

SF02015 “Breeding Lowchill, High Quality Summerfruit for the Australian Industry” 2002-2007

Funded by:
Horticulture Australia
Summerfruit Australia Limited
Low Chill Australia
Growcom

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Project Team

- Dr Bruce Topp, Principal Plant Breeder
- Mr Dougal Russell, Senior Experimentalist
- Mr Phillip Wilk, NSW DPI, Senior Extension Officer
- Mr Grant Bignell, Technical Officer
- Ms Stacy Griffin, Farmhand
- Dr Alan George, Senior Principal Horticulturist
- Mr Bob Nissen, Senior Experimentalist
- Dr Kenji Beppu, Kagawa University, Japan
- Mr Suthin Promchot, Visiting PhD student, Kasetsart University, Thailand
- Dr Claire Wood, Food Scientist
- Dr Heather Smyth, Food Scientist
- 12 grower evaluators in NSW and QLD
- Breeding colleagues at Univ. of Florida, USDA Georgia, Univ. of Chapingo Mexico and Royal Company Spain
- Industry steering committee

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Background to project

- Project started in response to grower requests. Growers needed new varieties with higher *eating quality for consumers* and better *adaptation for grower profitability*. They wanted input into direction of new variety breeding rather than fully relying on overseas.
- Scoping project in 2001 mapped out the breeding plan.





Using germplasm from Queensland, Florida, Georgia, California, Europe, Mexico, Brazil, China, Taiwan and Korea

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Project methodology

- International collaboration
- Rapid and wide testing of new selections
- Close industry involvement through regular field days, grower evaluators and project steering committee



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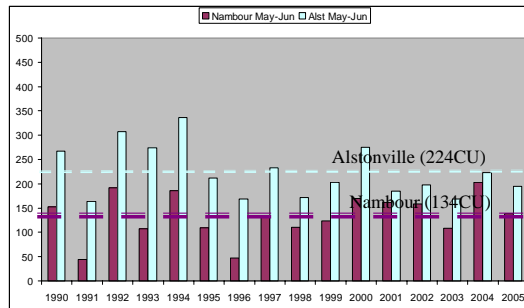
An industry steering committee reviews the breeding and provides direct input into the project

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Tree Traits

- 100 to 400 chill units
- More compact flowering and ripening
- Reduced fruit set
- More compact tree habit



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Fruit Traits

- 50% nectarines : 35% peaches : 15% other
- 80% regular-acid/sugar balance : 20% low-acid
- 70% yellow flesh : 30% white flesh
- 50% melting flesh : 50% other flesh types



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Breeding Strategies to Improve Fruit Quality – Fruit sweetness

1. Increase fruit development period.
For a set harvesting period.
Reduce chilling requirement.
Suitable for regions without spring frost

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Breeding Strategies to Improve Fruit Quality – Fruit sweetness

2. Assortative mating ie select and then inter-cross the sweetest individuals in the population

Need to be able to accurately discriminate among the individual seedlings in the population to select the sweetest.

Do this by designing a sampling technique that accounts for differing levels of variability at each stage of sampling.

Experiment to determine a sampling scheme for specific levels of genetic discrimination for fruit sugar levels.

[Mr Suthin Promchot, Kasetsart University]

- Used 3 cultivars, UFGold, White Satin and SunWright.
- Sampled 6 trees for each cultivar
- Sampled 50 fruit from each tree
- Measured sugar (soluble solids content) level of each fruit using hand refractometer
- Partitioned the variability at each level of sampling
- Concluded that we need to sample 10 fruit from each single seedling tree in our progeny in order to discriminate 0.62 difference in SSC between seedlings.



Breeding Strategies to Improve Fruit Quality – Fruit sweetness

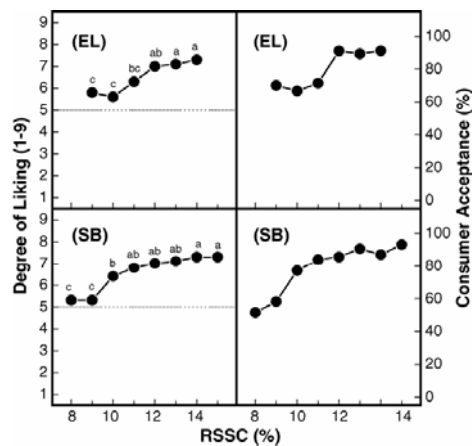


- Alter the sugar to acid ratio to change perceived sweetness.

Using the honey gene to reduce flesh acidity in peach and nectarine.

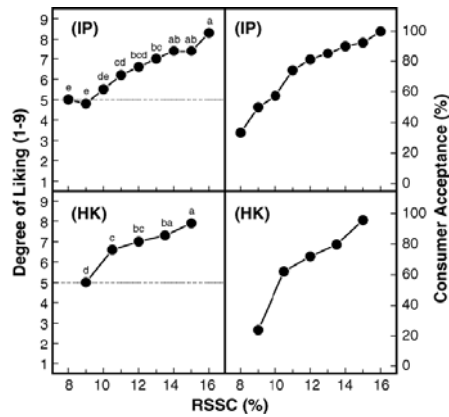
How will consumers accept these fruit types?

High-acid, yellow-flesh peach Elegant Lady (EL) and nectarine SpringBrite (SB) at different ripe soluble solids contents (RSSC)



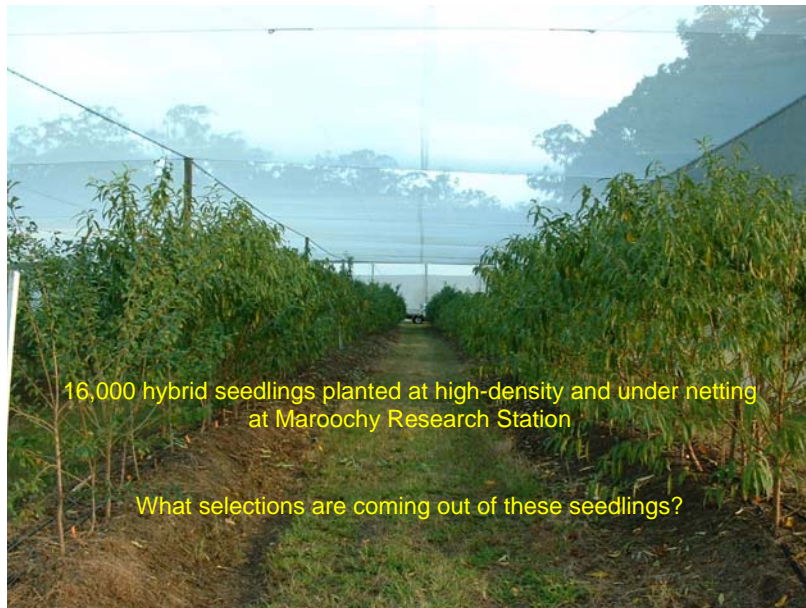
Source: C.H. Crisosto, G.M. Crisosto / Postharvest Biology and Technology 38 (2005) 239–246

Low-acid, white-flesh peach Ivory Princess (IP) and nectarine Honey Kist (HK) at varying ripe soluble solids contents (RSSC)



Source: C.H. Crisosto, G.M. Crisosto / Postharvest Biology and Technology 38 (2005) 239-246

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16,000 hybrid seedlings planted at high-density and under netting at Maroochy Research Station

What selections are coming out of these seedlings?

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All yellow peach



- Ripe early October
- 13% tss
- Non-melting flesh
- No red in skin or flesh
- Good flavour

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All Yellow Nectarine



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Blood plum



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 Queensland Government
Department of Primary Industries and Fisheries

Peento non-melting nectarine



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 Queensland Government
Department of Primary Industries and Fisheries

Mid-chill nectarine

- Ripe early
November
- Flesh is sweet (14%
tss), melting and
juicy
- 400 chill units



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Tree Architecture Quantum leap for the future

- Shorter internodes
- Reduces tree size by
30-40%
- Does not activate until
3-years old
- Candidate for molecular
marker assisted
selection
- Future breeding
required



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New HAL breeding project 2006-2011 KEY POINTS

- Rapid progress since 2002 and *new cultivars* to be released in new project
- Expanded to *medium-chill* as well as *low-chill* testing
- Incorporates evaluation with the breeding to provide valuable *information for growers* on cultivar performance
- Network of *international* scientists contributing to the breeding

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Acknowledgments

- This project has been facilitated by HAL in partnership with [Summerfruit Australia](#). It has been funded by the summerfruit levy and voluntary contributions from [Low Chill Australia](#) and [Growcom](#). The Australian Government provides matched funding for all HAL's R&D activities.
- Cooperation of University of Florida breeders Dr Wayne Sherman and Dr Jose Chaparro in exchanging information and germplasm.
- Cooperation of Australian Nurserymen Fruit Improvement Company and Birdwood Nursery in providing trees.
- Low chill growers evaluating the new selections and providing representation on the project steering committee.

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