

Latest update from the Australian Strawberry Breeding Program

BS17000: National Strawberry Varietal Improvement Program (2017-2022)

Jodi Neal – Principal Plant Breeder, Katie O’Connor – Plant Breeder, Australian Strawberry Breeding Program Team, Queensland Department of Agriculture and Fisheries

The Australian Strawberry Breeding Program (ASBP) aims to breed new varieties that are specifically adapted to Australia’s three major production climates: temperate, subtropical, and Mediterranean. These varieties must be highly profitable for growers and have excellent quality to satisfy consumer preferences. This article provides an update on the 2022 subtropical and Mediterranean trial seasons which have recently wrapped up, and an overview of the start of the 2022-23 temperate summer season.

The breeding program consist of four stages of trials that run concurrently every year in the three production regions. Firstly, parent plants are specifically chosen with high value traits and cross-pollinated in complementary combinations. The seeds are then germinated, with each seed producing a genetically distinct individual. These seedling plants are visually assessed for key traits at monthly intervals throughout the season. Seedlings that perform poorly throughout the season are discarded, and those that show promise are clonally propagated via runners for trialling in early-stage clonal trials the following year. Plants in the clonal trials are harvested and assessed weekly for a large number of production and consumer traits.

At the end of the season, the ASBP breeding team select the best performing plants based on quantitative genetic analyses and trial these for a second year in advanced-stage clonal trials. After advanced clonal testing, the best plants are yet again selected for trialling in an ‘on-farm’ environment by a small number of growers across the production region.

Feedback and data from the growers over two years and input from the region’s reference group panel are used to decide whether any varieties will be commercially released to industry.

Subtropical breeding trials

The ASBP subtropical breeding trials are located at the Maroochy Research Facility in Nambour and Bundaberg Research Facility. This year, 16,500 seedlings were planted at Nambour and around 2,700 at Bundaberg (Figure 1).

Based on visual assessments, 201 seedlings were selected for clonal trialling next year, with 78 coming from Bundaberg and six originating from a seed exchange with the University of Florida. Also evaluated at Nambour were 136 early-stage and 42 advanced-stage accessions (Figure 2), with 28 and 10 being selected for trialling again in 2023, respectively.

Two farms in Bundaberg and three in south-east Queensland trialled 11 advanced-stage accessions. One selection, 2017-040, has been progressed for protection under Plant Breeder’s Rights and is now available for trial in small numbers from some plant propagators.



Figure 1. Seedlings at Bundaberg, with coloured flags indicating good performance at different time points throughout the 2022 subtropical season. Photo credit: Katie O'Connor



Figure 2. Harvesting of the 2022 subtropical clonal trial at Nambour. Photo credit: Katie O'Connor



Figure 3. 2022 Mediterranean seedling and clonal trial at a grower's property in Bullsbrook, WA.

Photo credit: Jodi Neal

Mediterranean breeding trials

The Australian Mediterranean production region is focussed around Perth, WA. Thankfully, inter-state travel was permitted again in 2022 and Jodi Neal was able to travel to WA to visit the trials throughout the season.

Around 1,300 seedlings were planted and evaluated at a grower's farm in Bullsbrook (Figure 3). These seedlings all had a clonal copy stored in tissue culture at Maroochy Research Facility, to circumvent the issues and risks involved in transporting selected plants back to Queensland for propagation. Additionally, 71 Mediterranean seedlings were assessed in the powdery mildew resistance trial at Nambour, and 380 seedlings that were not established enough for cloning were instead planted at Nambour. A total of 45 Mediterranean selections were selected from the seedling trials for evaluation in early-stage trials in 2023.

Ten advanced-stage clones and 23 early-stage clones were evaluated at the same grower's property, and five of the advanced accessions were also assessed across two on-farm trials in Bullsbrook. Two advanced and eight early-stage clones were selected to trial again in 2023, incorporating feedback from local growers who visited the trial in August and October 2022.

Temperate breeding trials

The ASBP temperate breeding trials are conducted at Wandin North, Victoria and Applethorpe Research Facility, Queensland. Around 1,300 seedlings were planted at Applethorpe, and 13,900 at Wandin in April.

The clonal trial is located at Wandin, and is comprised of 51 early-stage and 39 advanced-stage accessions (Figure 4). Evaluation of fruit and plants in the clonal trial commenced in late October, and visual seedling assessments for the summer season will begin in mid-November.

Fifteen accessions are being trialled across ten temperate on-farm trials over the 2022/23 summer season. Plants of two newly-released temperate varieties Tahli-ASBP and Tamara-ASBP are being grown commercially on multiple farms this season, with early reports of performance sounding positive.

Detailed information on these new varieties can be found on PAGE 75 in the Spring 2021 issue of the Australian Berry Journal.



Figure 4. 2022-23 temperate clonal and seedling trial at Wandin, Victoria.
Photo credit: Karen Spencer



Figure 5. Strawberry breeders (L-R) Twan Couwenberg, Dr Jodi Neal, Albert Konings and Dr Katie O'Connor at Konings Plant Netherlands. Photo credit: Martine Somers

International Strawberry Congress

Breeders Jodi Neal and Katie O'Connor attended the International Strawberry Congress in Antwerp, Belgium in September.

The congress was a fantastic opportunity to meet with peers face-to-face for the first time in many years. One notable highlight was the discussion of emerging technology.

More than many other international breeding groups, the Australian program is working towards, or has already achieved some of the requirements needed by robotic harvesters and yield prediction AI that will form a critical part of future strawberry production systems.

Jodi and Katie met with breeders and other staff from Vissers Plant Innovators (Netherlands), with whom ASBP has established a seed exchange of temperate material.

They also had a tour of the extensive breeding efforts being conducted at the NIAB East Malling Research Institute and Driscoll's in Kent, UK, as well as surrounding farms including one using 50 robotic strawberry harvesters.

The trip resulted in a much deeper understanding of temperate strawberry breeding efforts around the world and contextualised the position of the ASBP in terms of the global strawberry breeding network.

Acknowledgements

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We thank the contributions by the Temperate and Subtropical Reference Groups and Mediterranean industry members 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), Junrey Amas (WA technical officer), Maddy Betts (laboratory technical assistant), Mitchell Gates (Nambour field assistant), Apollo Gomez (pathologist), Joanna Kristoffersen (genetics and virus indexing), Joy Lai (WA technical officer), Dale McKenna (Nambour field technical officer and hydroponics), Pierick Martin (Nambour field assistant), Alan McWaters (Applethorpe technical officer), 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).



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