Australian Strawberry Breeding Program Update

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A temperate season wrap-up and activity update from strategic levy investment project (BS22000): Australian Strawberry Breeding Program which is part of the Hort Innovation Strawberry Fund.

The Australian Strawberry Breeding Program (ASBP) focuses on creating superior strawberry varieties that are specifically adapted to Australia's key production zones. These new varieties are designed to enhance economic viability for farmers by delivering higher yields, larger fruit, and disease tolerances, as well as traits desirable by consumers such as good flavour and attractive appearance. This article summarises our activities in the last six months, including an overview of the 2023-24 temperate breeding season that has recently concluded.

Strawberry field day a huge success

On 17 July 2024 Berries Australia ran a strawberry field day with the assistance of DAF at the Maroochy Research Facility in Nambour. We had an amazing turn-out, with over 65 growers and industry representatives attending. Growers were given the opportunity to check out promising new accessions coming through the subtropical pipeline and pick their favourites, and several accessions were particularly well-liked by multiple attendees (Figure 1).

University of Queensland PhD student Dilmini Hettiarachchi also gave a presentation on her work on strawberry flavour as part of the Hort Frontiers project 'Genetics of Fruit Sensory Preferences', of which ASBP is a collaborator. Dilmini ran an interactive aroma display afterwards, where growers were invited to identify aromas such as bubblegum, floral, and grassy in different strawberry fruit (Figure 2).

Temperate season wrap-up and a promising accession

This season at our Wandin Research Facility in Victoria we assessed 11,900 temperate stage 1 seedlings from 55 families (unique crosses) and collected detailed data on 68 stage 2 accessions and 22 advanced (stage 3+) accessions (Figure 3). We also placed 11 accessions out on grower farms across Victoria, Tasmania, South Australia, southern WA, and the Granite Belt in Queensland. An unusually cold autumn led to an early drop-off in yield in our trial, which was similarly experienced by many Victorian growers. Despite this setback, we're very happy overall with quality of our temperate population this year, with some very high yields, large fruit sizes, and good flavour.

This season we identified temperate accession '2017-025-130' as a potential candidate for commercial release. This accession has been trialled for 7 years in our Wandin trials and has been out on farms for grower assessment for 4 years, with positive feedback. It yields similarly to day neutral varieties and has high yield comparable with *Cabrillo*, good flavour, and excellent fruit size. We're currently working with Toolangi Certified Strawberry Runner Growers' Co-op to multiply the accession for larger semi-commercial on-farm trialing in 2025, prior to a commercialisation decision being made.

We also held our annual Temperate Reference Group meeting on 9 April this year where we sought input and feedback from temperate industry representatives.

Figure 1. Industry members assessing advanced subtropical accessions at the strawberry field day held on 17 July this year. Photo credit: Katie O'Connor

Figure 2. Aroma hands-on display run by Dilmini Hettiarachchi at the strawberry field day. Photo credit: Katie O'Connor

Figure 3. 2023-24 temperate breeding trial at Wandin North, Victoria. Photo credit: Jodi Neal

Figure 4. Farm walk at Wandin Research Facility, April 2024. Photo credit: Adrian Englefield

These meetings are extremely valuable in guiding our breeding aims and activities. The meeting was followed by a farm walk of the Wandin Research Facility and breeding trial, including our new propagation area (Figure 4).

Subtropical and Mediterranean seasons in progress

Our subtropical and Mediterranean trial seasons are well underway, and the quality of material in these trials is very high so far. This season we've produced and are assessing over 4,100 stage 1 Mediterranean seedlings, more than double our usual number. This increase in plant numbers will greatly improve our likelihood of producing advantageous varieties for the Mediterranean region.

For the subtropical region, we currently have our eye on one of our stage 6 accessions that has been looking particularly promising to date, both in our trials and grower trials. At the end of this season, together with the Subtropical Reference Committee, we'll decide if it should be progressed to larger-scale on-farm trialling.

Fusarium and powdery mildew resistance experiments underway

Our annual screening experiments for tolerance to fusarium wilt and powdery mildew are currently in progress. For the fusarium experiment, 6-10 replicate plants of each of 25 accessions have been inoculated with spores of *Fusarium oxysporum* f. sp. *fragariae*, placed on heating mats to promote pathogen growth, and will be assessed for severity of wilt symptoms over the next six months (Figure 5).

Our powdery mildew resistance experiments rely on natural inoculation and spread of the pathogen. Plants are grown in gutters in a protected cropping environment, and powdery mildew is allowed to spread naturally. Fruit and leaves are assessed separately for severity of symptoms three times over the season, and analysed results are used to guide crossing decisions. This year we're evaluating 316 stage 1 accessions, bred specifically for powdery mildew tolerance, and 20 stage 2+ accessions.

Figure 5. Disease resistance trial for Fusarium wilt. Plants are placed on heating mats to promote pathogen growth and observed for wilt symptoms for six months. Photo credit: Jodi Neal

Commercialisation partner for novelty varieties

Lastly, we are happy to announce that following a rigorous tender process, Australasian Plant Genetics (APG) have been selected as commercialisation partner for the ASBP novelty white and pink varieties 'SW20-317-ASBP' and 'SB17-230-ASBP', respectively. APG are in the process of sub-contracting propagators for these varieties to make them commercially available to growers as soon as possible.

Conclusion

The ASBP team is committed to leading advancements in strawberry breeding and meeting the varied requirements of growers across different production regions. We extend our sincere gratitude to the industry for their continued support, invaluable feedback, and cooperation in our breeding efforts.

The ASBP is guided by the principle of fostering idea exchange. If you would like more information, please contact Jodi Neal (email: jodi.neal@daf.qld.gov.au; phone: 07 5381 1352). Your thoughts and feedback are highly valued by the project team.

Acknowledgements:

The Australian Strawberry Breeding Program has been funded by Hort Innovation using the strawberry research and development levy, with co-contributions from the Queensland Government through its Department of Agriculture and Fisheries and funds from the Australian Government.

We thank the contributions by the Temperate, Subtropical and Mediterranean Reference Groups who have helped guide the program, the Industry Development Officers, and all other industry members who provide feedback, advice, and support.

We are also extremely grateful to all the fruit producers in all states who have trialled, collected data on, and given feedback on our on-farm accessions. This has helped us make more informed and better commercial judgments.

The Australian Strawberry Breeding Program team members include Jodi Neal (project lead), Michaela Antoine (Perth field assistant), Geoffrey Brinkley (Nambour lab assistant), Mitchell Gates (Nambour lab assistant), Apollo Gomez (pathologist), Joanna Gillespie (genetics and virus indexing), Dilmini Hettiarachchi (PhD student), Lilian Kass (Nambour field assistant), Dale McKenna (Nambour field technical officer and hydroponics), Alan Noon (Wandin field assistant), Katie O'Connor (breeding and genomics), Michelle Paynter (virus indexing, tissue culture, and pathology), Sandy Shaw (Wandin field assistant), Karen Spencer (Wandin operations manager), and Louella Woolcock (Nambour field and glasshouse operations manager).

Hort Innovation STRAWBERRY FUND

Queensland Government

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