



Australian Government  
Australian Centre for  
International Agricultural Research

# Pacific sandalwood

Growers' guide for sandalwood production  
in the Pacific region



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Photo: (facing page) Luis Almeida

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# Acronyms and abbreviations

<b>Term</b>	<b>Description</b>
2CC	second cutting chips
DBH	diameter at breast height
DBHOB	diameter at breast height over bark

## Units

<b>Unit</b>	<b>Definition</b>
cm	centimetre
cm AGL	centimetres above ground level
g	gram
ha	hectare
kg	kilogram
L	litre
m	metre
m <sup>2</sup>	square metre
m AGL	metres above ground level
m ASL	metres above sea level
mm	millimetre
ppm	parts per million
t	tonne, metric tonne (1,000 kg)
°C	degree Celsius



# 6 Hosts

## 6.1 Host silviculture

Host species silviculture is a critical aspect to a successful sandalwood plantation. The growth and size characteristics of the host species will influence their optimal spacing (i.e. the distance between the sandalwood tree and the host species), arrangement and management.

The ratio, spacing and arrangement of hosts and sandalwood aims to:

- promote haustorial connections between hosts and all sandalwood
- maximise the number of different host species available to the sandalwood
- provide protection from exposure to sun/heat
- allow room for sandalwood to extract soil resources (water and nutrients)
- permit sandalwood to intercept direct sun for part of the day.

While hosts are essential for good sandalwood growth, some species can outcompete the sandalwood trees if they are planted at higher densities than described (Section 4.3) or if their growth is left unchecked. Ongoing plantation monitoring and adaptive management (i.e. silviculture) is therefore essential to balance the benefits of the host species with their potential to induce competitive stresses on the sandalwood trees.

Ensuring a good selection of hosts including short-term, medium-term and long-term hosts is critical to the good development of sandalwood (Figure 6.1). It is important that the development of the hosts matches that of the sandalwood. If the host is too slow to develop, then the sandalwood will be slow to develop, and may effectively 'overload' the host causing stress and even death of both the host and the sandalwood. Hosts that develop too quickly can overtop the sandalwood and cause it to develop poorly.

Host silviculture is an important but often overlooked aspect of sandalwood production. Hosts should be pruned back if they appear to be outgrowing the sandalwood. Removal of parts of the upper crown can help in this regard. If it appears that the existing hosts are struggling, it may be possible to introduce new hosts, though this is never as satisfactory as planting an adequate number of hosts at establishment (or in the 12 months before field planting of the sandalwood). The best hosts for later infill planting are pigeon pea through direct seeding, *Alternanthera dentata* and pinto peanut through stem cuttings, paper mulberry (*Broussonetia papyrifera*) through branch cuttings and some larger permanent hosts, especially those that are capable of root suckering such as *Acacia leptocarpa* and some *Casuarina* spp.

Figure 6.1 (photos on facing page) Well-spaced (5 m × 5 m) alternating rows of host (*Cassia fistula*) and sandalwood (*S. macgregorii*) in Papua New Guinea (above). Sandalwood (*S. austrocaledonicum*) planted with *Calliandra* alternated within each row in Vanuatu (below)



## 6.2 Host types

The plants with which sandalwood forms haustoria (see Section 2.2) are called hosts. Sandalwood forms haustoria with many different species, but some species (particularly legumes) support greater growth and vigour in the sandalwood. There are three main host types used for cultivating sandalwood:

1. **Pot host** – a herbaceous low-growing plant that is easy to propagate, which is planted in the polybag after the seedling reaches the 4–6 leaf stage. The size of the pot host needs to be maintained by pruning to avoid it outcompeting the sandalwood and typically persists in the field for the first few months after planting.
2. **Intermediate host** – a small tree or large shrub, typically a short-lived (about 5 years), nitrogen-fixing legume that is planted close (1–2 m) to the sandalwood. The intermediate host supports rapid early growth of the sandalwood. The size of the intermediate host will influence the distance it is planted from the sandalwood, and it may need to be pruned to ensure it does not outcompete the sandalwood.
3. **Long-term host** – a large tree that provides a host for the entire sandalwood rotation. It is planted at a lower density in the plantation and at least 3 m from the closest sandalwood tree (from 4 to 8 m to the closest sandalwood tree). Like the intermediate hosts, wider spacing is required for larger trees.

## 6.3 Preferred hosts for each species

Different sandalwood hosts are used in different geographic areas, with the various species of sandalwood, to promote optimum growth and vigour of sandalwood plantings (Table 6.1).

Table 6.1 Sandalwood species and their preferred hosts in different countries

	<i>Santalum album</i>	<i>Santalum austro-caledonicum</i>	<i>Santalum lanceolatum</i>	<i>Santalum macgregorii</i>	<i>Santalum yasi</i>	Weed risk
<i>Alternanthera nana</i>	Timor-Leste	Vanuatu	Aust	PNG	Fiji & Tonga	
<i>Alternanthera dentata</i>					Fiji	
Sims' wattle <i>Acacia simsii</i>			Aust	PNG		
Pinto peanut <i>Arachis pintoii</i>		Vanuatu	Aust		Fiji & Tonga	
Paper mulberry/hiapo <i>Broussonetia papyrifera</i>					Tonga	
Pigeon pea <i>Cajanus cajan</i>	Timor-Leste	Vanuatu		PNG	Fiji & Tonga	
<i>Calliandra calothyrsus</i> & <i>C. suranomensis</i>	Timor-Leste		Aust	PNG	Fiji & Tonga	
Coral tree <i>Erythrina poeppigiana</i>		Vanuatu (intermediate to long-term host)				
<i>Sesbania grandiflora</i>	Timor-Leste	Vanuatu		PNG		
Egyptian pea <i>Sesbania sesban</i>			Aust	PNG		
<i>Acacia auriculiformis</i>			Aust	PNG		
<i>Acacia crassicaarpa</i>			Aust	PNG		
<i>Acacia leptocarpa</i>				PNG	Fiji	
<i>Acacia leucophloea</i>	Timor-Leste					
Qumu <i>Acacia richii</i>					Fiji	
Namariu <i>Acacia spirorbis</i>		Vanuatu				
White siris <i>Albizia procera</i>	Timor-Leste			PNG	Fiji	Weed risk
Pink shower <i>Cassia javanica</i>	Timor-Leste			PNG		
Golden rain tree <i>Cassia fistula</i>	Timor-Leste			PNG		Weed risk
Beach she-oak/ nokonoko <i>Casuarina equisetifolia</i>	Timor-Leste	Vanuatu		PNG	Fiji & Tonga	
Citrus species, esp. <i>C. maxima</i> , <i>C. reticulata</i> , <i>C. x taitensis</i>		Vanuatu		PNG	Fiji & Tonga	
Poumuli/namamau <i>Flueggea flexuosa</i>	Samoa	Vanuatu			Fiji	
<i>Leucaena leucocephala</i>	Timor-Leste					High weed risk. Used for cattle fodder
<i>Pterocarpus indicus</i>	Timor-Leste	Vanuatu				
Tamarind <i>Tamarindus indica</i>	Timor-Leste					

## 6.4 Pot host

### 6.4.1 Alternanthera (*Alternanthera nana* and *Alternanthera dentata*)



Figure 6.2 Examples of alternanthera variation (top row) and alternanthera as a pot/initial sandalwood seedling plant host (bottom row)

Alternanthera is routinely used as the first host for sandalwood in the nursery. It is a highly variable ornamental plant (Figure 6.2). Sandalwood growth is more vigorous when alternanthera is planted in the polybag than when seedlings are planted without it. However, the pot host has to be regularly pruned; otherwise, the alternanthera can smother the sandalwood, eventually killing it. In wet conditions, the stem of alternanthera can fasten onto the stem of the sandalwood, causing it to rot and die.

## 6.5 Intermediate hosts

### 6.5.1 Sims' wattle (*Acacia simsii*)



Figure 6.3 *A. simsii* habit (left), flowers (top right) and fruit (bottom right)

This acacia, which is native to Australia and Papua New Guinea, is a small-sized (2–4 m) and relatively short-lived leguminous host shrub (Figure 6.3). It is propagated by seed and the very hard seed coat needs to be scarified or softened by pouring hot (70–80 °C) water over the seeds and soaking them for 24 hours. It should be spaced a minimum of 1.5 m from each sandalwood tree. Form pruning or thinning can be implemented as required.

### 6.5.2 Pinto peanut (*Arachis pintoii*)



Figure 6.4 *A. pintoii* flowers and foliage (left) and growing as a host for *S. album* (right)

Pinto peanut is a prostrate perennial shrub that is native to Brazil (Figure 6.4). It can reach 20–50 cm in height and forms a dense groundcover. It is a very suitable intermediate host because it is a nitrogen-fixing legume, does not compete with sandalwood for light and effectively suppresses weed growth. The plant propagates naturally by creeping stems (stolons), which can be easily removed to establish new plants. While it can take time and patience to establish on site, it is adapted to a wide range of soils, from sands to clays, preferably well drained.

### 6.5.3 Paper mulberry (*Broussonetia papyrifera*)



Figure 6.5 *B. papyrifera*: female flowers (left), male flowering catkins (centre) and fruit (right)

Photos: (left) Daderot, CC0 1.0; (centre) Didier Descouens, Fronton, France. 19 April 2014, CC BY-SA 4.0; (right) Didier Descouens, Clermont-le-Fort, France. 7 August 2019, CC BY-SA 4.0.



Figure 6.6 Paper mulberry (foreground) planted as host for *S. yasi* (tall tree in back) on 'Eua, Tonga

Photo: Lex Thomson

Paper mulberry is a small tree native to Asia and a Lapita/Polynesian introduction into the Pacific islands. It is fast growing, typically reaching 6–10 m with similar spread. In Polynesia it does not produce seed as all trees were originally female clones, so propagation is vegetative, from root or stem cuttings. This contributes to its lower weed potential in Polynesia, compared with some Pacific island nations (Hawai'i, Solomon Islands and Fiji) where both female and male plants have been introduced (Figure 6.5). If the paper mulberry is also being planted for the production of bark, then it can be planted at close spacing (e.g. 1.5–2 m × 1.5–2 m), but if it is planted purely as a host and will be allowed to grow into larger, permanent hosts then it should be planted at a wide spacing (e.g. 6–8 m apart and no closer than 2 m to planted sandalwood) (Figure 6.6).

#### 6.5.4 Pigeon pea (*Cajanus cajan*)



Figure 6.7 *C. cajan* flowers (left), fruit (centre) and foliage (right)



Figure 6.8 Pigeon pea as host plants (to the front and back right of photo)

Pigeon pea is a short-lived (3–5 years) leguminous shrub that can be planted by direct seeding (Figure 6.7). The seeds take 10–15 days to germinate. Because of its relatively small size (1–2 m), it can be planted close (1–2 m) to a young sandalwood seedling, while not being so big that it reduces sandalwood growth through competition. It is possible to plant one pigeon pea for every sandalwood tree (even at close sandalwood spacing) (Figure 6.8). The pods, leaves and flowers make an excellent animal fodder and the seeds are a well-known human food.

### 6.5.5 Sesbania (*Sesbania grandiflora* and *Sesbania formosa*)



Figure 6.9 *S. grandiflora* flowers (left) and growth habit (right)



Figure 6.10 Sesbania is an excellent intermediate host for any sandalwood species

Native to Australia, South-East Asia and India, sesbania is another short-lived perennial legume that is highly suitable as an intermediate host. It grows slightly bigger than pigeon pea. It is a fast-growing, open-branching tree that grows up to 8–15 m tall with a stem of up to 25–30 cm diameter (Figure 6.9 and 6.10). It is easily propagated by seed and usually germinates well without scarification. It can also be propagated vegetatively by stem and branch cuttings. It is recommended that this species be planted no closer than 2 m from any sandalwood tree, with one sesbania plant for every 2–3 sandalwood trees. Form pruning may be required to produce a clear bole for timber production.

### 6.5.6 Egyptian pea (*Sesbania sesban*)

Native to north-east Africa but naturalised in many countries where it is cultivated, this is a fast-growing, short-lived single or multistemmed shrub or small tree from 1 to 8 m tall that becomes more spreading when widely spaced. It is propagated by seed, which requires a pretreatment such as scarification (abrasion or acid) or soaking in water at 80 °C for 8 minutes (hot water pre-treatment can result in significant seed death if not carefully monitored). It is recommended that this moderate-sized long-term host be spaced a minimum of 3 m from any sandalwood tree. Branches can be regularly pruned, or the tree may be coppiced or pollarded to facilitate fodder production. It seeds prolifically and will readily establish on moist bare soils so active regeneration control may be needed in some settings to maintain the desired density.

## 6.6 Intermediate to long-term hosts

### 6.6.1 Coral tree (*Erythrina poeppigiana*)

The coral tree may be used as an intermediate host planted 1–2 m from sandalwood, if it is regularly pruned. Alternatively, it may be used as a long-term host planted at least 3–4 m from the sandalwood. The coral tree is a fast-growing legume from South America that can add significant amounts of nitrogen to the soil (Figure 6.11). It does, however, require regular pruning to maintain a manageable size and ensure that it does not outcompete sandalwood during the establishment years. The prunings are very useful as green manure. The spacing of these hosts should be one for every 2–3 sandalwood trees.



Figure 6.11 *E. poeppigiana* planted as a host for *S. austrocaledonicum*



## 6.6.2 Calliandra (*Calliandra calothyrsus* and *Calliandra surinamensis*)

Native to Mexico, Central America and Colombia, calliandra is a fast-growing perennial, multistemmed shrub or small tree of 5–6 m with a stem diameter up to 20 cm (Figure 6.12 and 6.13). It is propagated by seed, which requires a pretreatment of soaking in hot or cold water for 24–48 hours. It is recommended that this moderate-sized host be spaced a minimum of 3 m from any sandalwood tree. Branches can be regularly pruned, or the tree may be coppiced to facilitate fodder and firewood production. It will readily establish on moist, bare soils, so active regeneration control may be needed to maintain the desired density. Sandalwood appears to feed very heavily on, and derive considerable growth benefits, from *C. calothyrsus* but there is a risk that sandalwood can kill calliandra (same applies to citrus), which then become infected with brown butt rot (*Phellinus noxius*), which can then spread into and kill the sandalwood. The remedy is to plant a variety of hosts, not just calliandra, and have an appropriately high host–sandalwood ratio. Sandalwood seems to derive less growth benefit from *C. surinamensis*, but the latter is a stronger host, and its semi-horizontal branching habit is desirable to prevent overtopping of sandalwood.



Figure 6.12 *C. calothyrsus*: habit (left), flowers (centre) and fruit (right)

Photos: (left) Forest & Kim Starr, CC BY 4.0; (centre) Forest & Kim Starr, CC BY 3.0; (right) Roger Culos CC BY-SA 4.0.



Figure 6.13 *C. surinamensis*: habit (left), flowers (centre) and fruit (right)

Photos: (left) Katherine Wagner-Reiss, CC BY-SA 4.0; (centre) Scott Zona, CC BY 2.0; (right) Philipp Weigell, CC BY 3.0.

## 6.7 Long-term hosts

### 6.7.1 Papuan wattle (*Acacia auriculiformis*)



Figure 6.14 *A. auriculiformis* habit in natural stand (left), open seed pod and seed (top right), and collected seed pods with leaves (bottom right)

Northern or Papuan wattle (*A. auriculiformis*) is a medium-sized tree that grows to 30 m and adapts well to a range of soil types (Figure 6.14). It has a large spreading canopy and a spreading, densely matted root system. This tree is a very good host for sandalwood, although given its size and vigorous growth, attention needs to be given to appropriate wide spacing and canopy management. It is very useful for fuelwood and as a shade tree since it retains its canopy during the dry season. Plant at a minimum of 4–5 m from any sandalwood tree and plant midway between each third or fourth sandalwood tree (i.e. 16–20 m apart).

### 6.7.2 Salwood (*Acacia crassicarpa*)



Figure 6.15 *A. crassicarpa* in the wild, Keru, Papua New Guinea (left), flowers (top right) and seed pods (bottom right)

Salwood (*A. crassicarpa*) is a medium-sized tree that grows to a maximum of 30 m tall (Figure 6.15). The bole is often straight and branchless for about 13–18 m, and grows up to 50–60 cm in diameter. Salwood bark is dark or grey-brown, hard with deep vertical furrows; the inner bark is red and fibrous. It can grow on a wide range of soils from well to imperfectly drained acid soils. The crown is usually heavily branched and spreading in open environments and the canopy needs to be managed so it doesn't overtop the sandalwood. Plant at a minimum of 4–5 m from any sandalwood tree, midway between each third or fourth sandalwood tree (i.e. 16–20 m apart)

### 6.7.3 Coast wattle (*Acacia leptocarpa*)



Figure 6.16 *A. leptocarpa* habit (left) and flowering (right)

Native to Australia and Papua New Guinea, *A. leptocarpa* is a shrub (3–5 m) or small tree up to 15 m, with a diameter of up to 25 cm (Figure 6.16). It has a light to moderately dense crown and produces a single stem. It occurs on sandy or rocky soils. The hard-coated seed requires a regular dormancy breaking treatment such as pouring hot water (70–80 °C) over the seeds and soaking them for 24 hours. Discard floating infertile seeds, plant swollen seeds and re-treat any remaining seed. Form pruning may be required to limit the lateral spread of the crown, with prunings potentially used for firewood. The timber is decorative and useful in cabinet work but limited by the small dimensions of the tree. Plant a minimum of 2 m from any sandalwood tree, midway between each second sandalwood tree (i.e. 12 m apart).

#### 6.7.4 Ai-marō (Kemak name), white-bark acacia (*Acacia leucophloea*)



Figure 6.17 *A. leucophloea* habit (top left), pollarded (top right), bark (bottom left) and foliage (bottom right)

A large spreading tree native to East Asia and the Indian subcontinent, *A. leucophloea* can grow up to 35 m in height and up to a diameter at breast height (DBH) of 100 cm (Figure 6.17). Seed viability can be low. Hot water pretreatment improves germination, but it can still take 1–3 months. This species is slow to establish compared with *Leucaena* but it is much longer lived. The crown can be pollarded for fodder and to restrict canopy spread, the leaves should not, however, be used as a sole feed due to hydrocyanic acid toxicity. It also produces an attractive and durable timber.

### 6.7.5 Qumu (*Acacia richii*)



Figure 6.18 *A. richii* pods

*A. richii* is endemic to Fiji and is a small to medium-sized tree (6–25 m) with a rather light or sparse canopy. As with most other acacias, the hard-coated seed (Figure 6.18) requires a pretreatment such as pouring hot water (70–80 °C) over the seeds and soaking them for 24 hours. Discard floating infertile seeds, sow only swollen seeds and re-treat any remaining seed. Form pruning may be required to limit the lateral spread of the crown given its freely branching habit. The wood is a valued timber. Plant a minimum of 2 m from any sandalwood tree, midway between each second sandalwood tree (i.e. 12 m apart).

### 6.7.6 Namariu (*Acacia spirorbis*)



Figure 6.19 *A. spirorbis* habit, Tanna, Vanuatu (left) and leaves and flowers (right)

Namariu is an excellent host species for sandalwood, especially in Vanuatu, and occurs in the wild on all islands with natural populations of sandalwood. Naturally occurring areas of namariu are an indicator of good sites for growing sandalwood. Namariu is a large (15–20 m tall, 40–60 cm in diameter), long-lived tree and may be used as a host for more than one sandalwood rotation (Figure 6.19). If pruned and maintained to produce a clean, straight bole, its timber can be used for local construction and fencing. The subspecies *spirorbis* is endemic to Vanuatu and New Caledonia, while subspecies *solandri* is endemic to Papua New Guinea and Australia.

### 6.7.7 White siris (*Albizia procera*)



Figure 6.20 *A. procera* habit (main) and foliage (inset)

Native to Australia, South-East Asia and India, *A. procera* is a large, fast-growing, dry-season deciduous tree with an open canopy, up to 30 m tall, often with a straight bole of up to 9 m and reaching a diameter of 30–60 cm (Figure 6.20). It is an aggressive coloniser and potentially an invasive species. Fresh seed requires no pretreatment, stored seed responds well to soaking in hot (70–80 °C) water for 5 seconds, removing seed from direct heat and soaking in tap water overnight. Direct sowing into well-prepared soil is more successful than planting out from a nursery, as long as soil moisture is good and weeding is done regularly. Plant a minimum of 3 m from any sandalwood tree and plant midway between each second or third sandalwood tree (i.e. 12–18 m apart). Form pruning may be needed to produce a clear bole for timber production.

### 6.7.8 Golden shower (*Cassia fistula*) and pink shower or Java cassia (*Cassia javanica*)



Figure 6.21 *C. fistula* habit (left) and flowers (right)



Figure 6.22 *C. javanica* habit (left) and flowers (right)

Native to Asia, *C. fistula* and *C. javanica* are widely cultivated and are naturalised in many tropical countries. They are fast-growing, medium-sized, dry-season, deciduous/semi-deciduous trees. They commonly reach a height of 25 m (sometimes up to 40 m) and have a spreading crown (Figure 6.21 and 6.22). They are propagated by seed germinating from 7 to 30 days. It is recommended that these moderate to large-sized, long-term hosts be spaced a minimum of 3 m from any sandalwood tree and only be planted at the midpoint between each second or third sandalwood tree (i.e. 12–18 m apart) so they do not dominate the sandalwood trees later in the rotation. Form pruning may be required to produce a clear bole for timber production. They will coppice vigorously and produce many root suckers, which will need to be controlled, and are considered a weed in many areas.



### 6.7.9 Beach she-oak or nokonoko (*Casuarina equisetifolia*)



Figure 6.23 *C. equisetifolia* planted (left), female flowers (top right) and cones from a female tree (bottom right)

Native to the Pacific, South-East Asia and Australia, beach she-oak has been used widely as a sandalwood host (Figure 6.23). It provides good protection from winds without overtopping the sandalwood. Trees grow rapidly but can be easily controlled with minimal pruning. Spacing needs to be at least 15 m × 6 m to allow sufficient space for the growth and development of the sandalwood. Trimmings and thinnings may be used for firewood.

### 6.7.10 *Citrus* spp. (orange, pamplemousse, lime or lemon)



Figure 6.24 Mandarin host to *S. yasi*, Vavau, Tonga (left) and mandarin host to *S. yasi*, Taveuni, Fiji (right)

*Citrus* species are the main non-nitrogen-fixing species recommended as sandalwood hosts (Figure 6.24). However, if there are not enough citrus trees relative to the number of sandalwood trees, the citrus can be killed by the sandalwood. The use of citrus as a long-term host has the advantage of providing supplementary income during the maturation of the sandalwood trees, but the better (stronger) citrus hosts tend to be wilder forms of less commercial value, including rough lemon, pomelo and wild mandarin.

### 6.7.11 Poumuli or namamau (*Flueggea flexuosa*)



Figure 6.25 *F. flexuosa* plantation (left), flowers (top right) and fruit (bottom right)



Figure 6.26 Unpruned *F. flexuosa* (left), close up of flowers (top right) and fruit (bottom right)

*Flueggea* is native to Malesia from the Philippines through to the Solomon Islands and Vanuatu and has been introduced to several other Pacific islands. The species is adapted to the lowland, humid tropics and grows well on a wide range of soils. It is a small to medium-sized tree, typically reaching 10–15 m tall, with a DBH around 20–30 cm (Figure 6.25 and 6.26). Poumuli is propagated using fresh seed after the ripe fruits are de-pulped. Seed does not require any pretreatment prior to sowing. It is recommended that this host be spaced a minimum of 3 m from any sandalwood tree and only be planted at the midpoint between each second or third sandalwood tree (i.e. 12–18 m apart) so it does not dominate the sandalwood trees later in the rotation. This tree has a good bole form and produces a highly durable timber favoured for building construction uses (as a pole in ground contact).

### 6.7.12 Cassis (*Leucaena leucocephala*)



Figure 6.27 *L. leucocephala* stand (left), flower (top right) and seed pods (bottom right)

Cassis is a small tree 3–15 m tall and 10–35 cm in diameter (Figure 6.27). It is a potential sandalwood host, particularly if used as a fodder for feeding cattle in a cut-and-carry system. Although the species is exotic to the Pacific, it often occurs in wild sandalwood populations in Vanuatu. Cassis is, however, very competitive and invasive, and sandalwood growth will be severely reduced if cassis growth is not controlled by heavy pruning and weeding of naturally occurring seedlings. Cassis is a good indicator of suitable growing sites for sandalwood, but care must be taken to ensure that it does not become a weed.

### 6.7.13 Rosewood or bluwota (*Pterocarpus indicus*)



Figure 6.28 *P. indicus* habit (left), flowers (top right) and fruit (bottom right)

Sandalwood occurs naturally with rosewood, and early research indicates that rosewood is a good host for sandalwood. Rosewood is native to South-East Asia and the northern Pacific. Rosewood is a very large tree, 25–35 to 48 m tall and up to 2 m DBH, with a wide, spreading crown (Figure 6.28), and therefore spacing would need to be at least 15 m × 6 m to ensure that these trees do not dominate the sandalwood later in the rotation. No pretreatment is needed for seed germination, and it can also be propagated vegetatively. This tree produces valuable hardwood timber and, if managed by pruning, may produce a commercial product after two sandalwood rotations.

#### 6.7.14 Tamarind (*Tamarindus indica*)



Figure 6.29 *T. indica* habit (left), flowers (top right) and fruit (bottom right)

Tamarind is an evergreen, slow-growing and long-lived leguminous tree growing up to 30 m under good conditions (Figure 6.29). Given its slow growth, tamarind could be established a year prior to planting the sandalwood. The species is highly adaptable, growing equally well in dry tropical savannah climates and also areas with high and regular rainfall. It has an irregular-shaped crown and short trunk and is resistant to strong winds and cyclones. Its bark is dark grey in colour and fissured in texture. The leaves are finely pinnate compound with 10–20 pairs of oblong leaflets. The long slightly curved bean pods are a feature of the species, which contain 1–12 seeds surrounded by a sweet to sour sticky orange-coloured pulp. The pulp is used widely as a flavouring component in chutneys, curries and other cooked dishes.



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