



## Artocarpus heterophyllus

Moraceae

**Synonyms:** *Artocarpus philippensis*, *A. brasiliensis*, *A. maxima*

**Common names:** Jackfruit (En); khnacr (Cam); nangka (Ins,Mal); miiz, miiz hngang (Lao); peignai (Mya); langka (Phi); kxanon, makmi, banun (Tha); mit (Vie).

**Description:** A medium size, ever-green tree reaching 20 (-30) m in height and 80 (-200) cm in diameter. Bark rough to scaly, dark grey to grayish-brown. Leaves of young plants with 1–2 pair of lobes, whereas older leaves with entire margin (hence “heterophyllus”), obovate-elliptic to elliptic, thin leathery, 5–25 × 3–12 cm, broadest at the middle. Similar species: *A. altilis* fruits are smaller and more round, hanging from tip of branches. Leaves are much larger and deeply cut (see preceding page). *A. integer* has hairy leaves and twigs and the fruits are much smaller (next page).

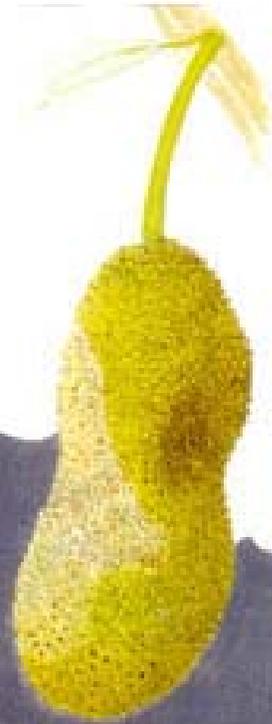
**Key characteristics:** Flowers and fruits from stem and major branches (cauliflory). Fruits very large, weighing from 10–50 kg. All living parts exude viscid, white latex when injured.

**Use:** Young fruit as vegetable, ripe fruit eaten fresh or made in to various sweet dishes. Seeds eaten after boiling, roasting or drying. Young leaves used as livestock fodder. Tannin from bark. Dyes from wood particles. Latex used as glue and cement. Timber medium hardwood, termite resistant. Renowned for a number of medical properties.

**Ecology:** Originates from evergreen forest at 400–1,200 m altitude. Prefers annual rainfall above 1,500 mm and well drained alluvial, sandy or clay loam soils with pH 6–7.5.

**Distribution:** Probably originates in Western Ghats, India, but has been introduced throughout the tropics, particularly Southeast Asia.

**References:** Hensleigh & Holaway (1988), Purseglove (1968), Verheij & Coronel (1991).



## Artocarpus integer

Moraceae

**Synonyms:** *Artocapus integrifolia*, *A. polyphema*, *A. champeden*

**Common names:** Cempedak (En); chempedak, campedak, baroh (Ins); chempedak [cultivated], bankong [wild] (Mal); sonekadat (Mya); champada (Tha); mit tó nù (Vie).

**Description:** An evergreen tree up to 20 m high, rarely with buttresses. Bark grey-brown and bumpy. Twigs and leaves with brown hairs. Leaves obovate to elliptic, 5–25 cm long and 2.5–12 cm wide with cuneate to rounded base, entire margin, pointed tip and 6–10 pairs of lateral veins curving forward. The leaf stalk is 1–3 cm long. Fruit cylindrical to almost globose, 20–35cm × 10–15cm, yellowish to brownish to orange-green.

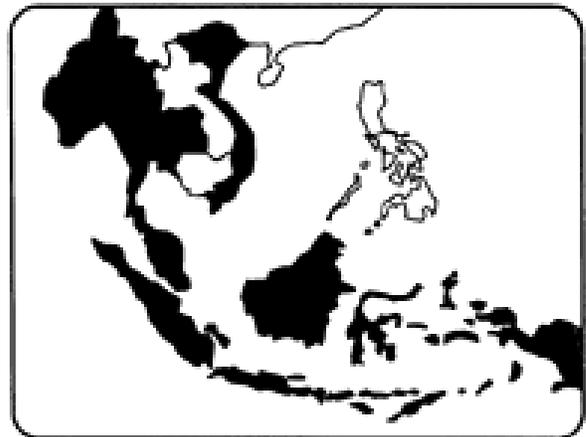
**Key characteristics:** Rarely buttresses; bark grey-brown, bumpy; twigs and leaves with brown hair; leaves obovate to elliptic; fruit cylindrical to round, yellowish to brownish to orange-green.

**Use:** The fruit flesh surrounding the seeds are eaten fresh or cooked. The seeds can be eaten after roasting or boiling. Young fruits and sometimes young leaves can be cooked and eaten as a vegetable. The strong and durable wood are used for building construction, furniture and boats. The bark can be used for rope making and the latex for making lime.

**Ecology:** Understorey tree commonly growing in secondary and sometimes in primary forests in lowland tropical rainforest areas up to 500 m altitude or sometimes higher, where there is no distinct dry season. Prefers well drained soils but tolerates temporary water-logging.

**Distribution:** Myanmar, Thailand, Vietnam, Malaysia and Indonesia.

**References:** Verheij & Coronel (1992).





*Averrhoa bilimbi*



*Averrhoa carambola*

## **Averrhoa bilimbi**

Oxalidaceae

**Common names:** Billimbi, cucumber tree (En); tralong tong (Cam); belimbing asam, belimbing wuluh, belimbing buluk (Ins, Mal); tayok-zaungya (Mya); kamias, iba (Phi); taling pling (Tha); khe tau (Vie).

**Description:** A small tree with few, upright, branches, 6–9 m high. Leaves pinnate usually with 7–19 pairs of 5–12 cm long ovate leaflets and a single terminal leaflet. Flowers auxiliary or cauliflorous, with 10–22 mm long, red-purple coloured, free petals. Fruit a yellowish-green berry, slightly lobed and up to 10 × 5 cm.

**Key characteristics:** Small tree; upright branches, pinnate leaves, 7–19 pairs of ovate leaflets +one terminal leaflet; some of the flowers on stem (cauliflower); fruit yellow-green, slightly lobed.

**Use:** Fruit used for pickles, curries, chutney and preserves in syrup and can also be used to clean metal and remove stains. Also used in traditional medicines.

**Ecology:** Prefer seasonal humid climates with a drier season, but not actual drought and slightly acid soils. Flooding and salinity is not tolerated.

**Distribution:** Origin S.E. Asia, now grown all over the humid tropics.

## **Averrhoa carambola**

Oxalidaceae

**Common names:** Carambola, star fruit (En); spo (Cam); fuand (Lao); belimbing manis (Mal, Ins); zaung-ya (Mya); Balimbing (Phi); ma fuang (Tha); khe (Vie).

**Description:** Small, usually much branched tree, to 15 m tall. Bushy growth, usually with drooping branches. 3–6 pairs of 4–10 cm long, ovate leaflets and a single terminal leaflet. Flowers normally in auxiliary panicles, with joined petals, up to 8 mm in length, light red with purple centre. Fruit 12 × 6 cm, shiny yellow-green when ripe, with 5 pronounced ribs. Many cultivars. Flower and fruit all the year round.

**Key characteristics:** Bushy tree; drooping branches, 3–6 pairs of leaflets, purple-red flowers; shiny yellow fruit with 5 pronounced ribs.

**Use:** As *A. bilimbi*. Fruit also used fresh in salads, drinks, jam and jelly.

**Ecology & distribution:** Like *A. bilimbi* but extends to frost free subtropical areas. More often commercially grown.

**References:** Pursglove (1974), Smitinand & Larsen (1981), Verheij & Coronel (1991).



## Azadirachta indica

Meliaceae

**Synonyms:** *Melia indica*, *Melia azadirachta*

**Common names:** Neem, margosa-tree (En); mind (Ins); tamaka (Mya); mambu, sadu (Mal); kwinin, sadao India (Tha); sàu-dâu (Vie). var. *siamensis*: kadoo, sadao, cha-tang (Tha).

**Description:** Up to 20 m high and 1 m in trunk diameter, with low branches and dense rounded crown. Bark brown when young, then grey with deep furrows and scaly plates. Inner bark pink, astringent and bitter tasting. Leaves pinnately compound (usually without single terminal leaflet) and may fall during severe drought. Each leaf has 9–17 pairs of 4– 8 cm long curved, lance shaped, saw-toothed and pointed leaflets. Flowers are abundant, small, white and fragrant, arising in the corner of leaf stalks. Fruits are small, smooth ellipsoidal drupes, yellow or greenish-yellow when ripe.

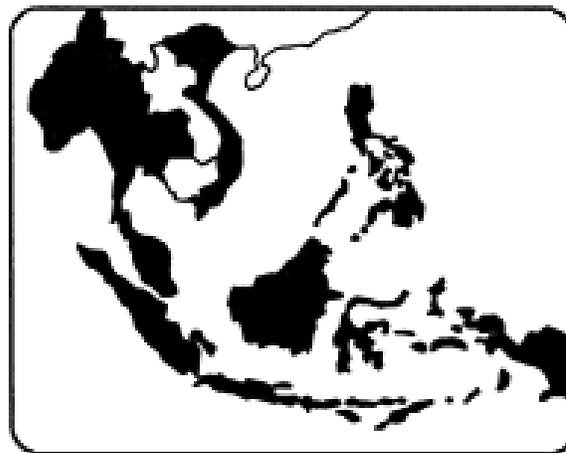
**Key characteristics:** Low branches; inner bark pink and astringent; pinnately compound leaves; leaflet margin undulate; flowers small, white, fragrant.

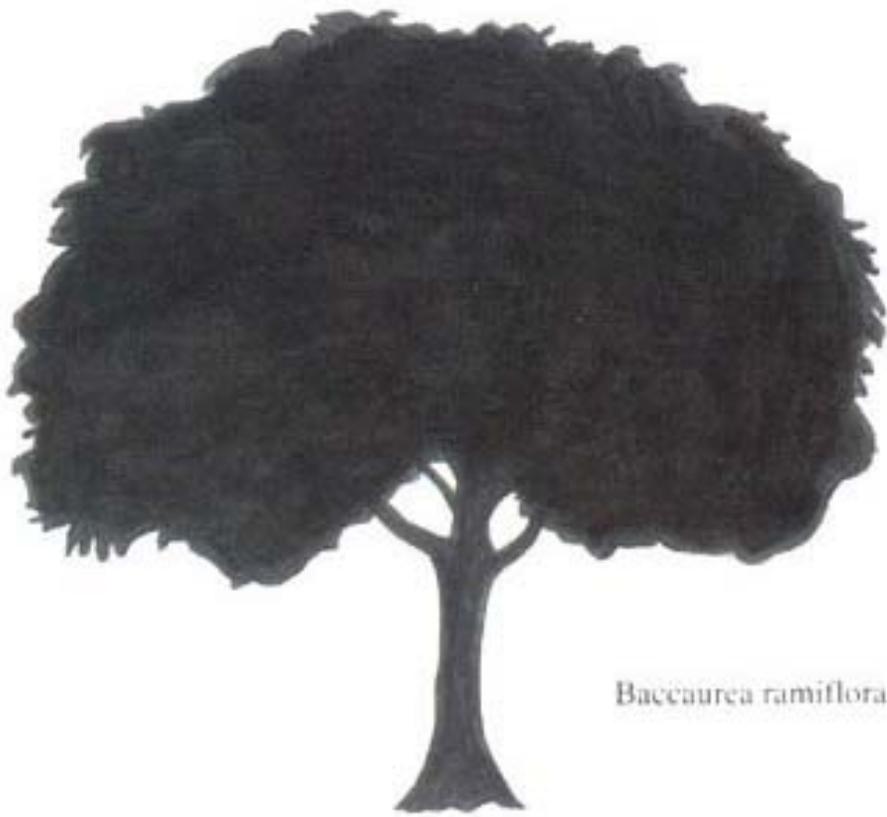
**Use:** Windbreak, shade and fodder tree for cattle, soil improvement and wasteland reclamation. Wood is insect repellent and used for construction, furniture, paper pulp, chipboard and fuelwood. Azadirachtin, an insecticidal compound can be extracted from the seeds and leaves.

**Ecology:** Thrives in a wide range of soils, temperatures and rainfall patterns and is found on poor soils from sea level to 1,500 m elevation surviving temperatures from below 0°C to over 40°C and annual rainfall down to 130 mm. Prefers acid soils, warm temperatures and from 450 to 1,500 mm of rainfall.

**Distribution:** Native to dry regions from the Indian subcontinent through Myanmar, Thailand and Malaysia to Indonesia.

**References:** F/FRED (1992), Hensleigh & Holaway (1988), National Research Council (1980, 1992).





*Baccaurea ramiflora*

## Baccaurea racemosa

Euphorbiaceae

**Synonyms:** *Baccaurea wallichii*

**Common names:** Kapundung (En); mente, kepundung (Ins, Mal); bencoy (Ins); jinteh merah.(Mal).

**Key characteristics:** Small tree, leaves glandular, flowers & fruits on large branches or trunk.

**Description:** 15–25m tall, 25–70cm in diameter with dense, irregular crown. Leaves simple, entire, ovate-oblong to obovate, 7–18cm long and 3–7cm wide, glandular, on 0.5–4.5cm long leaf stalks. Inflorescence on old branches or trunk. Male racemes 5–13cm long, with many 3-flowered densely haired cymes. Flowers small with 4–5 sepals and 4–8 stamens. Female racemes 10–20cm long, with larger flowers, 5 sepals and no petals. Fruits yellow-green or reddish, 2–2.4cm in diameter.

**Use:** Fruits eaten fresh, stewed, pickled or fermented. The excellent timber is used for house and boat construction and furniture making. Also used as support for rattan, as ornamental or as shade tree. Dyes is made from the bark.

**Ecology:** Native to tropical lowland forest up to 1,000 m altitude on a wide range of soils, from dry sandstone to peat swamps.

**Distribution:** Originates in western Malesia and widely cultivated in Java, Sumatra and Bali.



## Baccaurea ramiflora

**Synonyms:** *Baccaurea sapida*, *B. wrayi*

**Common names:** Burmese grape (En); phnkiew (Cam); mafai setambun, tajam molek (Ins); fai (Lao); pupor, tampoi, tempui (Mal); kanazo (Mya); mafai, omfai, hamkang (Tha); giau gia dat, giau tien, dzau mien dzu'ó'i (Vie).

**Key characteristics:** +/- buttresses; leaves ovate to ovate lance shaped; leaf stalk to 8 cm.

**Description:** Tree up to 25m high sometimes with buttresses. Leaves alternate, simple, ovate to ovate-lanceolate, 10–20cm long and 4–9cm wide with 1–8cm long petioles. Inflorescence on branches and trunk, soft-hairy, male racemes 3–8 cm long, female racemes 14cm long. 4–5 sepals. Fruits 2.5–3cm in diameter, smooth, yellowish pink to bright red.

**Ecology & Use:** As *B. racemosa*. Bark is used in traditional medicine.

**Distribution:** Myanmar, Thailand, southern China, Indo-China and peninsular Malaysia.

**References:** Verheij & Coronel (1992).





**Common names:** Annato (En); thidin (Mya); achuete (Phi); kham ngoh (Tha); dièunhuôm, siêm phung (Vie).

**Description:** A small bushy tree, 2–8 m tall and up to 30 cm in diameter. Bark color varying from green to red, young twigs with rust colored scales. Leaves alternate, ovate or heart-shaped, 8–20 cm long and 5–12 cm wide. Flowers pink or white, 5–8 cm in diameter with 5–7 obovate petals. Fruit green to dark red, 2–4 cm, fleshy and spined - resembling rambutan. Seed pods brown with 10–50 bright orange to yellowish-red seeds.

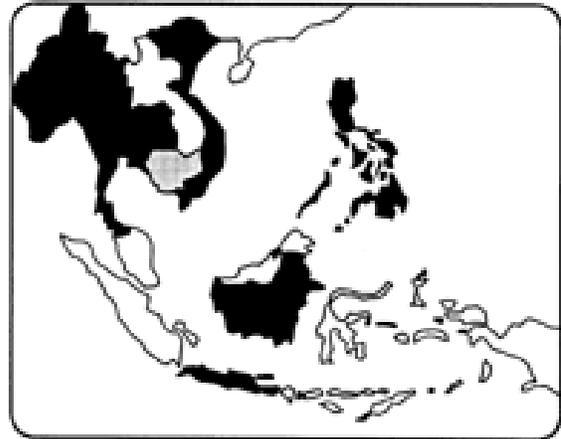
**Key characteristics:** Small, bushy tree, green to red stem, young twigs rust colored, ovate to heart-shaped leaves, large pink-white flowers, rambutan-like fruit.

**Use:** Often used as an ornamental or as living fences. Stem and branches can be used for firewood. Seeds are traded commercially as a dyeing agent for food, particularly cheese and butter, leather, floor polish and cloth. The bark and leaves have various medicinal uses.

**Ecology:** Lowland tropical species occurring up to 800 m altitude. Prefers moist deep, loamy soil but is adaptable. Tolerates mild droughts, shorter than 4 months.

**Distribution:** Originates in tropical America and now widely distributed in the tropics, including Myanmar, Thailand, Cambodia, Vietnam, Malaysia, Indonesia and the Philippines.

**References:** Guzman et al (1986), Hensleigh & Holaway (1988).





## Bombax ceiba

Bombacaceae

**Synonyms:** *Salmalia malabarica*, *Bombax malabaricum*

**Common names:** Silk cotton tree, red cotton tree (En); letpan (Mya); ngiu baan (Tha); malabulak (Phi).

**Description:** A large deciduous tree up to 40 m tall and 80 cm in diameter, often with buttresses. Branches in regular whorls. Bark light brown or grayish and fairly smooth. Young stem and branches are covered with large conical thorns. Leaves palmately compound of 5–7 oblong-lanceolate, pointed leaflets, 10–20 cm long, leathery and smooth. Leaf stalks longer than leaflets. The flowers are 8–10 cm long, red, occurring at or near end of branches, appearing before the leaves. The fruit is a cylindrical pointed capsule, 12 to 17 cm long with numerous seeds inside embedded in silky material.

**Key characteristics:** Sometimes spines on stem; horizontal branches, palmately compound leaves, large red flowers, seed capsules with silky /hairy fill.

**Use:** Silky material around seeds is used as stuffing (kapok) but of lower quality than *Ceiba pentandra*. Bark is used for rope making. Wood can be used packing cases, toys, matches, canoes and others. Young flowers can be eaten as a vegetable. Flowers, pods, roots and gum are used in traditional medicine.

**Ecology:** Tropical humid lowland species, often found near stream banks.

**Distribution:** From India to the Philippines, including Myanmar and Thailand.

**References:** Guzman et al (1986), Storrs (1990).





## **Bouea macrophylla**

Anacardiaceae

**Synonyms:** *Bouea gandaria*

**Common names:** Gandaria (En); ramania, gandaria (Ins); kundang, rembung, setar (Mal); ma praang, somprang (Tha).

**Description:** Up to 27 m tall tree with light brown, fissured bark. Branchlets often smooth, hanging and angular or flattened. Leaves ovate-oblong to lance shaped or elliptic, simple, entire, papery and shining, up to 45 cm long and 13 cm wide, but usually smaller. Leaf base acute to cuneate and leafstalk 1–2.5 cm long. The leaves form a quite dense foliage. Inflorescences are 4–12 cm long panicles with mostly 4-merous, yellowish flowers turning brown. The yellow-orange fruits are mango-like, roundish, 2.5–5 cm in diameter, fleshy-juicy, sour to sweet in taste with faint turpentine smell.

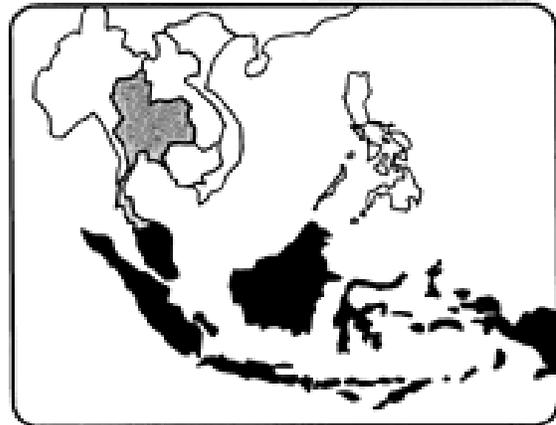
**Key characteristics:** Angular or flattened, hanging branchlets; leaves often large, forming dense foliage; flowers small, 4-merous; fruits yellow-orange looking like small mangoes.

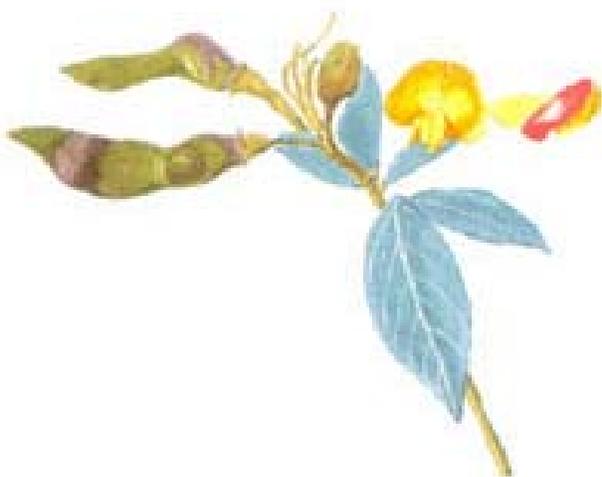
**Use:** The ripe fruit is eaten fresh, cooked in syrup, or made into compote. The young fruit is used in chili based condiment (“sambal”) and in pickles, the young violet leaves sometimes being eaten along with the sambal.

**Ecology:** Thrives in light fertile soils in the humid tropics from lowland to 300 m altitude where it occurs naturally. Cultivated up to 850 m altitude.

**Distribution:** Occurs naturally in Malaysia and Indonesia and is also cultivated in Thailand.

**References:** Verheij & Coronel (1992).





## Cajanus cajan

Leguminosae (Papilionoideae)

**Synonyms:** *Cajanus indicus*, *Cajan cajan*, *Cajanus bicolor*

**Common names:** Pigeon pea, cajan, red gram (En); pe-sinngon (mya); thua maetaai, thua rae, ma hae (Tha); kadios (Phi).

**Description:** Erect woody shrub of varying shape, 1–5 m high, branched and fine-haired. Stem and branches smooth and green. Leaves trifoliate with oblanceolate, pointed, hairy, 3– 10 cm long leaflets, grayish beneath. Flowers are 1.5 cm long, yellow, sometimes with red stripe. The pods are 4 to 10 cm long and 1 cm wide, hairy, pointed and contains 2–7 seeds.

<p><b>Key characteristics:</b> Bush; leaves with 3 leaflets - gray beneath; finely haired; yellow flowers; pods 4–7 cm × 1 cm with 2–7 seeds.</p>
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**Use:** Green pods and seeds used as vegetable and animal feed. Dried husks are also used for animal feed. Dried stalks and branches used for fuel and branches also for thatch and baskets. Leaves are fed to livestock, silkworms and lac insects or used as green manure. Also planted as windbreak and for erosion control. An enzyme called “urease” used medically, can be extracted from pigeon pea.

**Ecology:** Adapted to the arid and subhumid tropics. Grows in full sun on nearly any kind of soil, except waterlogged, but prefers neutral, light, deep loam or sandy soil, temperatures between 18 and 29°C, and rainfall between 600 and 1,000 mm. Tolerates as little as 400 mm annual rain and a dry season of 6 months.

**Distribution:** Grown all around the tropical world between 30°S and 30°N.

**References:** F/FRED (1992), Hensleigh & Holaway (1988), Purseglove (1974).



## Calliandra calothyrsus

Leguminosae (Mimosoideae)

**Synonyms:** *Calliandra confusa*, *C. similis*

**Common names:** Calliandra (En, Mya, Phi); kaliandra (Ins).

**Description:** A small tree or shrub from 1.5–12 m tall, with 3–5 or more crooked stems up to 30 cm in diameter with black-brown bark. Leaves alternate, dark green, bipinnate and 10–17 cm long, with 15–20 pairs of lateral axes (pinnae), 4–7 cm long. Each axis has 25 to 60 pairs of linear leaflets, 5–8 mm long and 1 mm wide. The puffball-like flowers are in pyramid shaped, subterminal clusters and have long red or purple stamens. The fruit pods are 8–11 cm long and 1 cm wide, curving back as they split open.

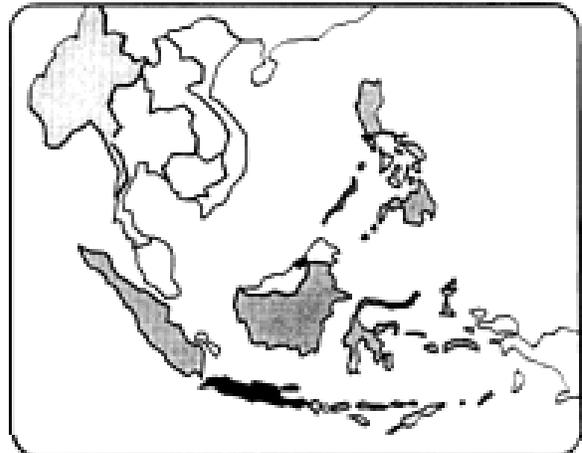
**Key characteristics:** Shrub or small tree; 3–5 crooked stems; black-brown bark; leaves bipinnate, dark green; flowers puff-ball like, reddish-purplish; fruit pods curving back as they split open.

**Use:** Mainly used for fuelwood and charcoal. Foliage is used as fodder and green manure and because it flowers year round it is popular as a honey tree.

**Ecology:** Thrives in tropical temperatures, from slightly elevated to 1,500 m altitude, with at least 1,000 mm annual rainfall, but prefers 2,000–4,000 mm. Tolerates 3–6 month dry season. Prefers light, well drained, slightly acidic soils and tolerates poor exhausted soils but not waterlogging. Nitrogen fixing.

**Distribution:** Native to central and southern America and widely cultivated in Indonesia. Also found in Myanmar, the Philippines, and other countries.

**References:** Hensleigh & Holaway (1988), Little (undated); National Research Council (1983); Westphal & Jansen (1993).





**Common names:** Papaya, pawpaw, melon tree (En); ihong, doeum lahong (Cam); papaya, gedang, kates (Ins); houng (Lao); papaya, betek, ketalah (Mal); thimbaw (Mya); papaya, kapaya, lapaya (Phi); malakor, loko, ma kuai thet (Tha); du du (Vie).

**Description:** A fast growing tree-like herb, 10–30 cm in diameter and 2 to 10 m high. Usually no branches, but if top is cut off, it will branch. Leaves spirally arranged, clustered towards top of stem, with up to 1 m long leaf stalks and palmate or deeply lobed leaf plates 25–75 cm in diameter, smooth, prominently veined and toothed. Flowers cream white to yellow, male, female or hermaphrodite on separate trees and looking somewhat different. The fruit is a fleshy berry 7–30 cm long and weighing up to 10 kg. Skin thin, smooth, turning from green to yellowish or orange when ripening. Flesh yellow to orange, soft, edible and sweet, with grey-black seeds along central cavity.

**Key characteristics:** Normally unbranched straight stem with “umbrella” of large characteristic leaves at top, white to yellow flowers and large green to yellow fruits year round.

**Use:** The ripe fruit is eaten fresh or used in salads, drinks, jam, candies. The green fruit can be cooked as a vegetable. Young leaves and flowers are also eaten in some areas. Carpaine, an alkaloid and papaine, an enzyme, are extracted for use in pharmaceutical, beverage and food industries.

**Ecology:** Tolerates any kind of well drained and not too dry soil, but is very sensitive to waterlogging and flooding. Thrives in warm areas with sufficient rainfall and temperature range of 21–33°C and occurs up to about 1,600 m altitude above where frosts may occur.

**Distribution:** Originates in tropical America but is now distributed throughout the tropical and warm subtropical world.

**References:** Hensleigh & Holaway (1988), Purseglove (1974), Verheij & Coronel (1991).



## **Cassia fistula**

Leguminosae (Caesalpinioideae)

**Common names:** Golden shower (En); ngu, ngu sahwe, pwabet (Mya); khuun, rajaphruek (Tha); bở-cap nước (Vie).

**Description:** A small to moderate sized tree up to 15 m tall. Bark greenish grey when young later turning reddish brown and peeling off in scales. Compound leaves 30–60 cm long on 7–10 cm long stalk, with 3–8 pairs of leathery leaflets, each about 12 cm long and 6 cm wide. The attractive flowers are large and yellow and borne in hanging racemes. The fruit pods are 30 to 60 cm long, cylindrical, smooth and dark brown when ripe.

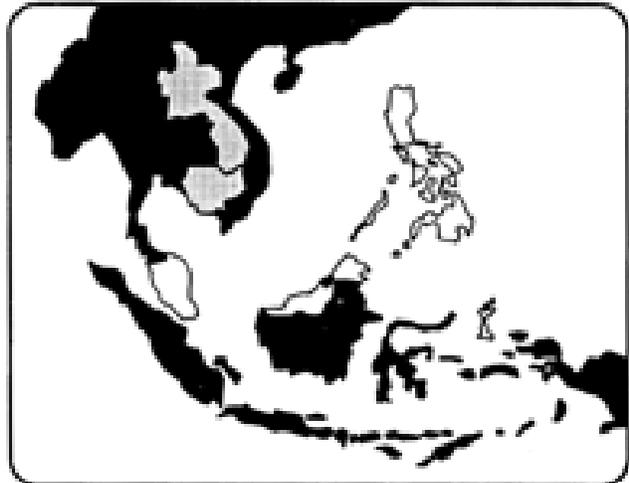
**Key characteristics:** Bark greenish when young later reddish brown, peeling off in scales; compound leaves; flowers large, yellow and abundant; fruit pods cylindrical to 30 cm long or more.

**Use:** The wood is used for buildings, carts, fence posts and agricultural implements as well as for charcoal. The bark is also used for dyeing and tanning and the pods are used in traditional medicine.

**Ecology:** Grows from sea level up to about 1,200 m altitude.

**Distribution:** From India and Nepal through Myanmar, Thailand, Laos, Cambodia, China, Vietnam and Indonesia.

**References:** Smitinand & Larsen (1984), Storrs (1990).





**Cassia siamea**

Leguminosae (Caesalpinioideae)

**Synonyms:** *Cassia florida*

**Common names:** Yellow cassia, kassod tree, kassaof tree, Bombay blackwood (En); mezali (Mya); minjri, mung, angkank (Phi); khi lek, pak chili (Tha); muông xiêm (Vie).

**Description:** A medium-sized tree, rarely exceeding 20 m in height and 50 cm in diameter at breast height (1.3 m above the ground). Dense evergreen spreading crown and smooth greyish bark. Young branches finely haired. Leaves are pinnately compound with even leaf arrangement of 7 to 10 pairs. Leaflets ovate-oblong, 7–8 cm long and 1–2 cm wide. Flowers are yellow and arise in large clusters and the fruit is a long flat pod with numerous seeds.

**Key characteristics:** Medium sized tree with gray bark and pinnately compound leaves, usually 7–10 pairs of leaflets, each up to 8 cm long. Large clusters of bright yellow flowers and clusters of long flat seed pods.

**Use:** Erosion control, windbreaks, shade. Wood is used for furniture, poles and fuelwood. Leaves can be eaten by ruminants. Young leaves and flowers used in curry dishes.

**Ecology:** Occurs naturally in dry lowland forests with average temperatures between 20 and 28°C and is very light demanding. Grows best in light, deep, well-drained and rich soils but may tolerate lateritic or limestone soils if well-drained. Most common in areas with annual rainfall of 650 mm or more and a dry season of 4 to 6 months.

**Distribution:** Native in southeast Asia and found in most countries of the region.

**References:** F/FRED (1992), Hensleigh & Holaway (1988), Smitinand & Larsen (1981).