Australian Strawberry Breeding Program Update: Subtropical and Mediterranean end of season reports and temperate trial update

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The Australian Strawberry Breeding Program (ASBP) aims to breed new superior strawberry varieties that are highly profitable for growers, have reduced production costs, and meet consumer preferences. These varieties are specifically bred for Australia's major production regions, which includes: the temperate region, covering Victoria, Tasmania, South Australia, southern Western Australia, and the Granite Belt in Queensland; the subtropical region, which encompasses South East Queensland to Bundaberg; and the Mediterranean region, which covers production areas near Perth, WA.

In this article we'll give you an update of our activities and progress across all targeted regions in 2020. The 2020 subtropical and Mediterranean variety trials are now complete, and the 2020-21 temperate season has just begun. Two new temperate varieties and one subtropical variety are also currently in the process of being commercially released, and high health plants of these have been distributed to plant propagators.

Our breeding trials all consist of four stages, which run concurrently in each production region every year: seedling trials, early-stage clonal trials, advanced-stage clonal trials, and on-farm trials.

Controlled cross-pollinations are performed to create thousands of seedlings that are genetically unique, and these seedlings are assessed for one year in field trials in their targeted production region. Seedlings that have desirable fruit characteristics and plant architecture are clonally propagated via runners for trialling in replicated 'early-stage' clonal trials. These early-stage trial plants are evaluated in detail weekly for numerous traits, and the best performing plants are selected for a second year of detailed assessment in 'advanced-stage' trials. From here, the best plants are again selected and distributed to a small number of fruit growers for 'on-farm' environment trials. Data and feedback from growers are used to decide whether any selections are suitable for future commercialisation as new varieties. Below is a summary of our activities in 2020 for each region.

Subtropical breeding trials

The subtropical breeding trials are performed across Maroochy (Nambour) and Bundaberg Research Facilities in Queensland. In early- to mid-March, 6,500 seedlings were planted at Nambour and 5,000 at Bundaberg (11,500 total). We also evaluated 63 early-stage and 33 advanced-stage selections at Nambour (Figure 1), and six selections were assessed in on-farm trials across south-east Queensland. After visual assessment throughout May to August, 230 seedlings have been selected from the subtropical region for assessments in clonal trials next year. We have identified 21 early-stage selections for advanced-stage trialling in 2021, and 10 selections will be progressed to on-farm trials for growers' feedback.

Figure 1. Subtropical and Mediterranean clonal trials at Maroochy Research Facility, Nambour.
Photo credit: Dale McKenna

One subtropical selection will be commercially released in 2021, based on its performance in breeding trials, on-farm trial data, and recommendations from growers (Figure 2). This selection has excellent yield and fruit size, good brix, and similar flavour, bruise and rain resistance to Red Rhapsody. A Subtropical Reference Group meeting will be held in mid-November to guide any additional selections to commercially release or advance to on-farm trialling.

Figure 2. Fruit of the subtropical selection to be named and released commercially in early 2021.
Photo credit: Katie O'Connor

Mediterranean breeding trials

The Mediterranean production region is concentrated around Perth, Western Australia. However, this year, the ASBP Mediterranean trial had to be conducted at Nambour due to COVID-19 travel restrictions. A total of 2,350 Mediterranean seedlings were assessed (Figure 3), with 32 selected for early-stage trials in 2021.

Nine early- and three advanced-stage Mediterranean selections were also trialled at Nambour in 2020. We selected two plants to progress to advanced-stage trialling and on-farm trials in Western Australia in 2021.

Figure 3. Jodi Neal assessing the Mediterranean seedling trial at Maroochy Research Facility, Nambour.
Photo credit: Katie O'Connor

Temperate breeding trials

Temperate breeding trials for the 2020/2021 season were planted at Wandin, Victoria in April 2020 (Figure 4). Our usual secondary trial at Applethorpe, Qld could not be run in 2020/21 due to drought. This is likely to have had minimal impact on breeding outcomes, however, due to the typically small size of this trial.

Around 14,500 seedlings are being assessed at Wandin this season, as well as 148 early- and 85 advanced-stage selections. Eight advanced temperate selections are currently being evaluated in nine on-farm trials across Victoria, South Australia, Tasmania, Western Australia, ACT, and Queensland.

Following consultation with the industry Temperate Reference Group earlier this year, we will be releasing two new temperate varieties in 2021. These selections have excellent flavour, and exceed performance of current industry standard varieties for a number of important traits, including yield and disease resistance. More information will be made available on these in early 2021.

Disease resistance trials

Routine screening for disease resistances has continued for selections from all three production regions. A powdery mildew resistance screening trial was conducted on substrate (hydroponics) at Nambour in 2020. This trial was comprised of 212 seedlings produced from crosses between commercial varieties and selections with resistance to powdery mildew, and 30 advanced-stage selections and commercial varieties from all three major production regions (Figure 5). A large proportion of seedlings showed good disease tolerance as well as improved agronomic traits over their parents (Figure 6).

Current experiments are screening 21 selections for resistance to Macrophomina phaseolina (charcoal rot), 30 for resistance to *Fusarium oxysporum f. sp.* Fragariae, and 34 selections for resistance to Colletotrichum gloeosporioides. These experiments help determine the level of disease resistance in our advanced selections and best varieties, and also guide controlled cross-pollinations to increase the production of seedlings with disease tolerance and resistance in our breeding population.

Figure 4. 2020/21 temperate clonal and seedling trials at Wandin, Victoria.
Photo credit: Karen Spencer

Figure 5. Strawberry breeder Katie O'Connor in the powdery mildew resistance screening trial at Maroochy Research Facility, Nambour. Photo credit: Jodi Neal

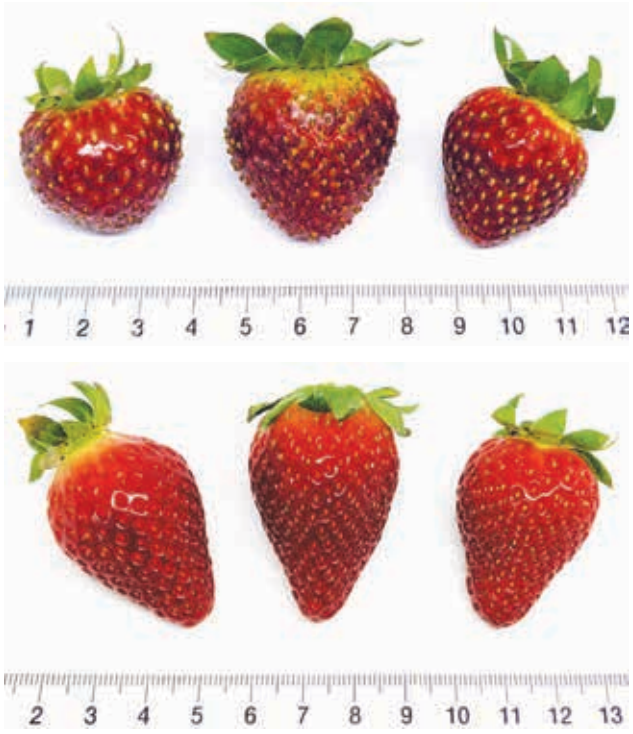

Figure 6. Top: powdery mildew symptoms on Red Rhapsody planted in the resistance screening trial in 2020. Bottom: powdery mildew resistant selection from the same trial. Photo credit: Katie O'Connor

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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 selections. This has helped us make more informed and better commercial judgments.

The Australian Strawberry Breeding Program team members include Jodi Neal (project lead), Madeline Betts (laboratory technical assistant), Clinton Buck (Nambour field assistant), Janine Conway (tissue culture), Apollo Gomez (pathology), Sue Hibbit (Wandin field assistant), Lien Ko (virus indexing and pathology), Dale McKenna (Nambour field technical officer, and hydroponics), Allan McWaters (Applethorpe technical officer), Alan Noon (Wandin field assistant), Katie O'Connor (breeding and genomics), Michelle Paynter (virus indexing, tissue culture, and pathology), Karen Spencer (Wandin operations manager), Matthew Webb (genomics), and Louella Woolcock (Nambour field and glasshouse operations manager).

One of the guiding principles of the breeding work is to foster the exchange of ideas, so please contact Jodi Neal if you would like more information:

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We value your thoughts and appreciate your feedback for the project team.

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