

The reconditioning of the pome fruit varietal collection at Grove, Tasmania

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Scientific Horticulture Pty Ltd

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Final Report

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Purpose of the project.

In 2010 the Tasmanian government decided to no longer operate their fruit research station in the Huon Valley of Tasmania. To prevent its sale and the loss of the resource to the fruit industry, OAK Tasmania entered into a contract with the government to manage the site. Of particular concern was the maintenance and preservation of the apple, pear and quince cultivar collection on the site with some trees more than 50 years old. Due to low levels of funding to the research station over many years this collection had been managed at a low level. This had resulted in overgrown and tangled trees with numerous blackberries and rootstock suckers as well as well established weeds around the trees and an inoperable irrigation system.

Due to the age of the trees and numerous tree deaths in the collection this project aimed to re-establish all the cultivars at a new site, using trees in a nursery bed propagated by the government and to re-juvenate the old collection site to ensure its survival until the new site becomes established.

Acknowledgments

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Media Summary

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Of particular concern was the maintenance and preservation of the apple, pear and quince cultivar collection on the site with some trees more than 50 years old. Due to low levels of funding to the research station over many years this collection had been managed at a low level. This had resulted in overgrown and tangled trees with numerous blackberries and rootstock suckers as well as well established weeds around the trees and a damaged irrigation system.

Due to the age of the trees and numerous tree deaths in the collection this project aimed to rejuvenate the heritage apple, pear and quince collection as well as re establish all the cultivars at a new site to ensure cultivar preservation into the future.

In the first year of this project the original heritage collection was heavily pruned, had root suckers and blackberries removed, had the irrigation system made operable and the pests and diseases including weeds were brought under control. This stimulated the trees into vigorous growth.

All cultivars, close to 500, in the heritage collection were propagated in the commercial nursery. These will be grown in the nursery for another year prior to planting out at a new site, beside the current germplasm (modern cultivars) collection.

To date the collection has been accessed by enthusiasts, commercial nurseries, the cider industry and breeders from around Australia.

Technical summary

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It is the intention of Tahune Fields Nursery to continue to maintain and expand the collection with new modern cultivars and heritage apples found in Australia that are not in the collection. Tahune Fields Nursery has provided grafting wood from the collection to interested parties as well as initiating a web based propagated tree sales by direct order for a limited range of cultivars. A grant has been obtained from the Tasmanian Community Fund for infrastructure development to make the site a tourist site. This will incorporate a commercial cidery and local arts and crafts as well as orchard walks through the heritage and germplasm collection.

Introduction

In 2010 the Tasmanian government decided to no longer operate their fruit research station in the Huon Valley of Tasmania. To prevent its sale and the loss of the resource to the fruit industry, OAK Tasmania, through its Tahune Fields Nursery, entered into a contract with the government to manage the site. Located on the research station were two blocks of apples, one of which contained the heritage apple collection and the other contained the germplasm collection. There are close to 400 apple cultivars, 37 apple rootstocks, 52 pear cultivars and 15 quince varieties in the heritage collection and just over 200 selections of apples in the germplasm block. Both Tahune Fields Nursery and the Government desired to maintain, re-invigorate and expand this collection.

The collection has been historically available as a resource for government pome fruit breeding programs in Victoria, Western Australia and Queensland as well as providing a resource for propagation wood for many individuals and nurseries interested in alternative apple cultivars. It provides a rich source of potential fruit cultivars for future industry needs, whether this be niche marketing, such as the current interest in cider production, changes in consumer preferences or pest and disease resistance.

The heritage collection at the research station was initially established in 1956 although it has been periodically added to. As there was a shortage of rootstocks at the time of establishment a range of rootstocks were used ranging from vigorous seedlings to dwarfing rootstocks. As such many of the trees are growing old and they are in a poor state of health. The State Government recognised this and had started on a propagation program to re establish the heritage collection at a new site. Unfortunately, due to restricted funding along with uncertainty as to the future for the research station these trees, in the nursery beds, were neglected with poor growth rates when Tahune Fields Nursery took over the management of the station.

Oak Tasmania, a not for profit disabilities services company that operates Tahune Fields Nursery close to the rear of the research station, felt that the maintenance of this collection was important for the Australian pome fruit industry and wider community. Further it felt that knowledge of the collection in Australia was poor and the collection was under utilised by industry, government, private individuals and potential overseas users of the collection. As this is globally a large collection it was felt that information about the collection should be promoted more extensively, using modern technologies. While a list of the cultivars in the collection was available on the internet descriptions of the fruit was not available in a convenient easy to access linked site and methods of obtaining the propagation wood or trees was not clear.

This project aims at re-invigorating the existing collection, propagating all trees in the collection and establishing them at a new site, developing descriptions of the cultivars in the collection and establishing a web presence for accessing information on the cultivar descriptions and procedures for the purchase of trees or propagation material.

Project Objectives and methods

1) Revitalisation of the existing heritage block.

- Severely prune the trees to allow for light and crop protectant sprays to penetrate the trees and eliminate tree to tree entanglement.
- Remove perennial weeds such as blackberries that are not controlled by normal orchard management activities.
- Removal of rootstock suckers

2) Maintenance of existing heritage and germplasm blocks.

- This includes the day to day normal operations of orchard management including sod maintenance, weed control, normal annual pruning, irrigation and pest and disease control.

3) Propagation of all trees from the heritage collection and establishment of a new collection site.

- Four trees of each of the 500 cultivars in the heritage collection to be propagated and grown on in the nursery.
- A new 1Ha collection site is to be prepared and planted to these trees.

4) Catalogue and internet database

- All cultivars in the heritage collection to be sampled and described
- A web based catalogue of the collection with a description of the described cultivars established.

Project Activities and results

1) Revitalisation of the existing heritage block.

Considerable time was spent in the heritage block in the winter of 2010 to remove rootstock suckers. In addition, at the same time, perennial woody weeds such as blackberries were removed. To encourage new growth in the heritage trees and to untangle trees they were severely pruned. This stimulated vigorous growth in the 2010/11 season with little fruit production as can be observed in figure 1. This activity was a once only task so apart from normal orchard management practices it was not necessary in the 2011/12 season.



Figure 1. Some of the trees in the heritage collection showing the vigorous shoot growth after severe winter pruning and the poor fruit set with only a few apple present.

2) Maintenance of existing heritage and germplasm blocks.

2011 and 2012 proved to be light years for fruit production in the heritage and germplasm blocks resulting in many trees without fruit and most fruitful trees having an extremely light crop load, many with just a handful of fruit. As such fruit thinning was not required.

The weeds in both blocks were sprayed in both seasons with glyphosate for weed control in early summer and this activity was a repeated on a regular basis as needed by

weed activity. The grass in the inter row was regularly slashed, however, in 2011 a slasher failure has meant the mid summer mowings were missed as can be observed in figure 1. The slasher was repaired and the regular site mowing activities renewed. In 2011 Irrigation was applied on a weekly basis during the growing season and this was changed to daily, via an automated system, in 2012.

In both the 2011 and 2012 the seasons, there were numerous wet periods and very conducive to black spot disease development. Cover sprays were applied on a 7 to 14 day cycle, depending on weather, to limit the infection and spread of this disease as well as powdery mildew and codling moth. A variety of materials including copper, sulphur, protectants and systemics were used although disease control was superior in the 2011/12 seasons.

In the winter of 2012 the trees were re-pruned and weed sprays applied as can be observed in figure 2.



Figure 2. The trees in the heritage collection after pruning and weed control in spring 2012

3) Propagation of all trees from the heritage collection and establishment of a new collection site.

It had been planned to ‘revitalise’ the nursery beds where the heritage trees had been propagated by the State Government, but despite much attention these trees failed to respond to irrigation, weed control and fertilizer. The symptoms were similar to those experienced with apple replant disease raising the possibility that this site was not fumigated prior to nursery bed establishment. As a result a decision was made, in the

autumn of 2011, to re bud all cultivars onto healthy MM111 in a different healthy nursery bed rather than to struggle on with unhealthy trees. The pre-existing nursery trees were maintained to ensure a backup of genetic material.

This ‘unplanned’ propagation activity impacted on the project in that a longer time of nursery growth (2011/12 and 2012/13) is needed meaning that the new site cannot be planted until the winter of 2013 rather than the winter of 2012.

Initially 4 trees per cultivar were budded and grown in the nursery for the 2011/12 season. These were lifted in the winter of 2012 and the best pair of trees for each cultivar planted in a new nursery bed, at wider spacing to allow for tree structure development in the spring of 2012. These will be cared for and lifted and planted into the new collection site in the winter of 2013.

The original site for the permanent planting was changed due to proposed new spray regulations in Tasmania that restrict the sprays that can be applied within 50m of a property boundary. The new site is more central to the property and will not be affected by these regulations if they are enacted, however, the previous site preparatory work had to be abandoned. The new site now only needs cultivation prior to planting in mid 2012. The beds are hilled up and irrigation mains are in place.

This site has an additional two advantages in that;

1. It is close to the planned tourist activity to be operated by the Nursery. A Tasmanian Community Funds grant has been obtained to construct tourist facilities on the site under the ‘Heritage Apple Walk’ project. It is planned to have orchard walks through the new heritage apple collection as part of this project.
2. It is an extension in the existing germplasm collection thereby combining the two collections, currently at two sites, into a single site.

4) Catalogue and internet database

Fruit assessments began in the second week of January in both 2011 and 2012. These occurred at approximately weekly intervals and involved walking the rows looking for trees with fruit that look ripe. A sample of fruit was taken and starch measured with standard iodine sprays of cut fruit surfaces. If starch had more than 50% absent from the cut surface a sample of fruit was taken for laboratory assessment. For the samples where there was more than 50% starch an estimate of harvest date was made and these trees re-inspected on that date. In the laboratory the fruit weight was measured, the skin appearance described, the flavour assessed and a juice sample was taken and measured for fruit sugars, acidity and polyphenols / flavonoids. The fruit sample was photographed. The results were mounted on the internet at www.scientifichorticulture.com.au, there is a ‘Heritage Apples’ button at the top of this page that will take you to the collection database. In 2012 this process was extended to the pear and quince trees in the collection.

For the quinces, which are normally processed into quince jelly rather than eaten fresh, instead of taste, sugars and acidity 200g of fruit was placed in an oven bag with 40ml of water and cooked at 120°C for one hour. The juice was then extracted and assessed for sugar, viscosity and colour. As there was a difference in the 'cutability' of the fruit notes on this were also taken. Photographs of the whole fruit, cut fruit and the extracted juice were taken. This data was added to the website on a different indexing page. Representational pages from the website are presented in figures 3 to 6.

There has been considerable interest in this project from the Western Australia apple breeding project as well as the cider industry and while this communication is ongoing one new cider cultivar, Galopin, spelt Gallopina in the collection at Grove, has been potentially identified and is currently being assessed in NSW for correct cultivar identity. If this does prove to be Galopin then this increases the number of cider apples in Australia from 31 to 32 cultivars. The assessments have identified other potential cider apples and these are being discussed by interested parties.

Screenshots of the collection website

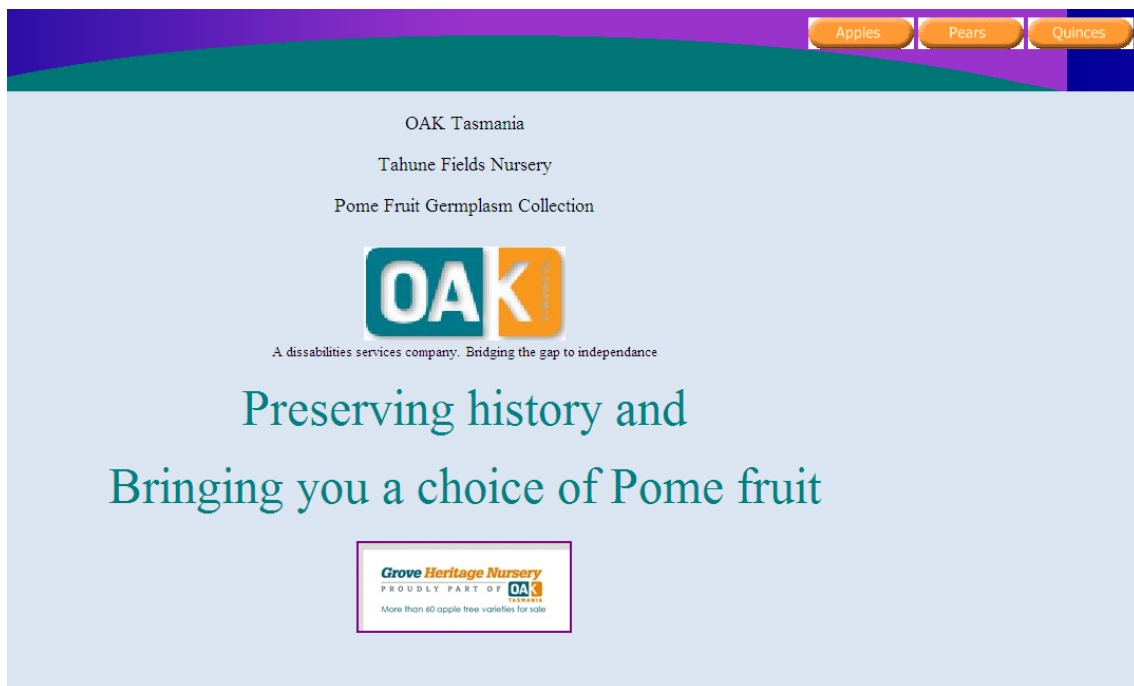


Figure 3. The home page of the heritage collection website. There are three buttons at the top to select apples, pears or quinces. The large button at the bottom of the page redirects the user to the Grove Heritage Nursery sales website for the purchase of trees or bud wood.



Figure 4. This is the apple main page. The three buttons at the top allow for selection back to the home page, to an alphabetical listing of all the cultivars in the collection or to the cultivars by harvest date. If harvest date is selected this takes you to another menu page where the starch test is explained or you can select from summer, autumn or winter ripe apples.

Raritan (week 7)

Harvest date - early season, week 7

Flowering - mid season

Fruit size - large 179g

Prone to black spot

Firm, crisp and juicy

A good flavoured apple

Fruit sugars - low 9.5%

Fruit acids - average

.....



Figure 5. A typical description page of an apple. This gives the cultivar name and harvest date along with information on the cultivar flowering season, fruit size and other aspects of the fruit including any disease susceptibility noted in the orchard.

Home

OAK Tasmania
Tahune Fields Nursery
Pome Fruit Germplasm Collection

OAK

Pineapple



Harvest date - mid season, week 11
Flowering - Mid season
Fruit size - large 222g
A yellow quince with fuzz on skin
Fruit sugars - average
Deep pinkish orange juice when cooked

Figure 6. A typical description page of a quince. This gives the cultivar name and harvest date along with information on the cultivar flowering season, fruit size and other aspects of the fruit including the potential colour of the Quince paste.

Technology Transfer

In addition to the marketing program for Grove Heritage Nursery conducted by OAK Enterprises for the sale of trees and bud wood from the collection several articles were written as a direct result of this project.

In 2010 an article was written on the features of the M and MM apple rootstocks held within the heritage collection at Grove Research station and published in Australian Fruitgrower, the pome fruit industry magazine. A table was prepared on the 33 M and MM rootstocks to enable a comparison on effects on orchard tree size, need for trellising, effect on fruitfulness, level of suckering, tolerance to water logging and pest and disease resistance.

An article for the Horticulture Australia annual report to industry was written and this was distributed to all growers both at their annual conference in August 2011 and also as an inclusion in Australian Fruitgrower in the August 2011 edition.

An article titled 'Designer Apples: Selecting apple cultivars for your markets' was written and published in the October 2011 edition of Australian Fruitgrower. The focus of this article was to alert growers to the presence of the database to assist them in choosing unusual apples that they might consider in potential niche marketing programs.

An article for the Horticulture Australia annual report to industry was written and submitted for distribution to growers in the winter of 2012.

Recommendations

It is recommended that Oak Enterprises continue with the redevelopment of the site and add to the collection wherever possible. It is proposed that the website database be updated on a regular basis as more information becomes available on existing cultivars or cultivars not currently featured on the website.