

Fig growing in NSW

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THE PLANT

The edible fig (*Ficus carica*) is a member of the genus *Ficus*. There are other species endemic in NSW, such as the Moreton Bay fig and Port Jackson fig, but these are not edible.

Plants belonging to the genus *Ficus* do not display an obvious flower like most other fruit crops. The 'fruit' (called a synconium) is really a hollow structure with numerous tiny flowers distributed over the inner surface. The synconium has separate male and female flowers.

The synconium develops into a fleshy structure that holds the true fruits (drupelets) inside. Because the flowers are inside the immature fruit, many species of *Ficus* need an insect pollinator. This is usually a wasp, and it enters via the 'eye', which is on the basal end of the fruit.

Flowers with long styles develop seeds if pollinated. The short-styled flowers host the growing larvae of fig wasps in the ovary that feed on the immature seed.

HISTORY

Figs were first recorded as cultivated plants in southern Arabia in 2900 BC. Figs were either eaten fresh or preserved by drying. Traders and explorers introduced figs to most countries. Figs were popular in these early times, and became a prominent symbol in ancient history. It is widely believed that the 'apple' eaten by Adam in the bible was in fact a fig.

Dried fig production was an important horticultural enterprise in the Murrumbidgee irrigation area during the 1920s. This industry declined in the 1950s, when cheaper imported figs entered the domestic market. Commercial fig production in NSW today caters for mostly the fresh fruit market.

CLIMATIC REQUIREMENTS

The edible fig is considered to be a sub-tropical plant, but can be grown successfully in cooler areas where winters are relatively moderate. Fig trees thrive in the inland areas of NSW, and can be grown in the cooler tableland areas. Young trees are very susceptible to frost damage, especially if spring frosts are severe. Figs do not require winter chilling to break dormancy.

A developing main crop of Calimyrna figs



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Figs can be grown in coastal areas, but fruit can be spoiled by rain and may ferment if hot temperatures follow wet weather.

SOIL TYPE

Figs are tolerant of most types of soil, but perform best on well-drained, reasonably fertile soils. Their root systems are fairly shallow, but extensive. Care must be taken when cultivating near the trees not to disturb the roots, as suckers can develop.

PROPAGATION

Figs can be propagated by cuttings, air layering or grafting. Figs grown from seeds are not true to type. Fig seedlings are used in breeding programs where different forms are desirable.

Most fig trees are propagated from hardwood cuttings. Cuttings can be taken in late autumn or early winter. They should be 20 to 25 cm long and contain several nodes. The base should be cut just below a node.

Cuttings can be planted out and grown in a glasshouse over winter. Otherwise they should be stored in sawdust or moist sand under cool conditions until early spring, and allowed to callus. Cuttings should be planted out into a well-drained propagation mix to develop roots. More than one node should be buried beneath the mix.

Softwood cuttings can be taken during summer if they are placed under mist in the nursery. Cuttings need to be 15 cm long, and planted in a well-drained mix with 9 cm of each cutting above the surface. Softwood cuttings should develop roots within 3 or 4 weeks.

SPACING AND PLANTING

Figs are large trees when left to grow naturally. In older orchards, trees were planted 9 to 12 m apart (67 to 119 trees per hectare), depending on the variety. Trees are now planted closer together in the row (4 to 5 m), with 6 to 7 m spacing between rows.

Hedgerow plantings 5 to 10 m apart have not been successful in the USA.

Young trees are usually planted between June and August, when they are dormant. Care must be taken to ensure that the roots do not dry out

in the establishment phase. Young trees are susceptible to sunburn until the canopy fills. A white acrylic (water-based) paint can be used to protect bark from the sun.

VARIETIES

Edible fig varieties fall under the following categories:

- persistent (common) figs (used for fresh fig production)
- caducous (Smyrna) figs (used for dried fig production)
- intermediate (San Pedro) figs (non-commercial fresh fig production)
- caprifigs—pollinisers of Smyrna and San Pedro figs (not edible).

Most information on varieties has been based on trials conducted overseas, mainly in California. The performance of these varieties may therefore differ in NSW districts, owing to environmental factors such as soil, rainfall, temperature and humidity.

Persistent (common) figs

Fresh fig production is based on persistent fig varieties. The synconia contain only female flowers. The fruit form without being pollinated, the seeds being empty. Figs with small eyes are preferred, as pollination may lead to the introduction of spoilage organisms in the fruit.

Two crops are usually produced each year. The first (breba) crop forms in spring on wood from the previous year and matures in December to January. The second crop (main crop) sets on new season wood in November to December. This crop usually matures between February and June.

Black Genoa

This is the leading commercial variety for fresh fruit production in NSW. The tree has an open and spreading habit. The fruit is dark purple at maturity, with red seeds and white flesh. It is a squat, pear-shaped fruit. It has a distinctive flavour and good storage qualities.

Brown Turkey

Brown Turkey is a small tree with sparse foliage. It crops well in most situations, but does not usually produce a breba crop. It is susceptible to souring during wet weather in coastal areas, but the fruit is reasonably resistant to splitting.

Fruit is medium to large and pear shaped, with prominent deeply coloured ribs and a large, open eye. The skin is purplish brown and lighter at the stem end. The flesh is pinkish brown with an excellent flavour. Harvested January to March.

Preston Prolific

Preston Prolific is thought to be a seedling of Black Genoa and originated in Victoria. The tree is vigorous with large leaves. The fruits are oblate, borne on a short stalk and green when immature, changing from straw to purplish brown when fully ripe. The flesh is very thick, creamy white and juicy with a distinctive sweet flavour. The pulp is amber coloured, sometimes tinted red. Fruit splitting is not a problem. The fruit matures in December to late April.

White Adriatic

The tree is of medium vigour with a low, spreading habit. White Adriatic usually produces no breba crop or only a small number of breba fruit. The main crop fruit is medium to large, spherical and usually greenish, tinged with amber when ripe. The pulp is a light strawberry colour to deep red, with an excellent flavour. White Adriatic has been grown in the Murrumbidgee Irrigation Area (MIA) for canning, jam and drying.

Cape White

Cape White is a vigorous tree with a low, spreading habit. It was introduced from South Australia and was mainly grown for jam. It produces a golden-coloured jam that is more attractive than that of White Adriatic. It grows best in warmer areas.

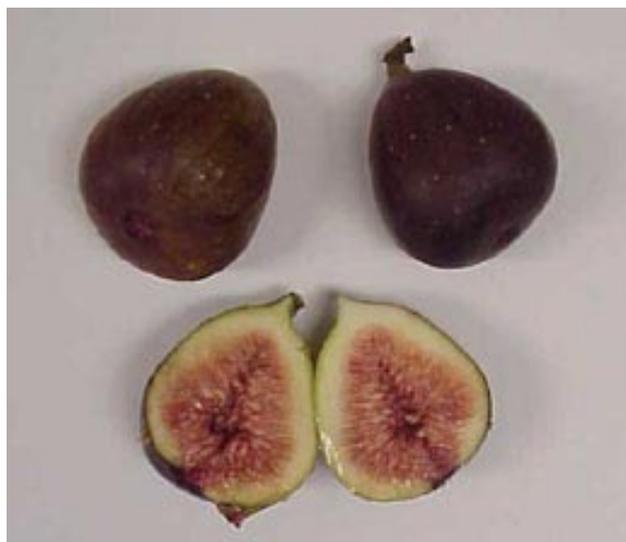
Trees are compact and vigorous. The fruit is small, squat and pear shaped, with almost no neck. The fruit is slightly ribbed, with a small, open eye. The flesh is cream to white, with a solid centre. The fruit matures in January or February, but is prone to splitting.

Other common fig varieties available in Australia include Blue Province, Conandria, Excel, Green Ischia, White Ischia, Tena and Flanders.

Caducous (Smyrna) fig varieties

Smyrna and the Calimyrna varieties were commonly grown for dried fruit production in the MIA back in the 1920s. Production of dried Smyrna figs is not common now.

These figs require pollination with caprifigs (caprification). The process of caprification is important in dried fig production, as the seeds



Black Genoa

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Brown Turkey

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contribute to the nutty flavour of the dried product.

Smyrna

Smyrna was traditionally grown for dried fruit production in the MIA and Sunraysia areas.

Production of Smyrna figs declined in the 1950s, when imported figs began to dominate the market. Its skin is golden yellow when ripe and has strawberry to red pulp. This is a versatile fig that can be glazed, eaten fresh, or made into jam. Smyrna usually does not set a breba crop.

Calimyrna

(Sari Lop, Erbeyli or Lob Injir)

Calimyrna is a variety bred from Smyrna in California. Several numbered selections of Calimyrna have been bred over the years. The fruit are large and yellow, with amber pulp and a large open eye. They are oblate to spherical and sweet, with a very rich, nutty flavour.

Calimyrna can produce brebas, but they are seedless and of poor quality.

Intermediate (San Pedro) varieties

San Pedro varieties set a breba crop without pollination. However, to produce a main crop pollination is required.

San Pedro figs are not grown commercially in NSW. The only variety available in NSW is Adam (also called Dauphine).

Adam

The tree is large and vigorous and reliably produces a heavy breba crop. Pollination is required to set the main crop. The fruit is oblate, with a short stalk, and is red to purple-black when fully ripe. The flesh is thick, creamy white and juicy. The pulp is darker red when pollinated.

Caprifigs

Caprifigs are useful only for pollinating Smyrna and San Pedro varieties. The name caprifig is derived from *caprificus* (or 'goat fig' in Italian), as it was considered worthless. The fruits are usually dry, pithy and resinous. They are not considered palatable. Unlike common figs the caprifig produces three crops of synconia. These are known by their Italian terms, *profichi*, *mammoni* and *mamme*.

Profichi

Profichi synconia form on buds just above the scars of fallen leaves on the previous season's wood (like the breba crop). They develop from October through to December. At this time new shoots and leaves are forming on the tree.

The synconia develop rapidly, and within three weeks the female flowers are ready for fertilisation. The male flowers do not produce pollen until early December. This pollen fertilises the edible fig varieties.

Mammoni

Mammoni form on the new growth each year (like the main edible crop). Mammoni start to develop in early December when the profichi crop is almost over, and continue to grow through until late March – early April. Mammoni caprifigs do not shed pollen.

Mamme

Mamme start to develop in May, when the mammoni crop is almost over and the tree has started to become dormant. They form near the tips of the branch. They stay on the tree during

winter, and develop fully in September when the female flowers of the profichi crop are receptive. The male flowers do not shed pollen.

The main varieties used to pollinate Smyrna and San Pedro figs in California are Roeding, Samson and Stanford. It is important that the correct variety of caprifig is chosen to ensure that pollen from the profichi crop is available at the right time.

CAPRIFICATION

The process of caprification is complex. It involves the presence of both the fig wasp and the correct stage of fig on the caprifig tree.

Commercial Smyrna-type figs are pollinated in early summer with pollen from the profichi caprifig. If the female flowers are receptive, the wasp will also pollinate the female flowers of the mammoni caprifig at this time. The flowers will then form seeds, completing the reproductive cycle of both the caprifig and commercial trees. The female wasp lays eggs in all the female flowers, pollinating at the same time. The larvae hatch and develop in flowers with short styles. The long-styled flowers develop seeds.

Generally one caprifig tree is needed for every 15 to 20 Smyrna trees. Planting the caprifig trees within the block is not recommended, as pollination is not even: the trees closest to the caprifigs can be over-fertilised and split, and more distant trees may not be pollinated.

Caprifig trees should be planted in a separate block. The profichi caprifigs (with wasps) are picked and placed in wire baskets around the

Profichi caprifigs on the previous season's wood



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orchard when the first wasps start to emerge. Each basket needs to contain six or seven figs. The profichi need to be replaced every three days for about three weeks, as not all the synconia of the Smyrna figs are receptive at the same time. It is useful to have more than one variety of caprifig so that the pollination period is extended.

PRUNING (ALL VARIETIES)

Commercial varieties crop in two stages. The first (or breba crop) is formed on the previous season's wood. The main crop is produced later, when the new wood grows its leaves and sets fruit buds. The main crop fruits are usually formed in the leaf axils on this new wood. For this reason, it is not necessary to select fruiting wood as you would for most deciduous fruit crops. A light winter prune may help to stimulate new wood growth and increase the main crop. Any branches that are diseased, broken or overlapping need to be removed.

Pruning, when combined with good tree management, should result in four to six figs per shoot, with new growth between 15 and 20 cm long. Excessive vegetative growth will lessen fruit quality. Some older wood should be left on the tree for the breba crop, and can be pruned the year after.

Mature trees may need a heavier winter prune approximately every three years to encourage enough new wood for a good main crop. Trees must have a healthy root system to recover from heavy pruning. Tree losses can result in areas with heavy nematode infestations.

TRAINING

Training trees into an open-vase shape is the usual practice in NSW. This system allows for easy access to fruit for picking. The open vase has usually four or five main structural limbs and can be picked from the ground.

In Japan a spur pruning method is used. The young tree is trained to produce four main branches. These are tied down so that they grow almost horizontally. Each year shoots are allowed to grow vertically from these branches. At the end of the year they are all cut off to small spurs, similar to the way in which grapevines are managed. This method has not yet been used in Australia.

IRRIGATION

Fig trees tolerate drier conditions than most fruit trees, but irrigation is still needed. The frequency depends on tree size, vigour, soil type and rainfall. Trees grown on the coast often require less water than those grown inland.

It is better to avoid major fluctuations in moisture, as most fig species do not cope well under these conditions. Fruit and leaf drop is a common response to moisture stress. Fig trees are easily stressed in dry periods because of their shallow root systems. Some varieties may shed early fruits in a dry spring if irrigation is inadequate.

An even moisture supply is important during fruit development. Too little water may result in less meaty or even hollow figs. A sudden increase in water supply during the ripening period will cause fruit to split.

Too much water in midsummer will cause excessive vegetative growth at the expense of fruit quality, and will place the tree at risk of damage if growth is too soft going into winter. Smyrna is more susceptible to fruit quality problems when vegetative growth is excessive.

SOIL MANAGEMENT

Deep cultivation should be avoided to prevent damage to the shallow fig roots. Best orchard practice encourages the use of ground covers (permanent sward) in the inter-rows to avoid soil erosion and improve infiltration of water. A mix of grasses and legumes is common, and the sward is mown to control growth. Herbicides can be used to control weed growth in a strip along the planted row.

NUTRITION

Control of vegetative growth is critical for good fruit quality, but this does not mean that trees do not need fertilisers. Sufficient nutrients must be supplied to ensure that the foliage is healthy, as it shelters the fruit from sunburn during summer. Small fortnightly applications of water-soluble fertilisers can be applied in the irrigation system throughout the growing season. Complete fertilisers with an NPK ratio of approximately 20:5:20 are commonly used.

Leaf analysis should be used at the end of the harvest season to monitor nutrition and tailor fertiliser needs.

A complete fertiliser or composted manure can be applied in winter. Figs prefer alkaline soils, so lime needs to be applied if the pH is less than 6.0. The ideal pH range is between 6.0 and 7.8.

FRUIT DROP

Fruit drop can be caused by several factors, including cool weather, insufficient irrigation, weak trees and nematodes. Figs that develop on the ends of branches often dry out or drop because there has not been enough heat for them to mature.

Smyrna-type figs will drop when they are partly grown if they have not been pollinated. (See caprification.)

PESTS AND DISEASES

Although fig trees are generally considered to be hardy, they are susceptible to a number of pests and diseases.

Root knot nematode (*Meloidogyne* spp.)

Host plants. Nematodes attack a wide range of plants and will carry over from an infected crop.

Description. Males are worm-shaped and up to 0.5 mm long. Mature females are about the same size and pear shaped. They are transparent and can be seen only under a microscope.

Damage. Nematodes damage the roots of the tree and cause significant damage on newly planted trees. Trees on light sandy soils are more susceptible to nematode attack. The females live inside the roots, causing galls to form. The 'knotted' roots have a reduced capacity to take up water and nutrients. The tree becomes stunted and yellow, and produces less fruit. Heavily infested roots may die and decay.

Control. In the past fumigants were commonly used, but many of these chemicals are being withdrawn from sale. Planting a green manure crop of mustard can act as a 'bio fumigant' before fig trees are planted. Resistant varieties such as Zidi can be grafted on to *Ficus cocculifolia*.

Dried fruit beetle (*Carpophilus* spp.)

Host plants. *Carpophilus* attack a wide range of fruits.

Description. Beetles are dark brown and approximately 3 mm long. The wing covers do

not completely cover the body. Some species may have yellow markings.

Damage. This small beetle enters the eye of the fruit, creating a favourable situation for the feeding of adults and larvae. Feeding adults carry yeasts into the fruit, causing souring. *Carpophilus* is more likely to attack developing figs rather than ones that are starting to dry.

Control. *Carpophilus* attack is likely if figs are grown near stone fruit and citrus trees, as the beetles over-winter in fallen fruits. All unwanted fruit should be destroyed after harvest.

Queensland fruit fly (*Dacus tryoni*)

Queensland fruit fly (QFF) is a major pest of most fruits in those areas of NSW where the climate favours infestation.

Description. The flies are small and brown to black, with distinctive cream to yellow markings on the mid-section.

Damage. Female fruit flies lay their eggs in ripening fruit. The larvae hatch and feed inside the fruit, which is then spoiled. The flies pupate in the soil.

Control. QFF can be monitored by using pheromone traps. These traps attract and kill male flies. The presence of flies in the traps indicates that a registered chemical should be applied according to label directions.

Destroy fallen fruit by burning or boiling before disposal. This will kill pupae and help break the breeding cycle.

Fig blister mite (*Aceria ficus*)

Description. These mites are colourless to white.

Damage. Blister mites are usually found in green fruit but can attack ripe fruit. They enter the eye and feed near the opening, causing rust-coloured, dry patches to develop on the florets. The damage appears when the fruit is cut open—the exterior of the fruit shows no symptoms. Affected fruit have reduced eating quality. Blister mites are known to spread the fig mosaic virus.

Control. There are no chemicals registered to control this pest. Often the first fruits to ripen are the most likely to be damaged. Samples should be taken when picking and checked for internal damage. Early fruit can be discarded as a precautionary measure if damage is detected in the samples.

Anthracnose

Description. Anthracnose is a fungal disease that affects leaves and fruit, mainly in coastal areas.

Damage. The fungus infects leaves and fruit under warm, humid conditions. The disease starts off as small brown to black spots, which grow out to form a larger 'target spot' of infected tissue. On leaves, the tissue surrounding the spots turns yellow. Infected fruit and leaves will eventually fall off if the disease is not controlled.

Control. Copper-based fungicides are normally used to control the disease. Consult your local horticulturist for registered products.

Fig rust

Description. Fig rust is a serious fungal disease of figs grown in coastal areas.

Damage. Young leaves are usually attacked. The fungus produces powdery yellow spots on the leaves. If the disease is not controlled the leaf tissue will turn yellow and the leaves will fall off. Trees can be seriously defoliated.

Control. Copper-based fungicides are normally used to control the disease. Consult your local horticulturist for registered products.

Fig mosaic

Description. Fig mosaic is caused by a virus that affects leaf pigment and causes a mottled pattern on the leaf. It is spread mechanically by grafting and taking cuttings from infected trees.

Damage. Photosynthesis is affected, as the leaf pigment is damaged. Trees become stunted and fruit production is reduced.

Control. There is no cure for fig mosaic virus. Affected plants should be removed so the virus does not spread. Virus-infected plants should not

Brown internal discoloration of ripe fruit caused by fig blister mite



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Picking figs into shallow trays for packing

be used for propagation. Orchard hygiene is important. Work on infected trees last so that the virus is not spread via sap on pruning tools. Clean tools thoroughly in a bleach solution.

Birds

Damage. Birds attack and eat developing figs, especially as they start to ripen. Fruit damage ranges from small claw marks and pecks to the whole fruit being eaten. Birds can be a serious pest in some areas, and permanent birdnetting is necessary. Once the birds have located your fig planting they are likely to continue returning to this good source of food, making them a persistent problem.

Control. Bird netting is most commonly used. Scare devices vary in effectiveness.

HARVESTING AND MARKETING

Figs destined for the fresh fruit market or canning should be picked when they become fully coloured and still firm. They are harvested by hand with a twisting and pulling motion. Pickers should wear gloves, as the latex from the tree can cause skin irritation. The fruit is then placed into buckets or shallow flats for transport to the packing shed. Fruit should be carefully packed to avoid latex drops staining the skin of harvested fruit.



Figs packed for sale

The fruit should be cooled to 0°C as soon as possible. Optimum coolroom temperature is between -1°C and 0°C, with 90 to 95 per cent relative humidity. At 4.4°C to 6.1°C and 75 per cent relative humidity, figs will keep for eight days. The shelf life out of the cool store is only 1 or 2 days.

Figs for the fresh fruit market are usually packed in single trays, using the plastic liner trays used for other fruits.

FIGS FOR DRYING

Since the loss of market share to imports in the 1950s, figs have not been grown for drying in commercial quantities in NSW. Smyrna and Calimyrna figs are the most suitable for drying, as the seeds contribute to the final flavour.

In California, drying figs is still a viable industry. Fruit is allowed to ripen and fall naturally before it is collected from the ground. This practice requires mechanised collection and a bare orchard floor. Figs can be picked off the tree, but care must be taken to pick with the stem intact.

After harvest, the figs are immersed in a boiling brine solution (100 g salt per 5 L water). This removes soil and cracks the skin to assist with drying. The figs are rinsed in clean water, then dried further by sun drying or dehydration. The final moisture content is aimed at 17 per cent. Dried fruits are graded to remove damaged, sunburnt, split, diseased and defective fruit. They are then sent to processors in bulk bins.

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