

On the way to profitable varieties for the Australian Industry: PF22000

National Passionfruit Breeding & Evaluation Program Update

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The **National Passionfruit Breeding and Evaluation Program (PF22000)** - funded by Hort Innovation, using the Passionfruit research and development levies and contributions from the Australian Government and led by Dr Mobashwer with a research team of Queensland Alliance for Agriculture and Food Innovation staff at UQ - has just passed the one-year mark. With the aim of developing high performing and profitable - purple and Panama varieties for Australian passionfruit growers, over the last year, the project team conducted several research activities.

Germplasm collection and expansion and arboretum establishment

Since the commencement of PF22000, the project team has been working with Hort Innovation to transfer existing germplasm and data from the previous program (PF19000) at Southern Cross University to the current program at the University of Queensland. Material transfer took longer than expected. In December 2023 and January 2024, we got access to the germplasm site at Alstonville, but most of the accessions were dead (Figure 1a). Shoot tips from 10 accessions were collected and propagated. We received a seed gene bank of around 500 accessions, including selfed/open pollinated seeds from germplasm and hand crossed bi-parental families. Germplasm seeds are being germinated in a controlled environment at Nambour. If any accession doesn't germinate, we will use an alternative method of germination to save the germplasm.

To enrich our genetic resources, we initiated collection of accessions from local growers, wild populations, national and international sources. We have collected plants/seeds of 47 accessions from a USA seed bank, 51 from an European seed bank, 10 from Australian online sources, 30 (varieties and feral) from Passionfruit growers (Jim Gordon, Keith Paxton, Shelley Gage, Jim Woods, and DT) and feral sources (Sharon Jones). We had a discussion with South African Passionfruit breeder, Mr Johan Husselman, (Figure 1c) with a possibility of exchanging germplasm.

On 17 May 2024, we met Professors and researchers from the Federal University of Vicosa, Brazil and discussed a potential opportunity of germplasm transfer in Australia. This year, we are going to organise a collaboration meeting with Chinese scientists aiming to broaden our germplasm collection. Over the next two years, through a PhD program at Murdoch University, we aim to DNA sequence all the accessions in Australian germplasm. This will help us in establishing an efficient breeding program in Australia.

To maintain the germplasm for future use, we established two arboreta; one at the Nambour Queensland Department of Agriculture and Fisheries (DAF) facility and another one at Keith Paxton's orchard in Woombye (Figure 1b). Forty-eight clonally propagated germplasm were planted at the QDAF site and 19 at Woombye.





Figure 1. a) Passionfruit germplasm trial at Alstonville (PF19000); b) Establishment of germplasm site; c) meeting with South African passionfruit breeder, Mr Johan Husselman (Second from the left). *Photo credits: Dr Mo, UQ*

Progeny generation and field trials

Last year, we conducted five parental hand crossings. In total, we generated around 800 new progeny from nine families, planted 200 of these at trial sites in Yandina and Nambour. We continued generating new progeny. Around 600 progeny will be planted in October 2024 at the Nambour and Woombye trial sites.

A replicate clonal trial was established at Keith Paxton's trial orchard at Woombye. Three elite selections from the previous breeding program (collected from Jim Gordon) along with three industry standards were planted in November 2023.

We have been generating data from this trial through a PhD program funded by The University of Queensland (Figure 2b). A field day was arranged at this trial and growers provided their opinion of each accession (Figure 2a). We will collect data for another year and analyse data in 2025 aiming to have a discussion meeting on variety release in 2026.

Staff and student recruitment

For smooth running of this project, a part time postdoctoral fellow (Dr Patrick Mason) was recruited in June 2024. The fellow will be assisting in conducting crossing, propagating materials, planting trials and collecting data from the trials (Figure 3). A UQ funded PhD student has commenced her study on 1 July 2024. The student is working on developing an efficient breeding strategy for passionfruit variety selection. The student will also offer support to solve some key industry problems, such as reduction of fruit size and plant vigour, susceptibility to diseases, blind tipping etc.

Other activities carried out in the past year

- Organised project reference group meeting
- Presented at two industry workshops
- Presented at one international conference



Figure 2. a) Field visit of a progeny trial by scientist from the university of Queensland, Murdoch University and Department of Agriculture and Fisheries; b) UQ PhD student Ms Xinhang Sun harvesting fruits from one of the promising accessions. c) Passionfruit field day at Woombye. *Photo credits: Dr Mo, UQ*

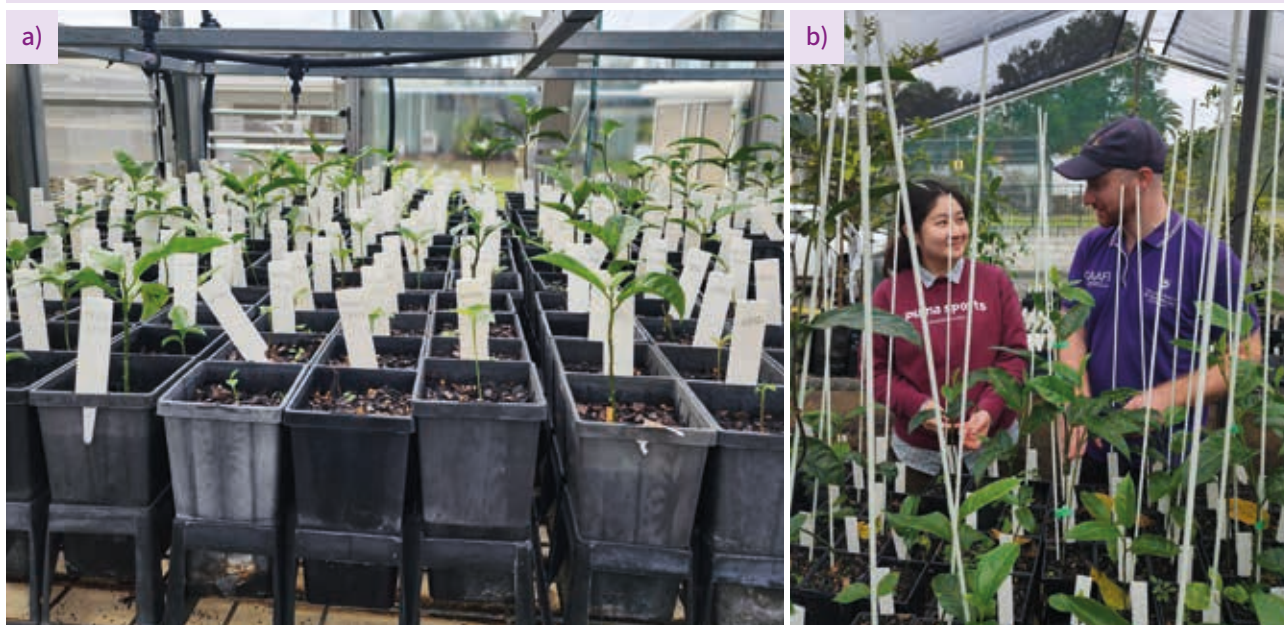


Figure 3. a) Passionfruit seedling progeny and germplasm in the glass house at Nambour; b) Dr Patrick Mason (Post-doctoral Research Fellow) and Ms Xinhang Sun (PhD student) are managing plants in the nursery. *Photo credits: Dr Mo, UQ*