



Citrus

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Small commercial citrus orchards were once popular in the district where we live. Remnant trees on original farming properties remain productive, despite being more than 80 years old. History records that the trees did not require spraying or artificial fertilisers and survived mostly on natural rainfall.

Citrus have grown very well for us too. As I wander around the garden I realise that we actually grow 18 different varieties. The Minneola tangelo was one of the first trees we planted, closely followed by Valencia and Joppa oranges and a Meyer lemon. All these trees thrived and their ease of culture and productivity encouraged us to experiment with a few more. Several kaffir limes, as well a Tahitian lime were established, then someone kindly gave me a West Indian variety. Villa Franca and Lisbon lemons were added to the range.



We love mandarins and now have two productive Imperial varieties and one later fruiting Murcott. In latter years an Arnold Blood orange was planted, though the gory, red flesh does not colour as well here on the coast as it does further inland.

When I first saw a Ruby grapefruit cut in half at the fruit shop I knew I had to plant one. We had room for a Washington navel, then someone gave me two pummelos. Recent additions include a dwarf Meyer called Lots A Lemons. Somehow along the way a cumquat and several different native microcitrus managed to squeeze their way into the garden. I cannot remember the last time we bought citrus fruit!

Growing Your Own

Citrus require deep well drained soil with a pH range of 6-7. Full sun positions provide the most favourable conditions for growth, flowering, fruit set and ripening. In addition to these factors, you should avoid exposure to strong winds, planting windbreaks to provide shelter if necessary.

Climatic Tolerance

Limes and lemons (with the exception of Meyer) hate the cold so avoid planting them in frost prone areas. Grapefruit, pummelo, sweet oranges, mandarins and kaffir limes are more cold tolerant, but cannot withstand heavy frost. Sour oranges like the Seville, Meyer lemons and cumquats are the most cold tolerant of all citrus.



Planting

Citrus can be planted at any time of year, but a good choice of varieties is most likely to be available during the winter/spring planting season. Planting distances vary according to the vigour of the tree. A small growing Meyer lemon may be established three metres from other plants, while larger growing lemons may require eight metres between trees. Incorporate plenty of nutrient rich compost into the soil prior to planting. Avoid using fresh animal manure or commercial organic fertiliser when planting as this can burn the roots. Always ensure that the union between the scion or budwood and the rootstock is well above the soil.

Nutritional Requirements

Citrus trees have a high requirement for nutrients. Feeding mulches like lucerne, pea straw and lab lab should be used around citrus as they provide supplementary nutrition. Compost, decomposed animal manure and rock dust help to provide much needed trace elements. Where on-site sources of nutrition are limited, applications of commercial organic fertiliser should be applied four times through the growing season.



Water Requirements

When well established in soil prepared with plenty of organic matter, citrus are remarkably drought tolerant. Of course, adequate water during fruit development is essential for the formation of large, juicy fruit, but irregular watering can often be worse than prolonged water stress (see fruit splitting). Navel oranges are the most fickle when it comes to watering. They are intolerant of dry conditions but also drop equal amounts of fruit if given excess water or fertiliser. Citrus cope well with recycled laundry water providing efforts are made to avoid the use of detergents with high sodium and phosphorous levels.

Pruning and Harvesting

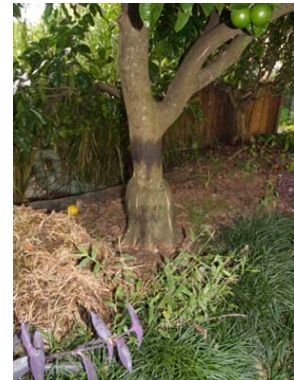
Pruning efforts during the first few years of growth should be directed to removing any shoots that emerge below the graft union and to forming a strong, well-spaced branch network. This will be required to support the weight of foliage and fruit borne by the tree in coming years. Any fruit that form during the first two years of growth should be removed. Allowing young plants to fruit prematurely can seriously set back the tree's establishment.

When trees begin fruiting, the main pruning required can be undertaken during harvest. Always clip fruit from trees when harvesting, taking the opportunity to remove any twiggy, non-productive growth at the same time. This will help to reduce opportunities for diseases such as citrus melanose to establish within trees. Heavy annual pruning of citrus is not required.

In cooler climates, large overgrown trees are occasionally pruned back hard as a rejuvenation strategy. This is done in late winter or early spring, after the last frost has passed. The technique should be avoided in warm climates, as bare branches rarely achieve good foliage cover before the onset of hot weather. This exposes the branches to sunburn and can result in the death of the tree.

Why graft?

Citrus trees are generally sold as grafted plants that join a selected variety (scion or budwood) to a compatible root system (rootstock). Citrus plants grown from seed do not usually grow true to type and often leave you with a thorny, unproductive tree.



Citrus rootstocks vary in their adaptability to different soil types, pH and salt levels. All rootstocks used in Australia must be tolerant to citrus tristeza virus, but some rootstocks are also more resistant to other diseases. Rootstocks influence the size, vigour, fruit size and quality of a tree. Unfortunately not all rootstocks are suitable for all citrus varieties due to graft incompatibility.

The main rootstocks used in Australia are;

Poncirus trifoliata – disease resistant and cold hardy rootstock used for oranges, grapefruit, most mandarins and lemons except for Eureka.

Troyer and Carrizo citrange – disease resistant, salt tolerant and cold hardy general purpose rootstock.

Swingle citrumelo – phytophthora, drought tolerant and salt tolerant rootstock for navel and valencia oranges and grapefruit.

Cleopatra mandarin - disease resistant rootstock suitable for all mandarins especially those intended for alkaline or saline soil.

Rough lemon - general purpose rootstock imparting good drought tolerance but susceptible to phytophthora and collar rot.

Sweet orange - general purpose rootstock for well-drained sites, but susceptible to phytophthora and collar rot.

Benton citrange - phytophthora resistant rootstock compatible with Eureka lemons.

Flying Dragon- cold tolerant rootstock imparting dwarfing characteristics to cultivars grafted on to it.



Did You Know?

Grapefruit trees are protected from severe strains of stem pitting virus (*Citrus tristeza virus*) by pre-immunisation with a mild strain of the disease. This technique has protected Australian grapefruit trees for over 30 years.

It is illegal to take citrus budwood or trees from Queensland to other states due the presence of orange stem pitting virus (*tristeza*) found in the Central Burnett area of the state.

Citrus in Pots

Deep green foliage, sweetly perfumed flowers and abundant fruit make citrus an attractive proposition when it comes to container planting. Dwarf lemons (Meyer, Lots A Lemons), cumquats, calamondins, native microcitrus and kaffir limes are the most suitable citrus for containers. Container plants are best supplied with nutrients through potting into rich compost, monthly doses of liquid fish and seaweed and small regular applications of commercial organic fertilisers or decomposed animal manure.

Pests of Citrus

Bronze Orange Bug

The eggs of these sucking insects lay dormant over winter, emerging as tiny, green nymphs when it warms up. They change colour from yellow to orange as they grow and have a distinctive black spot on their backs. Mature insects are dark brown to black. Bronze orange bugs cluster in groups on new growth and flower and fruit stems, feeding through a sucking proboscis. This causes new growth to die back and flowers and developing fruit to drop. If picking them off by hand, wear gloves and eye protection. These bugs secrete a caustic, acrid substance. Use an old vacuum cleaner to suck them off. Oil sprays are also effective, especially on nymph stages.



Borer

Several species of borer (beetles) attack citrus. Trees stressed by drought, lack of nutrients or some other condition are most likely to fall victim. Entire limbs can appear to die overnight. Look for evidence of sawdust-like frass that indicate the larvae are active. Prune dead and dying limbs below this point. Skewer grubs with thin wire or syringe oil-based compounds into borer holes, then seal the tree wounds with clay or wood putty. Alleviate tree stress.



Leafminer

Citrus leafminer (*Phyllocnistis citrella*) is the larvae of an introduced moth. The female moth lays her eggs between the upper and lower leaf surfaces of young foliage. The foliage becomes twisted and puckered as the larva mines its way through the leaf. Heavy infestations not only disfigure trees but can also retard growth. Female moths avoid leaves sprayed with horticultural oil. Spraying should coincide with new growth flushes. A number of other moths and butterflies feed on citrus trees. These pests are typically of little importance on all but young trees. Hand removal, use of Bt sprays (*Bacillus thuringiensis*) or dusting with Derris will bring about adequate control.

Fruit Fly

There are several different species of fruit flies that attack citrus. Thin-skinned varieties and those that ripen during peak fruit fly season (November until May) are likely to be more seriously affected. Your location and the density of the local fruit fly population will also influence the extent of damage. Strategies to avoid fruit fly infestation include growing varieties that ripen outside the main fruit fly season or selecting thick skinned varieties impenetrable to fruit flies. Practice hygiene by collecting and disposing of affected fruit. Place affected fruit into a bucket and cover with boiling water or freeze fruit prior to disposal to destroy larvae.



Exclude fruit flies by individually bagging each piece of fruit or using pest fabric to completely cover entire trees. Use baited traps containing a lure that entices flies to enter. The traps are designed so that the flies are unable to leave and eventually drown. Organic bait sprays based on the soil borne bacteria known as spinosad are now registered for fruit fly control in Australia.

Gall Wasps

Swollen lumps on the young stems of citrus tree signal egg-laying activity of the gall wasp. The lump on the stem enlarges as the wasp larvae grow. Eggs are laid in summer and early autumn, but young wasps will not emerge from the galls until winter. Use sharp secateurs to remove the affected stems at a leaf joint below the lump. Dispose of the affected stems and you will have significantly reduced next year's population of adult wasps.



Mites

Mites are microscopic pests more closely related to spiders than insects. Symptoms of infestation include loss of leaf colour, drying and cupping of foliage, grey or rusty foliage and fruit discolouration, distorted growth and rind hardening and distortion of fruit. Lemons and navel oranges seem particularly prone to mites. Oil sprays, soap and use of wettable sulphur will control outbreaks.

Scale and Sooty Mould

Several scale species are commonly found on established citrus trees. Scale insects are commonly associated with ants that harvest honeydew exudate produced by the scale and sooty mould fungus that grows on the honeydew. Oil sprays used to control citrus leaf miner will also control scale and sooty mould.

Spined Citrus Bug

These insects look like they are wearing pointed shoulder pads. When young they vary in colour, but adults are leaf green and well camouflaged. They feed by piercing the fruit and sucking up the liquid contents. Fruit develops dry patches and premature fruit fall in common. Lemons and mandarins appear particularly susceptible.



Diseases and Disorders of Citrus

Alternate Bearing

Some citrus varieties such as the Wheeny grapefruit are prone to a condition that sees trees carry extremely heavy crops in alternative years. Thinning crops when they bear heavily can help to even out production. Ensure that trees are supplied with adequate nutrition.

Brown Rot /Brown Spot

Two separate fungal diseases cause these conditions. Brown rot is a soft, smelly fruit rot that starts as a small patch, then expands to engulf almost the entire fruit. It is common on Navel oranges and lemons. Brown spot occurs on leaves, fruit and soft stems. They are smaller, darker in colour and there are more of them. It is common on mandarin, calamondin and grapefruit. It does not really matter whether you can tell these diseases apart, as the treatment for both is the same. Reduce wetting of the foliage and fruit. Trim lower branches so that they do not come in contact with the soil. Mulch heavily to avoid soil splash on lower branches. Remove affected fruit and any dead wood. Prune citrus to increase air flow and prune any surrounding vegetation to improve access to sunlight. Spray with a copper based compound.

Fruit Drop

It is common for a large proportion of the fruit that form on citrus to fall prematurely when they reach pea size. Stress associated with lack of soil moisture, hot, dry windy conditions, insects pests, copper deficiency and poor general nutrition can increase fruit drop.



Conversely the application of fertiliser at flowering or soon after can also predispose trees to fruit drop. Fertilise trees at times other than flowering and first fruit set. Minimise other stress to trees.

Fruit Splitting

Fluctuating soil moisture levels resulting from irregular rainfall or poor irrigation practices are the most common cause of fruit splitting. However, extreme fluctuations between day and night time temperatures, fluctuating humidity and excessive fertiliser application can also cause fruit to split.

Melanose

This disease typically affects more established trees, but often passes unnoticed until symptoms are severe. The skin on affected fruit becomes tough and dry, often developing a brown, crazed appearance. Foliage may also be affected. Spray trees with lime and copper sulphate compounds (Bordeaux) after all fruit has been harvested. Thoroughly wetting the foliage, trunk and branches with the spray. Reapply once each year until no further evidence of disease exists. Improve general tree health.

Root and Collar Rot

These disease causes the roots to rot and sections of bark on the lower to peel and ooze gum. Ensure that the graft union is well above the soil. Clear weeds or any excess mulch away from the trunk. Reduce watering and improve the soil drainage. Avoid damage to stems and roots. Prune affected trees and surrounding vegetation to improve airflow and increase sunlight. Use a sharp knife to cut away affected areas of the lower bark and paint the wound with Bordeaux paste. Trifoliata rootstock is more tolerant of heavy soil and offers some resistance to root rot.

Also see www.annettemcfarlane.com/Whats_Bugging_You.htm

Other Pests and Diseases

Aphids

The black citrus aphid (*Toxoptera citricida*) is the most serious aphid species to attack citrus. They cause tip dieback and can spread virus diseases. Oil or soap sprays will control outbreaks, but need to be applied regularly.

Leaf Yellowing

Citrus are hungry feeders and must be supplied with adequate nutrients to perform well. However, even trees well supplied with nutrients can develop yellow foliage at the end winter and in early spring. The uptake of nitrogen from the soil by citrus tree roots is less efficient when the soil is very cold. Trees can suffer a temporary deficiency of nitrogen towards the end of the cold weather. This will be rectified naturally once temperatures increase.

Stylar End Rot

This disease affects Tahitian limes where fruit is left overripe on the tree. The base of the fruit develops a soft rot and fruit fall to the ground. Fruit should be harvested at a green stage to prevent this occurring.

Virus and Viroid Diseases

There are a number of viruses and viroids that affect citrus. Some reduce the vigour of affected plants without showing any obvious symptoms. To guard against the spread of such diseases local and imported budwood and rootstocks are routinely subjected to indexing trials ensuring that grafted trees purchased by commercial growers and home gardeners are disease free.

Phytophthora Root Rot

Citrus require perfect drainage. Failure to fulfil this requirement predisposes trees to attack by this waterborne fungus. The disease causes the roots to rot and sections of the lower bark may peel and produce gum. Reduce watering and improve the soil drainage. Avoid damage to stems and roots. Trifoliata rootstock is more tolerant of heavy soil and offers some resistance to phytophthora.



Collar Rot

Gum oozing from the lower tree trunk, bark splitting and the gradual demise of citrus trees are symptomatic of collar rot. Fortunately, good cultural practices can largely eliminate its occurrence.

Ensure that the graft union is well above the soil. Clear weeds or any excess mulch from the trunk of the tree. Reduce watering and improve soil drainage. Prune affected trees and surrounding vegetation to increase airflow and increase sunlight. Use a sharp knife to cut away affected areas of the lower bark and paint the wound with Bordeaux paste.

Pick Of The Crop

Some citrus varieties fruit well across a wide range of climatic zones, while others vary considerably in their cold tolerance and suitability for planting in coastal and inland districts. Many gardeners make the mistake of simply planting the citrus variety most familiar to them. Keep in mind that the citrus you purchase in the fruit shop may not necessarily have been grown in your local area. Ask your local nursery to guide you to proven varieties known to perform well in your district.

Oranges (*Citrus sinensis*)

Valencia

Adaptable across a wide range of climates, these large trees produce rounded to oval fruit with green tinged skin. Fruit hold on the tree for months on end.

Navel Oranges

Washington Navel

The most popular large fruiting navel orange with great flavour and big, round sweet juicy, seedless fruit.

Thomson Navel

This early seedless navel variety, is generally considered inferior to the Washington Navel.

Leng Navel

Leng is a particularly early fruiting selection of the Washington Navel.

Lane's Late Navel

This late fruiting sport that ripens after the main Washington Navel harvest.

Joppa

A popular eating and juicing mid season orange it produces reliable crops of mid sized, rounded fruit that holds well on the tree.

Blood Oranges

Maltese Blood, Ruby Blood, Harvard, St Michael's Blood and Arnold blood oranges enjoy hot dry conditions which promotes blood red pigmentation on the skin and within the flesh of these selections. Prized by European gardeners as great eating and juicing oranges.

Seville (*Citrus aurantium*)

Seville or sour oranges are prized for their characteristic bitterness that makes them ideal for marmalade production. Rough and smooth skinned selections are available.

Lemons (*Citrus limon*)

Meyer

A cross between a sweet orange and a true lemon, Meyer is popular because of its compact growth and climatic adaptability. Suitable for regions too cold for true lemons. It is thin skinned with mild flavoured, juicy fruit.

Lots A Lemons

A new release variety that promises abundant fruit similar to a Meyer on a very dwarf plant well suited to pots.



Eureka

The large open trees produce rough skinned fruit with a distinctive nipple end ideal for coastal areas. It bears almost year round and has few thorns.

Lisbon

A vigorous, winter fruiting, thorny tree bearing fruit of a similar size and shape to Eureka, but thinner skinned. Performs across a wide range of climates.

Villa Franca

A vigorous selection producing good autumn and winter fruit on very large, often thorny trees that are well suited to dry inland areas.

Lemonade

A chance seedling variation developed in Australia that resulted in this vigorous, heavy cropping tree that produces very sweet, thin skinned fruit.

Grapefruit (*Citrus paradisi*)

Marsh Seedless

This vigorous tree fruits prolifically in hot climates. The near seedless fruit is large with pale yellow, thin skin and pale flesh. Does not hold well in warm climates. .

Wheeny

Developed in Australia, this variety performs particularly well in cooler regions. It contains numerous seeds and is primarily used for processing.

Pink Grapefruit

Pink fleshed sports include **Foster** (seedy), **Thompson** (seedless), **Ruby** (seedless) and **Red Blush** (seedless). All varieties develop good internal colour when grown in warmer climates with **Ruby** and **Red Blush** producing more pronounced red flesh and pink blushed skin when grown in hot inland regions.

Poorman

A hybrid selection showing increased cold tolerance, it bears pale orange rind and flesh.

Chironja

A grapefruit orange cross bearing large fruit with sweet juicy orange coloured flesh.

Pummelo (*Citrus maxima*)

The pummelo or shaddock is tropical tree with football sized fruit, half the thickness of which is skin and associated pith. It often grown as substitute for grapefruit and is fruit fly resistant.

Mandarin (*Citrus reticulata*)

Clementine

Early maturing variety producing sweet deep orange fruit filled with juice, but containing a high number of seeds.

Satsuma

An early fruiting, cold tolerant selection that matures into a small tree, bearing juicy seedless fruit with bright orange flesh.

Imperial

An early season selection that produces a thin, pale skinned fruit. What the fruit lacks in skin colour and size it makes up for in flavour and quantity.

Emperor

A mid season selection very similar to Imperial. The fruit tends to be slightly larger with a better skin colour, but many consider it lacks flavour intensity. Subject to brown spot.

Dancy



A mid season selection with loose skin and deep orange flesh. Trees tend to bear heavily in alternate years.

Murcott

A late ripening variety bearing sweet tasting, pale orange fruit.

Ellendale

A mandarin orange cross producing a late season harvest on an upright tree. The large, orange skinned fruit are easy to peel. Trees are suited to drier inland regions.

Kara

A very late season selection with deep orange flesh and great flavour.

Tangelo (mandarin grapefruit cross)

Minneola

Juice filled, deep orange fruit with intense flavour. This mid season fruit grows to the size of an orange or larger and has a distinct nipple at the stalk end.

Orlanda Similar to Minneola, but earlier maturing, sweeter flavoured and more rounded in shape.

Seminole

Similar to Orlanda, but with an intense tangy taste and good skin colour this selection is late maturing.

San Jacinto

Very early maturing variety with light orange flesh tangy flavour and skin that is easy to peel.

Wekiwa

Pale yellow fruit outwardly more closely resembling a grapefruit, but without the characteristic bitterness.

Limes (*Citrus aurantifolia*)

Limes are generally more suited to tropical and subtropical climates as they require warmth and are intolerant of frost.

West Indian

This small fruited, thin skinned fruit is a true tropical lime that bears characteristic lime green skin in warm climates. Trees are small, bushy and relatively short lived.

Tahitian Lime

A seedless or near seedless lime hybrid that can be grown over a wider climatic range, but still requires a frost free climate and more warmth than most other citrus.

Kaffir Lime (*Citrus hystrix*)

The foliage and the zest of the fruit of the kaffir lime are essential ingredients in south east Asian dishes. The figure-eight shaped leaf and round, knobby fruit are distinctive.

Cumquat

Meiwa (*Fortunella crassifolia*)

Large rounded fruit with sweet skin and segmented flesh used for marmalade or ornamental purposes, but also considered more suitable for eating than other varieties.

Nagami (*Fortunella margarita*)

Small oval fruit with sweet fruit but slightly bitter skin distinguish this variety. Used primarily for ornamental purposes as the fruit holds decoratively on the tree for long periods.



Calamondin (*Citrus madurensis*)

Rounded deep orange fruit resembling kumquats but typically grown as an ornamental or used for marmalade due to the bitter skin and fruit. Variegated forms are available.

Native Citrus

There are several species of native citrus including the finger lime, (*Microcitrus australasica*), the round lime (*Microcitrus australis*), the Mt White lime (*Microcitrus garrawayi*), the desert lime (*Eremocitrus glauca*) and the large leaf lime (*Microcitrus inodora*).

There has been considerable commercial interest in selecting and developing new selections of native citrus and experimenting with crossing them with well known citrus cultivars. Commercial production aimed at the restaurant, tourism and export market.

Native citrus varieties protected by plant variety rights include Rainforest Pearl, Outback Lime, Blood Lime and Sunrise Lime.

Did You Know?

The Buddha's hand is a novelty variety of citron notable for its grotesque hand-shaped fruit.