

Update from the Australian Strawberry Breeding Program

*End of Subtropical and Mediterranean seasons, and an update on the Temperate season
BS17000: National Strawberry Varietal Improvement Program (2017-2022)*

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The aim of the Australian Strawberry Breeding Program (ASBP) is to breed varieties that are specially adapted to Australia's major production climates: temperate, subtropical, and Mediterranean. These varieties must be highly profitable for growers and have superior quality to meet consumer preferences.

This article provides an update on the 2021 subtropical and Mediterranean season which has recently come to an end, and an overview of the start of the 2021-22 temperate summer season.

The ASBP conducts four stages of breeding trials concurrently every year in the three production regions. Firstly, a seedling population is produced from controlled cross-pollinations between specifically chosen parents for targeted traits. The seeds from these crosses are germinated, with each seed producing a genetically distinct seedling. These seedlings are visually assessed monthly throughout the season for key traits including plant architecture and fruit characteristics. Seedlings that show good performance throughout the season are clonally propagated via runners for trialling the following year in early-stage clonal trials. Plants in the replicated clonal trials are harvested and assessed weekly for a host of production and consumer traits.

At the end of the season, the ASBP breeding team analyse the data and select the best performing plants for trialling a second year in advanced-stage clonal trials. After advanced clonal testing, the best plants are again selected for trialling by a small number of growers in an 'on-farm' environment. Feedback and yield data from the growers are used to select the best plants for trialling a second year. Then, the decision is made for whether any varieties have the characteristics to be commercially released to industry.

Subtropical breeding trials

Subtropical breeding trials are conducted at the Maroochy Research Facility in Nambour and Bundaberg Research Facility. This year, over 8,000 seedlings were planted at Nambour (Figure 1) and around 5,800 at Bundaberg (Figure 2). Based on visual assessments, a total of 228 seedlings have been selected for clonal trialling next year. We also evaluated 163 early-stage accessions, and 32 advanced-stage accessions at Nambour (Figure 3), with 33 and 11 being selected for trialling again in 2022, respectively.

Five farms across south-east Queensland trialled nine advanced-stage accessions, with four of them looking promising as potential commercial varieties. Recently released subtropical variety Susie-ASBP will be available for purchase from runner growers this year or next. More information on this variety is available on PAGE 75 in the Spring 2021 edition of the Australia Berry Journal.



Figure 1. Katie O'Connor assessing seedlings in the 2021 subtropical seedling trial at Nambour. Photo credit: Jodi Neal



Figure 2. Jodi Neal making final seedling accessions in the 2021 subtropical seedling trial at Bundaberg. Photo credit: Katie O'Connor



Figure 3. Katie O'Connor and Jodi Neal in the 2021 subtropical clonal trial at Nambour. Photo credit: Suzette Argent

Mediterranean breeding trials

The Australian Mediterranean product region is concentrated around Perth, WA. Due to COVID-19 restrictions, ASBP breeders were unable to travel from Queensland to WA to assess the trials this year. Instead, industry development officers and contractor staff were trained to visually assess seedlings and collect data from the clonal trial. Additionally, photos were taken which allowed staff based in Queensland to assess some traits from afar.

Around 1,200 seedlings were assessed on a grower's farm in Bullsbrook. These seedlings all had a clonal copy stored in tissue culture at Nambour, to avoid the need to transport accessions back to Queensland and risk plant deaths. Two advanced stage clones and 41 early-stage clones were evaluated at a grower's property (Figure 4), and the two advanced accessions were also assessed at a second on-farm trial in Bullsbrook.

The Strawberry Growers Association of Western Australia AGM and Field Event was held on 22 October. Jodi Neal and Katie O'Connor gave a presentation about the Mediterranean node of the breeding program and fruit from the best performing accessions were available for industry members to see and taste.

Eighteen growers and industry representatives participated in the event. Datasheets were distributed to growers in both English and Vietnamese, and valuable feedback on the individual accessions was received.

Four accessions were particularly liked by growers, including one advanced accession which could be released to growers next year. A field walk of the advanced on-farm accessions was also undertaken.



Figure 4. Mediterranean clonal trial (left) and seedling trial (middle and right) at a grower's property in Bullsbrook, WA just after planting.

Photo credit: Dale McKenna

Temperate breeding trials

The temperate breeding trials are conducted at Wandin North, Victoria (Figure 5) and Applethorpe Research Facility, Queensland (Figure 6). Last season, drought conditions meant that no trial was conducted at Applethorpe. However, rainfall in the Granite Belt over summer has topped up the dams and allowed the trial to go ahead at Applethorpe this season. Around 1,500 seedlings were planted at Applethorpe, and 12,500 at Wandin in April and May, respectively. The clonal trial at Wandin consists of 71 early-stage and 38 advanced-stage accessions. Harvesting of fruit in the clonal trial commenced in late October, and visual seedling assessments will begin soon. Seven accessions are being trialled across ten temperate on-farm trials over the 2021/22 summer season. Plants of two newly released temperate varieties Tahli-ASBP and Tamara-ASBP will be available from propagators this year or next. Detailed information on these can be found on PAGE 75 in the Spring 2021 edition of the Australian Berry Journal.

Disease resistance trials

Routine screening for resistance to fusarium wilt, anthracnose (colletotrichum) wilt, charcoal rot, and powdery mildew continued this year. New subtropical variety Susie-ASBP has shown especially high tolerance to fusarium wilt, and so may also perform well in the Mediterranean region near Perth where this disease is especially problematic. Tahli-ASBP and Tamara-ASBP have moderate tolerance to charcoal rot, significantly higher than either Monterey or Albion. Genetic sources of resistance/tolerance to these diseases have been identified in other subtropical and temperate accessions.

Screening for resistance to powdery mildew was conducted under protected cropping at Nambour by allowing natural inoculation to spread throughout the trial. Eight families (produced from crosses between resistant accessions and commercial varieties), and advanced accessions and varieties from subtropical, temperate and Mediterranean nodes were assessed. Analyses for this trial are ongoing.



Figure 5. Team member Alan Noon in the temperate breeding trial at the Wandin Strawberry Research Centre. Photo credit: Karen Spencer



Figure 6. Temperate seedling trial at Applethorpe Research Facility, Queensland. Photo credit: Alan McWaters

Results from these disease screening trials help to guide cross-pollinations to produce seedlings with increased disease resistance. Studies regarding the genetic component of disease resistance are currently being conducted for powdery mildew and will soon commence for the other diseases. These studies may allow disease tolerances to be detected from the genetic fingerprint of strawberry plants, negating the need for costly and time-consuming glasshouse screening trials.

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 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.

Disclaimer

The above information is sourced from trials conducted on temperate and subtropical sites in Australia. This is the best available information on variety performance under local conditions at these sites. The information provided here may not be suitable for all sites or regions and varieties may perform differently in different locations.

The Queensland Department of Agriculture and Fisheries, and Horticulture Innovation Australia provide the above information as a guide only and take no responsibility for the performance of the varieties on individual farms.

The Australian Strawberry Breeding Program team members include:

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