Fruit Varieties Journal 45(3):135-142 1991

# The Successful Introduction and Assessment of Low-chill Stonefruit in Australia

D. J. FIRTH,[1] M. R. LOEBEL,[1] AND REX SWEEDMAN[2]

## Abstract

The low-chill stonefruit industry in Australia has developed rapidly over the last decade coinciding with the release of low-chill cultivars bred at the University of Florida. Main cultivars currently grown are 'Flordaprince,' 'Flordagold,' 'Maravilha' and 'Sherman's Red' peach; and 'Sunred,' 'Sundowner,' 'Fla. 5-14N' and 'Sunripe' nectarine. Recent releases from Florida are currently being assessed and will replace some current commercial cultivars in the near future.

## Introduction

In the past decade low-chill peaches have become an important industry in Australia, especially on the North and Central Coast of New South Wales and coastal southern Queensland. Plantings on a lesser scale currently extend to 25 regions around Australia, not only in tropical and sub-tropical areas of New South Wales and Queensland, but also in the Swan Hill area of Victoria; Perth and Canarvon areas of Western Australia; and Alice Springs in the Northern Territory (2) (Fig. 1). The industry has grown from trial plantings in the late 1970's to an area of over 1000 hectares with an annual value of over $10 million in 1990.

Prior to the introduction of low-chill cultivars in the 1970's stonefruit was mainly grown in the traditionally temperate areas of Australia. Lower chill clones have served to advance market availability of peaches, nectarines and plums by 4 to 8 weeks from early October and currently demand commensurate high early-season prices.

## Early History of Low-chill Stonefruit

The expansion of the Australian low-chill industry over the past decade can be traced to the introduction and rapid distribution through the New South Wales quarantine facilities. Stonefruit growing has had a long history with 'Earle' peaches being advertised in the Sydney Gazette as early as 1804. An 'early' or low-chill stonefruit industry based on seedling selections was established on the outskirts of Syndey by the early 1900's. This industry was based on the aromatic, melting and white-fleshed cultivars introduced to Australia during early settlement by British and by Chinese immigrants. The main peaches grown were 'Rennie,' 'Clarkes,' 'Watts Early,' 'W. H. Spinks,' 'Edward VII,' 'Governor Rawson,' 'Early Becky,' 'Aunt Becky' and 'Fairfax' 'Bell's November,' 'Bell's Improved,' 'Doncaster' and 'Braddock' (4). There were no satisfactory early nectarines, although 'Goldmine' was grown in coastal areas with some success. The only plum varieties that performed well in warmer areas were 'Wilson' and 'Paterson Early.'

A small low-chill industry was also established near Newcastle (200 km north of Sydney) and further north in the coastal districts of the Brisbane area. 'China Flat,' 'Bell's November,' 'Beauty of Booroodabin,' 'Watt's Early Champion,' as well as dwarfed strains of peach predominated at this time.

In 1961 the NSW Agriculture & Fisheries established a stonefruit variety and rootstock trial on the lower North Coast of New South Wales (32°S) but the high chill cultivars used in this trial exhibited symptoms of inadequate chilling, including delayed foliation, variable fruit size and late harvest times. Due to poor tree per-

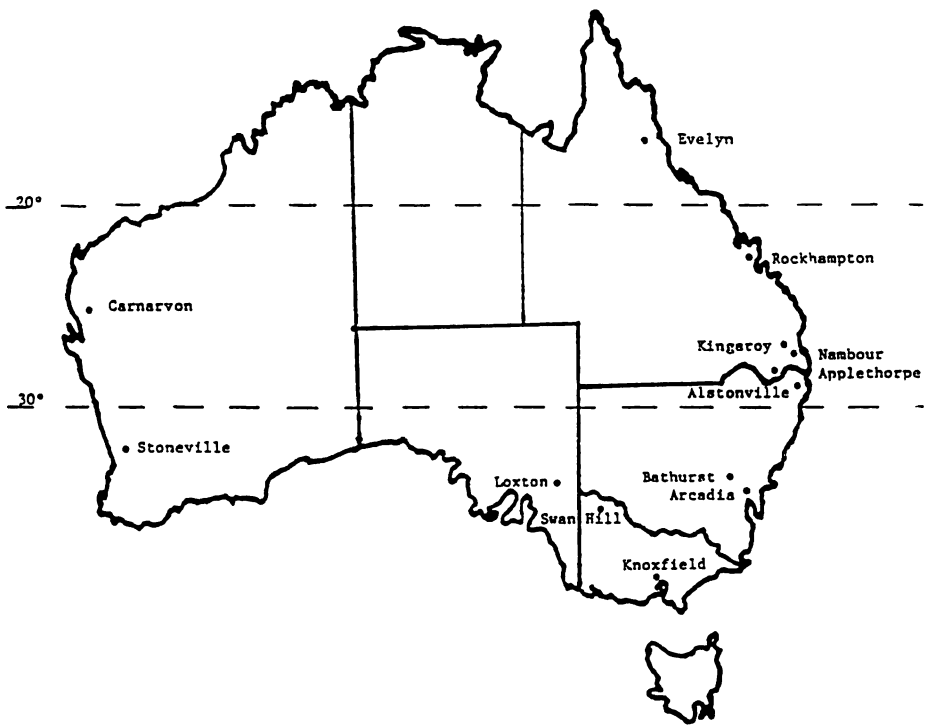
[1]Tropical Fruit Research Station, Alstonville, NSW Australia 2477.
[2]Principal Horticulturist (Deciduous Fruits) Sydney NSW Australia 2000.

formance and cropping, the trial was removed in 1968. Urban expansion within the Sydney area removed much of the stonefruit industry previously serving the early market within Australia. This vacated a market niche for early-season stonefruit. Once the potential of low-chill stonefruit to fill and expand this market niche was realized, the development of a viable industry followed.

**Introduction of Low-chill Varieties**

In 1968, 'Flordasun' and 'Maravilha,' the first early low-chill cultivars from the University of Florida's breeding program were introduced. In 1971 'Flordaqueen' and 'Flordahome' were planted at Bathurst, a high chill area (west of Sydney) but their performance was not impressive due to regular spring frosts.

During 1973 a low-chill stonefruit evaluation program using cultivars from the University of Florida and Texas A. and M. University breeding programs was commenced, with a total of 72 peaches, 35 nectarines and 24 plum clones imported between 1973 and 1990. These introductions were quarantined and then evaluated in the Hills District near Sydney, and at Alstonville on the North Coast of New South Wales. Plantings in south-east Queensland subsequently followed. Initial evaluation commenced at Canarvon in Western Australia in 1977. All introductions were also established in the arboretum at Bathurst Agricultural Research Station and over recent



years in the Fruit Variety Foundation and Stonefruit Multiplication Unit at Frankston, Victoria. Five low-chill cultivars were also introduced by the South Australian, Queensland and Victorian Departments of Agriculture and evaluated with the Florida material.

### The New Era

In 1978-79, 'Flordaqueen' and 'Flordasun' peach and 'Sunred' nectarine were established on the Far North Coast of New South Wales and at the Department of Primary Industries Granite Belt Research Station at Stanthorpe in southern Queensland, and from there to Ravenshoe near Atherton in north Queensland, and Department of Primary Industries officers at Atherton, Nambour and Kingaroy in southern Queensland (See Fig. 1). Also, in the same year, further cultivars were made available from Bathurst Agricultural Research Station. In 1979, Fla. 2.2 (later named 'Sherman's Red'), Fla. 3.1 ('Sherman's Early'), 'Flordagold,' 'Flordabelle' and 'Flordared' were also planted at these sites. The South African low-chill white-fleshed cultivars 'Albatross,' 'Orion' and 'Earlibelle' were also planted in northern New South Wales, along with some local selections including 'Barten,' a large white-fleshed peach and 'Bangold,' an 'Elberta' seedling.

'Flordaqueen' and the local selections were discarded because of their high chilling requirement but 'Flordasun' and 'Maravilha' peaches and 'Sunred' nectarine were highly successful in their cropping and went on to form the basis of the first commercial low-chill stonefruit orchards on the Far North Coast of New South Wales, and at Ravenshoe in north Queensland.

The industry expanded rapidly in the early-mid 1980's in northern New South Wales and southern Queensland, and by 1983 plantings were commencing at Canarvon in Western Australia. At that time the major cultivars were 'Flordasun'and 'Maravilha' peaches and 'Sunred' nectarine. Nevertheless, they were not without their problems as 'Flordasun' overset and produced small fruit, 'Maravilha' was too soft and broke down quickly on ripening, whilst 'Sunred' required heavy thinning to obtain adequate fruit size.

By the mid 1980's 'Flordasun,' 'Maravilha,' 'Sherman's Early' and 'Sherman's Red' peaches and 'Sunred' nectarine had been superseded on the North Coast. 'Flordaprince' and 'Flordagold' peach and 'Sundowner' nectarine became the major cultivars grown in northern New South Wales and southern Queensland, mostly on "coastal" seedling and some on Okinawa rootstock. 'Flordaprince' is still the main early cultivar in these areas, although growers are encountering problems with bacterial spot (Xanthomonas campertris pv. pruni) and tree management as trees age. Bacterial spot is also proving troublesome for 'Flordagold' in some areas. 'Flordaking' with relatively high chill requirement only performs in colder areas. 'Sundowner' nectarine is of similar maturity, season and quality to 'Sunred,' but requires less thinning. However, 'Sunred' is still the main variety in N.S.W.

### Latest Generation

In 1986 the first of a new generation of Florida clones was planted in the Sydney Hills District and at the Tropical Fruit Research Station, Alstonville, and soon after at Nambour, Lockyer Valley and other centers in coastal Queensland from latitude 17°S to 28°S. The first of the Florida plum clones was also planted including 'Gulf Ruby' and 'Fla. 8-1' pollinator. Extensive company plantings of low-chill stonefruit were made in the Coffs Harbour area on the North Coast and comprised the largest plantings in one area in Australia.

By 1990, 131 low-chill clones had been imported, mostly from Florida and 92 released, half since 1985. These were planted at Sydney and northern New South Wales and soon after at Nambour and other centers in Queensland before district release. Details of

**Table 1. Performance of Stonefruit Cultivars Assessed in Australia to 1989. a) Introduction of Stonefruit Cultivars from the University of Florida.**

| Florida code no. | Cultivar | Est. chill units | Year of intro-duction | Release date mth./yr. | Year planted north coast NSW | Comments (1989) |
|---|---|---|---|---|---|---|
| **Peaches** | | | | | | |
| | Flordaqueen | 550 | 1964 | N/A | 1979 | Soft yellow flesh, obsolete. |
| | Flordahome | 400 | 1964 | N/A | | Ornamental white flesh. Not tested on North Coast. |
| 13-72 | Maravilha | 250 | 1968 | 12/71 | 1979 | White flesh, too soft, browning flesh, likely to be replaced by Flordaglo. |
| | Flordasun | 300 | 1968 | 4/72 | 1978 | Needs heavy thinning—lacks firmness and skin color; obsolete. |
| 3-1 | Sherman's Early | 425 | 1976 | 2/77 | 1979 | Small, moderatechilling, soft tip, discarded. |
| 2-2 | Sherman's Red | 300 | 1976 | 2/77 | 1979 | Medium size, some tip, may be replaced by 82-3; obsolete. |
| | Flordabelle | 150 | 1976 | 6/80 | 1979 | Late, large, poor color, replaced by Newbelle. |
| | Flordared | 100 | 1976 | 6/80 | 1979 | Lacking color, lacks firmness, flesh browns, late season, obsolete. |
| 15-39 | Flordagold | 325 | 1976 | 6/80 | 1979 | Very firm, large, poor shape with inadequate chilling. Current midseason standard variety. |
| 5-2 | Flordaprince | 150 | 1977 | 7/81 | 1982 | Main early variety 1989. Very colorful, firm, susceptible to bacterial spot and russet. |
| 15-34 | Flordaking | 400 | 1977 | 4/83 | 1982 | Very large, poor shape with low-chill, short fruit dev. period, split stones in early years. Limited place. |
| 16-33 | San Pedro | 325 | 1978 | 4/83 | 1982 | Lacking color, strong tip, soft—good home garden variety, obsolete. |
| 5-5 | | 300 | 1977 | 2/85 | 1985 | Early, too small, poor color, slow to break dormancy. |
| TA170 | EarliGrande | 200 | 1977 | 2/85 | 1985 | Very early, low red color, large for season, soft. |
| 46A4 | | 400 | 1977 | 2/85 | 1985 | White, too soft, lacking color, inadequate chill on North Coast. Discarded. |
| 3-2 | | 200 | 1981 | 2/86 | 1986 | Flordaking time, short fuzz, slightly flat, uniform crop, looks promising. |
| 7-1 | Florgagem | 250 | 1982 | 2/86 | 1986 | Very attractive, firm, good quality, but strong suture bulge. Suits cooler areas. |
| 7-11 | | 350 | 1982 | 2/86 | 1986 | Firm, semi-freestone, after Flordagold. |
| 8-1 | Flordastar | 225 | 1982 | 2/86 | 1986 | Firm, early, may replace Flordaprince where bacterial spot occurs if size improves. |
| 8-7 | | 250 | 1982 | 2/86 | 1986 | — |
| 8-14 | | 300 | 1982 | 2/86 | 1986 | Very large, after Flordagold; lacks flavor and color for this season. |
| 9-1 | Flordadawn | 200 | 1981 | 2/86 | 1986 | Very early, 10 days before Flordaprince, small, too soft. |
| 9-4 | | 275 | 1982 | 2/86 | 1986 | Early, good size, tip too soft. |
| 9-8 | | 250 | 1982 | °S.I.Q. | — | — |

**Table 1.a) (Continued).**

| Florida code no. | Cultivar | Est. chill units | Year of intro-duction | Release date mth./yr. | Year planted north coast NSW | Comments (1989) |
|---|---|---|---|---|---|---|
| 9-10 | Desertred | 150 | 1982 | 2/86 | 1986 | Medium size, good color, bacterial spot recorded. Not suited to high rainfall areas. |
| 14-55 | | 350 | 1982 | °S.I.Q. | — | — |
| 10-64 | FlordaGrande | 75 | 1984 | 4/87 | 1988 | After Flordagold, may suit lowest chill areas, only fair flavor/color. Not fully evaluated yet. |
| 26-31 | FlordaBeauty | 150 | 1984 | 4/87 | 1987 | Similar to Flordabelle but one week earlier; little improvement. Discarded. |
| 1-8 | | 400 | 1984 | 4/87 | 1988 | — |
| 8-6 | | 300 | 1982 | 4/87 | 1987 | Mid season, good size and color, bacterial spot in 1988. Further testing. |
| 9-14 | | 200 | 1984 | 4/87 | 1987 | 10 days after Flordagold, medium size, firm, bumpy shape, others better. |
| 9-20C | | 300 | 1984 | 4/87 | 1987 | Late, low-chill processing, acid red color, nonmelting, export potential. Needs comparison with other 'c's when released. |
| 81-9 | | | 1984 | 4/87 | 1987 | Others better. Late, low color. |
| 81-8 | | 250 | 1984 | 7/87 | 1987 | Others better. |
| 82-8W | | | 1984 | 4/87 | 1987 | Soft. Discarded. |
| 82-9W | Flordaglo | 200 | 1984 | 4/87 | 1987 | White, very large, follows Florda-prince, firm, nonbrowning, fleshy, looks promising. |
| 82-24W | TropicSnow | 250 | 1984 | 4/87 | 1987 | Large, white, freestone, mid season—suture bulge; promising. |
| IEI38 | Newbelle | 150 | 1984 | 7/87 | 1988 | Replaces Flordabelle—has bright yellow ground color; promising. |
| 81-12 | | 250 | 1984 | 7/87 | 1988 | Mid season, large, lacks color, pointed. |
| 82-2 | | 200 | 1985 | 7/87 | 1988 | Very early, too small. |
| 82-3 | | 250 | 1985 | 7/87 | 1988 | Early, should replace 2-2 (Sherman's Red). |
| 82-19 | Flordacrest | 400 | 1985 | 7/87 | 1988 | Good variety, 1 week after Florda-king, attractive, firm, poor shape with inadequate chill. Not fully evaluated yet. |
| 82-21 | | | 1985 | 7/87 | 1988 | Late season, good color, quality, not fully evaluated. |
| M2-3 | | 450 | 1985 | 7/87 | 1988 | Unsuited to low-chill areas. |
| 5-12 | TropicSweet | 200 | 1986 | 6/89 | 1989 | Not evaluated yet. |
| 84-3 | | 150 | 1986 | 6/89 | 1989 | Ripe one week before Flordaprince, size small, not fully evaluated. |
| 84-5 | | 150 | 1986 | 8/89 | 1989 | Worth testing in areas where Florda-prince russets, similar to Florda-prince, same season. Not fully evaluated. Susceptible to bacterial spot. |
| 84-12C | ORO A | 350 | 1986 | 6/89 | 1989 | Small, round, yellow fruit. May have export potential. Not yet evaluated. |

**Table 1.a) (Continued).**

| Florida code no. | Cultivar | Est. chill units | Year of introduction | Release date mth./yr. | Year planted north coast NSW | Comments (1989) |
|---|---|---|---|---|---|---|
| **Nectarines** | | | | | | |
| | Sunred | 250 | 1968 | 2/77 | 1979 | Standard variety, likely to be superseded. Requires heavy thinning. |
| 44-28N | Sunlite | 450 | 1976 | 2/77 | 1979 | Needs more size for late season. Better for cooler inland sites. |
| 6-3N | Sundowner | 300 | 1977 | 10/81 | 1982 | Current standard variety; likely to be replaced due to thin skin and some tip in lower chill areas. |
| 3-4N | | 350 | 1977 | 4/83 | 1982 | Soft on suture—greenish ground color. Fills market gap between Sundowner, 5-14N. |
| 5-13N | | 250 | 1977 | 4/83 | 1982 | Small fruit. Skin cracks and russets. Discarded. |
| 5-14N | | 300 | 1977 | 4/83 | 1982 | Nice late, attractive—susceptible bacterial spot. |
| 5-15N | | 350 | 1977 | 4/83 | 1987 | Very attractive, late freestone, long, medium size. Not fully assessed. |
| 7E62N | Sunripe | 400 | 1977 | 4/83 | 1979 | Many sugar speckles, but good late season variety in district up to 1989. |
| 7-3N | | 350 | 1981 | 2/86 | 1986 | Soft on suture. Discarded. |
| 7-4N | Sungem | 425 | 1981 | 2/86 | 1986 | Attractive bright red, small, round, firm. Higher chill required. |
| 8-2N | | 400 | 1981 | 2/86 | 1986 | Similar to Sungem in seasom—long fruit—suture softens, tends to crack easily, higher chill sites needed. |
| 8-8N | | 150 | 1981 | 2/86 | 1986 | Low set, tends to crack easily, discarded. |
| KSE15N | | 350 | 1981 | 2/86 | 1986 | Late, large fruit, good color with sugar speckles. May suit medium chill localities. |
| 9-6N | | 200 | 1982 | 2/86 | 1986 | Early large nectarine, dark in color, higher chill than indicated. |
| 9-8N | | 250 | 1982 | 7/87 | | Bud set may be too light, greenish ground color, large fruit. |
| 9-12N | | 225 | 1986 | 1982 | 1986 | Promising. 9-11N may be better—not as dark, same season. |
| 9-13NR | Sunhome | 275 | 1982 | 2/86 | 1986 | Red leaf ornamental to replace Sunred in home gardens. |
| 9-15N | Sunblaze | 250 | 1982 | 2/86 | 1986 | One of best mid season. Similar color to 9-6N. |
| 82-25N | | 300 | 1984 | 4/87 | 1986 | Male, sterile, late, large nectarine, very nice, some blind buds. |
| 82-1N | | 425 | 1986 | °S.I.Q. | | Red leafed, double flowers, very late. |
| 8-12N | | 350 | 1984 | 4/87 | | |
| 9-11N | | 250 | 1984 | 4/87 | 1987 | Ripens between 9-6N and 9-15N. Similar fruit. Looks promising. |
| 81-6N | | 150 | 1985 | 4/87 | 1987 | Small, dark red, round, one week later than 81-17N. |
| 81-17N | | 150 | 1985 | 4/87 | 1987 | Small to medium but earliest ripening of low chill. Looks most promising. |

**Table 1.a) (Continued).**

| Florida code no. | Cultivar | Est. chill units | Year of introduction | Release date mth./yr. | Year planted north coast NSW | Comments (1989) |
|---|---|---|---|---|---|---|
| 82-23N | | 250 | 1985 | 4/87 | 1988 | Late ripening, large freestone—good potential. |
| M2-4N | Sundollar | 450 | 1985 | 4/87 | 1987 | Higher chill, tendency to crack. |
| 8-13N | Sunbob | 200 | 1985 | 7/87 | 1987 | Male sterile. Ripens with Sunblaze, lobed shape with low chill. Further testing. |
| C73-40N | Sunfre | 525 | 1986 | °S.I.Q. | | |
| 81-24N | | 300 | 1986 | 6/89 | 1989 | |
| 84-16N | | 250 | 1986 | 6/89 | 1989 | |
| **Plums** | | | | | | |
| 8-1 | | 200 | 1982 | 10/86 | 1989 | Small, round red fruit, pollinizer for Gulfruby. |
| 8-2 | Gulfruby | 275 | 1985 | 2/86 | 1986 | First good quality, early season plum with size. |
| 3-4 | Golfgold | 350 | 1985 | 4/87 | 1987 | Late, large, yellow; too late for low chill market. |
| 85-1 | | 275 | 1986 | 6/89 | 1989 | Late pollinizer for Gulfruby. |
| 86-1 | | | 1988 | 1990 | | Not evaluated yet. |
| 86-2 | | | 1988 | 1990 | | |
| 86-3 | | | 1988 | 1990 | | |
| 86-4 | | | 1988 | 1990 | | |
| 86-5 | | | 1988 | 1990 | | |
| 86-7 | | | 1988 | 1990 | | |
| 86-8 | | | 1988 | 1990 | | |
| 86-9 | | | 1988 | 1990 | | |
| 87-1 | | | 1988 | 1990 | | |
| 87-2 | | | 1988 | 1990 | | |
| 87-3 | | | 1988 | 1990 | | |
| 87-4 | | | 1988 | 1990 | | |
| 87-5 | | | 1988 | 1990 | | |
| 87-6 | | | 1988 | 1990 | | |
| 87-7 | | | 1988 | 1990 | | |
| 87-8 | | | 1988 | 1990 | | |
| 87-9 | | | 1988 | 1990 | | |
| 87-10 | | | 1988 | 1990 | | |
| 87-11 | | | | 1990 | | |

clonal assessment are shown in Table 1. An annual assessment update is published for industry (1, 3).

The criteria for assessment of clones includes data on budbreak, flowering and fruit set, fruit maturity time and range, yield, % size distribution, fruit characteristics of shape, ground color, flesh color, attractiveness, suture, tip, cavity, flavor, fruit quality, stone freedom, firmness and disease susceptibility, especially bacterial spot.

## The Future

The low-chill stone fruit industry is now well established in Australia following introduction of a large number of clones over the first decade. It has been generally acknowledged that lower levels of fruit set are required in Australia compared to Florida where late freezes reduce fruit numbers. This will be considered when future selections are made for the Australian low-chill industry.

## Table 1. b) Stonefruit Cultivars From Other Sources.

| Aust. access | Cultivar | Origin | Est. chill units | Year of introduction | Release date | Year planted north coast NSW | Comments (1989) |
|---|---|---|---|---|---|---|---|
| **Peaches** | | | | | | | |
| Nil | China Flat | Local selection | 125 | | | 1980 | Old low chill variety, red, flat shape, yellow flesh, sweet, late. |
| Nil | Hicks selection | | | | | 1980 | Early season, discarded. |
| Nil | Barten | | | | | 1980 | Late, large, discarded. |
| Nil | Bangold (Elberta) | | | | | 1980 | Too high chill requirement. Poor fruit color, late December. Discarded. |
| IV792524 | Candor | North Carolina | | 1977 | 1979 | 1984 | Too high chill requirement, low vigor, discarded. |
| IQ824068 | Fairway | California | | 1982 | 1984 | 1984 | Too high chill requirement, low vigor, discarded. |
| | Golden Queen | New Zealand | | 1961 | | | Too high chill requirement, low vigor, discarded. |
| IV732526 | Earlibelle | South Africa | 350 | 1973 | 1975 | 1980 | After Flordagold; large, white flesh, soft, unattractive. |
| IV732542 | Orion | South Africa | | 1973 | 1975 | 1980 | Mid season, white clingstone, Flordagold time. Suit inland. Discarded. |
| IV732518 | Albatross | South Africa | | 1973 | 1975 | 1980 | Late, after Flordagold, white flesh, good flavor. |
| IS715161 | Culemborg | South Africa | | 1971 | 1975 | 1983 | Late, large, white flesh, good flavor, stores well. |
| IQ794032 | Red Ceylon | Florida | | 1977 | 1981 | 1981 | |
| IQ844083 | De Wet | South Africa | | 1984 | 1986 | 1987 | Good size, early, soft tip, poor taste. |
| IQ824061 | EarliGrande | Texas | | 1977 | 1985 | 1985 | Early, good size, low red color, soft. |
| IN840499 | Idlewild | Louisiana | | 1984 | 1987 | 1988 | Not fully assessed as at 1989. Too late for lower chill near coastal areas. Too high chill. |
| IN840500 | La Feliciana | Louisiana | | 1984 | 1987 | 1988 | " " " |
| IV752482 | Sunnyside | California | | 1975 | 1980 | 1988 | " " " |
| IN840491 | 71-A73-3— | Louisiana | | 1984 | 1987 | 1988 | |
| | Semi-Red) | Moreton Bay | | | | 1985 | Too soft. Discarded. |
| | AllRed) | Q'ld. Allnut | | | | 1985 | Too soft. Discarded. |
| IV772476 | Earlired | USDA Maryland | | 1977 | 1980 | 1985 | Too soft. Discarded. |
| **Nectarines** | | | | | | | |
| | Brendavilha | Local selection | | | 1986 | 1986 | Early white flesh, too soft. |

## References


1. Firth, D. J. 1989. Low-chill stonefruit variety assessment, North Coast 1988. NSW Agriculture & Fisheries information sheet. Agdex 215/34.
2. Loebel, R. 1987. Low-chill stonefruit industry around Australia, pp. 39-45. In: Skinner, I. (ed.) Proc. First National Low-chill Stonefruit Conf., Exotic Fruit Growers Assn., Lismore, NSW, Australia.
3. Sanewski, G. 1989. Low-chill stonefruit fact sheet. Queensland Primary Industries.
4. Sweedman, R. 1987. An overview (of the low-chill stone fruit industry). In Proceedings. First National Low-chill Stonefruit Conf., Lismore, 2-4 September.