A tale of two ladies: Pink Lady and Sundowner

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Golden Delicious is a chance seedling found in West Virginia, USA in about 1890. It possibly originated from Grimes Golden. Lady Williams was discovered in Donnybrook, Western Australia in 1935 and is a chance seedling thought to have a parentage of Rokewood x Granny Smith. Rokewood is a hard apple, grown and stored in the days before refrigeration. Granny Smith stores well, but is highly susceptible to superficial scald.

Apple breeding in Western Australia
A small apple breeding program started in Western Australia in 1972 using Golden Delicious and Lady Williams as parents. These varieties were selected to combine the long storage ability and high flavour of Lady Williams with the sweetness of Golden Delicious.

It was also hoped that the physiological disorders bitter pit and superficial scald could be avoided in some of the progeny of the cross. Golden Delicious is subject to bitter pit but does not show superficial scald, whereas Lady Williams scalds but does not pit. Golden Delicious also produces seedlings with variable winter chilling requirements so that low chill varieties can be selected.

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It is five years since the first Western Australian-bred Pink Lady and Sundowner apples were sold on the local market. In that time, these crisp, sweet flavoursome apples have become top-selling, premium fruit.

The story is no different overseas. Trial shipments to London, Taiwan and Singapore have indicated a big demand for the unique Pink Lady apple — far more than Western Australia can presently supply.

One million fruiting Pink Lady apple trees are needed to meet anticipated export sales. Today, there are only 100,000 trees in the ground, of which about half are bearing fruit.

New high quality apple varieties are Australia’s only hope of re-entering export markets on a large and sustained scale at profitable prices.

By John Cripps and Eleanor Melvin-Carter
Horticultural Research Officers, South Perth

Pink Lady apples

Sundowner apple tree in flower

Pink Lady apples.
Initially, the Department of Agriculture’s apple breeding program had a low priority and used poor quality land. About 10,000 seedlings had been produced by 1985 when Pink Lady and Sundowner seedlings were released to a rather disinterested industry. However, Western Australia’s principal nurseryman and two growers recognised their potential. From about 1987, interest in these apples grew tremendously.

Similarly, interest in apple breeding also grew and the apple industry started partially funding the program. In 1988, apple breeding began at the Department of Agriculture’s Manjimup Horticultural Research Centre. The total number of seedlings planted annually in Western Australia rose from about 700 to 20,000 by 1990.

Gala, Red Delicious, Rokewood, Pink Lady, Sundowner, Golden Delicious, Fuji, Splendour and Lady Williams were all used as parents in this bigger apple breeding program in which the performance of various parent apples and the type of progeny produced can then be studied. The present aim is to breed varieties that ripen before Pink Lady to replace standard varieties such as Granny Smith and Red Delicious.

Pink Lady and Sundowner apples, the first two varieties to be released from the breeding program, are now in commercial production throughout Australia.

Genetics
Apple breeding relies on large populations of seedlings and mass selection to find the very few seedlings with some desirable characteristics. This is because several genes, not one gene, control inheritance of desired characteristics in apples. Apples are highly heterozygous, that is they have a diverse genetic make up, and produce highly variable progeny that may have characteristics not shown by their parents.

Fortunately, once a new selection is made, apple breeders can multiply material quickly by clonal propagation. This is simply dividing an individual plant into a number of parts that all grow and have the same genetic make up. Cloning, therefore, offsets the slow pace of genetic gain and the long pre-fruiting (juvenile) phase because there is no need to breed stable, seed-propagated hybrid varieties.

Hybridisation and cross pollination
Apples are bred by bagging up flowers of the male parent before they open and, when open, snipping off the anthers to collect the pollen. Anthers are dried at 25°C until they dehisce (burst open) to release the pollen. Flowers of the female parent are selected at the balloon (large unopened) stage. Other flowers at the wrong stage are removed from the cluster, as are petals and anthers from the flowers to be pollinated. A tiny paintbrush is used to brush pollen on to the stigmas of the female parent and the flower cluster is enclosed in a paper bag. Three weeks later the bag is removed, and if a fruit has set it is marked with tape. Later, the ripened fruit is harvested.

Seeds are taken from this fruit, stored in damp sand at 2°C for eight weeks or longer and then planted in small pots. When seedlings are 15 to 20 cm high, they are planted in the field at 7000 to the hectare.

Four to eight years later when the seedling trees are about two metres high, they may produce fruit, but in the meantime some selection takes place. Seedlings highly susceptible to mildew, and those with small leaves, are eliminated because potential commercial varieties usually have average sized leaves.

The world scene
Until recently, Australia had lagged behind other major apple-growing countries in its breeding program. Many have argued that breeding apples is a vast gamble; it is too expensive, takes too long and the results are too uncertain. It is possible to grow 100,000 seedlings and not to produce a commercial
The variety proved very popular in London.

Sundowner does not grow as vigorously as Pink Lady; it has wider branch angles and so trees are more manageable. It flowers abundantly and sets very heavily so that chemical thinning is often necessary. On the other hand, it is a reliable producer. However, in the 1990-91 season water core (breakdown of the cell walls around the core) was a problem. In the subsequent season, water core did not appear.

Sundowner appears to have a slightly shorter storage and shelf life than Pink Lady. Like Pink Lady, it is best stored in controlled atmosphere.

The fruit is mainly dark red with pronounced lenticel (superficial) spotting but shaded fruit may be mainly green. It is medium in size. It is slightly more acid than Pink Lady when harvested but when allowed to mature in store it is very sweet. The fruit is oblong to square and the calyx may be rather open. The flesh tends to be coarser, but the fruit is more resistant to bruising than Pink Lady.

Pink Lady

The Pink Lady apple is named after a cocktail, but the name is appropriate since the apple tends to be partially pink-skinned and is bred from Lady Williams.

Pink Lady is a crisp apple with dense firm fine flesh and a good balance between sugar and acid, which are apple characteristics most sought after by consumers.

Economic returns

In today's dollars, the Western Australian apple breeding program has spent more than $3 million in its search for a variety that looks and tastes good, stores well and has a long shelf life. On the other hand, if there were as many Pink Lady trees as there are Red Delicious trees in Australia (2.7 million) and the Pink Lady trees produced four boxes of fruit each, fetching $10 more than other varieties (a conservative figure), growers would pocket an extra $100 million each year. This conservative estimate shows that apple breeding can give a good return on invested funds.

Pink Lady

The Pink Lady apple is named after a cocktail, but the name is appropriate since the apple tends to be partially pink-skinned and is bred from Lady Williams.

The tree is vigorous with large leaves close together, growth is dense and upright but branch angles are good. Summer pruning and branch thinning are essential if abundant fruit buds are to be produced. Cropping is moderate. An open central leader with some shoots tied down to encourage cropping and fruit colouring must be developed.

The fruit, which ripens from late April to early May, is tall, oblong and slightly conical, with a very deep set eye in the base (calyx). The background colour of the skin is light green, changing to yellow when ripe and overlaid with a pink to red blush, depending on the climate in which the apple is grown. High summer sunshine hours and cool autumns improve skin colour and flavour. The skin is relatively thin. The apple can be bruised when ripe, if not handled carefully. Pink Lady is not prone to scald in store if harvested at the optimum maturity, however it may scald if harvested immature.

Sundowner

Although Sundowner has the same parentage as Pink Lady, it is a highly different apple. It flowers early in spring, showing that it has a low winter chilling requirement. It ripens late in May and so is suited to apple-growing areas with long, hot summers and warm autumns.

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The variety proved very popular in London.
Other new apple varieties which could be exported

**Gala**
Gala ripens in February. Trees need picking three to five times because all fruit on a tree does not ripen at the same time.

Gala crops regularly and heavily. It is a high quality, crisp, juicy and sweet apple, but has a thin skin and bruises relatively easily. Colour is distinctive, with partial pink-orange stripes and a cream background.

Storage life is short, three months at the most, but this is sufficient for an early variety.

Western Australia has a two-week export window for Gala apples because its Gala ripens two weeks before New Zealand-grown fruit. Good prices are received in south-east Asia during this period.

**Royals**
Royal Gala is a more highly coloured mutation of ordinary Gala and ripens a week to 10 days later. Its export potential has not yet been tested, but its attractive appearance and good eating quality suggest that it has a bright future. As with ordinary Gala, trees are vigorous and cropping is regular.

**Fuji**
Fuji is a very sweet, juicy apple that ripens in April and has a long storage life. It is subject to water core, which may not be a disadvantage in south-east Asian markets.

**Red Fuji**
A dull red mutation of Fuji, Red Fuji is subject to russet (browning of the skin). Skin colour is generally better in areas with cool autumns. This variety may have export potential but it is already widely grown in all apple exporting countries around the world. Its very sweet and rather bland fruit flavour suits Asian palates. Growth is vigorous, with much fruit carried on the tips of branches. It is a reliable producer.

The changing scene in the Western Australian apple industry

In the 1960s, the local apple industry was firmly based on exports with half the crop sent overseas. Granny Smith was the dominant variety and constituted two-thirds of our orchards. Exports declined in the 1970s owing to an increase in the price of fuel oil and an overvalued Australian dollar, and a tree pull scheme was instituted.

By 1984, half the apple trees in the State had been removed, but owing to increased use of irrigation and generally better technology, production remained the same. More fruit was put on the local market or processed, but smaller quantities were still exported to south-east Asia. Exports to Europe ceased in 1990 owing to competition from countries with lower labour costs.

In 1983, only 11,804 new apple trees were planted, but numbers planted then increased to 36,056 in 1986 and 92,993 in 1990 (see table). This increase resulted from the release of new varieties such as Gala, Royal Gala, Fuji, Red Fuji, Pink Lady and Sundowner. Plantings of Golden Delicious and Lady Williams increased, and at the same time, the number of Granny Smith, Jonathan, Yates, Dougherty and Cleopatra trees declined rapidly. The change in varietal mix has been partly caused by breeding programs and partly by a change in public taste towards new and slightly sweeter apples.

Testing export markets

Australia's apple exports have declined in the past 20 years from 7 per cent of the world export market or 142,000 tonnes to 1 per cent...
or 23,000 tonnes. Other countries went down a different path and to remain competitive, devalued their currencies, had lower labour costs or restructured their industry by planting new varieties. The world’s apple markets are still vastly over-supplied with standard varieties such as Red Delicious and Granny Smith, while new high quality varieties such as Royal Gala and Braeburn sell well at profitable prices.

The Western Australian Apple and Pear Council, local exporters and the Western Australian Department of Agriculture have test marketed sales of Pink Lady in overseas markets, although it will be several years before enough Pink Lady apples are grown for export. Markets differ in that Asians like a sweet, rather bland apple for example Red Delicious and Red Fuji, while Europeans prefer a crisp, highly flavoured even rather acid apple such as Cox’s Orange. There is a growing international demand for apples that are different. This is exemplified by a change in surface colour from all green or red to partial red or pink.

**Hong Kong**

A few boxes of fruit were sent to Hong Kong in 1989 for consumer appraisal, and in 1991 more fruit was sent to Singapore and London. In a consumer survey in Singapore (conducted by Frank Flannagan of Edith Cowan University, Mount Lawley Campus), 67 per cent of consumers who tasted Pink Lady said they preferred it to Washington State Red Delicious because it was a crisper apple with a better flavour.

**London**

After a successful trade launch of Pink Lady apples in London in 1991, a few boxes of fruit were sent to Selfridges’ store, where consumers’ comments about the taste of this apple ranged from “enthusiastic” to “ecstatic”. As a result of this success, Western Australia’s growers sent a total of 10 tonnes of Pink Lady and Sundowner apples for sale in Selfridges in July 1992. Growers were paid $40 a box (18.6 kg) for the bare (unpacked) fruit of Pink Lady and $30 for Sundowner compared with the normal export price for bare fruit of $4.50 a box for Granny Smith.

Fruit was supplied by several growers but packed in one shed. The shipment arrived in London in good condition, but some Pink Lady fruit in the bottom of boxes was bruised, probably during unloading. The Sundowner was a much less bruised variety. Selfridges commented that the load should be on pallets so that individual boxes would not be handled until the fruit was unpacked in the retail store. In the tastings at Selfridges, slightly more customers preferred Pink Lady to Sundowner, but all appreciated being given a choice of varieties. Fruit sold quickly at the equivalent of more than $6 a kilogram.

At the same time, 160 boxes of 125 size Pink Lady were sold in Marks and Spencers stores in packs of four apples at the equivalent of $1.10 per apple.

**Taiwan**

In 1992, Australia shipped 70 tonnes of apples to Taiwan under that country’s quota system. Western Australia sent one 10-tonne container of Pink Lady to Taiwan in late July. Fruit arrived in good condition. Sales through the Welcomes chain store were brisk, at $8.64 a kilogram when the product was promoted and tastings were available. However, without promotion, sales slowed.

Taiwan is a small, but high priced market for quality apples. It is hoped that Australia’s quota will increase in future years.

**The future**

- Pink Lady and Sundowner compete well with other export apple varieties and are a premium product for which high prices are paid.
- Large quantities could be sold overseas at profitable prices, but sustained promotion is essential in new markets.
- Thanks to successful publicity and initiative shown by the Department of Agriculture in developing a Pink Lady logo, the apple is well known amongst the fruit importing trade and retailers around the world.
- Any further new apple varieties produced by the Western Australian breeding program are unlikely to be available until the end of the decade, owing to the slow speed of the breeding, selection and testing process. However, they will be protected by Plant Variety Rights, which in turn means that money will flow back into the program.