme of "One Strawberry One World". Eight hundred researchers, industry figures, and marketers gathered for four days of research presentations, poster sessions, a trade show, and a one-day technical tour. It was a chance for the global industry to present ideas, compare notes, and stimulate research discussion and collaboration. This article will recap some of the common themes which emerged from the presentations at the conference.

About Yancheng

The host city Yancheng is located in Jiangsu province, the leading region in China for strawberry cultivation, with over 20,000 hectares planted. Jiangsu also accounts for 14.5% of the country's total strawberry tonnage, second only to Shandong province.

China is the world's largest producer of strawberries, yielding nearly 4 million tons annually from approximately 147,000 hectares. The industry is largely dominated by short-day cultivars, with day-neutral or everbearing varieties comprising just 6.3% of the total. The most widely planted variety is the Japanese cultivar *Benihoppe*, followed by Lassen Canyon Nursery's *Sweet Charlie* and another Japanese variety, *Akihime*. However, locally bred Chinese varieties are increasingly used in domestic production.

In Yancheng, most strawberries are grown under protected cropping conditions, with just 0.2% produced in open fields. Protected cropping setups primarily consist of a mix of polytunnels and glasshouses, with single-hoop polytunnels being the most common style. Unlike in Australia, where protected cropping is typically linked to substrate production, Chinese protected cropping is dominated by polytunnels over in-ground cultivation. However, the use of substrate production is steadily increasing each year, and Jiangsu is the site of the largest substrate facility in China.

Developments in Breeding Program Processes

Researchers at the Symposium focused on two breeding strategies: genetic loci identification and the integration of AI-assisted predictive modelling.

The research into identification of genetic loci linked to desirable traits has been ongoing for decades. Recent advancements in technology have made this process more affordable and more accessible to a wider range of research institutions. Breeding populations are now being treated as large datasets, enabling the study of genetic dominance and dosage effects across a wide range of traits.

The University of Florida, which places a strong emphasis on marker-assisted breeding, gave several presentations on this topic. Nearly every breeding program presenting at the Symposium indicated some level of active work on genetic marker identification. However, because genome populations differ, sometimes radically, between research facilities, any genetic marker identified by one program must still be independently validated within another program's population to ensure reliability; a process that takes time and money.

Large data volumes also make strawberry breeding a prime candidate for AI-assisted analysis. Breeding programs are increasingly experimenting with integrating AI into genome-wide prediction; a technique using past genetic data to predict the traits of early-stage seedlings. By using these predictions, breeders believe they can shorten the evaluation process and accelerate their breeding timelines. This type of analysis existed prior to the popularity of AI, but has been made easier as model training becomes more refined.

Breeding Traits for Target Markets

Breeding and genetics featured prominently throughout the conference. Breeding programs shared a focus on familiar core traits: disease resistance, fruit quality, fruit size, and yield. However, regional priorities based on consumer preferences and growing conditions were also highlighted. For example, Chinese breeding programs place high value on genetics which influence fruit aroma while Italian programs emphasise genetic gains in enhanced nutritional profiles and Turkish researchers are investigating candidate genes for water-deficit stress tolerance. Across the board, there is growing interest in breeding for heat tolerance, reflecting both rising global temperatures and the increased use of protected tunnel cultivation, which in certain situations heightens temperature-related plant stress.

Incorporating Wild Strawberry Populations into Breeding Programs

Continuing a theme from the previous ISS – communicated by Angela Atkinson in a series of 2021 Australian Berry Journal articles—wild strawberry populations continue to be collected, classified, studied and evaluated for use in commercial breeding lines.

Dr. Jiajun Lei presented an overview of his work cataloguing wild strawberry species in China. His team of researchers from Shenyang Agricultural University has collected 958 wild accessions, all housed at the germplasm repository in Shenyang. These accessions are being used to incorporate traits valuable to the Chinese market into commercial breeding lines such as strong aroma, colour variations in berries and flowers, disease resistance, and cold tolerance.

Also showcased via poster presentation was the "Professor Staudt Collection," an international germplasm repository containing over 1,000 accessions. This collection is being meticulously characterised for floral and fruit development and serves as a breeding resource for programs in Germany and the Netherlands.

The integration of wild phenotypes remains a key area of interest to top breeding programs. Such efforts have historically yielded major breakthroughs—for example, the integration of a wild phenotype into UC Davis breeding lines led to the discovery of day-neutrality, a trait common in many of the cultivars used in temperate Australian production today. Or more recently, the majority of white-fruit cultivars under development trace back to a single wild Chilean phenotype. Wild strawberries remain potential sources of genetic gains which can benefit commercial producers.

Symposium delegates were presented with a wide variety and regional producer showcase

Dr. Jiajun Lei presenting on his research into wild strawberry population characteristics in China

Ornamental pink-flower strawberry, developed for the Chinese market

Demonstration of an experimental hyperspectral imaging machine for berry grading and sorting

Delegates tour a variety demonstration greenhouse on the technical tour day in Yancheng

(L) Elevated substrate production in polyhouse, (C) in-ground double-walled polyhouse production and (R) Suspended substrate production facility, all in Yancheng, China

Chinese premium marketed strawberry incorporating novelty varieties

Novelty Varieties and Propagation

Nearly every breeding program present at the Symposium noted work on developing white or blush strawberry varieties for the commercial market.

The Australian strawberry breeding program drew significant attention as one of the few programs to be actively developing everbearing/day-neutral varieties for commercial release.

Fruit of ASBP specialty pink variety
Photo credit: Phill Jackson

The increasingly widespread availability of novelty varieties has already had an impact in Chinese strawberry marketing, where novelty varieties are being effectively used in retail displays and as high-value gift products.

F1 hybrid seeds remain a niche area of exploration, particularly in Japanese and Dutch programs. Presentations highlighted efforts to accelerate the traditionally slow process of developing F1 varieties by using DNA analysis to identify parent plants with high homozygosity, reducing the likelihood of producing seed off-types.

Pest and Disease Research

Pest and disease research remains a top priority globally and featured prominently in the Symposium's programming. Presentations covered key pathogens affecting strawberry production, including *Colletotrichum*, *Botrytis*, *Phytophthora*, and *Fusarium*. The most attention was given to *Neopestalotiopsis*, an emerging global threat to production.

Much of the work presented focused on identifying and isolating genetic loci and genetic mechanisms which underpin resistance that can be integrated into breeding pipelines. Chinese researcher Dr. Yongchao Han presented a genome-wide association study (GWAS) that identified six candidate genes potentially linked to *Colletotrichum* resistance. Similarly, Dr. Hongwen Li's team shared findings on molecular markers associated with resistance to powdery mildew. University of Florida researcher Dr. Seonghee Lee highlighted two susceptibility genes they believe influence resistance to *Neopestalotiopsis*, although this area remains in early stages of discovery. Genetic disease resistance is useful and valuable in a variety, but it is unlikely to provide complete protection again high disease pressure.

Dr. Silvia Sabbadini presented an innovative approach to *Botrytis* management. Her research focused on using RNA interference (RNAi) to manipulate RNA and silence the expression of undesirable genes. This method is being tested both for improving plant resistance to *Botrytis cinerea* and in the development of RNAi-based foliar sprays. Although early trials show these sprays are currently less effective than conventional options, they represent a different take on disease management solutions.

Chill Induction in Plug Plants

Chill induction in plug plants was addressed in several talks. Unlike bare-root systems, which naturally incorporate chill during their production cycle, plug plant propagation can sometimes, but not always, occur in controlled environments that can inhibit chill accumulation. Several approaches to artificial chill induction were presented.

Dr. Hong Yu of the Hangzhou Academy of Agricultural Sciences highlighted a method being trialled in nursery production in Donggang, where greenhouses use blackout curtains and controlled temperature reductions to simulate shorter photoperiods and cooler conditions. Preliminary results showed a moderate improvement in floral bud differentiation after propagated plants were planted in production fields.

Other studies explored post-tipping refrigeration techniques as a means of inducing chill in plug plants. While the impact of artificial chill response of bare-root runners is well documented, there is currently no consensus on protocols for plug plants. Preliminary findings from two studies showed consistent impacts of chill treatments on plugs for both runner development in nursery and floral initiation in production fields, but further research is needed to establish best practices.

Biodegradable Plastics

Several talks examined the potential roles of biodegradable plastic in strawberry production. Plastic mulch is still widely used for in-ground strawberry cultivation globally.

Dr. Carol Miles and Dr. Lisa DeVetter from Washington State University presented an overview of global plastic mulch use and assessed the feasibility of biodegradable options within current production systems. Their research has indicated that biodegradable mulches performed comparably to conventional plastics in terms of weed suppression, moisture retention, and soil temperature regulation. However, there are currently two significant barriers to the adoption of biodegradable mulches in Australia.

First, most currently available biodegradable plastics degrade within 18 months, making them unsuitable for growers with second-year plantings. Second, biodegradable mulches are incompatible with strip fumigation, as the fumigant readily passes through the mulch, reducing efficacy and posing serious safety concerns. Adoption in Australia would require an in-tandem shift toward broad-acre fumigation techniques, which may not be practical for many growers.

Water Management

Water management was another focus area, with Belgium's Proefcentrum Hoogstraten team sharing insights from recent projects. They presented a calculation tool developed for growers to estimate water storage capacity needs. The tool is based on extensive research into water consumption across different cultivation systems within Belgium. For example, their findings showed that most Belgian systems require over 800 litres per square metre annually, with tabletop and plastic hoop house systems—similar to those used in Australia—requiring slightly less. Belgian producers face strict limits on using water from reservoirs, so they focus instead on capturing and sterilising rainwater, as well as recirculating water collected from their fields.

While Belgium's higher rainfall levels make this approach more viable than it would be for many Australian regions, the development of such planning tools remains a useful option for producers.

In addition, the team presented a study comparing traditional and sensor-based substrate irrigation strategies. Typically, substrate growers rely on two metrics—drain volume and drain EC—to guide watering decisions.

The study introduced an additional layer of data: real-time moisture and EC measurements in the root zone using in-situ sensors. Conducted during the peak summer months (July–September), the researchers aimed to maintain a minimum root-zone moisture level of 30%. Results showed that using root-zone moisture sensors allowed more accurate measurements of water use, and that water use could be reduced by up to 20% without compromising fruit yield or quality.

The 11th ISHS International Strawberry Symposium will be held in Antwerp, Belgium in 2028.

For further details about presentations or questions about the topics covered in this article, please don't hesitate to contact Sandy Shaw at VicberryIDO@berries.net.au

All photos Credit: Sandy Shaw