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Persimmon growing in New South Wales

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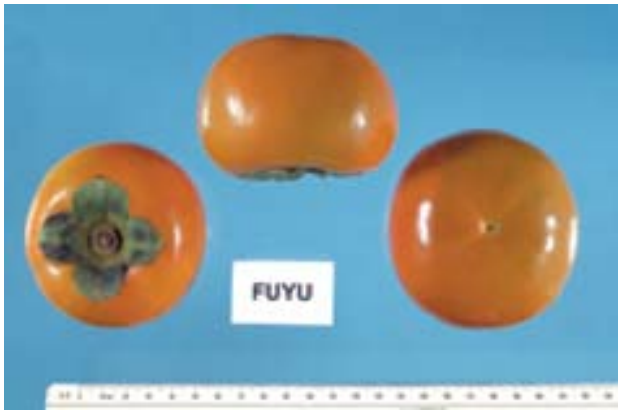
Introduction

The persimmon is a native of China, where it has been cultivated for centuries. The explorer Marco Polo recorded trade in persimmons in the early 14th century. It spread to Korea and Japan and later to the Mediterranean coast of France, Italy and Algeria. The fruit was introduced in California and Australia in the mid-1800s.

The persimmon, also known as kaki, is a major fruit in China, Japan and Korea; together, these nations produce more than one million tonnes annually. The fruit is also well known in Mediterranean and Middle Eastern countries and is ranked 14th in the world as the most consumed fruit after cherries and before avocados. In Australia, persimmons are less known and are considered a minor crop.

China is the world's biggest producer, followed by Japan and Korea while Italy is the main European producer (70 000 tonnes in 1993).

Figure 1. Fuyu, the main non-astringent persimmon grown in Australia..



The Australian persimmon industry has a farm-gate value of between $9 million and $10 million, with 280 producers (2000). Annual production is 2100 tonnes from approximately 300 000 trees. Most plantings (65%) consist of young trees less than six years old; more than half of these are of non-bearing age (less than 3 years old). Queensland is the biggest producer of persimmons in Australia, followed by New South Wales.

National production of persimmons is expected to increase considerably in the next few years.

The plant

Persimmons belong to the genus *Diospyros* in the ebony family and are fairly common trees in the warmer regions of the world, particularly in Asia and North America. The genus contains almost 190 species, of which three are used in commercial fruit growing: *D. kaki* (oriental or Japanese persimmon), *D. lotus* (the date plum) and *D. virginiana* (native American persimmon). The most important of these is *D. kaki*.

The persimmon tree can be either a multi-trunk or single-stemmed deciduous tree that can grow to 6 metres at maturity. The branches are brittle and easily damaged by wind. The leaves are large and turn a dark glossy green as they age. Under mild autumn conditions the leaves often turn an attractive yellow, orange and red colour making them valuable as an ornamental tree.

Persimmon trees usually bear either male or female flowers but some trees can have both. Most commercial Japanese cultivars bear only female (pistillate) flowers.

Figure 2. Flat Seedless, an astringent cultivar still grown in New South Wales, found mainly in older plantings.

Figure 3. Hachiya, an astringent cultivar requiring care in handling. Suited for both fresh and drying.

Flowers are borne in the leaf axils of new growth from one-year-old wood. Normally two to four flowers are formed on new growth and open after the shoots and leaves have matured in spring. Female flowers are single, large and cream-coloured and easily distinguished from male flowers by their large dark green four-lobed calyx. Male flowers are smaller, occurring in two to three flowered clusters on small weak shoots.

The characteristic astringency of unripe persimmons is caused by soluble tannin in the flesh. This astringency disappears in some cultivars when the fruit ripens (softens) and in others when the flower is pollinated and the fruit contains seeds. Non-astringent persimmon cultivars also occur in Japanese cultivars. These may be eaten when crisp like an apple or allowed to go soft.

The shape of the fruit varies with cultivars ranging from spherical, acorn or flattened. The colour of the fruit also varies from light yellow-orange to dark orange-red. The entire fruit is edible except the seed and the calyx.

Climate

Persimmons have proved to be highly adaptable to a wide range of climates in Australia, ranging from subtropical coastal regions of Queensland to mild coastal areas through to warm inland temperate areas in New South Wales. Generally, non-astringent cultivars require warmer growing conditions than astringent cultivars.

Japanese research has shown that fruit size, colour and quality of non-astringent cultivars is improved in areas where the average temperature in autumn is between 16°C and 22°C and the total sunshine during the growing season is greater than 1400 hours. If non-astringent cultivars are grown in cooler regions, the fruit may not lose all of its astringency and have a lower sugar content at harvest.

Delayed foliation and poor fruit set, due to insufficient winter chilling, does not appear to be a problem in New South Wales. The chilling requirement (at or below 7.2°C) of non-astringent cultivars is thought to be lower than that of astringent cultivars. The complete chilling range for persimmons is 200 to 400 hours.

Persimmons blossom much later than most deciduous fruit trees and so are less prone to late spring frost damage. The critical temperature for frost damage at bud burst is about 3°C for a duration of one hour. Early autumn frosts can cause skin blemishes on fruit and early defoliation.

Persimmons are sensitive to wind: they tend to be difficult to establish and do not crop satisfactorily if strong winds occur during the growing season. Fruit is also prone to wind rub from leaves and branches—often the main cause of skin blemish on fruit. Windbreaks can be used to help reduce wind speed and protect fruit from wind rub. Training systems using wires for support will also help reduce wind rub on the skin.

Land preparation

Persimmons can grow on a wide range of soil types but do best in well-drained loam soils with a good supply of organic matter. They perform particularly well on alluvial river flats, where trees can develop to a large size. Heavy clay loam soils that are prone to water-logging should be avoided. The preferred soil pH is in the range of 6.5 to 7.0.

Early and adequate soil preparation is essential for good establishment of persimmons. First, thoroughly rip the soil in both directions to a depth of 50 cm to bring old tree roots and rocks to the surface and break up any hard pan. This will also improve moisture penetration and drainage. Where soils are shallow (less than 1m) or poorly drained, planting on raised beds is recommended. Compared to other deciduous fruit trees, persimmons can tolerate damp soil conditions for a longer period provided the drainage is adequate.

Steep slopes should be avoided, as cultural operations such as pruning, thinning and harvesting will be more difficult and expensive. Sites with slopes greater than 3% and in high rainfall areas may require a soil erosion control plan.

Incorporating green manure crops or well-composted animal manure several months before planting can increase soil organic matter. Soil analysis is recommended several months before planting to identify and correct any soil nutritional problems.

Cultivars

Persimmons are generally classified into two major groups:

- Astringent: these cultivars have water-soluble tannins in the flesh of the fruit at maturity (harvest) and do not normally lose their astringency until soft and ripe.
- Non-astringent: these cultivars have lost their astringency by maturity and can be eaten crisp like an apple or at various stages of softness.

Over the last 20 years non-astringent cultivars have gradually replaced astringent ones. The non-astringent cultivar Fuyu (Figure1) now represents over 70% of Australia's plantings followed by Izu (12%) and Jiro (5%) (2000 planting statistics).

The main astringent cultivars still grown commercially for niche markets are Flat Seedless (Figure 2), Hachiya (Figure 3), and Tananashi. Hachiya and Korokuma are suitable for drying.

For a description of the main persimmon cultivars suitable for growing in New South Wales see Table1 (non astringent) and Table 2 (astringent)

Rootstocks

The three *Diospyros* species used as rootstocks for the oriental persimmon cultivars are:

- *D. virginiana*, American persimmon;
- *D. lotus*, date plum; and
- *D. kaki*, oriental persimmon

D. virginiana has a fibrous root system and is tolerant of both drought and waterlogging conditions and is hard in cold conditions. However, it suckers severely and trees propagated on it are not uniform in size or vigour.

D. lotus produces seedlings of uniform size with a fibrous root system without a tap root and does not sucker readily. It is regarded as being more resistant to waterlogging than *D. virginiana* and *D.kaki* but more susceptible to crown gall than *D. kaki*. The cultivar Fuyu is not compatible on *D. lotus* rootstock. Trees that do establish usually remain stunted.

D. kaki produces seedlings with long taproots with fewer fibrous laterals. Cultivars that do contain seed, such as Fuyu, generally produce uniform vigorous seedlings suitable for propagation. *D. kaki* is the most preferred of the three rootstocks.

Pollination

Persimmons varieties are further divided into two main pollination groups:

- Pollination constants: no change in flesh colour occurs after pollination and seed formation (Fuyu) and,
- Pollination variants: the flesh is light coloured when seedless, and dark reddish brown as a result of pollination and seed formation (Zenjimaru).

Cultivars are further subdivided according to the type of flower they bear. Most Japanese cultivars are pistillate constants (female only) with sterile stamens (male part) while staminate constants produce mainly male flowers and include the pollinators, Gailey and Zenjimaru. Dai Dai Maru is also considered a good pollinator for Fuyu but the tree can be vigorous, large

and slow to come into production. Gailey is the main pollinator used in Australia.

Some pistillate constant cultivars, such as Fuyu, can set fruit parthenocarpically (without seed) and still produce good yields regardless of pollination. In Japan, Fuyu has a low set and requires cross-pollination, often by hand, to improve yields. In New South Wales, Fuyu appears to be able to set a good crop without pollination. However, pollination is still desirable to help reduce natural fruit drop and improve fruit quality, especially in non-astringent cultivars.

A recommended layout for pollinators is every third tree in every third row. As bees mainly pollinate persimmon flowers, hives should be maintained in the orchard during flowering at the density of 2 to 3 hives per hectare.

Propagation

Persimmons, like most deciduous tree fruits, do not reproduce true to type from seed. Seedlings used for propagation can be grown from fresh seed that has been extracted during autumn from ripe fruit. To facilitate extraction the fruit may first be fermented in drums. The collected seed is washed and stored dry.

The seed is sometimes germinated in flat trays and when 15 to 20 cm high the seedlings are transplanted into the nursery rows during spring. Seed may also be planted directly in nursery rows 30cm apart in rows 1m apart or planted directly into long nursery containers to accommodate the plant's tap root system. Take care at this stage to prevent loss of roots through drying out.

Seedlings are usually large enough for budding or grafting at the end of the first season's growth.

Grafting is carried out when both stock and scion are dormant. Scion wood is collected from vigorous growth made during the previous season. This wood should be no less than 6mm in diameter and about 10cm long and contain three or four buds. The most common graft used is the whip and tongue.

Budding is an alternative to grafting and is normally carried out from late January to the end of February, using either a 'T' bud or 'chip' bud. Large well-developed buds are used, as small ones tend to dry out and shrink on the rootstock. Budding is usually not as successful as grafting.

Tree planting and training

Persimmons are best planted when fully dormant (July/August). Planting after bud break can result in transplant shock and poor establishment. Young nursery trees have an extensive fragile taproot system, especially on *D.kaki* rootstock and care should be taken not to disturb roots at planting. Special care is needed to prevent roots from drying out during transplanting from nursery rows to the orchard site. It is recommended that container-grown plants be used in preference to open nursery grown stock as these suffer less transplanting shock.

Trees that suffer initial setbacks rarely develop a satisfactory root system and generally lack vigour. Irrigation should be applied immediately after planting.

Planting distances for a persimmon vary depending on cultivar, rootstock, soil type and tree canopy management used. As a guide, dwarf cultivars (Izu and Ichikikeri Jiro) can be planted at 5m x 2.5m (800 trees/Ha), semi-dwarf cultivars (Fuyu) at 5m x 3m (660 trees/Ha) and vigorous cultivars (Flat Seedless) at 6m x 4.5m (370 trees/Ha).

Figure 4. Hail netting over six-year-old Fuyu cultivars trained to a palmette system. Thirlmere, New South Wales.

Tree training system can also influence planting distances. For palmette systems trees can be planted 2.5 to 3m apart within rows and in rows 4 to 5m apart (Figure 4). Tatura systems allow for closer inter-row plantings, giving an even higher plant density (over 1000 trees/ha).

Persimmons, like other deciduous trees, can be trained to modify their natural growing habit to help improve fruit quality and assist in harvesting. The most widely used training system in Australia is the modified central leader (42%) followed by palmette (35%).

The tree is quite adaptable to palmette training if wire supports are provided particularly in exposed situations. Such systems have the advantage of reducing wind damage to branches and fruit, earlier production, high yields and scope for greater mechanisation at harvest and during tree canopy management (Figure 5). Both semi-dwarf and vigorous cultivars are suited to the palmette system while dwarf cultivars, such as Izu, and some semi-dwarf cultivars, such as Fuyu, can be trained as modified central leaders.

The older open vase system is no longer recommended as it tends to produce trees that are spreading with branches and fruit more susceptible to sunburn.

As a general rule astringent cultivars are more vigorous than non-astringent cultivars.

Fruit thinning

There is evidence from Japan that thinning will improve fruit size and colour and also help control some insect pests, such as mealy bugs, by eliminating fruit crowding. Thinning will also reduce biennial bearing, particularly if it is carried out at the flowering stage.

Figure 5. Mechanically aided harvest of palmette-trained Fuyu persimmons. Thirlmere, New South Wales.

Biennial bearing can be problem, particularly on late maturing cultivars carrying a heavy autumn crop and with early defoliation. Such trees may show fewer flowers and a lighter crop load the following year.

Since hand pollination is not carried out in Australia and good fruit set is not assured it is preferable to thin fruit after the main period of fruit drop or young fruitlet stage in late spring/early summer. If thinning is practised, aim to leave two to four fruits per bearing laterals.

Commercial growers in New South Wales do not normally thin persimmon flowers or fruit due to high labour costs.

Pruning

Young trees may need some light pruning when dormant and during early summer in order to develop a strong framework for the selected training system.

Summer pruning on mature trees may be necessary to improve fruit size and colour and thicken laterals, particularly on vigorous cultivars

Generally, mature trees may only require thinning out of weak shaded branches, or removal of broken and misplaced limbs during dormancy.

It is important to remember that flower buds are borne on the end of current season's growth and excess pruning can reduce crop load by forcing strong vegetative growth. No flowers will develop if shoots are heavily cut back.

With more vigorous, less precocious cultivars, cincturing and spreading of limbs to more horizontal angles may help achieve earlier and better fruit yields.

Nutrition

Persimmons tend to have only one main, compact, growth flush during spring and early summer and adequate moisture and nutrients are essential during this period.

Regular soil and leaf analyses should be used to develop and refine any fertiliser program. As a general guide, young trees up to 3 years old will benefit from a complete fertiliser applied before bud break and again in mid-summer together with several light applications of nitrogen during the growing season.

Persimmons respond well to applications of nitrogen and potassium. A mature tree may require up to 125–

Figure 6. Circular leaf spot on Fuyu persimmon leaves. Heavy infestation can cause early tree defoliation. Cobbitty, New South Wales.

250g of nitrogen and 150–300g of potassium a year depending on soil fertility and crop load.

Split applications of nitrogen and potassium are recommended. As a guide, apply one third of the annual nitrogen and potassium fertiliser before or at bud break and the remainder over summer in two or more applications. Try to avoid a heavy application late in the season as excess fruit drop and calyx separation on some cultivars may occur.

Light applications of both nutrients in compounds such as in potassium nitrate can be applied through the irrigation system up to and after harvest. The after-harvest application will help maintain leaf condition and prevent early leaf drop. Early leaf drop reduces the build-up of starch reserves in the tree essential for next season's growth.

The phosphorus requirement for persimmons is low compared to other deciduous fruit crops. Phosphate uptake by the plant is slow and, if needed, is best applied in autumn and incorporated into the soil. As an annual guide mature trees may need 30 to 40g of phosphorus. If a pasture cover crop (legumes and grasses) is used between rows, an annual application of phosphate (9%P) at 200–250kg/ha after harvest will encourage crops to grow through autumn and winter. Some of the phosphorus in the organic matter will slowly become available to the tree.

Figure 7. Skin russeting on Hachiya, Cobbitty, New South Wales.

Persimmons lend themselves well to fertigation (applying soluble fertilisers via the irrigation system) and most nutrients can be applied this way. Nitrogen rates can be reduced by up to 50% and potassium by up to 25% since fertigation is more efficient in providing available nutrients over several applications and less is lost from leaching.

PLANT AND CROP PROTECTION

Insect pests

Queensland fruit fly (*Bactrocera tryroni*) is the most serious pest of persimmons. Damage appears as small black spots. In astringent cultivars the larvae often fails to develop. Early cultivars are particularly prone to attack.

Mealybugs (*Pseudococcus* spp) are mainly found beneath the calyx of fruit, making them difficult to control. The presence of this pest can restrict movement of fruit to interstate or overseas markets. Biological control is available using natural predators such as ladybirds and lacewing larvae.

Fruit spotting bug (*Amblypelta nitida*). Damage appears as black, sunken spots between the calyx and the shoulders of the fruit. The flesh below the spot is dark and severely damaged and fruit often drop.

Vertebrate pests. Birds and flying foxes can cause serious crop losses to ripening fruit in coastal orchards in some seasons. Permanent netting, with a mesh size of 20–45 mm, has proven to be the most effective long-term control method.

Diseases

Cercospora leaf spot (*Cercospora kaki).* Small dark brown angular spots appear on leaves in late summer and autumn. Severe infections can cause early defoliation. Some cultivars are more resistance than others.

Circular leaf spot (*Mycosphaerella* spp.). Small to large circular spots surrounded by a watermark like halo (see Figure 6).

Crown gall (*Agrobacterium radiobacter* var. *tumefaciens*). Large galls (swellings) develop around the crown with smaller marble-size galls on larger roots. Persimmons are very susceptible to crown gall and it is essential to treat seedlings and nursery trees with a registered inoculant before planting.

Physiological disorders

Calyx-separation (dehiscence). A cavity develops beneath the calyx of the fruit and turns a dark colour—this is often is the site for secondary infection. Fruit with calyx-separation usually colours early with an uneven finish, leading to downgrading.

Skin russeting (rings). Symptoms are concentric shallow rings around the fruit. The causes are not known, but damage from thrips during flowering, excessive nitrogen, irregular irrigation or high relative humidity during fruit ripening are possible causes. Skin russeting is more prevalent on conical oblate shaped astringent cultivars such as Hachiya (Figure 7).

Weeds

Newly planted trees should be kept free of grasses and weeds. A weed-free band of up to 1 metre on either side of young trees is recommended. This may need to be increased as the trees become larger. A pasture mix of clovers and grasses sown down between rows can help suppress weeds and help reduce soil erosion. Keep weeds away from micro-irrigation outlets as they can affect the wetting pattern of sprinklers.

There are a limited number of agricultural chemicals registered in Australia for the use on persimmons. Contact your nearest NSW Agriculture horticultural advisory officer for advice on control strategies for these pests.

Irrigation

Supplementary irrigation is essential for growing persimmons. Under-tree micro-irrigation systems using drippers or sprinklers are now widely used in all new plantings. Adequate soil moisture is essential after planting to prevent transplant shock, particularly when bare-rooted plants raised in open-ground nurseries are used. Once established, the critical times for adequate soil moisture are during early spring to promote shoot growth and fruit set, and during summer and early autumn to maintain fruit quality.

The amount and timing of irrigation can be scheduled with the use of tensiometers or one of the many commercially available electronic soil moisture devices.

Harvesting and packing

Fruit needs to be well developed and show the characteristic colour for the cultivar before being harvested. Firm fruit that remains on the tree until it develops a good colour will develop a higher sugar content and have good flavour and consistency after harvest. Immature fruit does not soften evenly after harvest and may remain partly astringent and generally lacking flavour.

Sugar levels and colour are a good indication of fruit maturity. Persimmons are considered ready for harvest when they have reached a full orange to orange-red colour with no visible green background (colour maturity charts are useful here) and a sugar level of 14–15% soluble solids (14–15° Brix) as measured using a refractometer. For the cultivar Fuyu a soluble solid of 15° Brix is recommended at harvest. In Japan, the Fuyu cultivar can attain soluble solids of up to 18° Brix.

The best way to harvest persimmons is to clip the fruit from the tree with small secateurs, leaving the calyx and a short stem attached to the fruit. It is possible to snap the fruit from the tree but this requires skill and may injure the fruit.

The persimmon season in New South Wales begins in late February and extends to late May depending on cultivars and growing regions. Two to three picks are required depending on the cultivar and seasonal conditions.

Harvested fruit is best placed in plastic 10 L containers and not in traditional wooden fruit bins. If bins are used they should be shallow with smooth or padded sides. Take special care with astringent cultivars with a pointed apex, such as Hachiya, to prevent damage to the top of the fruit.

Field heat in fruit should be removed as soon as possible by a cooling system, such as fan-forced cooling within an existing cool room, to bring pulp temperature below 20°C before packing.

Persimmons are graded according to size, colour and freedom from skin blemish. Fruit showing blemishes

from insect damage, wind abrasion, skin russeting or skin puncture damage caused by birds or flying foxes should be graded out. Any fruit that is poorly or unevenly coloured should be rejected for quality local or export packs. All fruit packed needs to have the calyx and stem intact and be fresh in appearance. Fruit can easily be bruised and is graded and packed mostly by hand. However, fruit graders can be used if soft brushes and sponge rollers are used. Some fruit waxing is also carried out.

The most popular package for persimmons is a single-layer tray 90 mm deep with a plastic insert liner as commonly used for stone fruit. Fruit count ranges from 12 to 30 pieces of fruit per tray and in New South Wales most fruit is packed to a count of 18 to 25 with an average weight of 4–4.5kg per tray. Smaller fruit is packed loose in 10kg containers. Fruit for export is generally packed in slightly shallower higher quality trays with a lid (Figure 8). Larger and high quality fruit can be packed in polysocks within trays. Fruit pack-out for persimmons can be low (60–80%), particularly for export markets.

Storage

Persimmons can be successfully cool stored for up to 3 months at 0°C and 90–95% relative humidity. During storage, the skin colour intensifies and turns darker and, if stored with other fruits with ethylene gas present flesh firmness may decrease. The cultivar Fuyu can be stored for up to 5 to 6 months using controlled atmosphere storage with 5–8% CO_2 and 2–3% O_2 at O°C. Good results can also be obtained by placing fruit in a .06 mm thick low-density polyethylene bag and storing at 0°C. The post-harvest life of the fruit can be improved if the fruit has been pollinated.

Yields

A combination of factors such as cultivar, age of tree, density and tree training system used can determine yields. The national average yield for persimmons from trees six years or older in 2000 was 16 t/ha. Mature Fuyu trees can yield up to 30 t/ha while more vigorous cultivars such as Flat Seedless can yield up to 40 t/ha. Some of the dwarf and semi-dwarf cultivars are precocious croppers and start cropping between 2 and 3 years after planting, especially in subtropical areas, while more vigorous cultivars like Flat Seedless in cooler areas may take longer. A persimmon tree reaches full bearing age at 8–10 years and can continue producing commercial crops for a further 15 to 20 years.

Figure 8. Fuyu persimmons packed in single layer tray for export. Thirlmere, New South Wales.

Marketing

Persimmons are considered an exotic fruit in Australia and consumption per capita is low. They are better known in ethnic communities from Asia, the Middle East and Mediterranean countries. The introduction of better eating non-astringent cultivars over the last 20 years, together with improved packaging and marketing, is expected to result in increased consumption of persimmons in Australia.

Most fruit is consigned to fruit wholesalers at central markets in metropolitan centres where it is sold to retailers, smaller fruit outlets or exporters. Some direct marketing and export takes place by coordinated groups of fruit producers.

Overseas markets for high-quality, large, clean fruit of non-astringent types exist mainly in Asia and to a lesser extent in the Middle East.

Persimmons have a limited processing potential because of their high tannin content.

Persimmon uses

Fully ripe non-astringent persimmons are usually eaten fresh—skin and all—while astringent cultivars are cut

in half and eaten with a spoon when soft. Some people prefer to add lemon juice or cream and a little sugar. The flesh may be added to salads, blended with ice cream or yoghurt, used in cakes, puddings, mousse or made into a jam or marmalade. Ripe fruit can be frozen whole or pulped and frozen in the home freezer. They are a good source of vitamin A and C and are low in kilojoules.

Drying is common in Japan and Brazil. The fruits are picked when mature but firm, peeled and hung by their stems for 30–50 days to dry in the sun. Kneading every 4–5 days is necessary to give uniform texture and improve flavour. Then they are taken down and 'sweated' for 10 days in heaps under mats. Sugar crystals form on the surface. Last, they are hung up again to dry in the wind.

In Asia, the wood of the persimmon tree is prized and used for fancy inlays on tables. The wood is also used for carvings, wood turning and in wooden golf clubs.

Hyperlink

Queensland Fruit Fly: http://www.agric.nsw.gov.au/Hort/ascu/fruitfly/fflyinde.htm

References and further reading

Collins, R.J. 1997, *Developing the Australian Non-astringent Persimmon Industry,* PhD thesis, University of Queensland

Geroge, A.P., Collins, R.J. and Nissen, R.J. 1994, 'Growth, yield and fruit quality of non-astringent persimmon in subtropical Australia,' *Australian Journal of Experimental Agriculture*, **34**, 267–75.

Geroge, A.P., and Nissen, R.J. 1985, 'The persimmon as a subtropical fruit crop,' *Queensland Agricultural Journal*, May/June, 133–140.

Kitagawa, A.H. and Glucina, P.G. 1984, *Persimmon culture in New Zealand*, New Zealand Department of Science and Industrial Research Information Service series No. 159, Science information Publishing Centre, Wellington, New Zealand.

Nissen, R.J., Geroge, A.P., Broadley,R.H. and Collins,R.J. 2000, 'A survey of cultivars and management practices in Australian persimmon orchards,' Proc. II International Symposium on Persimmon, Novetel Twin Waters Resort, Sunshine Coast, Queensland.

Nissen, R.J., Geroge, A.P. and Broadley, R.H. 2000, *Persimmon nutrition—a practical guide to improving fruit quality and production,* Queensland Department of Primary Industries, Nambour, Queensland, IS 0727-6273.

Nissen, R.J., Geroge, A.P. and Collins, R.J. 2000, 'Persimmon Information Kit,' *Agrilink* series, Queensland Department of Primary Industries, Maroochy Research Station, Nambour, Queensland.

Web sites

http://www.crfg.org/pubs/ff/persimmon.html

http://www.hort.purdue.edu/newcrop/japanese_persimmon.html

http://fruitsandnuts.ucdavis.ed

Table 1. Characteristics of non-astringent persimmon cultivars grown in New South Wales.

Cultivars	Harvest period	Fruit size	Skin colour	Fruit shape	Tree vigour	Tree habit	Comments
Izu	Early to late March	Small–medium	orange/red	oblate	low	dwarf	Earliest. Very dwarf tree. Good fruit quality. Fruit fly prone.
Maekawa Jiro	early to late March	large	orange/red	oblate	low	dwarf	Early Jiro type. Good quality.
Ichikikei Jiro	early to late March	large	orange/red	oblate	low	very dwarf	Good fruit quality. Compact tree. Needs pollination.
Matsumoto Wase Fuyu	mid March to early April	large	orange	round to oblate/flat/four sided	moderate	semi-dwarf	Early Fuyu type. Branches brittle. Good quality. Biennial bearing.
Hana Fuyu	mid April to early May	large	orange/red	round/oblate	moderate	semi-dwarf	Larger and earlier than Fuyu.
Suruga	Early April to early May	large	orange/red	round/oblate	moderate	semi-dwarf	Late maturing. Not suitable for cooler areas. Calyx-separation.
Fuyu (Figure 1)	mid April to late May	large	orange/red	round/oblate	moderate	semi-dwarf	Main cultivar in Australia and Japan. Very good quality. Stores well. Pollination needed. Several strains available. Merbein strain is superior.

Table 2. Characteristics of astringent persimmon cultivars grown in New South Wales.

Cultivar	Harvest period	Fruit size	Skin colour	Fruit shape	Tree vigour	Comments
Korokuma	early to mid March	large	yellow/ red	broad conical	vigorous	Suitable for drying. Concentric rings at apex. Ripens unevenly. Pollination variant.
Hachiya (Figure 3)	early to late April	large	deep orange/ red	oblong/ conical with apex	vigorous	Excellent flavour. Mostly seedless. Suitable for drying. Pollination constant.
Tanenashi	late March to mid April	very large	yellow/ light red	round/ conical	weak to moderate	High quality but pasty consistency. Heavy fruit set. Biennial bearing. Suitable for drying.
Dai Dai Maru	late March to late April	small	deep red	round	moderate	High quality, sweet and regular cropper. Pollinator for Fuyu.
Flat Seedless (Figure 2)	mid April					
to mid May	large	orange/ red	round oblate	vigorous	Best of astringents. High quality. Smooth texture. Low astringency. Slow to come into production. Wilson selection best.	
Yemon	late April to early May	small to medium	yellow/ red with mottling	oblate/ four sided	moderate	High quality. Pollination variant. Soft.