

National Passionfruit Breeding Program

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National Passionfruit Breeding Program

- Now a bit over two years into the three year project (concludes July 2019)
- Program advised by Steering Committee - two or three grower members, one industry member (PAI), HIA representative

National Passionfruit Breeding Program

- Steering Committee – provides advice on running the program
- Steering Committee members currently include: Ross Brindley, Jim Gordon & Ian Constable

National Passionfruit Breeding Program

Original Program Aims:

- To select potential new scion varieties
- Begin process of generating new inbred lines
- Establish seedbank
- Maintain industry arboretum

New Scion Varieties

Selecting potential new scion varieties

- by organising the crossing program, co-ordinating trialling of crosses – carrying out or assisting with assessment of vines in trials (1st, 2nd and next season 3rd stage trials)
- developing DNA markers to carry out early stage selection

2015/16 1st stage trial

Selecting potential new scion varieties

- 1st stage trial – Tom x Lacey, Tom x 23-E
~800 seedlings in all. A few selections made.
- 2nd stage trial – trial packs went out from John McLeod to a number of growers
2016 – none of the selections considered of commercial potential. One may be useful in further breeding.

2016/17 1st stage trials

Selecting potential new scion varieties

- 1st stage trial – 580 seedlings (crosses SP, P12, TL, S12, T12). Twenty-nine selections.
- 2nd stage trial 2017/18 – 29 selections grafted and grown at three sites, Burringbar, Duranbah and Clothiers Creek. Four of these 29 selected vines were distributed as trial packs (last years AGM).
- 3rd stage trial (2018/19) proposed for 12 of these selections which are promising (none of the four selections turned out to be promising).

2016/17 1st stage trials

- 3rd stage trial (2018/19) proposed for 12 of these selections

SP-16-42D
Out of season
fruit
potential



2016/17 1st stage trials

- 3rd stage trial (2018/19) proposed for 12 of these selections

SP-16-59

Good performer



2016/17 1st stage trials

- 3rd stage trial (2018/19) proposed for 12 of these selections

P12-16-37
Another good
performer



3rd stage trial – 2018/19

Parents – 1st Trial Year – Vine No.	No. grafted vines planned for trial
Sweetheart x Pandora - 2016 - 59	65
Sweetheart x Pandora - 2016 – 36D	65
Pandora x No.12 - 2016 - 37	20
Pandora x No.12 - 2016 - 33	65
Sweetheart x Pandora - 2016 - 90	20
Sweetheart x Pandora - 2016 – 42D	29
Toms Sp. X No.12 - 2016 - 4	65
Pandora x No.12 - 2016 - 53	41
Sweetheart x Pandora - 2016 – 72	20
Sweetheart x Pandora - 2016 – 22D	20
Sweetheart x Pandora - 2016 – 4D	20
Sweetheart x Pandora - 2016 - 55	20
Total	450

2017/18 1st stage trials

Parents	Total seedlings
Toms Sp. x Lacey	168
Toms Sp. x Toms Sp.	59
Sweetheart x Sweetheart	77
Total	304

- Tweed variety and derivatives ownership issue, crosses/seedlings from 2017 not taken up by project as they were all Tweed variety crosses.

2018/19 1st stage trials

Parents	Total seedlings	Grafted seedlings
Toms Sp. x PAI #10	180	80
Black Gem x PAI #10	87	87
Misty x Misty	89	89
USA 'Purple'	18	18
USA Frederick (red/purple)	41	41
USA Lilikoi (flavicarpa)	40	20
Lacey x Lacey inbred lines	37	37
Misty Gem crosses	9	9
Total	501	381

DNA markers

Fruit quality measurements 2017

- Sugar content (BRIX), pH, fruit weight and colour measured in mapping population (Tom x Lacey)
- Measurements from >800 fruit from >120 vines

DNA marker/fruit quality associations –T x L

- We combined the DNA marker information (so far 1,940 DNA markers) with the measurement of fruit quality

TxL_No	BRIX	pH	Fruit weight	v15281518	v15281520	v15281524	v15281553	v15281563	v15281564	v15281567	v15281572
17	15.9	3.048	68.2	2	0	2	0	2	2	2	0
18	14.45	3.0375	71	2	0	2	0	0	2	2	0
19	12.6	2.9667	74	0	2	2	0	0	2	2	0
20	14.2857	3.4957	87	2	2	2	0	2	2	2	0
21	11.88	3.304	72.6	2	0	2	2	2	2	2	2
23	11.95	3.2167	53.33	0	0	2	2	0	2	2	2
24	13.025	3.02	83.5	2	2	2	2	2	2	2	2
25	14.95	3.025	80	2	2	2	2	2	2	2	2

Test DNA marker - fruit quality associations

- Some good associations between DNA markers for each of the fruit quality traits!

How do we use the DNA markers?

- First we need to validate the markers.

DNA marker validation

Measure the same fruit quality traits on new vines (TxL)



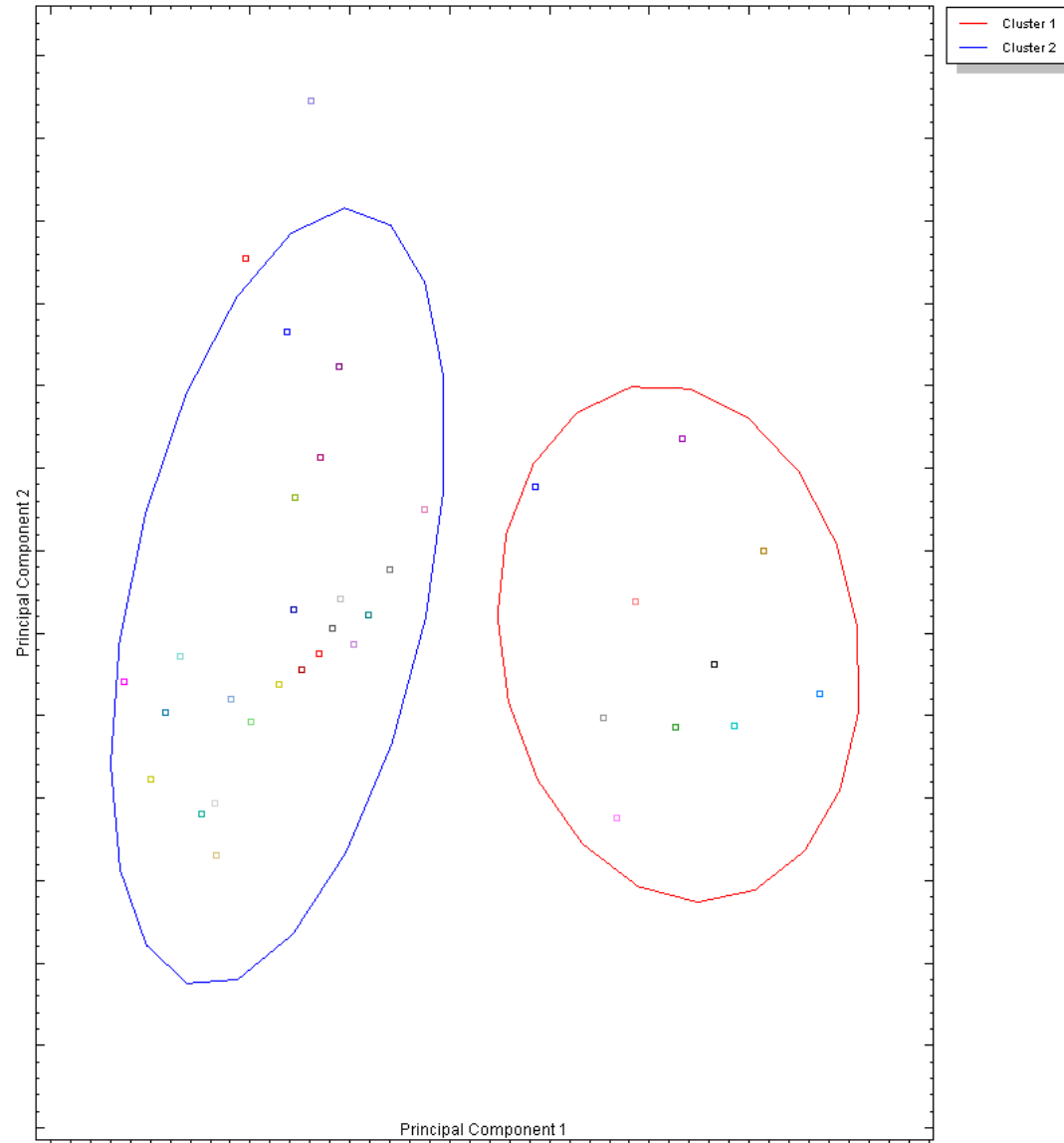
Assay the DNA markers that were associated with traits on these vines (TxL) and check that the association holds up.

DNA marker development - 2018

- Fruit quality traits have been measured on vines from a population of 68 T x L vines at Newrybar. Around 200 fruit measured to date.
- We are currently developing a DNA marker test for each of 10 markers for validation (original assays cost \$50 each, require high quality DNA)
- Used DNA sequence from PAI/SCU project on DNA fingerprinting toolkit & SCU funded genotyping

DNA marker assay

Marker assay
for fruit colour
& fruit weight



Further validation of markers

- Say four DNA markers.
- Grow 400 healthy Tom x Lacey seedlings and extract DNA
- Four markers would be expected to select ~25 individuals from the 400 based on their DNA
- These 25 could be grown up and assessed as usual (375 lose out and are discarded)
- Can also check if DNA markers work in other crosses and apply to these crosses as well.

Rootstock & Panama sub-project

Aim:

- To trial different varieties and crosses as **rootstocks** to compare their performance in the field.
- To trial the performance of some of these same varieties and crosses as **Panama** type fruiting varieties in the field.
- Also to get a crossing program underway for potential future rootstock and Panama breeding.

Rootstock & Panama sub-project

True-breeding Lines

McGuffies Red

Heuston

Q.DPI flavicarpa

Griffiths Pandora

McLeods Pandora

Bunnings Pandora

Cook Is. Pandora

Crosses

McGuffies Red x Bunnings Pandora

McGuffies Red x Griffiths Pandora

McGuffies Red x McLeods Pandora

McLeods Pandora x Bunnings Pandora

McLeods Pandora x QDPI flav.

McLeods Pandora x McGuffies Red

Griffiths Pandora x McLeods Pandora

Q.DPI flav. x McLeods Pandora

QDPI flav. x McGuffies Red

Bunnings Pandora x McGuffies Red

Bunnings Pandora x QDPI flav.

Rootstock trial – this season

- Graft Sweetheart or Misty Gem onto rootstocks for field trials.
- Up to 1,000 rootstock vines (7-8 different types)

Panama trial – this season

- Up to 450 Panama vines (5 different types)
- Both nurseries and SCU had trouble with poor germination of stored seed

Other news

- Visit to Taiwan in November – they supply vines to other countries in the region – Vietnam and Cambodia
- Contact with Columbian passionfruit breeder – collaboration possibilities

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