



# Farmnote

## Mandarins, tangors and tangelos for Western Australia

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### Introduction

The citrus industry in Western Australia is dynamic and continually changing to meet the needs of the market and consumers.

The industry is always looking for new varieties that will:

- extend the season (good early and late cultivars)
- replace older varieties that have cultural problems (rootstock incompatibility, thorniness and overcropping)
- provide improved fruit quality (easy peel, fewer seeds and better colour)

The WA Department of Agriculture and Food, with industry cooperation, maintains major variety demonstration sites at West Gingin, Bindoon and Wokalup. New varieties made available by Auscitrus are reworked on trees at these sites allowing for rapid evaluation. This is possible because of the high level of collaboration and generous support from F&J Taddei Nominees, Niela Citrus and the WA College of Agriculture at Harvey.

This Farmnote is intended to provide basic information on some of the commonly grown varieties in Western Australia. It also provides information about less common varieties and varieties that have recently been released in Australia and have not yet been extensively tested under Western Australian conditions.

### Choosing varieties

Choosing varieties for your orchard can be difficult, especially if you are looking at new varieties that have not had extensive evaluation in your area. There are a number of considerations that will improve your chance of success with a new variety.

- Consider the market for the variety you intend to plant
- Look for information on the performance of varieties in conditions similar to yours
- Always purchase trees from a reputable nursery where the source of the bud-line is known.
- Select suitable rootstocks for your variety and local conditions.

Remember maturity times will vary from one location to another. Keep in mind the impact the new variety will have on your operation. Maturity times may clash with existing varieties in the orchard.

If information is limited, you may wish to rework a few existing trees to evaluate the new variety before committing to large numbers.

### What are mandarins, tangors and tangelos?

Mandarins (also known as tangerines) are a variable group of loose skinned citrus fruit with a characteristic aromatic flavour. They are popular because they eat well, and are easy to peel and separate into segments. Although its origin is unclear, the mandarin is thought to have come from north-east India or south-west China. From its origin, the mandarin spread throughout much of south-east Asia and is now grown in suitable climatic regions throughout the world.

Tangors and tangelos are terms used for hybrids created from crossing mandarins with other citrus types. Tangors are the result of a mandarin orange cross and tangelos are the result of a mandarin grapefruit cross. In many instances it can be difficult to determine the difference between the three groups, especially if the parentage is not known.

### Mandarin varieties

The most commonly grown mandarin in WA is the mid-season Imperial, to which all other varieties are compared and around which other varieties are planned. The main early season variety is the Nules Clementine and the most popular later variety is Hickson. Of the newer varieties, industry has shown most interest in the mid-season variety Daisy, as it is very attractive and distinctly different to Imperial.

**Avana Apireno and Avana Tardivo (recent introductions):** (Available through Auscitrus and local nurseries) The Avana are a group of Mediterranean mandarins also known as the Willowleaf group. There are a number of improved selections or clones in this group including Avana Apireno and Avana Tardivo. These selections originated in Italy and were introduced into WA in 2002. Early evaluation shows they are similar in many ways to Imperial. Apireno fruit have similar seed numbers, flavour, size and skin peel-ability but fruit

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mature about 3 to 5 weeks later. Colour development appears to be slightly slower. Like Imperial, fruit quality can deteriorate quite quickly if left on the tree too long. Tardivo is also very similar to Imperial. It matures 6 to 8 weeks later and the fruit appear to be slightly smaller and seedier. Colour development is also slower, however it does maintain fruit quality on the tree quite well. Both selections also have the same upright growth habit and narrow leaves of Imperial. These varieties may have a place in extending the season for Imperial like varieties in the local market. Evaluation in WA is continuing.

**Caffin Clementine (recent introduction):** *(Available through Auscitrus and local nurseries)* Imported into Australia from New Zealand. Early evaluation of this variety at West Gingin shows that fruit mature slightly earlier than Nules and colour up better, however fruit quality cannot be maintained on the tree for as long. Evaluation in WA is continuing.

**Clausellina (Satsuma or Japanese mandarin):** *(Available through Auscitrus and local nurseries)* This variety is a bud mutation of Owari satsuma selected in 1962 in Spain. It was imported into Australia in 1990. It is an early seedless variety that does not keep on the tree, going puffy, dry and soft quickly. Like other satsuma mandarins, internal maturity occurs before full colour is achieved and fruit will require de-greening. Inferior to other Satsuma types and not recommended for planting in WA.

**Clementard Clementine:** *(Available through Auscitrus and local nurseries)* Introduced into Australia in 1990, this Spanish variety is most likely a mutation of Fina. Trees are dense and need significant structural management. Fruit mature just after Nules. Some de-greening of fruit may be necessary. In WA trials this variety has not cropped well and it is not recommended for planting.

**Corsica 1 and Corsica 2 Clementines (recent introductions):** *(Available through Auscitrus and local nurseries)* Imported from New Zealand, these 2 selections of clementine mandarin originally came from the Mediterranean region. They both mature at a similar time to Nules clementine however evaluation at West Gingin and Wokalup has shown fruit quality to be inferior to Nules. They are not recommended for planting in WA.

**Daisy (recent introduction):** *(Available through Auscitrus and local nurseries)* Developed in California by the US Department of Agriculture, this early to mid season variety matures at a similar time to Imperial. Fruit are a glossy red-orange colour, have good eating qualities and keep on the tree quite well. The fruit can be quite seedy (15–20 seeds per fruit) when grown with other seeded varieties. Daisy has shown promise in testing at West Gingin, Bindoon and Wokalup and some plantings have been established by local growers.

**Dancy:** *(Available through Auscitrus and local nurseries)* This mid season variety is not widely planted in Western Australia. The fruit is thin-skinned easy peel with smooth, fairly glossy bright red-orange rind. It is small to medium in size, juicy and has good flavour. The ripening period is June through July, depending on locality, and usually falls between the varieties Imperial and Emperor.

**Emperor:** *(Available through Auscitrus and local nurseries)* Follows Imperial in maturity, however there are many different strains in the industry with large variations in quality. The fruit has a pale orange skin that is prone to becoming puffy. Maturity occurs from mid June to late July. Flavour is average and fruit can be dry if picking is delayed. Emperor has declined in popularity and is now only grown by a small number of citrus orchardists.

**Fallglo (recent introduction):** *(Available through Auscitrus and local nurseries)* A cross between Temple and Bower made in Florida by the US Department of Agriculture. Fallglo is an early to mid-season variety with good size. The fruit are attractive and are characterised by a distinctive small-depressed navel. Fruit can be very seedy and yields at West Gingin have been light to moderate.

**Fina Clementine:** *(Available through Auscitrus and local nurseries)* Thought to have been introduced into Spain from Algeria in 1925 this variety was the foundation of Spain's Clementine industry. Introduced into Australia in 1987. Fruit mature in April and are small. This variety has not been grown in significant numbers by local industry.

**Fortune (recent introduction):** *(Available through Auscitrus and local nurseries)* A late maturing Californian variety originating from a cross between Algeria clementine and Dancy. This variety is currently undergoing evaluation at West Gingin. Fruit have good colour but biannual bearing has been observed and in some years fruit size has been quite small. Fruit are also very seedy and are noted for their high acidity levels which may be a problem.

**Freemont (recent introduction):** *(Available through Auscitrus and local nurseries)* This variety was derived from a cross between Clementine and Ponkan carried out in 1964 in Florida. At West Gingin this variety matures in May and has an excellent orange colour but fruit have been consistently small and seedy. It is likely that heavy thinning will be required to produce good size.

**Hickson (industry standard):** *(Available through Auscitrus and local nurseries)* A productive high quality mid to late season variety introduced into Western Australia from Queensland. The variety needs detailed pruning in the early years to separate the branches. It is prone to bad crotch angles and susceptible to limb splitting under crop load if the main branches are not staggered.

**Imperial (industry standard):** *(Available through Auscitrus and local nurseries)* Imperial is a widely planted and popular variety in Western Australia. Fruit have excellent colour and flavour and thin, smooth, glossy and easy to peel rind. Older trees may develop a biennial bearing habit that can be controlled by chemical thinning in the heavy crop year. Harvest period is from May to August depending on location. Imperial is incompatible with some rootstocks and fruit are susceptible to watermark.

**Kara:** *(Available through Auscitrus and local nurseries)* This late season variety has recently lost popularity with the local industry. The fruit is well sized, juicy and highly coloured but fruit hold their acidity levels for too

long and can have high seed numbers. Some fruit can develop a rough pebbly skin. Fruit will become puffy if left on the tree too long. Kara is not recommended for planting in WA.

**Marisol Clementine:** (Available through Auscitrus and local nurseries) This is the earliest of four clementine selections that were introduced into Australia in 1987. It ripens in early April. Fruit are medium size but mature very fast on the tree and must be harvested as soon as they are mature. This variety has not been grown in significant numbers by local industry.

**Miho (Satsuma or Japanese mandarin):** (Available through Auscitrus and local nurseries) This variety of satsuma (mikan) mandarin was developed in Japan from the Miyagawa variety and was released in Australia in 1996. It ripens in early to mid April at West Gingin. Like other Japanese mandarins it has no seeds and requires de-greening as internal maturity occurs before full colour development. Fruit will not keep well on the tree and must be picked at optimum maturity or they become puffy, soft and develop off flavours. It is expected that, like other satsuma mandarins, Miho should have good cold tolerance. Satsuma mandarins require a high degree of tree management to produce marketable quality fruit.

**Nova (Suntina) (recent introduction):** (Available through Auscitrus and local nurseries) This Florida hybrid of Fina Clementine and Orlando Tangelo has a distinctive reddish-orange rind and produces medium to large sized fruit. The skin can be a little difficult to remove but the internal qualities are good. Fruit peel-ability improves if fruit are left on the tree a little longer. At West Gingin it matures in May at the same time as Imperial. Fruit will be seedless if grown in isolation but can be quite seedy when grown in mixed planting's. Granulation (internal drying) has been observed in late hanging fruit.

**Nules Clementine (industry standard):** (Available through Auscitrus and local nurseries) Nules is the best of the established Clementine selections in Western Australia and is currently the major clementine variety grown here. It is one of the most important varieties grown in Spain. The fruit have quite good eating qualities and keep much better on the tree than other currently available varieties. Fruit are reasonably sized and ripen in early to mid April, about 3 weeks after Marisol. Fruit ripen internally before colour has fully developed and de-greening may be required if early harvesting is desired.

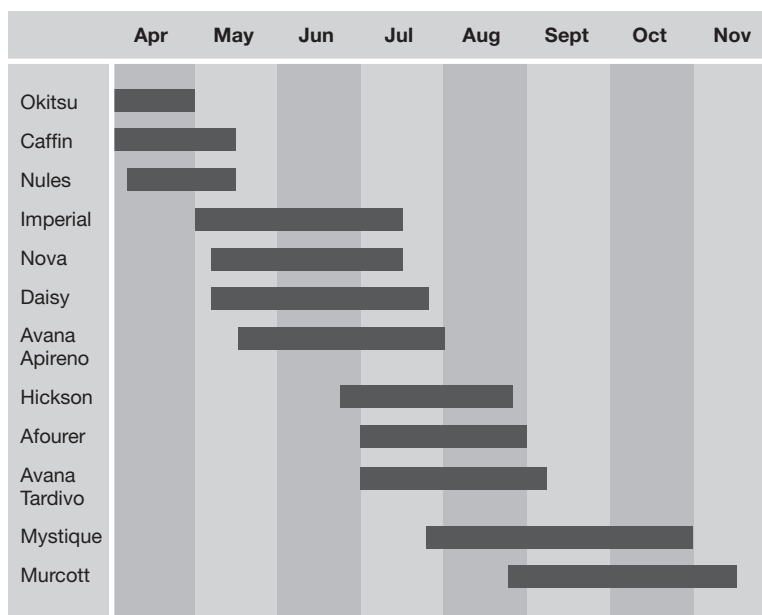
**Okitsu (Satsuma or Japanese mandarin):** (Available through Auscitrus and local nurseries) This satsuma (mikan) mandarin variety has a similar history to Miho. At West Gingin it ripens early in mid April. It has no seeds and requires de-greening as it matures internally before full colour is achieved. It will not keep well on the tree and must be picked at optimum maturity or fruit become puffy, soft and develop off flavours. It is expected to have good cold tolerance and like other satsuma mandarins will require a high degree of tree management to produce fruit of sufficient quality to market.

**Oroval Clementine:** (Available through Auscitrus and local nurseries) This Clementine selection matures earlier and is larger than Nules Clementine but fruit quality is not as good. This variety has been available for many years but has not been taken up by the local industry.

**Silver Hill (Satsuma or Japanese mandarin):** (Available through Auscitrus and local nurseries) This is a satsuma (Japanese mandarin) type that has been available in Western Australia for many years. It matures several weeks before Imperial. The fruit are smooth skinned and easy to peel but tend to lack flavour. Skin colour can be variable and fruit become puffy when overripe.

**Sunburst:** (Available through Auscitrus and local nurseries) This variety comes from Florida and is a cross between sister varieties Robinson and Osceola. It is very highly coloured and has a distinctive segmented appearance but is very seedy and in evaluation at West Gingin, fruit have become puffy prior to reaching the accepted marketable sugar/acid ratio of 8:1.

**Taylor-Lee:** (Available in Queensland through Golden Grove Garden Centre) The Pressler family at Emerald selected this mid season variety. It was grown from seed and one of the parents is Murcott. Fruit are medium/large and have good colour and eating qualities. The skin is tight but much easier to peel than Murcott. This variety has not been evaluated in WA but fruit from the Eastern States has been sold on the local market here.



Maturity times for some mandarin and tanger varieties at West Gingin.

## Tanger Varieties

Tangors are a cross between a mandarin (Tangerine) and an orange. Although attractive, the fruit does not peel as readily as true mandarins. The most commonly grown tanger in WA is the late variety Murcott. There has also been substantial planting's of the newer variety Mystique and some interest in another new variety Afourer. Ellendale, which was a popular variety twenty years ago, has lost favour in more recent years.



**Afourer (Delite) (recent introduction):** (*Available through Auscitrus and local nurseries*) Afourer is considered by some to be one of the most promising new varieties worldwide. Maturity testing at West Gingin shows that it reaches the required 8:1 brix/acid ratio in early July but it does not reach its peak until late August. It develops a highly attractive deep orange/red colour and is easy to peel. It has good flavour with acceptable, but not excessive acid. It is medium sized but can crop heavily in some years requiring thinning. Although seedless if grown in isolation it can be quite seedy when grown in mixed planting's. It was originally anticipated that this variety would mature late enough to replace Murcott in Western Australia. Testing has shown that this is not the case as it matures well before Mystique and Murcott. Some trial planting's of Afourer have recently been established by local industry.

**Ellendale:** (*Available through Auscitrus and local nurseries*) This variety is usually of good size with excellent flavour and juice content although seed numbers can be high (15 to 22 per fruit). If the fruit is left on the tree too long it will become dry. The harvest period is from mid August to late September. Some early budlines of this variety were poor and trees did not set a good crop however improved selections such as **Leng** and **Herps** are now available and should be used. Obtaining trees through a reputable nurseryman should help overcome this problem.

**Murcott (industry standard):** (*Available through Auscitrus and local nurseries*) This is an attractive juicy thin-skinned variety with good flavour that is popular in the marketplace. Over-cropping can be a problem with this variety and fruit can be small if not thinned adequately. Seed numbers can be high. Fruit mature from mid August to October. If the fruit are left standing too long, the skins become leathery and difficult to peel. It should be noted that instances of sudden tree death on some rootstocks are common with this variety.

**Ortanique (Topaz) (recent introduction):** (*Available through Auscitrus and local nurseries*) Ortanique is a tangor originally from Jamaica. A trademark on the Ortanique name has resulted in it being called a range of different names in other countries. It has good colour, medium to large size, is juicy and has good eating qualities. Trees are reliable bearers and fruit will hang on the tree for a long time. In West Gingin harvest commences in August and goes through into November. The degree of seediness varies depending on pollination and fruit will be seedless when trees are grown in isolation. Trees can be thorny if tree vigour is not controlled and very thorny shoots may need to be pruned out.

**Mystique:** (*Available through local nurseries*) This is a seedling selection of Ortanique from Western Australia. The trees and fruit are very similar in character and appearance to Ortanique. Fruit have excellent internal and external colour, excellent flavour, good size (even with a heavy crop), and are very juicy. Like Ortanique fruit will hang on the tree for a long time, and hence have a long harvest period that commences in August and goes through into November. Fruit are seedless when trees are grown in isolation.

## Tangelo Varieties

Tangeloes are the result of crossing a mandarin and a grapefruit. Fruit are a rich orange colour and look more like mandarins in appearance than grapefruit.

There are four varieties that have been grown in Western Australia for many years. In order of ripening these are Orlando, Minneola, Seminole and San Jucinto.

Only Minneola is well accepted in the marketplace due to its brilliant colour and unusual pear shape. Minneola should be harvested between August and September. Best acceptance is achieved if fruit is allowed to reach a sugar acid level of 8.5 to 1. To achieve this maturity it may be necessary to spray with Cittite<sup>®</sup>, a hormone that prevents fruit dropping, and gibberellic acid to delay rind aging.

These four tangelo varieties should be available through local nurserymen.

## References and further reading

### Related Farmnotes:

Note: 156 'Orange varieties for Western Australia'

Note: 155 'Citrus Rootstocks for Western Australia'

### Books and Publications

Saunt James. "Citrus Varieties of the World" published by Sinclair International Limited, Norwich, England 2000

### Web sites

The Australian Citrus Growers Inc. web site at [www.australiancitrusgrowers.com](http://www.australiancitrusgrowers.com) has factsheets available on many different varieties of **mandarins, oranges, grapefruit and lemons.**

### Other citrus links of interest include:

- Florida USA citrus site – [www.ultimatecitrus.com](http://www.ultimatecitrus.com)
- Florida Department of Citrus – [www.fred.ifas.ufl.edu/citrus/](http://www.fred.ifas.ufl.edu/citrus/)
- NSW Agriculture site – [www.agric.nsw.gov.au/reader/4631](http://www.agric.nsw.gov.au/reader/4631)
- Queensland Department of Primary Industries and Fisheries – [www.dpi.qld.gov.au](http://www.dpi.qld.gov.au)
- South Australian Research and Development Institute SARDI – [www.sardi.sa.gov.au](http://www.sardi.sa.gov.au)
- University of California, Riverside Citrus Variety Collection – [www.citrusvariety.ucr.edu/](http://www.citrusvariety.ucr.edu/)



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