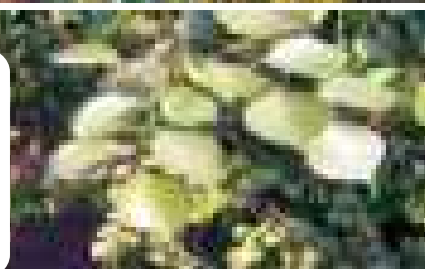
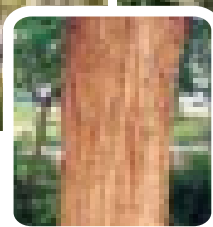
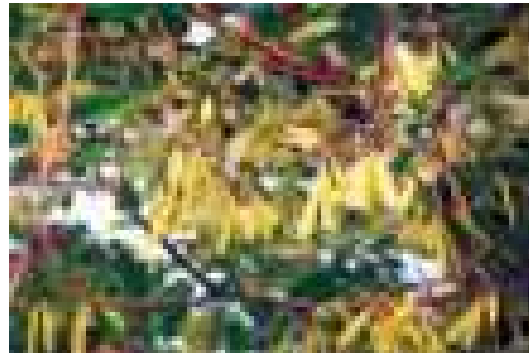


# Dalbergia sissoo (Tahli)



Declared as State Tree of Punjab by Govt. of Punjab vide Notification No. 34/13/Ft.IV-83/6052 Dated 15.03.1989.

## Scientific Name

*Dalbergia sissoo* Roxb ex D.C.

**Family:** Fabaceae

**Synonyms:** *Amerimmon sissoo* (Kuntze)

**Common Name:** Shisham

**Vernacular Name:** Tahli

## Botanical Description

*Dalbergia sissoo* is a medium to large sized gregarious and deciduous tree having thick bark. It attains height upto 30 m.

**Bark** is rough grey, thick with shallow broad longitudinal fissures.

**Leaves** are imparipinnate, alternate, rachis 3.5-8 cm, leaflets 3-5, alternate 3.5-9 × 3.7 cm broadly ovate.

**Flowers** are yellowish white, 7-9mm long, sessile, papilionaceous.

**Fruit** is a pod 4.5-10×0.7-1.5 cm, linear oblong, indehiscent, stipitate glabrous, apex, acute, reticulated against the seed.

**Seeds** are 8-10 × 4-5.5 mm, brownish-black, reniform, compressed, with papery testa.

## Natural Habitat

This tree is a characterized species of Khair-sissoo primary seral type forest. Due to its light demander quality and drought tolerance, it mainly found in Sub Himalayan tract and outer Himalayan valley from Indus to Assam. It grows mainly in Subtropical and Tropical climate.

## Phenology

The tree sheds leaves from November-

December to January-February. Leaves turn brown prior to falling. Young flower buds appear along with leaves. The flowers generally open in March and April. Pale green young pods form very rapidly at the end of April. By July leaves become full sized yellowish green, but finally turn brown and ripen during November-December.

## Geographical Distribution

**Native:** India, Nepal, Bhutan, Malaysia, Pakistan, Afghanistan, Myanmar, Bangladesh.

**Exotic:** Mauritius, Sri Lanka, Kenya, Palestine and South Africa.

## Biophysical Limits

**Altitude:** 1500 m

**Mean Annual Temperature:** 39-49° C

**Mean Annual Rainfall:** 3200-4500 mm

**Soil Type:** The tree can grow well on a site including pure sand, good drainage and sufficient soil-aeration. It avoids stiff clayey soil and saline soils. Tree has a marked preference for porous soil with adequate moisture. Tree can grow well at pH 8.8 to 9.0.

## Silvicultural Characteristics

- It is a strong light demander.
- Tree is drought hardy but seedlings are sensitive to drought.
- It is frost hardy but seedlings are frost sensitive.
- Intolerant to water logging.

## Uses

- Wood of *Dalbergia* is preferred for doors and window shutters.
- Suitable for wooden flooring and panelling.
- Considered as finest wood for cabinet and furniture due to its dark colour and non-liability to crack and split.
- Leaves used as fodder.
- Makes an excellent fuelwood.
- Decoction of the leaves is said to be useful in gonorrhoea.

## Occurrence in Punjab

- Wildlife Sanctuaries : WLS-1, WLS-2, WLS-3, WLS-4, WLS-4, WLS-5, WLS-6, WLS-7, WLS-8, WLS-9, WLS-10, WLS-11, WLS-12, WLS-13
- Reserve Forests: RF-1, RF-4, RF-5, RF-6
- Wetlands: Harike, Kanjli and Ropar
- Rivers: Beas, Ravi, Satluj
- Zoological Parks: ZP-1, ZP-2, ZP-3, ZP-4 and ZP-5
- Botanical Garden: Baradari Garden, Patiala
- Roads: SH-11, SH-15, SH-16, SH-19, SH-20 (v1, Seg.2, Seg.3, Seg.4), SH-22, NH-1, NH-1A (Seg.1, Seg.2, Seg.3) and NH-15 (Seg.1, Seg.2, Seg.3, Seg.4, Seg.6, Seg.7, Seg.8)
- Universities: AU, BFRUHS, CU, GADVASU, GKU, GNDU, GRAU, PAU, PbiU and SGGSWU

## *Delonix regia* (Gulmohar)



**Scientific Name:** *Delonix regia* Hook. Raf.

**Family:** Fabaceae

**Synonyms:** *Poinciana elata* Bojex. Hook

**Common Name :** Fire Tree

**Vernacular Name:** Gulmohar

### Botanical Description

Gulmohar is a moderate sized, fast-growing, deciduous tree with broad spreading umbrella shaped crown of light feathery foliage, attaining a height of about 18 m and a girth of 2 m in favorable situations.

**Bark** is brown and rough.

**Leaves** 30 to 60 cm long, bipinnate, with a stout petiole; 11-18 pairs of pinnate each with 20-30 pairs of along leaflets, 6 to 8 mm long and 3 mm wide. At the base of leaf stalk, two stipules occur which have long, narrow, comb-like teeth.

**Flowers** appear in corymbs along and at the ends of branches; sepals 5, thick, green outside and reddish within, reflexed when the flowers open

**Fruit** is a green pod and flaccid when young and turn dark-brown and woody, 30 to 60 cm long by 3.8 to 7.6 cm broad, ending in a short beak, when mature.

### Natural Habitat

It is now widespread in most tropical and subtropical areas of the world.

### Phenology

Its chief ornament are flowers, which appear when the tree is completely leafless in April-May, covering the crown in its entirety with dazzling, large flaming red flowers, making it a most conspicuous object in the landscape. Pods of the previous year keep hanging, till they are fallen by wind currents and rotten on the ground to release the seeds. The tree remains leafless from March to May, the new leaves appear at the end of hot season in May or June till the monsoon rains.

### Geographical Distribution

**Native:** Madagascar and Zambia.

**Exotic:** Brazil, Egypt, Ethiopia, India, Kenya, Mexico, Nigeria, Puerto Rico, Singapore, South Africa, Sri Lanka, Sudan, Tanzania, Uganda, United States of America.

### Biophysical Limits

**Altitude:** 0-2000 m

**Mean Annual Rainfall:** Over 700 mm

**Mean Annual Temperature:** 14-26° C.

**Soil Type:** The species seems to tolerate many types of soils from clay to sandy, but it prefers sandy soils.

### Silvicultural Characters

- The tree is a light- demander.
- The young plants are fire- tender.

- The species is attacked by *Ganoderma lucidum* root rot, especially in the high rainfall areas.
- Due to its shallow root system, the trees are liable to be uprooted during strong storms.

### Uses

- Planted for its ornamental flowers and light green foliage in gardens and avenues.
- The tree yields a gum in warty tears of a yellowish or reddish brown colour, soluble in water, forming a thick mucilage.
- Seed contain gum which may find use in textile and industries.

### Occurrence in Punjab

- Wildlife Sanctuaries : WLS-8, WLS-9
- Reserve Forests: RF-1, RF-3
- Wetland: Harike
- Zoological Parks: ZP-2, ZP-3 and ZP-4
- Botanical Garden: Baradari Garden, Patiala
- Road: NH-15 (Seg.3)
- Universities: BFRUHS, ChdU, DAV, DBU, GADVASU, GNDU, GRAU, LPU, PAU, PTU and PbiU

# *Dendrocalamus strictus* (Bans)

## Scientific Name

*Dendrocalamus strictus* Roxb.

**Family:** Poaceae

## Synonymus

*Arundo hexandra*  
*Bambusa glomerata*  
*Bambusa hexandra*  
*Bambusa pubescens*

## Associated Species

*Bamboosa indica*  
*Bambo arundinaceae*

**Common Name:** Bamboo

**Vernacular Name:** Bans

## Botanical Description

Deciduous densely tufted Bamboo

**Culms:** It is a medium sized bamboo with culms of about 8-20 m tall and 2.5-8 cm in diameter. The internodes are 30-45 cm long and thick-walled. Culms are hollow, when growing under humid conditions, but nearly solid under dry conditions. This species has pale blue green culms when young, and dull green or yellow culms on maturity, which can slightly zig-zag from the middle towards the top. Its nodes are somewhat swollen and basal nodes are often rooting.

**Branches:** Many clustered branches with 1 larger dominant branch. The lower nodes often have branches.

**Leaves:** Leaf size is variable as they are smaller in dry locations and bigger in moist areas; sizes vary between 5-25 cm long and 1-3 cm broad.

**Seeds:** Gregarious flowering cycle varies from 25-45 years. This does not mean that all the clumps of a tract flower at the same time. It commences with intensive sporadic flowering for 2-3 years, increasing progressively resulting in the flowering of all the clumps in a period of five years. Sporadic flowering is seen almost every year. Flowers appear from November to February and fruits are seen from February to April.

## Natural Habitat

This species is mainly found in semi dry and dry deciduous forests, or as understory in mixed forests and teak plantations. It grows on hill slopes, ravines and alluvial plains from sea level up to 1,200 m.

## Phenology

It exhibits both spodic and gregarious flowering

## Geographical Distribution

**Native:** Burma, Bangladesh, Nepal, India.

**Exotic:** Malaysia, Southern region of China.

## Biophysical Limits

**Altitude:** 0-1200m

**Mean Annual Temperature:** 20°C - 30°C

**Mean Annual Rainfall:** 1000-3000 m

**Soil Type:** Sandy loam soils with good drainage & pH between 5.5 - 7.5

## Silvicultural Characteristics

- It is a strong light demander. In the initial stages it can tolerate shade to some extent.
- The species does not tolerate cattle damage in the initial stages.
- It can with stand moderate winds, however succumbs to heavy gales in the formative years. Drought, fire and mechanical injury can be with held to some extent.

## Uses

- It is extensively used as raw material in paper mills and also for a variety of purposes such as light construction, furniture, musical instruments, bamboo board, mats, sticks, agricultural implements, rafts, baskets, woven wares and household utensils.
- Young shoots are edible and used as food.
- Leaves are used as forage and decoction of leaves, nodes and silicious matter is used in traditional medicines.

## Occurrence in Punjab

- Wildlife Sanctuary : WLS-10
- Reserve Forest : RF-5
- River : Beas
- Zoological Park : ZP-2
- University : PAU



# *Diospyros cordifolia* (Kendu)

## Scientific Name

*Diospyros cordifolia* Linn.

**Family :** Ebenaceae

## Synonyms

*Diospyros Montana* Roxb. *Var. Cordifolia* (Roxb.) Heim.

## Associated Species

*Diospyros tomentosa*  
*Diospyros embryopeteris*

**Common Name :** Kendu

**Vernacular Name:** Kendu

## Botanical Description

It is a small deciduous tree, which attains height of 10 m. Branching spines may develop at ends. Branchlets are strong, often branched thorns scattered over the trunk.

**Bark** is very dark (greyish brown) becoming rougher as the tree ages.

**Leaves** velvety, 3-10 cm long; base of leaf faintly heart-shaped; blade slender, tapering, lamina 2.5-8 x 1.5-4 cm.

**Flowers** tubular, with 4 creamy white petals; cup-shaped, with 4 creamy petals bent backwards. Male and female flowers grow on separate trees. Male flowers are perceptibly smaller, stalkless and are bunched together in groups of 2-6 (usually 3). Female flowers are solitary & have little stalks; they also have broader flower-cups which persist as the flower develops into a fruit.

**Fruit** cherry-sized, yellow when ripe.

## Natural Habitat

Dry, single storeyed thorn forests. It is able to find niches in washes or gullies, where the soil is a little deeper.

## Phenology

Leaves begin to drop in January; new leaves early in March, strikingly beautiful in April. Flowers appear in April. Fruit set quite quickly after the flowers and remain on the tree till February or March of the following year.

## Geographical Distribution

**Native:** India, Pakistan, Sri Lanka, Burma and China

**Exotic:** Malaysia and Australia.

## Biophysical Limits

**Altitude:** 200-1500 mm

**Mean Annual Temperature:** 3-49° C

**Mean Annual Rainfall:** 300-2000mm

**Soil Type:** Good growth is noticeable on sandy, loamy and alluvial soils with good moisture content and pH between 5.5-7.0

## Silvicultural Characteristics

- Strong light demander & drought resistant.
- Frost hardy but young seedlings are susceptible to frost.
- Susceptible to fire and browsing damages.
- Large tree is susceptible to water-logging.

## Uses

- The viscid pulp of the fruit is used to cure boils.
- The twigs and leaves are lopped for fodder.

- The wood related to true ebony is seldom available in usable sizes but is said to be beautifully mottled, streaked and useful for carving and making small articles of furniture, carts & implements.

## Occurrence in Punjab

- Wildlife Sanctuaries: WLS-1 and WLS-10
- Botanical Garden :Ram Bagg, Amritsar
- University: PAU



# *Elaeocarpus ganitrus* (Rudraksh)



**Scientific Name:** *Elaeocarpus ganitrus* Roxb.

**Family:** Elaeocarpaceae

**Synonyms**

*E. sphaericus* K. Schum.

*Ganitrus sphaericus* Gaertn.

**Common Name:** Rudraksh

**Vernacular Name:** Rudraksh

**Botanical Description**

Rudraksh is a large evergreen broad-leaved tree which grows in the area from the Gangetic plain to the foothills of great Himalaya. This tree is a perennial and attains height upto 16 m and in rare instances 60 m.

**Bark** is dirty white and coarse texture. Tree obtains a pyramidal shape and is shining green on the upper side with an uninteresting fibrous dorsal side.

**Flowers** are white with fringed petals and appear in April-May.

**Fruits** appear in June and ripen by August-October. Seeds are bulbous in shape & beads are enclosed by outer shell of blue color on fully ripening. Hence, beads are also called as blueberry beads.

## **Natural Habitat**

This tree is mainly found in tropical forest at a height of 2000 m.

## **Phenology**

It is an evergreen tree that grows quickly. The Rudraksh tree starts bearing fruit in three to four years. As the tree matures, the roots buttress rising up narrowly near the trunk and radiating out along the surface of the ground.

## **Geographical Distribution**

**Native:** Philippines, Myanmar, India, Bangladesh, Iran and Nepal

**Exotic:** Pakistan.

## **Biophysical Limits**

**Altitude:** 500 to 2000 m

**Mean Annual Temperature:**

5°C- 45°C

**Mean Annual Rainfall:** 250-1000 mm

**Soil Type:** It can grow well in all types of soils except sandy soils.

## **Silvicultural Characteristics**

- Young plants are drought sensitive, but mature can tolerate varying degrees of drought.
- Susceptible to water logging.
- Light demander and shade bearer.
- Susceptible to fire and browsing damages.

## **Uses**

- Beads are major stress reliever, reducing circulatory problems. Beads also used for making malas.
- Cultivated as an ornamental tree.
- Fruits are also known as Amritphal (Fruits of Nectar) and it satisfy thirst.

## **Occurrence in Punjab**

- Reserve Forests: RF-4, RF-5
- Zoological Park : ZP-5
- Universities: PAU and RGU

# *Erythrina indica* (Flame Tree)

**Scientific Name:** *Erythrina indica* Lamk

**Family:** Fabaceae

**Synonyms:** *Erythrina variegata* Linn.

**Associated Species :** *Erythrina suberosa*

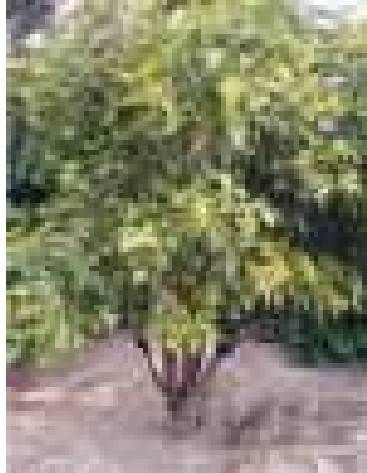
**Common Name:** Indian Coral Tree

**Vernacular Name:** Flame tree

### Botanical Description

*Erythrina indica* is a medium-sized, spiny, deciduous tree normally growing to 6-9 m (occasionally 28 m) tall. Young stems and branches are thickly armed with stout conical spines up to 8 mm long, which fall off after 2-4 years; rarely a few spines persist and are retained with the corky bark.

**Bark** is smooth and green when young, exfoliating in papery flakes, becoming

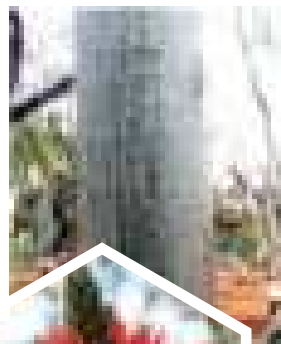


### Silvicultural Characteristics

- Strong light demander
- The tree occurs in a wide range of soils.
- It is somewhat frost-sensitive, tender shoots dying back but quickly re-grows under favourable conditions.
- Drought resistant & sensitive to water-logging.

### Uses

- The new leaves are eaten in curries.
- Used as livestock fodder as it is rich in nitrogen (4% of dry weight).
- The bark is stringy and provides a strong fiber that is used in rope making.



thick, corky and deeply fissured with age.

**Leaves** are trifoliate, alternate, bright emerald-green, on long petioles 6-15 cm, rachis 5-30 cm long, prickly; leaflets smooth, shiny, broader than long, ovate to acuminate with an obtusely pointed end. Leaf petiole and rachis are spiny.

**Flowers** in bright pink to scarlet erect terminal racemes 15-20 cm long; stamens slightly protruding from the flower.

**Fruit** is a cylindrical torulose pod, green, turning black and wrinkly as they ripen, thin-walled and constricted around the seeds. There are 1-8 smooth, oblong, dark red to almost black seeds per pod.

### Natural Habitat

*E. indica* is indigenous to the low-elevation deciduous forests of South Asia, found widely scattered throughout the region on plains and undulating terrain up to about 750 m elevation.

### Phenology

In India, the rich, red blooms make their

striking appearance among the leafless branches in January-March. The short lived flowers are quickly followed by the new leaves in early summer. Soon after flowering, the big green pods begin to form.

### Biophysical Limits

**Altitude:** Upto 750 m

**Mean Annual Rainfall:** 500-1500 mm

**Mean Annual Temperature:** 19-27° C

**Soil Type:** Tolerates a wide range of soils frequently on deep alluvial loams, silts and clays.

### Geographical Distribution

**Native:** India.

**Exotic:** Malaysia, Myanmar, Thailand.

- The bark decoction is used in stomach disorders, anti-abortion treatment,

# *Eucalyptus globulus* (Safeda)

## Scientific Name

*Eucalyptus globulus* Labill.

**Family:** Myrtaceae

## Synonyms

*E. cordata*

*E. diversifolia* Miq.

**Common Names:** Blue Gum

**Vernacular Name:** Safeda

## Botanical Description

*Eucalyptus globulus* ssp. *globulus* is a large to very large evergreen tree, 40-55 (max. 60) m tall, with straight massive trunk.

**Bark** is smooth, mottled grey, brown, and greenish or bluish, peeling in long strips, at base becoming grey, rough and shaggy, thick and finely furrowed; root system deep and spreading.

**Leaves** are alternate, drooping on flattened, yellowish leafstalks of 1.5-4 cm, narrowly lance shaped, 10-30 cm long, 2.5-5 cm wide, mostly curved or sickle shaped, long-pointed at tip.

**Flowers** 1 (rarely 2-3) at leaf base on very short, flattened stalk or none, more than 5 cm across the very numerous, spreading, white stamens about 12-15 mm long, with odour of camphor; buds top-shaped, 12-15 × 12-25 mm; base (hypanthium) 4 angled, very warty, whitish bloom, with 2 lids.

**Fruits** or seed capsules single at leaf base, broadly top-shaped or rounded, 1.5-5 × 2-2.5 cm, 4-angled, warty, with whitish, broad, thick, flat or convex disc and 3-5 slits; seeds many and irregularly elliptical, 2-3 mm long, dull black; many small, sterile seeds.

## Natural Habitat

The species is adapted to subtropical climates with winter rainfall, such as the Mediterranean region and to cool zones of tropical mountains, but it is not hardy in warm, temperate climates.

## Phenology

Flowers appear in February to March, seeds ripen from March to April. The tree flower and produce fertile seeds at the age of five years.

## Geographical Distribution

**Native:** Australia and Indonesia

**Exotic:** India, Pakistan, Burma and Thailand

## Biophysical Limits

**Altitude:** 1700-2300 m

**Mean Annual Temperature:** 14.2°C



**Mean Annual Rainfall:** 1300-2500 mm

**Soil Type:** The principal limiting soil factors are insufficient depth, poor drainage, salinity and the presence of a high content of assimilable carbonates. However, where climatic conditions are favourable, suitable performance is reported on shallow and sometimes stony soils, particularly if subsoiling is practised.

## Silvicultural Characteristics

- Strong light demander and sensitive to weeds.
- Frost and fire tender.
- Susceptible to drought and water-logging.

## Uses

- It's wide spreading and dense root system is very useful in erosion control.
- The flowers are a source of nectar that provides good honey.
- It is one of the best *Eucalyptus* species for papermaking. The wood is very hard and strong, with medium texture.
- Wood is used for light construction, plywood, utility poles, piles, tool handles and even railway sleepers.

- The oils are used as an inhalant with steam and other preparations for relief of colds and influenza symptoms.
- Leaf oil is used as an antiseptic.
- An attractive ornamental with large, dark green, glossy adult leaves, glaucous and bluish juvenile leaves and stems, showy flowers and fruits.

## Occurrence in Punjab

- Wildlife Sanctuaries :WLS-4, WLS-10 and WLS-12
- Reserve Forest: RF-4
- Zoological Park: ZP-2
- Road: NH-1
- Universities: BFRUHS, CU, DAV, DBU, GADVASU, GNDU, LPU, PbiU and TU

# Eucalyptus tereticornis (Safeda)

**Scientific Name:** *Eucalyptus tereticornis* Sm.

**Family:** Myrtaceae

**Synonyms**

*Eucalyptus tereticornis* var. *pruiniflora* (Blakely) Cameron  
*Eucalyptus insignis* Naudin  
*Eucalyptus populifolia* Desf.  
*Eucalyptus subulata* Schauer  
*Eucalyptus umbellata* (Gaertn.) Domin nom. illeg.

**Associated Species**

*Eucalyptus citriodora*

**Common Name:** Forest Red Gum

**Vernacular Name:** Safeda

**Botanical Description**

Eucalyptus is an evergreen, large tree up to 50 m tall; bole relatively short, straight, up to 200 cm in diameter.

**Bark:** Bark smooth, whitish, peeling in regular thin sheets or large flakes, becoming mottled with white, grey or bluish patches, often some rough, dark grey bark at base.

**Branches:** Twigs reddish or yellowish-green.

**Leaves:** Leaves alternate, drooping on slender leaf stalks, narrowly lance shaped, 10-21 x 12-5 m, often curved, long pointed at tip and short pointed at base, slightly thickened, shiny green on both surfaces, hairless, with many fine side veins at an angle and a distinct vein along edge.

**Flowers:** Flower clusters (umbel) single at leaf base, 2.5-3 cm long including rounded stalk of 1 cm; flowers 5-12, spreading on equal stalks 5-7 m; buds 12-16 x 5 m, with half-rounded base and long, narrow, conical, hornlike lid.

**Fruits:** Fruit or seed capsules several, half round or top shaped, 6-9 m long, 8-10 m in diameter, with raised disc and prominent rim, opening with 4-5 raised teeth curving inward.

**Natural Habitat**

This species has a wide distribution, occurring over the widest range of latitudes of any Eucalyptus species.

**Phenology**

Flower appear in March-April. Trees of five years old onwards seed profusely twice in a year; once in October and next in May. Summer collection yields cleaner seeds with less chaff.

**Geographical Distribution**

**Native:** Australia, Papua New Guinea

**Exotic:** Argentina, Brazil, Fiji, Ghana, Greece, India, Indonesia, Madagascar, Malaysia, Nigeria, Pakistan, Philippines, South Africa, Turkey, Zimbabwe.

**Biophysical Limits**

**Altitude:** 0-1000 m

**Mean Annual Temperature:** 2-32°C

**Mean Annual Rainfall:** 500-3000 mm

**Soil Type:** It grows on variety of soils, with a preference for deep, well-drained soils fairly light textured, including alluvial soils, silts and clays. A neutral or slightly acidic pH is suitable, but not a strong acidic soils.

**Silvicultural Characteristics**

- Eucalyptus is versatile, fast growing and strongly coppicing tree possessing a wide range of soil and climatic adaptability.
- Light demander & moderately salt tolerant and relatively fire resistant, frost sensitive.
- Known to suffer cholrosis and die-back due to the reduced iron absorption in alkaline soils.

**Uses**

- *E. tereticornis* has a strong, hard and durable heartwood, with a density of about 1100 kg/m<sup>3</sup>. It is used for construction in heavy engineering, such as for railway sleepers.
- The leaves of *E. tereticornis* are used in the production of cineole based Eucalypts oil.

**Occurrence in Punjab**

- Wildlife Sanctuaries : WLS-1, WLS-2, WLS-3, WLS-5, WLS-6, WLS-7, WLS-8, WLS-9 and WLS-13
- Wetlands : Harike, Kanjli and Ropar
- River : Beas, Ravi and Sutlej
- Botanical Garden : Ram Bagg, Amritsar
- Zoological Parks : ZP-1, ZP-3, ZP-4 and ZP-5
- Roads : SH-11, SH-15, SH-16, SH-19, SH-20 (Seg-1, Seg-2, Seg-3, Seg-4), SH-22, NH-1A (Seg-1, Seg-2, Seg-3), NH-15 (Seg-1, Seg-2, Seg-3, Seg-4, Seg-5, Seg-6), NH-64 (Seg-1, Seg-2, Seg-3), NH-71 (Seg-1, Seg-2, Seg-3), NH-95
- Universities: AU, GKU and PAU





# *Ficus amplissima* (Chela)

**Scientific Name:** *Ficus amplissima* Sm.

**Family:** *Moraceae*

**Synonyms**

*Ficus tsiela* Roxb. ex Buch.-Ham

**Common Name:** Jadi

**Vernacular Name:** Chela

**Botanical Description**

A large glabrous sized deciduous tree attains height upto 20 m. Roots are typically strangler like, but wrap themselves around the trunk in the absence of a victim.

**Bark** pale brown or yellow with a greenish tinge, relatively smooth in texture.

**Leaves** broadly oval with a tapering, pointy tip; 3 nerves from the base; upper surface darker and shiny .

**Fruits** are pear shaped figs, about 12 mm in diameter and pale green at first, before darking to a deep purple when mature. They grow in leaf axils or from the scars of fallen leaves, achenes, ovoid reniform.

**Flowers** perienth of 3, ovate petals. Staminate florets sessile, monoandrous, filaments clavate, larger than anther, pistillate florets, stigma cylindrical.

**Natural Habitat**

Sub canopy trees in disturbed evergreen forests up to 1000 m.

**Phenology**

Leaves distinctly thin through dry seasons, seldom completely bare; new leaves appear in May. Figs ripen in late March; again in August- September.

**Biophysical Limits**

**Altitude:** 0-1200 m

**Mean Annual Temperature:** 0-28° C

**Mean Annual Rainfall:** 1200-1400 mm

**Soil Type:** Deep black soils, but it can with stand poor soils.

**Geographical Distribution**

**Native:** India, Sri Lanka and Maldives.

**Exotic:** Australia.

**Silvicultural Characteristics**

- It grows well in sandy loams and tolerate acidic to alkaline condition.
- It also tolerates moderate soil salinity and aerosol salt spray.
- It is drought tolerant.

**Uses**

- It is widely grown as ornamental and shade tree.
- Bark and leaves of *Ficus amplissima* are used in traditional medicines against fever.

**Occurrence in Punjab**

- University: PAU



# *Ficus benghalensis* (Bohar/Barota)

**Scientific Name:** *Ficus benghalensis* Linn.

**Family:** Moraceae

**Synonyms:** *Ficus indica* L.

**Common Name:** Banyan tree

**Vernacular Name:** Bohar, Barota

### **Botanical Description**

Very large, fast growing, evergreen tree up to 20 meters, with spreading branches and many aerial roots. The giant banyan trees of India are the largest trees in the world by canopy coverage. One individual specimen, Thimmamma Marrimanu, in Andhra Pradesh, covers 19107 sq meters and is the largest single tree by two dimensional canopy coverage.

**Bark** is greyish brown to brown, smooth exudation milky.

**Leaves** stalked, ovate-cordate, 3-nerved, entire, when young downy on both sides; petiole with a broad smooth greasy gland at the apex, compressed, downy.

**Flower** inflorescence is syconia, sessile is axillary pairs, globose, basal bracts 3, broad, rounded, glabrous, coriaceous and persistent.

**Fruit** in axillary pairs, the size of a cherry 1.5-2.0 cm across ripening orange to red, achenes 2x1.5 mm, globose ellipsoid, dark brown.

### **Natural Habitat**

Monsoon and rain forests. Often planted throughout the forest tract of India. Hardy, drought resistance and withstands mild frost.

### **Phenology**

Tree shed its leaves in autumn and new leaves appear in February. Flowering takes place from July to August and followed by fruiting. Fruits ripen at September to October.

### **Geographical Distribution**

**Native:** India, Bangladesh and Burma.

**Exotic:** China and Thailand.

### **Biophysical Limits**

**Altitude:** 0-1500 m

**Mean Annual Temperature:** 15-45°C

**Mean Annual Rainfall:** 1500 mm

**Soil Type:** Grow well in moist soils. It can grow in all types of soils having sufficient moisture content.

### **Silvicultural Characteristics**

- Drought resistant & fairly frost hardy.
- Withstand a small amount of water-logging.

### **Uses**

- Latex is aphrodisiac, tonic, vulnary, maturant, lessens inflammations; useful in piles, nose-diseases, gonorrhoea, etc.

- The aerial root is styptic, useful in syphilis, biliousness, dysentery, inflammation of liver, etc.
- It is planted for soil conservation.
- Timber is used for well-curbs, furniture etc.
- Suitable for paper pulp.
- Leaf (Crude protein 9.63%) lopped for fodder.

### **Occurrence in Punjab**

- Wildlife Sanctuaries : WLS-2, WLS-4, WLS-5, WLS-6, WLS-8, WLS-9, WLS-11 and WLS-13
- Reserve Forests: RF-1, RF-4 and RF-5
- Wetlands: Harike, Kanjli & Ropar
- Zoological Parks: ZP-1, ZP-2, ZP-3, ZP-4 and ZP-5
- Botanical Gardens: Baradari Garden, Patiala and Ram Bagg, Amritsar
- Roads: SH-15, SH-16, SH-19, SH-20 (Seg.1, Seg.2, Seg.3, Seg.4), SH-22, NH-1, NH-1A (Seg.1, Seg.2, Seg.3), NH-15 (Seg.1, Seg.2, Seg.4), NH-64 (Seg.2, Seg.3), NH-71 (Seg.2, Seg.3) and NH-95
- Universities: BFRUHS, CU, DBU, GADVASU, GKU, GNDU, LPU, PAU, PTU, PbiU, RGU and TU



# *Ficus benjamina* (Weeping fig)

## Scientific Name

*Ficus benjamina* Linn.

**Family:** Moraceae

**Synonyms:** *F. nitida* Thunb.

**Associated Species :** *Ficus lurata*

**Common Name:** Benjamin fig

**Vernacular Name:** Weeping fig

## Botanical Description

A large evergreen tree with 18-21 m height (in its moist, natural habitat) with a dense, spreading crown of glossy, pointy leaves and drooping branchlets. Three separate varieties of the species and numerous ornamental hybrids are distinguished, causing much confusion. Aerial roots absent or thin, not prominent

**Bark** pale grey, dull, more or less smooth, with a characteristic pattern of lenticels.

**Leaves** are glossy, smooth, leathery, with fine secondary veins, leaves up to 12 cm long, with thin tails twisted to one side.

**Flowers** are inconspicuous and not showy, male and female and gall flowers in same receptacle.

**Fruits** are known as figs and without stalks, in pairs, with considerable in size, colour and shape.

## Natural Habitat

It can grow in moist and shady areas having good water supply.

## Phenology

Leaves evergreen, with new flushes in the rains. Flower appears in December to February. Figs ripen in July and ripen in January and often again in May.

## Biophysical Limits

**Altitude:** 0-1000 m

**Mean Annual Temperature:** 5-48° C

**Mean Annual Rainfall:** 300-1560 mm

**Soil Type:** It can grow in a variety of soils but best results obtained in alluvial and loamy soils having good moisture content.

## Geographical Distribution

**Native:** Native to South and South East Asia & Australia.

**Exotic:** UK, North America & Europe.

## Silvicultural Characteristics

- Strong Light demander but can tolerate some shade.
- Frost sensitive & drought susceptible.
- Damaged by fire and browsing damages.

## Uses

- Used as a good fodder tree.
- Timber is used to make tables, cabinets, chairs.
- Widely grown as an ornamental plant and as an avenue tree.

## Occurrence in Punjab

- Zoological Park: ZP-5
- Botanical Garden: Baradari Garden, Patiala
- Universities: ChdU, GADVASU, GNDU, LPU, PAU and TU



# Ficus carica (Anjeer)

**Scientific Name:** *Ficus carica* Linn.

**Family:** Moraceae

**Synonyms**

*Ficus sylvestris*

*Ficus palmata*

**Common Name:** Common fig

**Vernacular Name:** Anjeer

**Botanical Description**

Large deciduous tree, growing to a height of 7-10 m.

**Bark** is smooth white.

**Leaves** are fragrant 12-25 cm long and 10-18 cm across and deeply lobed with three or five lobes.

**Flower** itself is not visible outwardly, as it blooms inside the infructescence. The complex inflorescence consists of a hollow fleshy structure called the syconium, which is lined with numerous unisexual flowers.

**Fruit**, the fig is actually the infructescence or scion of the tree, known as a false fruit or multiple fruit, in which the flowers and seeds are borne. It is a hollow-ended stem containing many flowers.

**Natural Habitat**

It is mostly a phreatophyte that lives in temperate areas with standing or running water, grows well in the valleys of the rivers and ravines saving no water, having strong need of water that is extracted from the ground. The deep-rooted plant searches groundwater, in aquifers, ravines, or cracks in the rocks.

**Phenology**

Flowers appear in the month of January-February. Figs appear on tree during April to May and fruit ripen in July to August. Rainy season is best suitable for fruit setting as it causes figs to split.

**Biophysical Limits**

**Altitude:** 0-1700 m

**Mean Annual Temperature:** 4 to 52° C

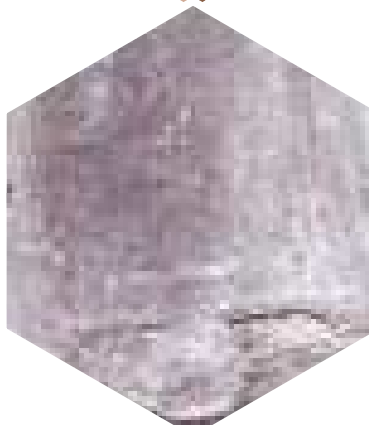
**Mean Annual Rainfall:** 500-1500 mm

**Soil:** It prefers light and medium soils, requires well-drained soil.

**Geographical Distribution**

**Native:** Western Asia, Mediterranean countries of Europe and North Africa.

**Exotic:** England, Mexico, USA, South East Asia including India.



**Silvicultural Characters**

- Drought & frost hardy.
- Light demander but can tolerate some shade.

- Withstands a wide range of soils & temperatures.
- Fairly tolerant to salinity & water-logging.
- Resistant to high velocity wind damages.

**Uses**

- Fruit is considered to be a laxative, emollient, expectorant analgesic and carminative.
- It is usually employed in preparations of laxative syrups, combined with Senna.
- A decoction of the fruit is used in cases of colds, soothing the mucous membranes of our respiratory tract.
- Fresh fig can be used externally as an emollient poultice in treatment of boils and small tumors.
- White, milky juice extracted from the stems and leaves is used for removal of warts.
- Fruits can be eaten fresh or dried and used in jam making.
- Grown as an ornamental tree.
- This tree, with the water, cools the environment in hot places, creating a fresh and pleasant environment.

**Occurrence in Punjab**

- Wildlife Sanctuary : WLS-13
- Zoological Park: ZP-2
- University: PAU

# *Ficus microcarpa* (Chilkhan)

**Scientific Name:** *Ficus microcarpa* Linn.

**Family:** Moraceae

**Synonyms:** *Ficus retusa* Linn.

**Common Name:** Indian laurel fig

**Vernacular Name:** Chilkhan

## **Botanical Description**

A large evergreen tree and attains height of 15 m with a dominating presence, usually with a few aerial roots wrapped around the top of a short, grey trunk. The dense, glossy canopy grows to a massive size, with spreading branches cantivated in such as to defy common sense. Aerial roots thick, few, not reaching the ground or becoming prop-roots.

**Bark** pale grey, smooth, marked with horizontal dots; exuding milky latex when bruised.

**Leaves** about 8 cm long, glossy, oval, blunt, thick; leaf-buds small, about one cm long.

**Flowers** teples glabrous. Male flowers dispresed among the fruitlets of ripe fig. Bracts at the base of fig, 3 lateral bracts not present on the outer side of fig of the body.

**Fruit** figs small, in pairs, yellow brown when ripe, less than one cm in diameter, in axillary pairs, very pale at first, paperbag-brown when ripe, with a faint, darker aureole around the apex.

## **Natural Habitat**

An epiphytic 'strangler' like the banyan, but only in the wild. Aerial roots can grow into long curtains but do not reach the ground. It is reasonably drought- tolerant and grows in a variety of well- drained soils.

## **Phenology**

The tree is evergreen. Flowering takes place from February to May and fruits ripen in hot season. The tree is usually epiphytic when young. The growth of seedlings is moderate to rapid.

## **Geographical Distribution**

**Native:** Within the subcontinent, native to the sub Himalayan tract from Kumaon eastwards to Assam, the Sundar bans, Bangladesh, Myanmar and the Andamans; southwards through Central India to Sri Lanka.

**Exotic:** It extends through South East Asia and South China to tropical Australia and the islands of the South West pacific.

## **Biophysical Limits**

**Altitude:** 0-1000 m

**Mean Annual Temperature:**

18 to 47° C

**Mean Annual Rainfall:**

750- 3500 mm

**Soil Type:** Tree can grow on a variety of soils ranging from shallow and dry hill slopes to deep alluvium along stream banks. The growth is much better on latter as compared to former.

## **Silvicultural Characteristics**

- Tree is strong light demander.
- Fairly drought resistant.
- Most frost hardy species of its genus.

- It is usually epiphytic.
- Intolerant to water-logging and saline conditions.

## **Uses**

- It's pounded leaves and bark are applied as a poultice in rheumatic headaches and to wounds and bruises.
- The juice of the bark (in milk) is regarded as useful in liver disease.
- The timber is unusual among fig trees for being moderately hard, pale reddish-grey and beautifully mottled, but is seldom used.
- It is best known as an evergreen avenue tree capable of casting a dense shade over an immense area.
- Considered as good fodder tree in India.

## **Occurence in Punjab**

- Botanical Garden: Baradari Garden, Patiala
- Universities: GNDU, PAU, PbiU & PTU.



# *Ficus racemosa* (Gular)

**Scientific Name:** *Ficus racemosa* Roxb.

**Family:** Moraceae

**Synonyms**

*Ficus glomerata* Roxb.

*Covellia glomerata* Roxb.

**Common Name:** Cluster fig tree

**Vernacular Name:** Gular

**Botanical Description**

A medium sized deciduous tree attaining a heights upto 12 m.

**Bark** grayish yellow or rusty, with milky sap.

**Leaves** 18 cm long, leathery, tapering at both ends; 3 strong veins from base; toothed when young.

**Flowers** petals glabrous, lobed or laciniate-denticulate in the female flowers, entire in the male. Flowers produced around the ostiole. Bract at the base of the fig, three, persistent in ripe fruits. Lateral bracts not present on the outside of the fig body.

**Fruit** figs produced on special shoots from the trunk and main branches. Fig pedunculate, globular or depressed pyriform, about 30-35x35-40 mm, Orifice closed by interlocking and inflexed bracts. Figs in large clusters from trunk or main branches.

**Natural Habitat**

According to folk wisdom, there runs a hidden stream under every gular tree. This is not unfounded the gular is a 'riparian' tree, growing naturally near streams or ponds in moist, clayey loams. It is conspicuously absent in arid regions. The gular is not a 'strangler' and is never epiphytic on other trees.

**Phenology**

Leaves evergreen near a perennial source of water. Otherwise, leaves shed in January, leafless till early March. Figs often produced in 2 crops, one in March- April and the second in the rains.

**Geographical Distribution**

**Native:** Africa

**Exotic:** Tropical Asia from India to Australia, avoiding only the driest parts.

**Biophysical Limits**

**Altitude:** 0-1500 m

**Mean Annual Temperature:** 3 to 45 °C

**Mean Annual Rainfall:** 1000- 2500 mm

**Soil Type:** It can grow in a variety of soils having good moisture content.



**Silvicultural Characteristics**

- Moderate drought tolerant & frost hardy.
- Tolerates wide range of temperature.
- Resistant to browsing damages by cattle.

**Uses**

- Most parts of the tree are used in traditional healing.
- An astringent lotion made from the bark is credited with treating deep wounds inflicted by a tiger's claws.
- The figs are carminative and the milky

latex is used to treat piles and diarrhea.

- The leaves make an excellent fodder.

**Occurrence in Punjab**

- Wildlife Sanctuaries : WLS-4, WLS-5, WLS-10 and WLS-13
- Reserve Forests: RF-5 and RF-6
- Zoological Parks: ZP-2, ZP-4 and ZP-5
- Botanical Garden: Baradari Garden, Patiala
- Universities: DBU, GNDU, GRAU, LPU, PAU and TU

# *Ficus religiosa* (Pipal)

**Scientific Name:** *Ficus religiosa* Linn.

**Family:** Moraceae

**Synonyms :** *Ficus religiosa* Roxb.

**Associated Species :** *Ficus elastica*

**Common Name:** Sacred fig

**Vernacular Name:** Pipal

## **Botanical Description**

*Ficus religiosa* is an evergreen or deciduous tree, 20 m tall, irregularly shaped, with wide spreading branches and without aerial roots from the branches. The trunk is regularly shaped, often with low buttresses.

**Bark** is grey with brownish specks, smooth, exfoliating in irregular rounded flakes.

**Leaves** are alternate, spirally arranged and broadly ovate, glossy, coriaceous (leathery), dark green leaves, 10-18 × 7.5-10 cm, with unusual tail-like tips, pink when young, stipulate, base-cordate. Petioles is slender and 7.5-10 cm long. Galls on leaves.

**Flowers** are axillary sessile, unisexual.

**Fruits (Figs)** in pairs, rounded, flat-topped green, to 1.5 cm across, axillary, sessile, smooth, ripening to purple with red dots, basal bracts 3 and broad.

## **Natural Habitat**

It is found scattered in forests, where it propagates as an epiphyte on other trees especially widely found in uplands and plane area.

## **Phenology**

Tree has a high crown. It flowers from mid February to April. Fruit ripens in April-May. It sheds its all leaves in autumn. New leaves appear in spring with flowering.

## **Geographical Distribution**

**Native :** India, Nepal, Thailand.

**Exotic:** Myanmar, Indonesia, Philippines.

## **Biophysical Limits**

**Altitude:** 1000-1800 m

**Mean Annual Temperature:** 15-45° C

**Mean Annual Rainfall:** 250-1250 mm

**Soil Type:** It grows in all types of soils but loamy soil is best for its cultivation.

## **Silvicultural Characteristics**

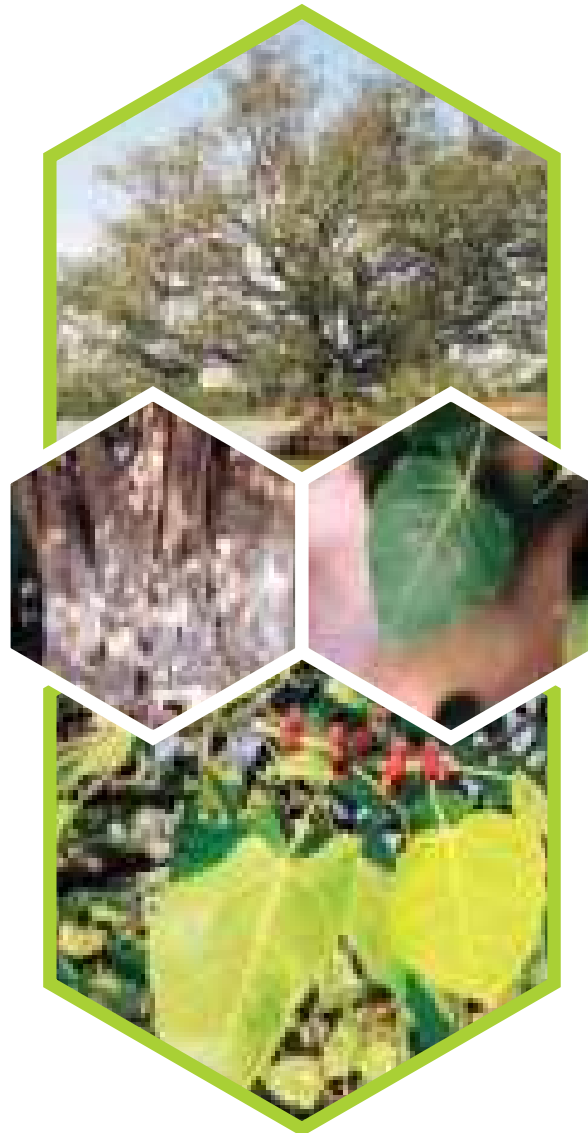
- Strong light demander & drought sensitive.
- Frost tolerant & fast growing tree.
- Damaged by browsing and fire.

## **Uses**

- Leaves are lopped as fodder for elephants, camels, goats and cattle.
- Bark is used in tanning.
- Wood is greyish-white, moderately hard and heavy.
- The ripe fruit is cooling and relieves foul taste, thirst, biliousness, diseases of blood and heart.
- Dried fruit cure asthma, seeds are useful in urinary discharge; young bark is an astringent.

## **Occurrence in Punjab**

- Wildlife Sanctuaries: WLS-2, WLS-3, WLS-4, WLS-5, WLS-6, WLS-8, WLS-9 AND WLS-10



- Reserve Forests: RF-1, RF-3, RF-4, RF-5 and RF-6
- Wetlands: Harike, Kanjli & Ropar
- River : Satluj
- Zoological Parks: ZP-1, ZP-2, ZP-3, ZP-4 and ZP-5
- Botanical Gardens: Baradari Garden, Patiala and Ram Bagg, Amritsar
- Roads: SH-15, SH-16, SH-19, SH-20 (Seg.1, Seg.2, Seg.3, Seg.4), SH-22, NH-1, NH-1A (Seg.1, Seg.2, Seg.3), NH-15 (Seg.1, Seg.2, Seg.4), NH-64 (Seg.2), NH-71 (Seg.1, Seg.2, Seg.3), NH-95
- Universities: BFRUHS, CU, DBU, GADVASU, GKU, GNDU, LPU, PAU, PbiU, RGU and TU

# *Ficus virens* (Pilkhan)

**Scientific Name:** *Ficus virens* Ait.

**Family:** Moraceae

**Synonyms:** *Ficus infectoria* Roxb.

**Common Names**

Curtin fig tree, White fig

**Vernacular Name:** Pilkhan

**Botanical Description**

Large deciduous tree and attains height of 24-27 m. It has long aerial roots like the banyan's but they tend to wrap themselves around the top of the trunk instead of becoming dangling prop-roots.

**Bark** grey with a silvery aspect; with milky sap.

**Leaves** are smooth, oval with a broad base and short, pointy apex; 3 nerves start from the base.

**Flowers** produced around the ostiole are of male sex. In the female flower, the stigma linear, lateral and tuberculate. Bracts at the base of the fig, three, persistent. Lateral bracts not present on the outside of the fig body.

**Fruit** are known as figs, sessile or pedunculate, peduncles up to 6mm long, figs +/- globular, depressed globular or pyriform, about 8-13x7-12 mm. Orifice closed by interlocking apical and internal bracts. Figs pea-sized, growing from the axils of leaves in pairs, on short stalks.

**Natural Habitat**

A scattered tree of relatively moist forests, but adaptable and drought hardy to a great extent. Like other strangler figs, it often starts life as an epiphyte, growing on other trees and eventually killing them.

**Phenology**

Leaves begin to drop in mid February with little or no synchronization. New leaf appear in early March, going from dusty purple to red, then through a dazzling array of russets and bronzes till they turn pale green. Figs ripen July to September.

**Geographical Distribution**

**Native:** Sub-Himalayan belt across Pakistan and North West India and in the monsoon forests of Central India.

**Exotic:** Malaysia and Australia.

**Biophysical Limits**

**Altitude:** 300-1800 m

**Mean Annual Temperature:** 5-46° C

**Mean Annual Rainfall:** 200-1000 mm

**Soil Type:** It prefers loamy, silt and clayey soils with good moisture content and aeration. It cannot grow well in sandy soils.

**Silvicultural Characteristics**

- Strong light demander.
- Drought resistant to an extent but young seedlings dies out at severe stress.
- Frost hardy at maturity but susceptible at young stage.
- Resistant to fire and browsing damages.

**Uses**

- The leaves make an excellent fodder, particularly liked by elephants.
- It's qualities of being a quick grower

and providing ample shade make the Pilkhan an excellent and much used avenue tree.

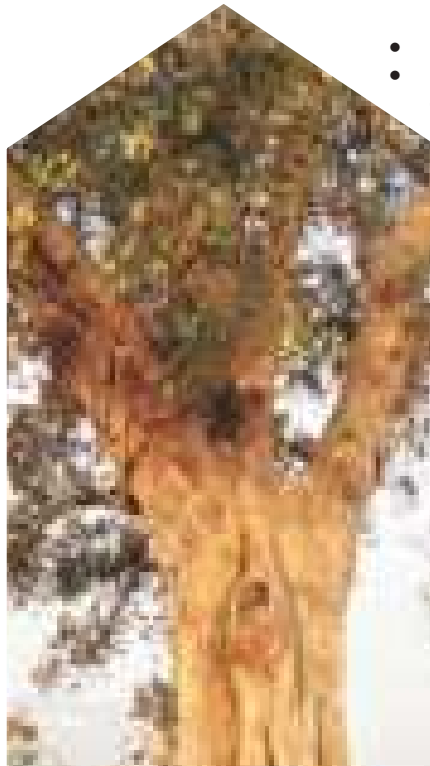
• Because of the size of its canopy, it makes an excellent windbreak.

• A decoction made from the bark is used as a gargle and wash for ulcers.

• The grayish wood is moderately hard but not durable and is little used except to make charcoal in NW India.

**Occurrence in Punjab**

- Wildlife Sanctuaries : WLS-4, WLS-9 and WLS-10
- Reserve Forests: RF-1, RF-4, RF-5 and RF-6
- Wetland : Harike
- Zoological Parks: ZP-3 and ZP-4
- Botanical Gardens: Baradari Garden, Patiala and Ram Bagg, Amritsar
- Roads: SH-19, SH-20 (Seg.3), NH-1A (Seg.2, Seg.3), NH-15 (Seg.4) and NH-71 (Seg.2, Seg.3)
- Universities: BFRUHS, GADVASU, LPU, PAU, PbiU and RGU





# *Ginkgo biloba*

## (Ginkgo)

**Scientific Name:** *Ginkgo biloba* L.

**Family:** *Ginkgoaceae*

**Common Name:** Maiden hair tree

**Vernacular Name:** Ginkgo (Living fossil)

**Botanical Description:** It is a large tree, attains a height up to 35m.

**Bark** is reddish brown and fissured longitudinally in older trees.

**Leaves** are fan shaped with veins radiating out into the leaf blade, sometimes bifurcating, but never anastomosing to form network. Dictyotomous venation. Leaves are usually 5-10cm. Leaves of long shoots are usually notched or lobed.

**Flowers** of *Ginkgo* are dioecious; with separate sexes on separate trees. Female plants do not produce cones. Two ovules are formed at the end of stalk, after pollination one or both develops into seeds; the seeds are 1.5-2.0 cm long, smell like rancid butter.

**Fruit** is single naked ovule ripens into a drupe like seed.

### **Natural Habitat**

In its natural habitat, it a hardy tree tolerating variety of climates.

### **Biophysical Limits**

**Altitude:** 2000 m

**Mean Annual Temperature:** 24-32°C

**Mean Annual Rainfall:** 700-100 mm

**Soil Type:** It tolerates a range of soil types.

### **Geographical Distribution**

**Native:** China, Japan, Taiwan and Turkey

**Exotic:** America, India and Europe except North of Europe & South Africa.

### **Silvicultural Characteristics**

- It is intolerant to shade, drought and water logging.
- Capable of sprouting from ligno- tubers.

### **Uses**

- Fruits, seeds and leaves are used to prepare food and drinks.
- Seeds are used to prepare medicines for asthma, excessive leucorrhoea and to regulate urinary frequency.
- Used as soil improver, nitrogen fixing and as ornamental tree in polluted sites.

### **Occurrence in Punjab**

- Botanical Garden: Ram Bagg, Amritsar.
- University: PbiU



# Gmelina arborea (Gamari)

**Scientific Name:** *Gmelina arborea* Roxb.

**Family:** Verbenaceae

**Synonym:** *Gmelina rheedei* Hook.

**Common Names**

White teak, Kashmir teak

**Vernacular Name:** Gamari

**Botanical Description**

*Gmelina arborea* is an unarmed, large sized deciduous tree with a straight trunk. It is wide spreading with numerous branches forming a large shady crown, attains a height of 30 m.

**Bark** is smooth, pale ashy-grey or grey to yellow with black patches and conspicuous corky circular lenticels. Inside surface of bark rapidly turns brown on exposure and exfoliates into thick woody plates or scurfy flakes. Blaze pale orange and mottled with a darker orange colour.

**Leaves** opposite-decussate, 5-15 cm long, pubescent or glabrous; leaf blades broadly ovate, 10-25 cm x 7-20 cm wide, apically long acuminate or caudate, permanently densely fulvulous-tomentellous with stellate hairs beneath, glanduliferous just above the petiole on the basal attenuation.

**Flowers** abundant, scented, reddish, brown or yellow, in terminal and axillary 1- to 3-flowered cymes on the panicle branches, which are about 8-40 cm long.

**Fruit** a drupe, 1.8-2.5 cm long, obovoid, seated on the enlarged calyx, glossy and yellow when ripe; exocarp succulent and aromatic; endocarp bony and usually 2-celled. Seeds 1-3, lenticular, exalbuminous.

**Natural Habitat**

The species occurs in a variety of forest habitats, including tropical semi-evergreen, sub-mountain, very moist teak forests, deciduous, sal and dry teak forests. It also occurs in *Syzygium* parkland and low alluvial savannah woodland. The tree is a light demander, although it can stand some shade. It is moderately frost hardy and recovers quickly from frost injuries.

**Phenology**

The panicles of flowers appear in February when the trees are leafless and flowering continues through April by which time the trees put out young green leaves. The old leaves fall in January to February and the new ones appear in March to April. The fruits develop rapidly and ripen from May to July.



**Geographical Distribution**

**Native:** Bangladesh, Cambodia, China, India, Japan, Laos, Myanmar, Pakistan, Nepal, Sri Lanka, Thailand, Vietnam.

**Exotic:** Africa, Australia, Columbia, Costa Rica, Europe.

**Biophysical Limits**

**Altitude:** 1500-4500 m

**Mean Annual Temperature:** 0-25° C

**Mean Annual Rainfall:** 1800-3000 mm

**Soil Type:** This species grows best on high silt deposits near rivers. It does not thrive where the drainage is poor, while on dry, sandy or otherwise poor soil it remains stunted.

**Silvicultural Characteristics**

- Strong light demander.
- Drought sensitive.
- Frost tolerant.
- Fast growing tree.
- The tree coppices well and coppice shoot grow vigorously.
- It produces root suckers.
- It is susceptible to browsing damage.

**Uses**

- The fruit of *G. arborea* is edible.
- Leaves are regarded as good fodder and cattle eat the fruit.

- Flowers produce abundant nectar, which produces high-quality honey.
- Plantations of *G. arborea* have been established for tobacco curing.
- The wood produces good-quality pulp. Unmixed semi-chemical pulp is suitable only for carton board or low-grade writing paper.
- It is regarded as a valuable general-purpose wood because of its dimensional stability.
- Wood is used for manufacture of furniture, plywood core stock, mine props, matches and timber for light construction.
- Bark, leaves and roots contain traces of alkaloids and are used medicinally.
- After 18 months of growth, the tree's low, dense canopy provides effective weed control.
- Valuable in coffee and cocoa plantations to protect young trees and to suppress invasive grasses.
- *G. arborea* is sometimes planted as an avenue tree.

**Occurrence in Punjab**

- Reserve Forest: RF-1
- Zoological Park: ZP-2
- Road: NH-71 (Seg.3)
- Universities: GNDU, PAU and PbiU

# Grevillea robusta (Silver oak)

## Scientific Name

*Grevillea robusta* A. Cunn.

**Family:** Proteaceae

## Synonyms

*Grevillea acanthifolia* A. Cunn.

*Grevillea alpina* Lindl.

*Grevillea annulifera* F. Muell.

**Common Name:** Australian oak

**Vernacular Name:** Silver oak

## Botanical Description

It is a fast-growing evergreen tree, between 18-35 m tall, with dark green delicately dented bipinnatifid leaves reminiscent of a fern frond. It is the largest plant in the *Grevillea* genus, reaching diameters in excess of 1 m.

**Bark** is dark brown and deeply fissured.

**Leaves** are alternate, pinnate, pinnae 10-25 cm long, deeply pinnatifid or entire and appear bipinnate or same time tri pinnate. The fern like leaves are dark green above and silvery grey beneath.

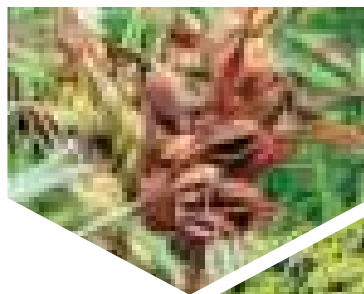
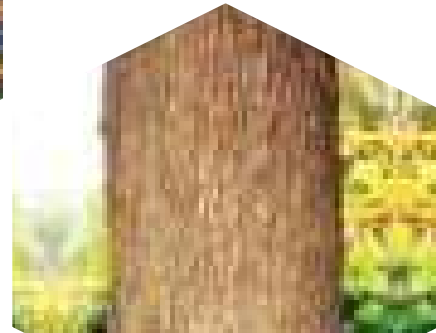
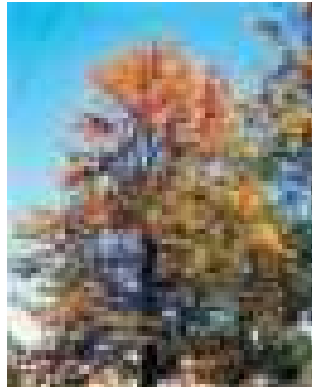
**Flowers** crimson gold coloured in shoot racemes 7.5-15.0 cm long, appears in small leafless twigs and the old wood below the leaves, pedicels, slender, 1.25 cm long, perianth glabrous, segment 4, recurved to one side. Fruits a oblique coriaceous follicle 15-19 mm long tipped with persistent style dehiscing on one side. Seed 1 or 2 papery. Like others of its genus, the flowers have no petals, instead they have a long calyx that splits into 4 lobes.

## Natural Habitat

Silky oak occurs naturally along coastal river banks in well-drained soils. It is reasonably drought-tolerant; the roots produce a chemical substance that inhibits and kills off ingibits seedling growing nearby including its own which is why it does not form dense stands.

## Phenology

Silver-oak flowers from March through October, with the peak of flowering usually in June. The perfect yellowish orange, showy flowers are borne on 8 to 18 cm long racemes that occur in panicles of one to several branches (3). Trees usually begin to flower at age of 10 years. The fruit, a pod like follicle, 20 mm (0.8 in) in diameter, is slightly flattened and has a long-curved



style. The hard dark-brown to black follicle splits open to release the one or two seeds it contains but remains on the tree up to 1 year after opening.

## Biophysical Limits

**Altitude:** 100-800 m

**Mean Annual Temperature:** 5-47° C

**Mean Annual Rainfall:** 760-1000 mm

**Soil Type:** Silver oak is tolerant of a wide range of soils if they are well drained. It will grow on neutral to strongly acid soils but does best on those that are slightly acidic.

## Geographical Distribution

**Native:** Australia.

**Exotic:** India, Puerto Rico and USA.

## Silvicultural Characteristics

- Drought tolerant and light demander.
- Intolerant to shade and frost.

## Uses

- Planted as a shade tree in tea plantations and still used mainly for wind breaks, alley cropping and as an ornamental tree.
- The timber known in the trade as southern silky oak is attractively figured and easy to work.

## Occurrence in Punjab

- Wildlife Sanctuary : WLS-9
- Reserve Forests: RF-1 and RF-5
- Wetland: Harike
- Zoological Parks: ZP-3 and ZP-4
- Botanical Gardens: Baradari Garden, Patiala and Ram Bagg, Amritsar
- Road: NH- 1A ( Seg.3)
- Universities: BFRUHS, GADVASU, LPU, PAU, PTU, PbiU, RGU and TU

## *Grewia optiva* (Biul)

**Scientific Name:** *Grewia optiva* Linn.

**Family:** Tiliaceae

**Synonyms**

*Grewia oppositifolia* Buch.Ham. ex D. Don

**Common Name:** Dhaman

**Vernacular Name:** Biul

**Botanical Description**

*Grewia optiva* is a small to medium-sized deciduous tree, 9-12 m in height; crown spreading; bole clear, 3-4 m and about 1 m diameter. Branches smooth, pale silvery-brown.

**Bark** is dark brown, thick and roughish, exfoliating in small woody scales; blaze rather fibrous, pale yellow, often tinged pink towards the exterior.

**Leaves** are opposite, 5-13 cm × 3-6 cm, ovate, acuminate, closely serrate; teeth small, blunt; rough and hairy above, pubescent beneath, base rounded, slightly oblique, 3-nerved; petiole 0.3-1 cm long, stout, tomentose; stipules 0.5 cm long, linear subulate, caducous.

**Flowers** 1-8 solitary or axillary. Petals yellow or white inside; shorter than sepals, linear, claw distinct.

**Fruit** is a fleshy drupe, 2-4 lobed, each lobe about 0.8 cm in diameter, olive green then black when ripe, edible.

**Natural Habitat**

This is a tree of the subtropical climate. In its natural habitat, the maximum shade temperature seldom exceeds 38° C and the minimum temperature rarely drops below 2° C.

**Phenology**

Old leaves are shed in March and April and new ones appear in April-May. Flowers appear with the new flush of leaves. The fruits are formed soon after and attain full size by September, ripening between October and December. The immature fruit is olive green, turning black on ripening. Fruits are much liked by birds, the major dispersal agent. The fruits are borne on previous year's shoots.

**Geographical Distribution**

**Native:** India

**Exotic:** Information not available.

**Biophysical Limits**

**Altitude:** 0-1500 m

**Mean Annual Temperature:** 38° C

**Mean Annual Rainfall:** 800-1000 mm

**Soil Type:** Survives on a variety of soils. It can withstand on loamy, silt and sandy soils.

**Silvicultural Characteristics**

- It is frost sensitive & light demander.
- Cannot tolerate browsing damages.
- It is drought tolerant.

**Uses**

- The ripe fruits are edible and has a pleasant acid taste.
- The leaves are rated as good fodder and lopped.
- The wood is hard, tough with good elasticity, strength properties & used for oar shafts, poles, frames, tool handles and other purposes where strength and elasticity are required.
- The tree is often planted in hedges and field boundaries.

**Occurrence in Punjab**

- Wildlife Sanctuary : WLS-13
- Reserve Forest: RF-3
- Zoological Park: ZP-4
- University: PAU



# Guazuma ulmifolia

## (Pigeon wood)

**Scientific Name:** *Guazuma ulmifolia* Roxb.

**Family:** Sterculiaceae

**Synonyms**

*Guazuma guazuma* (Linn.) Cockerell

*G. tomentosa* H.B.K.

*G. polybotrya* Cav.

*Theobroma guazuma* (Linn.) Poveda

**Common Name:** Bastard cedar

**Vernacular Name:** Pigeon wood

**Botanical Description**

Middle-sized deciduous tree attains height upto 18 m.

**Bark** grey-brown, cracked, rough.

**Leaves** 6-20 cm long, hairy, markedly unequal at base; margins irregularly toothed

**Flowers** are short stalked, small in size, have a brown-yellow color, five parted, 1 cm in length and fragrant. The calyx contains are lobed (2-3), have hairs that are brown or light grey in color, as well as greenish. They have 5 petals with a yellow-like stamen, 15 anthers per pistil, 5 stigmas (combined), ovary lighter green in color with hairs, and also contains a style. The fruit capsules are round to elliptical in shape are 15-25 mm in length. Seeds shaped like eggs and are 3 mm in length, grey in color.

**Natural Habitat**

*Guazuma ulmifolia* is widely adapted, growing in alluvial and clay soils and in humid and dry climates. A pioneer species that grows best in full sunlight, it colonizes recently disturbed areas and is also found growing along stream banks and in pastures. It is a common species in secondary forest growth.

**Phenology**

Leaves remain on the tree all year except in very dry, areas where the leaves drop at the end of the dry season. Flowers from March to October and produces seed all year.

**Geographical Distribution**

**Native:** Caribbean, Mexico, Central America and Colombia, Ecuador, Peru, Bolivia, Paraguay, Argentina and Brazil.

**Exotic:** India and Indonesia.

**Biophysical Limits**

**Altitude:** 400-1200 m

**Mean Annual Temperature:** 24-47° C

**Mean Annual Rainfall:** 600-2500 mm

**Soil Type :** Best suited to alluvial and clay soils in humid and dry climates.



**Silvicultural Characteristics**

- Drought & shade tolerant.
- Sensitive to salinity, water-logging, fire and browsing damages.
- Frost sensitive.

**Uses**

- Important source of fodder for livestock.
- A decoction of dried bark and fruit used to treat diarrhea, hemorrhages and uterine pain.
- Fresh bark boiled in water to aid in

childbirth, for gastrointestinal pain, asthma, diarrhea and dysentery, wounds and fevers.

- Crushed seeds soaked in water used to treat skin wounds, rashes, skin parasites, dermatitis, fungal infections and leprosy.
- Fruits as an astringent to stop bleeding.

**Occurrence in Punjab**

- University: PAU

# Holoptelea integrifolia (Kanju)

**Scientific Name:** *Holoptelea integrifolia* (Roxb.) Planch.

**Family:** Ulmaceae (Elm family)

**Synonyms:** *Ulmus integrifolia* Roxb.

**Common Name:** Jungle cork tree

**Vernacular Name:** Kanju

**Botanical Description:** Large deciduous trees, to 25 m high

**Bark:** 6-8 mm thick, whitish-grey, smooth; blaze yellowish-grey, streaked with light brown; branchlets pubescent.

**Leaves:** simple, alternate; stipules lateral, scarious; petiole 5-10 mm, stout, pubescent; lamina 6-12.5 × 2.5-6.5 cm, ovate-oblong, ovate or elliptic-ovate, base rounded or subcordate, apex acuminate, margin entire, distantly serrate when young, coriaceous, glabrous above, appressed pubescent punctate below; lateral nerves 6-9 pairs, pinnate, prominent, intercostae reticulate, prominent.

**Flowers:** polygamous, appear before leaves, 5-8 mm across, greenish-purple, in axillary fascicles; tepals 4 or 5, free, anthers pubescent; female flowers with longer pedicels; ovary superior, compressed, long stipitate, 2-winged, 1-celled, ovule 1; style bifid. Fruit a samara, 3 cm across, orbicular, wings nerved, glabrous, seed one.

**Natural Habitat**

Commonly found in dry mixed deciduous forest.



**Phenology**

Flowering occurs in March when tree is leafless. Fruit forms quickly and turned green to brown in April to mid May.

**Geographical Distribution**

**Native:** India, Sri Lanka, China & Myanmar.

**Exotic:** Information not available.

**Biophysical Limits**

**Altitude:** 700-1200 m

**Mean Annual Temperature:** 18-47° C

**Mean Annual Rainfall:** 250- 750 mm

**Soil Type:** It prefer loam soil, gravelly subsoil with good drainage.

**Silvicultural Characteristics**

- Drought tolerant but seedlings can be damaged by drought.
- Moderate light demander and salinity tolerant.
- Sensitive to frost, fire and browsing damages.
- Sensitive to water-logging.
- It coppices well.

**Uses**

- The dried/fallen twigs are used as fuel wood.
- Wood is moderately hard and used for fuel. Decoction of the bark is applied to cure rheumatism.
- The bark is also used in many other medicinal preparations.
- The stem bark is made into a paste and applied to cure swellings.

**Occurrence in Punjab**

- Wildlife Sanctuary : WLS-13
- Reserve Forest: RF-3
- Road: SH-22
- University: BFRUHS



# Jacaranda mimosifolia

## (Neeli gulmohar)

### Scientific Name

*Jacaranda mimosifolia* D. Don.

**Family:** Bignoniaceae

**Synonyms:** *J. caerulea*

**Common Name:** Blue jacaranda

**Vernacular Name:** Neeli gulmohar

### Botanical Description

Moderate-sized deciduous tree attaining a height of 15-18 m.

**Bark** pale or dark brown, shallowly cracked fissured.

**Leaves** twice-feathered; finely cut and fern-like; 9-16 pairs of side-stalks with numerous pairs of tiny, pointy leaflets plus one terminal leaflet.

**Flowers** bell-shaped, lavender or purple-blue, in open clusters; inside of the bell white and softly downy.

**Fruit** a flat woody capsule, almost round, 3-6 cm in diameter; brown when ripe.

### Natural Habitat

The species has been cultivated in almost every part of the world. Established trees can however tolerate brief spells of temperatures down to around -7°C.

### Phenology

Leaves shed in January; renewed in early April. Flowers with the new leaves, early April to mid May; occasional short flushes in the rains. Fruit appear by June, remaining till the following February or even later.

### Geographical Distribution

**Native:** USA, Spain, Brazil, and Argentina.

**Exotic:** India, South Africa, Australia & Zimbabwe.

### Biophysical Limits

**Altitude:** 0-1000 m

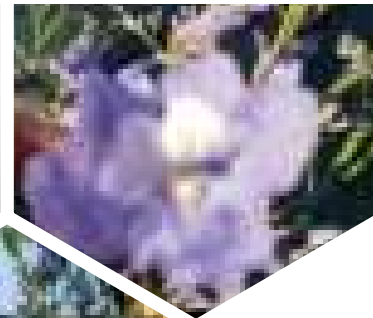
**Mean Annual Temperature:** 18-47°C

**Mean Annual Rainfall:** 500-3000 mm

**Soil Type:** Clay, loam, sand, slightly alkaline, acidic, well-drained soils are suitable for its growth.

### Silvicultural Characters

- Strong light demander.
- Drought and salinity tolerant.
- It coppices well and produces root suckers.
- Sensitive to water-logging.



### Uses

- Cultivated as an ornamental plant.
- Used as the wood for the body of acoustic guitars.

### Occurrence in Punjab

- Reserve Forest : RF-1
- Zoological Parks: ZP-2 and ZP-4

- Botanical Gardens: Baradari Garden, Patiala and Ram Bag, Amritsar
- Universities: BFRUHS, DAV, GADVASU, GNDU, LPU, PAU, PbiU and TU

# *Kigelia africana* (Jhar-phanoos)

## Scientific Name

*Kigelia africana* (Lamk.) Benth

**Family:** Bignoniaceae

**Synonyms:** *Kigelia pinnata* Jacq. DC.

**Common Name:** Sausage tree

**Vernacular Name:** Jhar-phanoos

## Botanical Description

A large deciduous tree growing upto 20 m tall.

**Bark** is grey brown, not very rough, flaking in small plates.

**Leaves** are feather like, compound with 3-4 pairs of large, leathery leaflets.

**Flowers** are large, fleshy, funnel-shaped, maroon or liverish.

**Fruit** large, woody, cucumber-shaped, up to 60 cm long.

## Natural Habitat

It is well distributed in South, Central and West Africa. It prefers areas of high humidity and often forms gallery forests that follow the course of a river. Seedlings are sensitive to frost.

## Phenology

Leaves straggly or shed in January to February; new leaves in March-April, individual trees differing widely. Flowers appear from April to August. Fruit from in the rains and remain for very long on the tree.

## Biophysical Limits

**Altitude:** 0-1000 m

**Mean Annual Temperature:** 18-47° C

**Mean Annual Rainfall:** 750- 3500 mm

**Soil Type:** It requires deep well drained loamy soils for its good growth.

## Geographical Distribution

**Native:** Mozambique, Zimbabwe and large swathes of tropical Africa.

**Exotic:** India, Pakistan, Sri Lanka, Australia, Myanmar.

## Silvicultural Characteristics

- Drought & salinity tolerant.
- Frost sensitive & light demander.

## Uses

- The tree has a long history of medicinal use in Africa. Various parts are used, mostly for treating skin ailments but also for gastric complaints.



- A number of cosmetics companies produce skin creams and shampoos derived from the fruit.
- The boiled fruit also yields a reddish dye.

## Occurrence in Punjab

- Wildlife Sanctuary : WLS-9
- Reserve Forest : RF-1
- Zoological Parks: ZP-2 & ZP-4
- Botanical Garden: Baradari Garden, Patiala
- Roads: SH-15 & NH-15 (Seg.8)
- Universities: PAU & PbiU



# *Koelreuteria paniculata* (Pride of India)

## Scientific Name

*Koelreuteria paniculata* Laxm.

**Family:** Sapindaceae

## Synonyms

*Koelreuteria apiculata* Rehder & Wilson

**Common Name:** Goldenrain tree

**Vernacular Name:** Pride of India

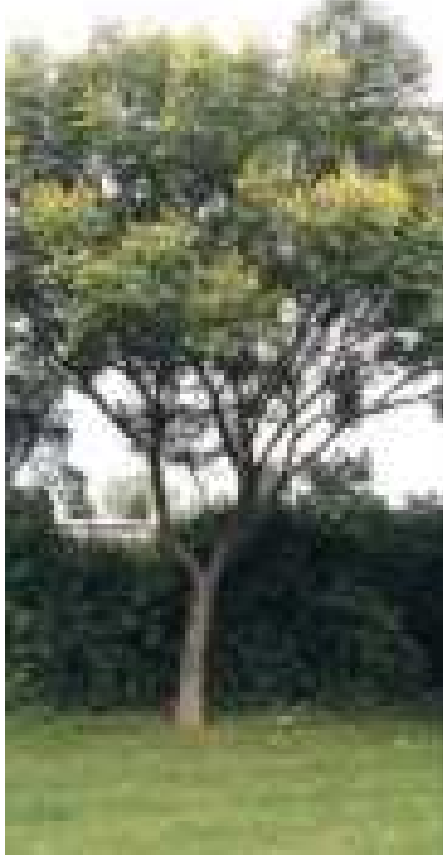
## Botanical Description

A small to medium-sized tree growing upto 10 m tall. Fast-growing tree, developing a round head and wide spread.

**Bark** light grayish-brown, becoming ridged and furrowed.

**Leaves** alternate, compound (sometimes the larger, middle leaflets are themselves compound), to 18 inches long; each leaf has 7-17 leaflets that are irregularly lobed and deeply toothed; emerging leaves are bronze, pinkish or purplish; autumn leaves are dull yellow.

**Flowers** are large, showy, stalked clusters of small yellow flowers; the falling flowers,



which can form a carpet under the tree.

**Fruits** are inflated, papery, 3-parted capsules, 3-6 cm long, that somewhat resemble Chinese lanterns.

## Natural Habitat

It generally grows in warm, moist areas of tropical and subtropical regions.

## Phenology

The blooming period occurs during the summer (usually mid to late summer in Illinois) for about 2-4 weeks. The flowers are mildly fragrant. Fertile flowers are replaced by inflated seedpods that become 3-6 cm long at maturity.

## Geographical Distribution

**Native:** India, China & Korea.

**Exotic:** USA

## Biophysical Limits

**Altitude:** 0-1500 m

**Mean Annual Temperature:** 6-47°C

**Mean Annual Rainfall:** 150- 3500 mm

**Soil Type:** It can grow well in deep alluvial, loamy, moist soils having good aeration and moisture content. It cannot do well in sandy soils.

## Silvicultural Characteristics

- Strong light demander.
- Tolerant to drought, clay soil & air pollution.
- Sensitive to frost, water-logging & saline conditions.

## Uses

- Cultivated as an ornamental tree.
- The flowers are ophthalmic and are used in the treatment of conjunctivitis & epiphora.
- Berries roasted, leaves & young shoot cooked for human consumption.
- A yellow dye is obtained from the flowers. The seeds are used as beads in necklaces, etc.

## Occurrence in Punjab

- Universities: GNDU, LPU, PAU and PbiU

# *Lagerstroemia flos-regianae* (Queen's flower)

**Botanical Name:** *Lagerstroemia flos-regianae* Retz.

**Family:** Lythraceae

**Synonyms**

*L. speciosa* Linn. Pers.

*Lagerstroemia munchausia* Willd.

**Associated Species :** *Lagerstroemia floribunda*

**Common Name:** Lagerstromia

**Vernacular Name:** Queen's flower

**Botanical Description**

A large deciduous tree, attains height of 20 m.

**Bark** smooth.

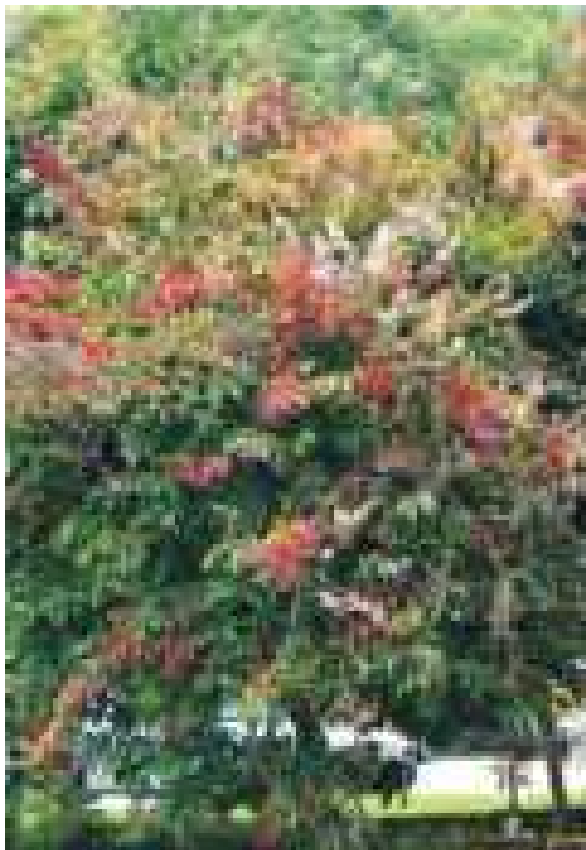
**Leaves** glabrous, elliptic or ovate-lanceolate, short-petioled, leathery, obtuse or acuminate, dark-green above, Pale beneath.

**Flowers** mauve or pink to purple, large, showy, in ample terminal panicles.

**Fruit** capsule globose, 5-6 valved, woody. Seed with wings, pale brown.

**Natural Habitat**

It is widely cultivated as an ornamental plant in tropical and subtropical areas.



**Phenology**

Flowers appear in May-October and followed by fruiting. Capsules ripen after one week and fall off on ground.

**Biophysical Limits**

**Altitude:** 0-1500 m

**Mean Annual Temperature:** 22-47° C

**Mean Annual Rainfall:** 1500- 4500 mm

**Soil Type:** Grows on a wide variety of soil types and is drought resistant. Intolerant to saline soil.

**Geographical Distribution**

**Native:** India, Burma, Malaysia & Bangladesh.

**Exotic:** China, from West Indies to Australia.

**Silvicultural Characteristics**

- Frost & drought hardy.
- Resistant to water-logging.
- Sensitive to salinity.
- Tolerant to smoke and pollution.
- It coppices well.
- Strong light demander.

**Uses**

- Cultivated as an ornamental tree.
- Timber is highly valued and used for railway sleepers, beams, bridges, constructional work, furniture, cooper's work, planks, paddles, oars, heavy checks, mortars, etc.
- Leaves and fruit are used in tanning.

**Occurrence in Punjab**

- University: LPU

# *Lagerstroemia indica* (Saoni)

**Scientific Name:** *Lagerstroemia indica* Linn.

**Family:** Lythraceae

**Synonyms:** *L. faueri*

**Associated Species :** *Lagerstroemia thorelii*

**Common Name:** Crape myrtle

**Vernacular Name:** Saoni

**Botanical Description**

A deciduous glabrous small tree attains a height of 6-9 m.

**Bark** smooth and brown.

**Leaves** subsessile, elliptic or oblong, mostly acute, broad cuneate or rounded at the base, pubescent on veins beneath, generally alternate.

**Flowers** white, pink or purple, in panicles; Fruit capsule, woody, broadly ellipsoid.

**Natural Habitat**

In the wild, the species is most often found as a multistemmed large shrub.

**Phenology**

Flowering occurs from May-November followed by fruit set.

**Geographical Distribution**

**Native:** China and Myanmar.

**Exotic:** India and other tropical & subtropical countries.

**Biophysical Limits**

**Altitude:** 0-1000 m

**Mean Annual Temperature:** 18-47° C

**Mean Annual Rainfall:** 750- 3500 mm

**Soil Type:** Grow best in any reasonably good soil with a pH of 5.0-6.5.

**Silvicultural Characteristics**

- Frost & drought hardy.
- Strong light demander.
- Resistant to water-logging & sensitive to salinity.

**Uses**

- Cultivated in gardens throughout the India because of its flowers.
- Good for mass effect, hedges or screening.
- The timber of species has been used to manufacture bridges, furniture and railway sleepers.

**Occurrence in Punjab**

- Zoological Park : ZP-4
- Botanical Garden : Baradari Garden, Patiala
- Universities: GNDU, LPU & SGGSWU



# Lagerstroemia parviflora (Dhaura)

**Scientific Name:** *Lagerstroemia parviflora* Roxb.

**Family:** Lythraceae

**Synonyms:** *Lagerstroemia microcarpa* Roxb.

**Common Name:** Small flowered crape myrtle

**Vernacular Name:** Dhaura

## Botanical Description

A large deciduous tree growing upto 30 m. tall.

**Bark** smooth, even, ash-coloured, exfoliating in dark coloured scurfy pieces; young parts as well as inflorescence pubescent with very short simple hairs.

**Leaves** opposite, sessile or very shortly petiolate, oblong or ovate, acute or obtusely acuminate, glaucous beneath, glabrous above, coriaceous, closely reticulate beneath.

**Flowers** white, fragrant, in few or many flowered axillary and terminal panicles.

**Fruit** capsule, ovoid or cylindrical, with its lower portion immersed in the accrescent woody calyx. Seeds with terminal wings having a thick curved back.

## Natural Habitat

Native of China and SE Asia; currently widely cultivated throughout the tropical and subtropical world; thrive in warm-temperate regions.

## Phenology

Flowering occurs from April-June & followed by fruiting. Fruit capsules ripe after one or two months. The capsules remain on the tree after ripening.

## Geographical Distribution

**Native:** China, Myanmar, Indo-China regions, Bangladesh, Phillipines, Thailand.

**Exotic:** Australia & Europe.

## Biophysical Limits

**Altitude:** 0-1200 m

**Mean Annual Temperature:** 18-47° C

**Mean Annual Rainfall:** 750- 3500 mm

**Soil Type:** It grow best in any reasonably good soil with a pH of 5.0-6.5, but does not thrive on water logged soils.

## Silvicultural Characteristics

- Frost hardy & strong light demander.
- Drought hardy.
- Sensitive to water logging, salinity & browsing damages.
- Tree coppices and pollards well.

## Uses

- A sweet edible gum exudes from the bark.
- Bark & leaves are used in tanning.
- The hard, tough & elastic wood is largely employed for ploughs, construction, water tanks, wood pipe, buggy- shafts, axe-handles and boats etc. It is said to yield good charcoal.

## Occurrence in Punjab

- University: PAU



# Leucaena leucocephala (Subabul)

## Scientific Name

*Leucaena leucocephala* (Lamk.) de Wit.

**Family:** Fabaceae-Mimosoideae

## Synonymus

*Acacia leucocephala* (Lam.)

*Leucaena glauca* Benth.

*Mimosa glauca sensu L.*

*Mimosa leucocephala* Lam.

**Common Name:** White lead tree

**Vernacular Name:** Subabul

## Botanical Description

*Leucaena leucocephala* is a small tree, growing to 7-18 m tall, variably shrubby and highly branched.

**Bark** is darker grey-brown and rougher with shallow, rusty orange-brown vertical fissures and deep red inner bark on older branches and bole.

**Leaves** are compound with (min. 4) 6-9 pairs pinnae; pinnular rachis 5-10.2 cm long, leaflets 9-16 (max. 21) mm long, 2-4.5 mm wide, 13-21 pairs per pinna, slightly asymmetric, linear-oblong to weakly elliptic, acute at tip, rounded to obtuse at base, glabrous except on margins. Leaves and leaflets fold up with heat, cold or lack of water.

**Flower** heads 12-21 mm in diameter, 100-180 flowers per head, in groups of 2-6 in leaf axils, arising on actively growing young shoots, flowers white or pale cream-white.

**Fruits** 11-19 cm long, 15-21 mm wide, 5-20 per flower head, linear-oblong, acute or

rounded at apex, flat, 8-18 seeded, orange brown, glabrous and slightly lustrous or densely covered in white velvety hairs, papery, opening along both margins. Seeds hard, dark brown with a hard, shining testa, 6.7-9.6 mm long, 4-6.3 mm wide, aligned transversely in pod.

## Natural Habitat

*L. leucocephala* is essentially a tropical species requiring warm temperatures for optimum growth and with poor cold tolerance and significantly reduced growth during cool winter months in subtropical areas.

## Phenology

This evergreen plant is deep rooted. It often has a combination of flowers, immature and mature pods all present on the tree at the same time.

## Geographical Distribution

**Native:** Colombia, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Panama, Spain & United States of America.

**Exotic:** Found in tropical and subtropical areas including India.

## Biophysical Limits

**Altitude:** 0-1500 m

**Mean Annual Temperature:** 15-25° C

**Mean Annual Rainfall:** 1200 mm

**Soil Type:** Survives on a variety of soils. It can withstand drought on loamy, silt and sandy soil.

## Silvicultural Characteristics

- Sheds its leaves even with light frost and heavy frost damages all above ground growth.
- It thrives under irrigation regimes.
- It is a drought tolerant plant and withstands a long drought period due to its deep root system.

## Uses

- *L. leucocephala* is one of the highest quality and most palatable fodder trees of the tropics.
- *L. leucocephala* is in bloom almost throughout the year, providing constant forage to honey bees.
- The tree is suitable for making excellent charcoal.
- Produces paper with good printability but low tearing and folding strength.
- Wood is strong, medium textured, close grained and easily workable for a wide variety of carpentry purposes.
- Suitable as an ornamental and roadside landscaping species.
- It has high nitrogen-fixing potential.

## Occurrence in Punjab

- Wildlife Sanctuaries : WLS-9, WLS-10, WLS-12 and WLS-13
- Reserve Forests: RF-3, RF-4, RF-5 and RF-6
- Wetland : Harike
- Rivers : Beas and Ravi
- Zoological Parks: ZP-2, ZP-4 and ZP-5
- Roads: SH-19, SH-20, SH-22, NH-1A (Seg.2, Seg.3), NH-15 (Seg.3, Seg.4, Seg.7), NH-64 (Seg.3), NH-71 (Seg.3)
- Universities: AU, CU, GADVASU, GNDU and PAU



# Litchi chinensis (Litchi)

**Scientific Name:** *Litchi chinensis* Sonn.

**Family:** Sapindaceae

**Synonyms**

*Nephelium litchi* Camb.

*Dimocarpus litchi* Lour.

**Common Name:** Litchi

**Vernacular Name:** Litchi

**Botanical Description**

A small round-topped tree which can attain upto 10-28 m, entirely glabrous. Seeds completely covered with the white succulent arillus.

**Bark** is brown, smooth, fissured and have small lenticels.

**Leaves** paripinnate leaflets 2-6 pairs, alternate or opposite, elliptic oblong to ovate-lanceolate, glossy, glabrous and shining above, pale beneath.

**Flowers** grow on a terminal inflorescence with many panicles on the current season's growth. The panicles grow in clusters of ten or more, reaching 10 to 40 cm (3.9 to 15.7 in) or longer, holding hundreds of small white, yellow, or green flowers that are distinctively fragrant.

**Fruits** vary in shape from round to ovoid to heart-shaped. The thin, tough inedible skin is green when immature, ripening to red or pink-red, and is smooth or covered with small sharp protuberances. The skin turns brown and dry when left out after harvesting. The fleshy, edible portion of the fruit is an aril, surrounding one dark brown inedible seed that is 1 to 3.3 cm long and 0.6 to 1.2 cm wide (0.39-1.30 × 0.24-0.47 in).

**Natural Habitat**

Litchi is native to the Southern part of China.

**Phenology**

Flowers appear in April-May followed by fruiting. Fruits mature in 80-112 days, depending on climate, location and cultivar.

**Geographical Distribution**

**Native:** China, Sri Lanka, Taiwan, Thailand, Vietnam, Japan, India, Bangladesh, Pakistan, Nepal.

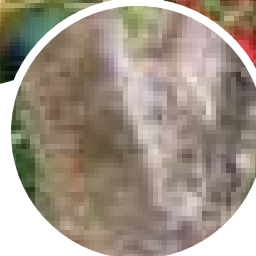
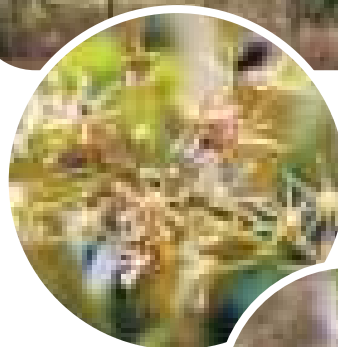
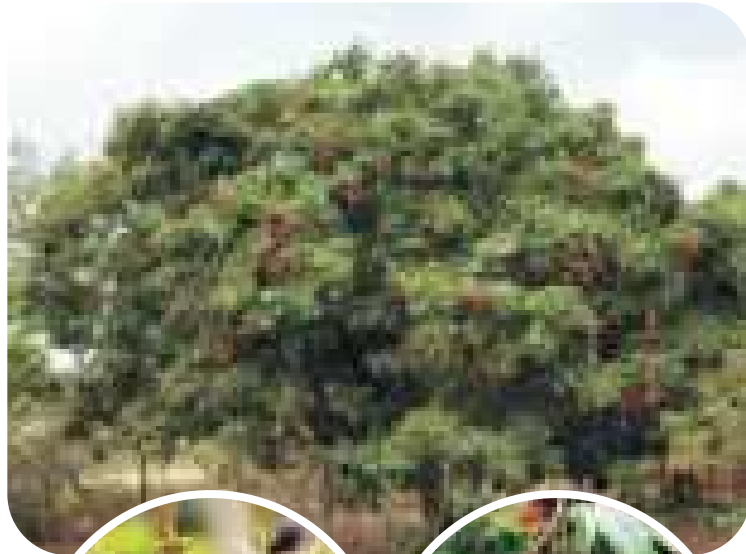
**Exotic:** Australia, parts of Southern Africa & USA.

**Biophysical Limits**

**Altitude:** 500-2500 m

**Mean Annual Temperature:** -4 to 40°C

**Mean Annual Rainfall:** 750-3500 mm



**Soil Type:** Growth is best on well-drained, slightly acidic soils rich in organic matter.

**Silvicultural Characteristics**

- Stronger light demander.
- Frost & drought hardy.
- Sensitive to water-logging, fire & browsing damages.
- It coppices well & tolerate a wide range of soils.

**Uses**

- Fruit is highly prized for its soft fleshy edible aril of its seeds.
- Litchi seeds are also edible when roasted.
- It is also planted as an ornamental tree.
- The crushed seeds are used to alleviate pain and for intestinal problems.
- Root, flower and bark extracts are taken as a treatment for sore throat.

**Occurrence in Punjab**

- Botanical Gardens: Baradari Garden, Patiala and Ram Bagg, Amritsar
- University: TU

# Livistona chinensis

## (Fan palm)

### Scientific Name

*Livistona chinensis* (Jacq.) R. Br. ex Mart

**Family:** Arecaceae

### Synonyms

*Latania chinensis* Jacq.,

*Latania borbonica* Comm. Ex Juss.,

*Livistona oliviformis* (Hassk.)

### Associated Species

*Livistona rotundifolia*

**Common Name:** Chinese fan palm

**Vernacular Name:** Fan palm

### Botanical Description

Fan palm is a evergreen plant, attains height of 9-15 m. Even though palms are generally classified as trees, however, botanically palms are not trees.

**Bark** is grey brown, rough, with horizontal ridges. Top of trunk and base of leaves densely matted with fibers.

**Leaves** are large, fan shaped, with 50-60 pleated segments; undivided at the centre, forked at the tips; ends drooping. Leaves fan shaped, up to 3 m long and nearly as wide. Typically, about 20 leaves in a crown, emerging from a dense mat of fibers.

**Flowers** in much branched clusters; tiny yellowish green.

**Fruit** olive shaped, bluish green, glossy, in large clusters.

### Phenology

Leaves evergreen, flowers in March-April and sometimes in January. Fruit form very quickly after the flowers and ripen by August-September.

### Natural Habitat

In its native habitat, it grows in open subtropical forests. It develops a long tap root, enabling it to withstand extended periods of drought. Young plants need to be shaded and mature plants prefer semi-shade but will survive full sun.

### Geographical Distribution

**Native:** Japan, China & Taiwan.

**Exotic:** USA, India & tropical areas worldwide.

### Biophysical Limits

**Altitude:** 0-1000 m

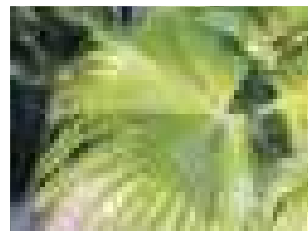
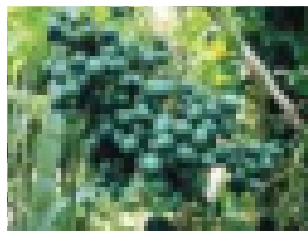
**Mean Annual Temperature:** 2-34° C

**Mean Annual Rainfall:** 500-1500 mm

**Soil Type:** Widely adaptable to all type of soils.

### Silvicultural Characteristics

- Frost hardy & strong light demander.
- Moderate Drought resistant.



- Coppices well and produces root suckers.

### Uses

- Widely grown for ornamental purposes.

### Occurrence in Punjab

- Zoological Park: ZP-5
- Botanical Garden : Ram Bagg, Amritsar
- Universities: DAV, DBU, GNDU, LPU, PAU, PTU, RGU and TU

# Madhuca latifolia (Mahua)

**Botanical Name:** *Madhuca latifolia* Roxb.

**Family:** Sapotaceae

**Synonyms**

*Bassia latifolia* Roxb.

*Madhuca indica* Gmel.

*Madhuca longifolia* Macbride

**Common Names:** Mahua

**Vernacular Name:** Mahua

**Botanic Description**

*Madhuca latifolia* is a large, much branched deciduous tree up to 18 m high. Bole short, crown rounded.

**Bark** is grey to black with vertical cracks, exfoliating in thin scales.

**Leaves** oblong-shaped, rigid, clustered at the end of branches, 6-9 cm × 13-23 cm, thick and firm, exuding a milky sap when broken. Young leaves pinkish and wooly underneath.

**Flowers** creamy, corollas fleshy, juicy, clustered at the end of branches.

**Fruit** ovoid, fleshy, greenish, 3-5 cm long, 1-4 seeded. Seed large, 3-4 cm long, elliptical, flattened on one side.

**Natural Habitat**

Mahua is a frost resisting tree of the dry tropics and sub-tropics, common in deciduous forests. The tree is usually found

scattered in pastures and cultivated fields in central India. It is extensively cultivated near villages.

**Phenology**

Leaf fall occurs from February to April, flowers appear in March-April, fruits ripen from June to August. *M. latifolia* is long-lived and starts bearing from about the 10<sup>th</sup> year. A full grown tree can produce up to 90 kg of flowers in a year. It is believed to be pollinated by bats which feed on the corollas.

**Geographical Distribution**

**Native:** India, Pakistan & USA

**Exotic:** Australia, Indonesia, South East China, Myanmar, Philippines

**Biophysical Limits**

**Altitude:** up to 1200 m

**Mean Annual Temperature:** 2-46° C

**Mean Annual Rainfall:** 550-1 500 mm

**Soil Type:** *M. latifolia* grows best in deep loamy or sandy-loam soils with good drainage, it also occurs on shallow boulder, clayey and calcereous soils.

**Silvicultural Characteristics**

- Seedlings grow slowly but with strong stout root system.
- Strong light demander.

- It tolerates moderate shade.
- Drought resistant and withstands comparatively long periods of drought and scanty rainfall.
- Frost hardy but suffers in severe frost.

**Uses**

- The sweet, fleshy corolla is eaten fresh or dried, powdered and cooked with flour.
- Outer fruit coat is eaten as a vegetable.
- Leaves, flowers and fruits are lopped for goats and sheep.
- Seed cake is also fed to cattle.
- Wood is used for house construction, naves and felloes of cartwheels, door and window frames.
- Oil from the fruit kernels principally consists of palmitic and stearic acids and is mainly used for soap and candle making.
- Mahua oil is used to treat seeds against pest infestation.

**Occurrence in Punjab**

- Botanical Garden: Baradari Garden, Patiala
- Universities: BFRUHS, GNDU, PAU, PbiU and TU





# *Mallotus philippensis* (Kamala)

## Scientific Name

*Mallotus philippensis* (Lamk) Muell. Arg.

**Family:** Euphorbiaceae

**Common Name:** Kum-kum tree

**Vernacular Name:** Kamala

## Botanical Description

A small to medium-sized monoecious tree, up to 25 m tall and with a bole up to 50 cm in diameter, but usually much less. Slash turning deep red. Branch lentic reddish-brown glandular.

**Leaves:** Its leaves are alternate and simple, more or less leathery, ovate to lanceolate, 5-16(-23) cm × 2-7 (-9.5) cm, cuneate to rounded and with 2 glands at base, acute or acuminate at apex, entire, conspicuously 3-nerved, hairy and reddish glandular beneath; petiole 1-4 (-10) cm long, puberulous and reddish-brown.

**Flower :** Male flowers appears in terminal and axillary points, 2-10 (-16) cm long, solitary or fascicled paniculate spikes, each flower with numerous stamens, small; female flowers in spikes or slender racemes, each flower with a stellate hairy, 3-celled ovary with 3 papillose stigmas.

**Fruit:** Fruit is a depressed-globose, 3-lobed capsule, 5-7 mm × 8-10 (-12) mm, stellate-puberulous and with abundant orange or reddish glandular granules, 3-seeded. Seeds are subglobose and black, in each of the three parts of the capsule, seeds 2 to 3 mm in diameter.

## Natural Habitat

It has a widespread natural distribution, from the western Himalayas, through India, Sri Lanka, to southern China, and throughout Malaysia to Australia. Some times gregarious but more usually mixed with other species, both in forests and in open scrubland.

## Phenology

In its natural habitat *M. philippensis* flowers from March to April and fruits mature in July-August. It has extra floral nectaries attracting ants.

## Biophysical Limits

**Altitude:** 0-1600 m.

**Mean Annual Temperature:** 16-28° C

**Mean Annual Rainfall:** 800-2000 mm



**Soil Type:** It tolerates a wide range of soil types, including infertile soils, limestone, acid and rocky land.

## Geographical Distribution

**Native:** Afghanistan, Australia, Bhutan, Cambodia, China, India, Indonesia, Japan, Laos, Malaysia, Myanmar, Nepal, Papua New Guinea, Philippines, Sri Lanka, Thailand, Yemen

**Exotic:** Information not available.

## Silvicultural Characters

- It is a shade tolerant, frost & drought hardy.

## Uses

- It serves a preservative for vegetable oils and airy products.
- It also recorded to be used as a dye for

food-stuffs and beverages, which seems unlikely because it generally known as purgative.

- The leaves are used as fodder and in Southern China used as host plant for lac insects.
- The wood is often used as fuel wood but it is also suitable for paper pulp.
- The fibrous bark is used to make rope.

## Occurrence in Punjab

- Wildlife Sanctuary : WLS-4
- Reserve Forests : RF-1, RF-6
- Roads: SH-19, SH-20 (Seg-3) & NH-15 (Seg-8)

# Mangifera indica (Amb)

**Scientific Name:** *Mangifera indica* Linn.

**Family:** Anacardiaceae

**Synonyms**

*Mangifera amba* Forssk.

*Mangifera arbor* Bontit

**Common Name:** Mango tree

**Vernacular Name:** Amb

**Botanical Description**

*Mangifera indica* is a large evergreen tree to 20 m tall with a dark green, umbrella shaped crown, with stout trunk.

**Bark** is brown, smooth, with many thin fissures; thick, becoming darker, rough and scaly or furrowed; branchlets rather stout, pale green and hairless. Inner bark light brown and bitter.

**Leaves** are alternate, simple, leathery, oblong-lanceolate, 16-30×3-7 cm, on flowering branches, up to 50 cm on sterile branches, curved upward from the midrib.

**Flowers** radically symmetrical, usually have 5 spreading petals, 3-5 mm long, 1-1.5 mm broad, streaked with red, imbricate, with the median petal prolonged like a crest at the base, finely hairy and fragrant, partly male and partly bisexual; stalk short; 5 stamens, 1 fertile, the other 4 shorter and sterile, borne in a disc. The flower has a conspicuous 5-lobed disc between the petals and stamens. Inflorescence 16 cm or more in length, a much branched panicle bearing many very small (4 mm) greenish-white or pinkish flowers.

**Fruit** an irregularly egg-shaped and slightly compressed fleshy drupe, 8-12 (max. 30) cm long, attached at the broadest end on a pendulous stalk.

**Natural Habitat**

The mango thrives in both the subtropics and the tropics. In the subtropics, the cold months ensure excellent floral induction, but late frosts are a major risk; tender parts of the tree are killed by frost. In the tropics, the mango grows anywhere up to 1200 m elevation, but for fruit production a prominent dry season lasting more than 3 months is necessary.

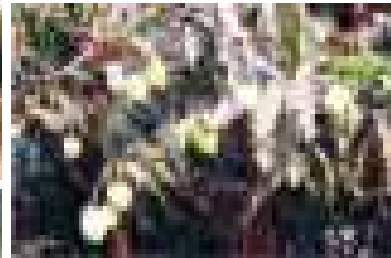
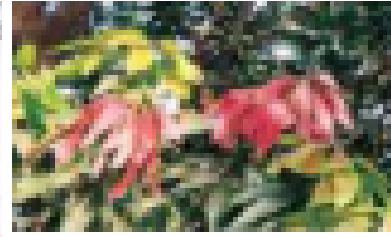
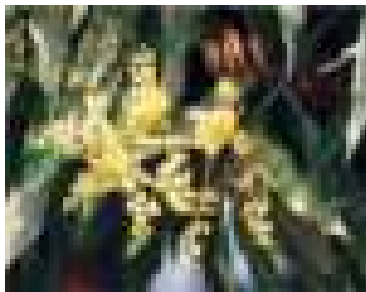
**Phenology**

Nearly evergreen, flowering occurs in February-March followed by fruiting. Fruits ripen in June-July.

**Geographical Distribution**

**Native:** Bangladesh, India, Malaysia, Myanmar, Pakistan

**Exotic:** Rest of world except its native range.



**Biophysical Limits**

**Altitude:** 0-1200 m

**Mean Annual Temperature:** 24-27° C

**Mean Annual Rainfall:** 1500-2000 mm

**Soil Type:** Mango trees thrive in well-drained soils with pH ranging from 5.5 to 7.5 and are fairly tolerant of alkalinity.

**Silvicultural Characteristics**

- The trees are drought tolerant but also withstand occasional flooding.
- Trees shade out grasses because of their thick crowns.
- It is a shade bearer in early stages of growth, strong light demander especially for flowering.

**Uses**

- Mango is cultivated for the fruit, which can be eaten in many ways for a long time.
- Young leaves are cooked as a vegetable.
- Mango leaves are occasionally fed to cattle.
- *M. indica* is an important honey plant, secreting large quantities of nectar.
- The wood makes excellent charcoal and firewood.
- The wood is used for many purposes, including indoor construction, meat-chopping blocks, furniture, carpentry,

flooring, boxes, crates and boat building (canoes and dugouts).

- Its umbrella-shaped crown makes the mango tree a suitable shade for people and their livestock; it also acts as a firebreak.
- Bark is the source of a yellowish-brown dye used for silk.
- Seeds are used to treat stubborn colds and coughs, obstinate diarrhoea and bleeding piles.
- The bark is astringent, homeostatic and antirheumatic.
- Mango leaves improve soil fertility when used as mulch for crops.
- Young mango is often interplanted with other fruits and vegetables and the tree is a valued component of the traditional home garden agro forestry system.

**Occurrence in Punjab**

- Wildlife Sanctuaries : WLS-4, WLS-9, WLS-10, WLS-11, WLS-12 and WLS-13
- Reserve Forests: RF-1 and RF-3, RF-4
- Wetlands: Harike, Kanjli & Ropar
- River : Satluj
- Zoological Parks: ZP-2, ZP-3, ZP-4 and ZP-5
- Botanical Gardens: Baradari Garden, Patiala and Ram Bagg, Amritsar
- Roads: SH-11, SH-15, SH-20, SH-B, NH-1 (Seg.1, Seg.3, Seg.4, Seg.6, Seg.8), NH-64 (Seg.3), NH-71 (Seg.1), NH-71 (Seg.2, Seg.3)
- Universities: AU, BFRUHS, DBU, GADVASU, GNDU, GRAU, PAU, PbiU, RGU and TU

# Melia azedarach

## (Dek/Drek)

**Botanical Name:** *Melia azedarach* Linn.

**Family:** Meliaceae

**Synonyms**

*Melia bukayan* Royle.

*Melia dubia* Cavanilles

*Melia indica* (A. Juss) Brandis

*Melia japonica* Don.

**Associated Species**

*Melia azadirach* (Sub spp. *compacta*)

**Common Names:** China tree & Persian lilac

**Vernacular Name:** Dek / Drek

**Botanical Description**

*Melia azedarach* is a deciduous tree up to 45 m., with a spreading crown and sparsely branched limbs.

**Bark** smooth, greenish-brown when young, turning grey and fissured with age.

**Leaves** alternate, 20-40 cm long, bipinnate or occasionally tripinnate. Leaflets 3-11, serrate and with a pungent odour when crushed.

**Inflorescence** a long, axillary panicle up to 20 cm long; flowers showy, fragrant, numerous on slender stalks, white to lilac; sepals 5-lobed, 1 cm long; petals 5-lobed, 0.9 cm long, pubescent; staminal tube deep purple blue, 0.5 cm long, 1 cm across.

**Fruit** a small, yellow drupe, nearly round, about 15 mm in diameter, smooth and becoming a little shrivelled, slightly fleshy. Seed oblongoid, 3.5 mm × 1.6 mm, smooth, brown and surrounded by pulp.

**Natural Habitat**

A tree of the subtropical climatic zone, the natural habitat of *M. azedarach* is seasonal forest, including bamboo thickets, Tamarindus woodlands. It is highly adaptable and tolerates a wide range of conditions; for example, the most frost-tolerant cultivars can be planted outdoors in sheltered areas in the British Isles.

**Phenology**

It flowers from March to May in the northern hemisphere, although some forms flower throughout the summer and even throughout the year.

**Geographic Distribution**

**Native:** Bangladesh, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Pakistan, Papua New Guinea, Sri Lanka, Thailand, Vietnam.

**Exotic:** Information not available.

**Silvicultural Characteristics**

- Strong light demander.



- Frost and drought hardy but seedlings get affected under both conditions.
  - Tree has shallow root system and liable to uprooted by strong winds. It is susceptible to fire & browsing damage.
  - Tree is fast growing but short lived.
  - Sensitive to water logging.
- Uses**
- Leaves are lopped for fodder and are highly nutritious.
  - Fuelwood is a major use of *M. azedarach*.
  - Wood is used to manufacture agricultural implements, furniture, plywood, boxes, poles, tool handles.
  - It is also used in cabinet making and in construction due to its resistance to termites.
  - Aqueous & alcoholic extracts of leaves and seed reportedly control many insect, mite and nematode pests.
  - Various parts have anthelmintic, antimalarial, cathartic, emetic and emmenagogic properties and are also used to treat skin diseases.
  - Dried ripe fruit is used as an external parasiticide.
  - Fruit stones make ideal beads and are used in making necklaces and rosaries.
- Occurrence in Punjab**
- Wildlife Sanctuaries : WLS-1, WLS-2, WLS-3, WLS-4, WLS-5, WLS-6, WLS-7, WLS-8, WLS-9, WLS-12, and WLS-13
  - Reserve Forests: RF-1 and RF-4
  - Wetlands: Harike, Kanjli and Ropar
  - River: Satluj
  - Zoological Parks: ZP-1, ZP2, ZP-3, ZP-4 and ZP-5
  - Botanical Garden: Baradari Garden, Patiala
  - Roads: SH-11, SH-16, SH-19, SH-20, SH-20 (Seg.1, Seg.3), NH-1, NH-1A (Seg.1, Seg.2), NH-15 (Seg.1, Seg.2, Seg.4, Seg.6, Seg.8), NH-64 (Seg.3), NH-71 (Seg.1), NH-71 (Seg.2), NH-71 (Seg.3) and NH-95
  - Universities: AU, BFRUHS, CU, GADVASU, GKU, GNDU, GRAU, LPU, PAU, PbiU and RGU

# Millettia ovalifolia (Tuma)

**Scientific Name:** *Millettia ovalifolia* Linn.

**Family:** Fabaceae

**Synonyms**

*Millettia peguensis* Linn.

**Common Name:** Moulmein rosewood

**Vernacular Name:** Tuma

**Botanical Description**

Large sized deciduous tree, attains height upto 25 m.

**Bark** ashy or pale brown, smooth except in patches.

**Leaves** feather compound, with 2 pairs of opposite leaflets and terminal leaflets.

**Flowers** purple mauve, tiny versions of the pea-flower, in long, drooping clusters.

**Fruit** a flat woody pod, 5-10 cm long.

**Natural Habitat**

A tree of dry or only slightly humid forests, in secondary jungle or open savannah, often near streams.

**Phenology**

Leaves shed in mid March; bare briefly until new leaf begins in April. Flowers sometimes late in March but prime time usually in the second week of April. Fruit appear in may and remain for a long time.

**Geographical Distribution**

**Native:** Myanmar, Thailand, Vietnam & Cambodia.

**Exotic:** India & Pakistan.

**Biophysical Limits**

**Altitude:** 0-1000 m

**Mean Annual Temperature:** 18-47° C

**Mean Annual Rainfall:** 750- 3500 mm

**Soil Type:** It can grow well in deep alluvial soils having good porosity and moisture content

**Silvicultural Characteristics**

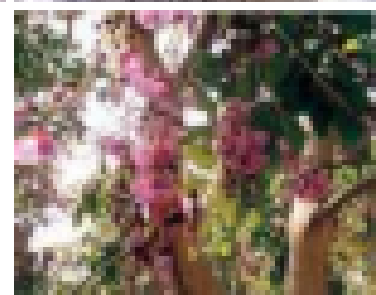
- Drought tolerant & frost hardy.
- Sensitive to water logging.
- Coppices well.
- Light demander but tolerate some shade.

**Uses**

- It makes a beautiful ornamental and avenue tree.

**Occurrence in Punjab**

- Universities: LPU, PAU & PbiU



# Millingtonia hortensis (Akaash nim)

**Scientific Name:** *Millingtonia hortensis* L.

**Family:** Bignoniaceae

**Synonyms**

*Bignonia azedarachta* König & Sims  
*Bignonia cicutaria* K.D.Koenig ex Mart.  
*Bignonia hortensis* (L.f.) Oken  
*Bignonia suberosa* Roxb.  
*Millingtonia dubiosa* Span.  
*Nevrilis suberosa* Raf. nom. illeg.

**Common Name:** Akaash nim

**Vernacular Name:** Akaash nim

**Botanical Description**

The tree grows to height of between 18 to 25 metres and has a spread of 7 to 11 metres.

**Bark** is cracked and furrowed and the numerous fissures make golden brown colour.

**Leaves** are imparipinnate and resemble that of the neem.

**Flower** is white in colour, flowers come as large panicles which emit a pleasant fragrance. They are bisexual and zygomorphic. The bell-shaped sepals of the flower have five small lobes. The flower has four stamens with parallel anthers unlike in most other plants of this family where the anthers are divergent. The corolla is a long tube with five lobes.

**Fruits** is a smooth flat capsule and is partitioned into two. It contains broad-winged seeds. The fruits are fed on by birds which aid in seed dispersal. In cultivation, the viability of seeds is low unless they are sown immediately after the fruit ripens, so the plant is generally propagated through cuttings.

**Natural Habitat**

**Phenology**

Tree flowers twice a year from April till the rains and from October to December.

**Biophysical Limits :** Information not available.

**Soil Type :** It grows on various types of soils.

**Geographical Distribution**

**Native:** South Asia including India & South East Asia.

**Exotic:** Information not available.

**Silvicultural Characteristics**

- It is a strong light demander and frost hardy.
- It can not tolerate water logging.



**Uses**

- The tree is considered ornamental and the pleasant fragrance of the flowers renders it ideal as a garden tree.
- The wood is also used as timber and the bark is used as an inferior substitute for cork.
- The leaves are also used as a cheap substitute for tobacco in cigarettes.

**Occurrence in Punjab**

- Road : NH-1
- University: BFRUHS

# Mimusops elengi (Maulsari)

**Scientific Name:** *Mimusops elengi* Linn.

**Family:** Sapotaceae

**Synonyms**

*Mimusops timorensis* Burck

*Diospyros longipes* Hiren.

**Common Names:** Spanish cherry, Bullet wood

**Vernacular Name:** Maulsari

**Botanical Description**

Middle sized tree; more or less evergreen attains height upto 16 m.

**Bark** nut-brown or greyish, deeply fissured and cracked.

**Leaves** 5-15cm long and 2.5-6.0 cm wide, glossy on top, wavy-edged. Petioles and twigs produce water milky exudate.

**Flowers** white, fragrant, with numerous narrow petals.

**Fruit** a berry, green at first, turning red-yellow when ripe.

**Natural Habitat**

*Mimusops elengi* is a medium-sized evergreen tree found in tropical forests. It is slow growing tree that does best in warm, slightly moist climates.

**Phenology**

Leaves nearly evergreen; most trees thin out in March. New leaf in late April, pale green, contrasting with the older leaves. Flowers in May-June; another flush in the rains. Fruit from February to June.

**Geographical Distribution**

**Native:** Malaysia, Sri Lanka and India.

**Exotic:** Australia.

**Biophysical Limits**

**Altitude:** 0-1500 m

**Mean Annual Temperature:** 8-47° C

**Mean Annual Rainfall:** 150- 2500 mm

**Soil Type:** It prefers well-drained soil.

**Silvicultural Characteristics**

- It can withstand water-logging for up to 2 months in the year.
- It is frost tender, but tolerates shade well.
- Light demander and drought resistant.
- Tolerant to dust and smoke.



**Uses**

- Planted in gardens and as avenue tree along the roadsides.
- Bark and fruit have medicinal properties.
- Bark is also used for tanning and dyeing.
- Fruit is eaten raw as well as pickled.
- Wood is used for making boards or card frames, furniture, oil-presses, music instruments and in turnery.
- Flowers are used in native perfumery

and are also used for making garlands.

**Occurrence in Punjab**

- Reserve Forest: RF-2
- Zoological Parks: ZP-2 and ZP-4
- Botanical Garden: Ram Bagg, Amritsar
- Universities: BFRUHS, GADVASU, GNDU, LPU, PAU, PbiU and TU

# Mitragyna parvifolia (Kalpvriksh)

## Scientific Name

*Mitragyna parvifolia* (Roxb.) Korth.

**Family:** Rubiaceae

## Synonyms

*Nuclea parvifolia* Roxb.

*Stephegyne parvifolia* (Roxb.) Korth.

**Common Name:** Kaim

**Vernacular Name:** Kalpvriksh

## Botanical Description

*Mitragyna parvifolia* is a large tree growing 12 to 15 m in height.

**Stem** is erect and branching.

**Leaves** are dark green, simple, smooth, rounded and decussate. Petioles are 1-4 cm long.

**Flowers** are in terminal heads, fragrant, creamy-white or yellow, in ball-shaped clusters; peduncle supported by a pair of bract like oblong leaves.

**Fruits** are capsules arranged in globose heads, 2 to 3 millimeters lone, ribbed. Seeds are many, small, 10-ribbed.

## Natural Habitat

A tree of hot, dry forest in the plains, ascending to about 1300 m. It grows rapidly and coppices well. It is sometimes found self sown on abandoned cultivated land.

## Phenology

Leaves start thinning out in January. Some trees remain bare through March. New leaf in early May, with another flush in the rains. Flowers mid May or June, continuing into the rains. Fruit start forming in August or a bit later, remaining on the tree for many months.

## Geographical Distribution

**Native:** South-East Asia & India.

**Exotic:** Found in tropical and subtropical regions of Africa.

## Biophysical Limits

**Altitude:** 500-1500 m

**Mean Annual Temperature:** 0 to 47°C

**Mean Annual Rainfall:** 750-1900 mm

**Soil Type:** It can grow on a variety of soils.

## Silvicultural Characteristics

- Frost & drought hardy.
- Sensitive to water logging.

## Uses

- Wood is useful for manufacturing of bobbins, furniture, planks, tool handles, plywood, turnery etc.
- It's bark, leaves, and fruits have been used as a folk medicine in many countries.
- The deciduous leaves are loaded with naturally-occurring alkaloids like dihydrocorynantheine, hirsutine isorhynch hophylline and rynchophylline.

## Occurrence in Punjab

- Road : SH-22 (At Gurudwara Shaheed Baba Uday Singh Ji, Village Attari, Distt. Ropar).



# Moringa oleifera (Sohanjana)

## Botanical Name

*Moringa oleifera* Lamk.

**Family:** Moringaceae.

## Synonyms

*Moringa pterygosperma* Gaernt;

*Moringa moringa* (Linn.) Millsp

## Common Names

Moringa, Horse-radish-tree

**Vernacular Name:** Sohanjana

## Botanical Description

*Moringa oleifera* is a small, graceful, deciduous tree with sparse foliage and attains height upto 8 m.

**Bark** is smooth, dark grey; slash thin, yellowish. Twigs and shoots shortly but densely hairy. Crown wide, open, typically umbrella shaped and usually a single stem; often deep rooted. The wood is soft.

**Leaves** alternate, the old ones soon falling off; each leaf large (up to about 90 cm long), with opposite pinnae, spaced about 5 cm apart to the central stalk, usually with a 2nd lot of pinnae, also opposite, bearing leaflets in opposite pairs, with a slightly larger terminal leaflet.

**Flowers** produced throughout the year, in loose axillary panicles up to 15 cm long; individual flower stalks up to 12 mm long and very slender; 5 pale green sepals 12 mm long, finely hairy, 5 white petals, unequal, a little longer than the sepals; 5 stamens with anthers, 5 without; style slender, flowers very sweet smelling.

**Fruit** large and distinctive, up to 90 cm long and 12 mm broad, slightly constricted at intervals, gradually tapering to a point, 3-(4-) angled, with 2 grooves on each face, light brown.

## Natural Habitat

Readily colonizes stream banks and savannah areas where the soils are well drained and the water table remains fairly high all the year round.

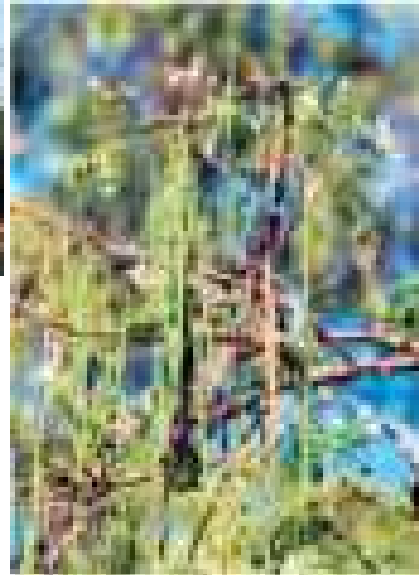
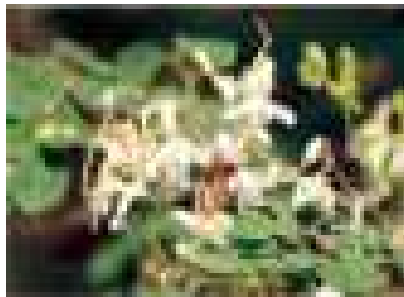
## Phenology

New foliage appears in February to March followed by flowering. Elongated pendulous green fruits grow at fast rate the fruits ripens from April to June.

## Geographical Distribution

**Native:** India, Malaysia, Oman, Qatar, Saudi Arabia, United Arab Emirates, Yemen

**Exotic:** Information not available.



## Biophysical Limits

**Altitude:** 0-2000 m

**Mean Annual Temperature:** 18-28° C

**Mean Annual Rainfall:** 500- 1300 mm

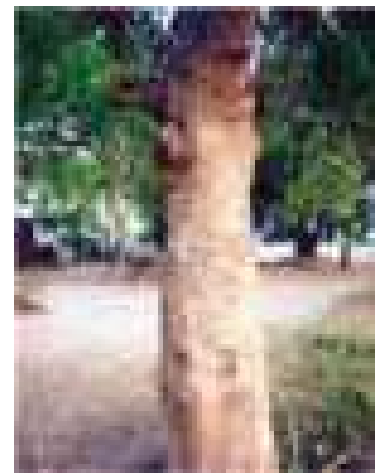
**Soil Type:** Loamy, sandy or sandy-loam having good moisture content and pH 5 -9.

## Silvicultural Characteristics

- It is quite drought tolerant but yields much less foliage where it is continuously under water stress.
- Sensitive to low temperature.
- Resistant to water-logging.
- Sensitive to fire and browsing damages.

## Uses

- The leaves, a good source of protein, vitamins A, B and C and minerals such as calcium and iron, are used as a spinach equivalent.
- Young pods are edible and reportedly have a taste reminiscent of asparagus.
- The green peas and surrounding white material can be removed from larger pods and cooked in various ways.
- Excellent oil extracted from seed can be used as salad oil.
- Flowers provide nectar to honey bees for most part of the year and can be eaten.
- Wood is an acceptable firewood for cooking but makes poor charcoal.
- The tree provides semi shade, useful in intercropping systems where intense direct sunlight can damage crops.



## Occurrence in Punjab

- Reserve Forests: RF-1 and RF-4
- Wetland : Ropar
- River : Sutlej
- Botanical Garden: Baradari Garden, Patiala
- Zoological Parks : ZP-2, ZP-3, ZP-4 and ZP-5
- Roads: SH-15, SH-16, SH-20 (Seg.2), SH-22, NH-15 (Seg.1), NH-71 (Seg.2)
- Universities: BFRUHS, GNDU, PAU and PbiU



# Morus alba (Toot)

**Botanical Name:** *Morus alba* Linn.

**Family:** Moraceae

**Synonyms**

*Morus macrophylla* Moretti

*Morus morettiana* Jacq. ex Burr.

*Morus nervosa* Deless. ex Spach.

**Associated Species**

*Morus indica*

**Common Names**

Indian mulberry, mulberry, Russian mulberry

**Vernacular Name:** Toot

**Botanical Description**

*Morus alba* is a fast-growing moderate-sized tree with a fairly cylindrical, straight bole, up to 10 m high.

**Bark** is dark greyish-brown, rough with vertical fissures.

**Leaves** are very variable, ovate or broadly ovate, distichous, simple to 3-lobed, dentate, palmately 3-veined at base.

**Flowers** are greenish, inconspicuous, with 4 free imbricate petals. Inflorescence axillary, pendulous.

**Fruit** a syncarp, consisting of many drupes enclosed in a fleshy perianth up to 5 cm long.

**Natural Habitat**

*M. alba* grows in areas with a subtropical or mild temperate climate. The shade-tolerant trees are highly susceptible to drought and inhabit ravines, valleys and coastal areas.

**Phenology**

The tree remains deciduous in winters. New leaves appears at spring following by flowering. Fruits ripen from April to June. Tree of age five years start producing viable seed.

**Geographical Distribution**

**Native:** Cambodia, China, India, Indonesia, Japan, Laos, Myanmar, Pakistan, Thailand, Vietnam, Zanzibar.

**Exotic:** Ethiopia, France, Italy, Kenya, Korea, Malaysia, Mozambique, Namibia, Nepal, South Africa, Tanzania, Uganda, United Kingdom.

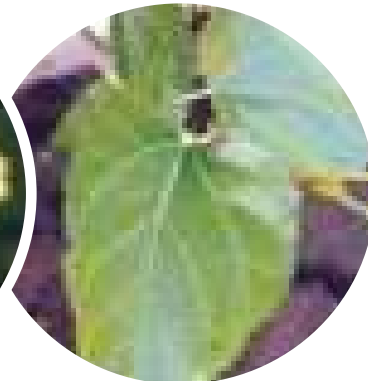
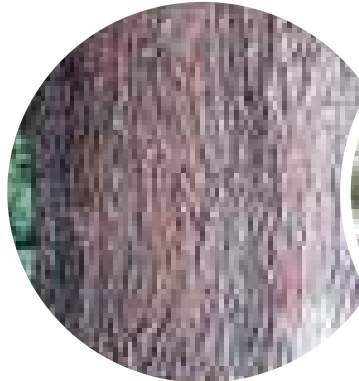
**Biophysical Limits**

**Altitude:** 0-3300 m

**Mean Annual Temperature:** 0-43°C

**Mean Annual Rainfall:** 1500-2500 mm

**Soil Type:** The plant grows on a variety of soils ranging from sandy loam to clay loam, but prefers deep, alluvial, loamy soil with sufficient moisture and pH 6.0-7.5.



**Silvicultural Characteristics**

- It is shade tolerant tree and can grow as an under storey with strong light-demander.
- The tree can withstand frost.
- It cannot tolerate drought.
- Susceptible to fire and browsing damages.

**Uses**

- Leaves are highly nutritious and contain vitamins B complex, also used as fodder for livestock.
- Makes medium-quality fuel wood.
- Wood yields sulphate pulp with satisfactory strength for white writing and printing paper.
- Wood is suitable for house building, boats, beams, posts, flooring, bridge building, agricultural implements, cabinet work, furniture and turnery.
- Bark is said to be good in the treatment of stomach-ache.
- Leaves and young branchlets used for treating heavy colds, cough, red eye, insect bites and wounds.

**Occurrence in Punjab**

- Wildlife Sanctuaries : WLS-1, WLS-2, WLS-3, WLS-4, WLS-5, WLS-7, WLS-8, WLS-9, WLS-10, WLS-11, WLS-12 and WLS-13
- Reserve Forests: RF-1, RF-2, RF-3 and RF-4
- Wetlands: Harike and Ropar
- River : Sutlej
- Zoological Parks: ZP-2, ZP-3, ZP-4 and ZP-5
- Roads: SH-11, SH-15, SH-16, SH-19, SH-20, SH-20 (Seg.2), SH-20 (Seg.3), SH-22, NH-1, NH-1A (Seg.1, Seg.2, Seg.3), NH-15 (Seg.2, Seg.3, Seg.4, Seg.6, Seg.8), NH-64 (Seg.1, Seg.2, Seg.3), NH-71 (Seg.1, Seg.2, Seg.3) and NH-95
- Universities: AU, BFRUHS, ChdU, DAV, DBU, GADVASU, GKU, GNDU, GRAU, LPU, PAU, PbiU and SGGSWU

# Neolamarckia cadamba (Kadamb)

## Scientific Name

*Neolamarckia cadamba* (Roxb.) M. Bosser

**Family:** Rubiaceae

## Synonyms

*Anthocephalus cadamba*, (Roxb.) Miq.

*Anthocephalus chinensis* (Lam.) A.

Rich. ex Walp

*Anthocephalus indica* (Lam.)

**Common Name:** New Guinea labula

**Vernacular Name:** Kadamb

## Botanical Description

*Neolamarckia cadamba* is a large tree with a broad crown and straight cylindrical bole. The tree may reach a height of 20 m.

**Bark** is gray, smooth in young trees, rough and longitudinally fissured in old trees.

**Leaves** are glossy green, opposite, simple more or less sessile to petiolate, ovate or elliptical (10-25×7-20 cm), base truncate or pubescent beneath; lateral nerves 10-14 pairs, pinnate prominent.

**Flowers** bisexual, 5-merous, calyx tube funnel-shaped, corolla gamopetalous saucer-shaped with a narrow tube, the narrow lobes imbricate in bud. Stamens 5, inserted on the corolla tube, filaments short, anthers basifixed. Ovary inferior, bi-locular, sometimes 4-locular in the upper part, style exserted and a spindle-shaped stigma, inflorescence appears in clusters; terminal globose heads without bracteoles, subsessile fragrant, orange or yellow flowers.

**Fruit** a capsule on a fleshy globose receptacle, 3.5-5.0 cm across. Seed may be angular and minute.

## Natural Habitat

*N. cadamba* is an early-succession species which grows best on deep, moist, alluvial sites, often in secondary forests along riverbanks and in the transitional zone between swampy, permanently flooded and periodically flooded areas.

## Phenology

The tree remains leafless during hot season. The small orange coloured highly scented flowers in globose heads appears from May to July. Fruits ripens from August to September and fall in January- February.

## Geographical Distribution

**Native:** Australia, China, India, Indonesia, Malaysia, Papua New Guinea, Philippines, Singapore, Vietnam.



**Exotic:** Costa Rica, Puerto Rico, South Africa, Taiwan, China & Venezuela.

## Biophysical Limits

**Altitude:** 300-800 m

**Mean Annual Temperature:** 23° C

**Mean Annual Rainfall:** 1600 mm

**Soil Type:** Prefers well drained soils. It does not grow well on leached and poorly aerated soils.

## Silvicultural Characteristics

- Strong light demander & sensitive to drought.
- Seedlings are very sensitive to frost.
- Young plants are very susceptible to browsing by cattle.

## Uses

- Wood is light & used for ply and packing cases & tool handles.
- Dried bark is used to relieve fever and as a tonic.
- An extract of the leaves serves as a mouth gargle.

## Occurrence in Punjab

- Reserve Forest : RF-4
- Botanical Gardens : Baradari Garden, Patiala & Ram Bagg, Amritsar
- Universities: DAV and DBU

# *Olea ferruginea* (Indian olive)

**Scientific Name:** *Olea ferruginea* Linn.

**Family:** Oleaceae

**Synonyms**

*Olea europaea* sub spp. *cuspidate*

(Wall. & G. Don)

**Common Names**

African olive, Wild olive, Iron tree

**Vernacular Name:** Indian olive

**Botanical Description**

Much branched evergreen tree upto 15 m high.

**Bark** smooth when young, peeling off in narrow strips when old.

**Leaves** have an opposite, decussate arrangement and are entire, 3 to 7 cm long and 0.8 to 2.5 cm wide; the apex is acute with a small hook or point and the base is attenuate to cuneate. Leaf margins are entire and recurved, the upper surface is grey-green & glossy and the lower surface has a dense covering of silvery, golden or brown scales.

**Flowers** are borne in panicles or racemes 50 to 60 mm long. The calyx is four-lobed, about 1mm long. The corolla is greenish-white or creamy, the tube is 1 to 2 mm long, lobes are about 3 mm long and reflexed at the anthesis. The two stamens are fused near the top of the corolla tube, with bilobed stigma.

**Fruit** globose to ellipsoid fruit is a drupe, 6 mm in diameter and 15 to 25 mm long; it is fleshy, glaucous to a dull shine when ripe, and purple black.

**Natural Habitat**

The climate in its natural zone is characterized by hot and dry summer and considerable degree of cold during winter.

**Phenology**

An evergreen tree, it sheds its leaves in January-February, but new leaves appear before old ones fall. Flowering occurs from March to September according to locality and elevation. The fruits ripen from September to December.

**Geographical Distribution**

**Native:** South Africa, Pakistan, India and China and Middle East.

**Exotic:** Australia.



**Biophysical Limits**

**Altitude:** 500 to 2000m

**Mean Annual Temperature:**

-10°C to 43°C

**Mean Annual Rainfall:** 500-1200 mm

**Soil Type:** It grows well in a variety of soils having good moisture level.

**Silvicultural Characteristics**

- Shade bearer and grows best on cooler aspects and protected situations.
- It can tolerate drought to some extent, but does not withstand water-logging.
- Heat tolerance capacity is maximum.
- Sensitive to frost.

- Susceptible to fire and browsing damages.
- It produces root suckers.

**Uses**

- It yields a number of useful items including quality fodder, firewood and edible fruits.
- The leaves, bark, roots, fruits and seeds are used for treatment of various diseases.
- The fruits are also a source of olive oil.

**Occurrence in Punjab**

- Botanical Garden: Baradari Garden, Patiala

# Parkinsonia aculeata (Parkinsonia)

**Scientific Name:** *Parkinsonia aculeata* L.

**Family:** Fabaceae- Caesalpinioideae

**Synonyms**

*Inga pyriformis* Jungh.

*Mimosa pedunculata* Hunter

*Parkia harbesonii* Elmer

*Parkia macropoda* Miq

**Common Name:** Jerusalem thorn

**Vernacular Name:** Parkinsonia

**Botanical Description**

It is a small tree and attains height up to 10 m. Jerusalem-thorn often has multiple stems, especially if burnt or cut, and usually has a branchy, low, and diffuse crown.

**Bark** of smaller stems and twigs is thin, smooth, and yellow-green or blue-green. There are paired spines at the nodes and a larger spine (1 to 2 cm long) at the end of the leaf axis.

**Leaves** are alternate, bipinnately compound (20 to 40 cm long) with a flattened rachis and many tiny (2 to 4 mm long) leaflets that are shed during the winter or the dry season.

**Flowers** are yellow or yellow and orange fragrant flowers are grouped in racemes and have five sepals and five petals.

**Fruits** are legumes 3 to 10 cm long, slightly flattened with constrictions between each seed. The seeds are one to several in number, ellipsoid, gray.

**Natural Habitat**

*P. aculeata* is native to semi-desert vegetation, especially desert valleys and desert grassland zones. The tree is thorny and reproduces easily; at times it escapes from controlled cultivation and becomes a weed.

**Geographical Distribution**

**Native:** USA

**Exotic:** Australia & India

**Biophysical Limits**

**Altitude:** 0-1300m

**Mean Annual Temperature:** 0-36°C

**Mean Annual Rainfall:** 200-1000 mm

**Soil Type:** It grows on a wide range of dry soils (sand dunes, clay, alkaline and chalky soils, etc.)



**Silvicultural Characteristics**

- It is a light demander and drought resistant.
- It is frost hardy and excessive seed bearer.

**Phenology**

The showy flowers appear in April-May and sporadically almost throughout the year. In India, seeds generally ripen in March-April.

**Uses**

- *P. aculeata* is used for landscaping. It is also useful in hedges and for living fence posts.
- Wood is used for fuel.
- Various extracts of leaves, flowers, fruits and bark are used in herbal medicine to treat arthritis & fever, and as a nerve stimulant & abortive.
- Its leaves are good fodder.

**Occurrence in Punjab**

- University: BFRUHS

# Phoenix sylvestris (Khajoor)

## Scientific Name

*Phoenix sylvestris* Linn. Roxb.

**Family:** Areaceae

## Synonyms

*Elate sylvestris* Linn.

*Elate versicolor* Salisb.

**Common Name:** Wild date palm

**Vernacular Name:** Khajoor

## Botanical Description

Tall feather leaves palm with a height of 7.5-15 m, evergreen. Trunk grey-brown, stepped from the stumps of fallen leaves. Spines on lower leaf- stem sharp, woody, sharp, stiff, triangular in cross-section, but only along the lower part of the main leaf-stem.

**Bark** greyish, sometimes nearly black, fallen leaf bases. the base of the trunk is usually covered with dense root lets.

**Leaves** coconut like, with long, feathery, grayish green leaves, leaflets thin, foded at base.

**Flowers** tiny, creamy yellow, in light clusters; male and female flowers on separate trees.

**Fruit** olive like, orange- yellow when ripe, in large clusters.

## Natural Habitat

It regenerates best in moist, sandy depressions where sub-soil water lies not too deep. Extremely adaptable, tolerating full sun, fairly serve drought and frost. On suitable sites, it can form pure forests.

## Phenology

The flowering season is first to the third week of August. The fruits take almost one year for attaining maturity. The ripening starts from the first week of June and continues till the middle of July.

## Geographical Distribution

**Native:** To relatively dry parts of the Indian subcontinent and Sri Lanka. Often seen growing gregariously along streams and watercourses, ascending to about 1300m.

**Exotic:** Australia, Spain, North Africa, Mexico, Puerto Rico & USA.

## Biophysical Limits

**Altitude:** 0-1500 m

**Mean Annual Temperature:** 5.5 to 27 °C

**Mean Annual Rainfall:** 500-2500 mm

**Soil Type:** Widely adaptable to all type of soils.

## Silvicultural Characteristics

- Drought tolerant & strong light demander.
- Tolerant to all type of soils.
- Resistant to heavy winds due to its leaf modifications.

## Uses

- The leaves are woven into floor - mats, baskets, fans and brooms, and the leafstalks yield paper and rope.
- The fruit and seeds are used in folk medicine as a tonic and for treating heart ailments, abdominal cramps, fevers and vomiting.

- Chiefly valued for its sugary sap which exudes (in winter) from incisions made just below the leaves.

## Occurence in Punjab

- Wildlife Sanctuaries : WLS-2, WLS-3, WLS-4, WLS-7 and WLS-8
- Reserve Forests: RF-3, RF-4, RF-5 and RF-6
- Zoological Parks: ZP-2, ZP-4 and ZP-5
- Roads: SH-20 (Seg.2, Seg.3), NH-1, NH-1A (Seg.1, Seg.2), NH-15 (Seg.4) and NH-71 (Seg.3)
- Universities: CU, ChdU, GKU, GNDU, LPU, PAU, RGU and SGGSWU



# Phyllanthus emblica (Amla)

**Scientific Name:** *Phyllanthus emblica* Linn.

**Family:** Euphorbiaceae

**Synonyms**

*Cicca emblica* Kurz

*Mirobalanus embilica* Burm.

*Phyllanthus mairei* Lev.

**Common Name :** Amla

**Vernacular Name:** Amla

**Botanical Description**

*Phyllanthus emblica* Linn. is a graceful tree, normally reaching a height of 18 m.

**Bark** is a pale greyish-brown and peels off in thin flakes like that of the guava. While actually deciduous, shedding its branchlets as well as its leaves, it is seldom entirely bare and is therefore often cited as an evergreen.

**Leaves** are oblong, only 3 mm wide and 1.25-2 cm long, distichously disposed on very slender branchlets, give a misleading impression of finely pinnate foliage.

**Flowers** are small, inconspicuous, greenish-yellow flowers are borne in compact clusters in the axils of the lower leaves. Usually, male flowers occur at the lower end of a growing branchlet, with the female flowers above them.

**Fruit:** Light green at first, the fruit becomes whitish or a dull, greenish-yellow, or, more rarely, brick red as it matures. It is hard and unyielding to the touch. The skin is thin, translucent and adherent to the very crisp, juicy, concolorous flesh. Ripe fruits are stringent, extremely acid and some are distinctly bitter, three celled and six seeded.

**Natural Habitat**

It is subtropical rather than strictly tropical.

It survives the unusually cold winter weather in its natural habitat and often shows a remarkable ability to recover from cold injury. On the other hand, it is intolerant of excessive heat. In India, mature trees can stand temperatures up to 46°C.

**Phenology**

Greenish yellow flowers appear from March to May. Old leaves commence falling in November-December and fruit ripen from November to February.

**Geographical Distribution**

**Native:** Bangladesh, China, India, Malaysia, Pakistan, Sri Lanka.

**Exotic:** Brazil, South Africa, South America.

**Biophysical Limits**

**Altitude:** 1700-2300 m

**Mean Annual Temperature:** 14-46°C

**Mean Annual Rainfall:** 700-1500 mm



**Soil Type:** It can successfully grow in slightly acidic to saline soils having pH between 6.5-9.5.

**Silvicultural Characteristics**

- Light demander and survive to both drought and frost.
- Fruit becomes whitish in severe frost.
- Seedlings are frost & shade sensitive.
- In very arid areas, the young plants need protection from intense heat.

**Uses**

- The foliage furnishes fodder for cattle.
- The wood serves also as fuel and a source of charcoal.
- The hard but flexible red wood, though highly subject to warping and splitting, is used for minor

construction, furniture, implements, gunstocks, hook as and ordinary pipes.

- An infusion made by steeping dried fruit overnight in water also serves as eyewash.
- It is a rich source of vitamin c and used as antioxidant.
- A powder prepared from the dried fruit is an effective expectorant as it stimulates the bronchial glands.
- Liquor made from the fermented fruits is prescribed as a treatment for indigestion, anaemia, jaundice, some cardiac problems.
- The tannin-rich bark, as well as the fruit and leaves are highly valued.
- A fixed oil derived from the fruit allegedly acts as a hair-restorer and is used in shampoos in India.

**Occurrence in Punjab**

- Wildlife Sanctuaries: WLS-10 and WLS-12
- Reserve Forests : RF-1, RF-4 and RF-5
- Zoological Parks : ZP-2, ZP-4 and ZP-5
- Botanical Garden: Ram Bagg, Amritsar
- Universities: BFURHS, DBU, GNDU, PAU and TU



# Pinus roxburghii (Chir pine)

**Scientific Name:** *Pinus roxburghii* Sarg.

**Family:** Pinaceae

**Synonyms**

*Pinus longifolia* Roxb.

*P. longifolia*, non Salisb.

**Common Name:** Pine tree

**Vernacular Name:** Chir pine

**Botanical Description**

*Pinus roxburghii* is a large tree reaching 30-50 m with a trunk diameter of up to 2 m, exceptionally 3 m.

**Bark** is red-brown, thick and deeply fissured at the base of the trunk, thinner and flaky in the upper crown.

**Leaves** are needle-like, in fascicles of three, very slender, 20-35 cm long, and distinctly yellowish green.

**Cones** are ovoid conic, 12-24 cm long and 5-8 cm broad at the base when closed, green at first, ripening glossy chestnut-brown when 24 months old. They open slowly over the next year or so, or after being heated by a forest fire, to release the seeds, opening to 9-18 cm broad. Seeds are 8-9 mm long, with a 40 mm wing, and are wind-dispersed. The plant is not self-fertile.

**Natural Habitat**

*Pinus roxburghii* is widespread and common in the north-south oriented outer valleys of the Himalaya and its foothills and often forms pure stands especially on dry, fire-prone slopes. Mature trees are relatively fire resistant; regeneration after destructive fires can be massive and rapid when it acts as a pioneer species.

**Phenology**

Its needle like leaf appears in January. The seeds ripen in April. The flowers are monoecious (individual flowers are either male or female, but both sexes can be found on the same plant) and are pollinated by wind. Male flower catkins release their pollen sometime in the first 2 weeks of February. Fruit cones remain on the tree for upwards of 2 years.

Female flower-cones are fertilized in February and start growing immediately. They slowly turn woody and dark brown, eventually releasing their seed when the scales open 25 month after fertilization.

**Geographical Distribution**

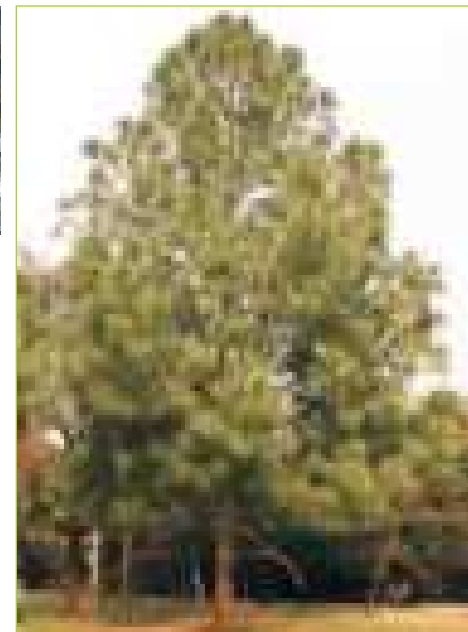
**Native:** Bhutan, China, India, Nepal & Pakistan.

**Exotic:** Norway.

**Biophysical Limits**

**Altitude:** 500-2300 m

**Mean Annual Temperature:** -15 to 47° C



**Mean Annual Rainfall:** 760-1000 mm

**Soil Type:** It can grow in a variety of soils. Suitable for light (sandy) and medium (loamy) soils, prefers well-drained soil and can grow in nutritionally poor soil.

**Silvicultural Characteristics**

- Strong light demander and cannot grow in the shade.
- It prefers dry or moist soil and can tolerate drought.
- Cannot tolerate heavy water-logging.
- Susceptible to fire and resistant to frost.

**Uses**

- Chir pine is widely planted for timber in its native area.
- The locals use easily carvable bark to make useful items like lids for vessels. Blacksmiths of native region also use bark exclusively as the fuel for their furnaces.
- Chirpine rosin is principally used in paper, soap, cosmetics, paint, varnish, rubber and polish industries.
- Other uses include manufacture of linoleum, explosives, insecticides and disinfectants, as a flux in soldering, in brewing and in mineral beneficiation as a frothing agent.
- The turpentine obtained from the resin

of all pine trees is antiseptic, diuretic, rubefacient and vermifuge. It is a valuable remedy used internally in the treatment of kidney and bladder complaints.

**Occurrence in Punjab**

- Wildlife Sanctuary: WLS-13
- Reserve Forests: RF-1 and RF-5
- Botanical Gardens: Baradari Garden, Patiala and Ram Bagg, Amritsar
- Universities: GADVASU, GNDU, LPU, PAU and TU

# *Pistacia integerrima* (Kakar)

## Scientific Name

*Pistacia Integerrima*, Stewart Ex.Brandis

**Family:** Anacardiaceae

## Synonyms

*Pistacia chinensis*

*Rhus integerrima*

**Common Name:** Kakar

**Vernacular Name:** Kakar

## Botanical Description

It is small tree and attains height up to 12m.

**Bark** is gray-brown with shallow reddish brown furrows, later forming rectangular to almost square flat-topped ridges.

**Leaves** are alternate, pinnately compound, 10 to 12 inches long, 10 to 12 lanceolate to narrow ovate leaflets, entire margins, tapering pointed tips, shiny green above, paler below.

**Flower** are unisexual, red to green, males in tight 2 to 3 inch long clusters along last year's stem, females in looser, longer groups, somewhat showy since they appear before the leaves in early spring.

**Fruit:** Bright red (later turning dark blue), round drupe, 1/2 inch in diameter, in long grape like cluster that ripen in early fall.

## Natural Habitat

Information not available.

## Phenology

This is a dioecious tree shedding its leaves during the dry season and is wind pollinated. Flowers appear from March-May and fruits appear from June-October.

## Biophysical Limits

**Altitude:** 80-190m

**Mean Annual Temperature:** 0-48°C

**Mean Annual Rainfall:** 1270 mm

**Soil Type:** Prefers well drained entisol and inceptisols and is tolerant to heavy clay soils.

## Geographical Distribution

**Native:** India and Afghanistan.

**Exotic:** USA

## Silvicultural Characteristics

- It does not tolerate fire and is strongly susceptible to acidic soils.
- Its wind firm, termite resistant, frost hardy and moderately drought resistant

## Uses

- It is used as fodder and as fuel & charcoal manufacturing.



- It is also used as soil improver and water purifier.
- It is planted as avenue tree for shade and flowers.

## Occurrence in Punjab

- Wildlife Sanctuaries : WLS-11 & WLS-13
- Reserve Forest : RF-3



# *Pithecellobium dulce* (Jangli jalebi)

## Scientific Name

*Pithecellobium dulce* (Roxb.) Benth.

**Family:** Fabaceae - Mimosoideae

**Synonyms:** None

**Common Name:** Manilla tamarind

**Vernacular Name:** Jangli jalebi

## Botanical Description

**Bark** The bark is grey, becoming rough, furrowed and eventually peeling.

**Leaves** are bipinnate, with 2 pairs of 2 kidney-shaped leaflets each 2-2.5 x 1-2 cm. New leaf growth coincides with the loss of old leaves, giving the tree an evergreen appearance. Thin spines are in pairs at the base of leaves, and range from 2 to 15 mm in length.

**Flowers** are in small white heads 1 cm in diameter. Each flower has a hairy corolla and calyx surrounding about 50 thin stamens united in a tube at the base.

**Fruits** are in the form of Pods and are 10-15 x 1.5 cm; the colour becomes spiral and reddish-brown on ripen. Each pod contains 5-10 shiny black seeds up to 2 cm long. The grey bark and tightly-coiled seed pods are characteristic of tree, and make it easy to distinguish.

## Natural Habitat

*P. dulce* is not exacting in its climatic requirements and grows well at low and medium altitudes in both wet and dry areas. It grows on poor soils, on wastelands and even with its roots in brackish water.

## Geographical Distribution

**Native:** Argentina, Bolivia, Brazil, Colombia, Ecuador, Mexico, Paraguay, Peru, United States of America, Uruguay, Venezuela.

**Exotic:** Cambodia, China, Cuba, Ethiopia, India, Indonesia, Kenya, Laos, Malaysia, Myanmar, Philippines, Puerto Rico, Sudan, Thailand and Vietnam.

## Biophysical Limits

**Altitude:** 900-1500 m

**Mean Annual Temperature:** 0-48°C

**Mean Annual Rainfall:** 250-1650 mm

**Soil Type:** *P. dulce* is found on most soil types including clay, limestone, and wet sand with a brackish water table. The tree is rated highly tolerant to soil salinity and impoverished soils. It however grows best on well-drained, deep, fertile loamy agricultural soils.



## Silvicultural Characteristics

- It is a strong light demander, but can stand a considerable shade.
- It is a drought resistant species but susceptible to frost.
- It coppices well.

## Phenology

It flowers from October to November and bear mature fruits in abundance during January and February; bloom is between April and June and the pods ripen 2-3 months later, from June to August.

## Uses

- Seeds are used to make pulp and

made into a sweet drink similar to lemonade and also eaten roasted or fresh. The seeds are used fresh in curries in India.

- Pods and leaves gathered from hedge clippings are devoured by livestock.
- Flowers are visited by bees and yield good quality honey.
- The wood of *P. dulce* is strong, durable and a good fuel

## Occurrence in Punjab

- Reserve Forest : RF-1
- University: BFRUHS

# Polyalthia longifolia (Ashok)

## Scientific Name

*Polyalthia longifolia* Sonn.

**Family:** Annonaceae

## Synonyms

*Saraca indica* auct. Non Linn. Baker

## Associated Species

*Saraca ascoa*

*Polyalthia suberosa*

**Common Name:** Buddha tree

**Vernacular Name:** Ashok

## Botanical Description

A medium, erect, near evergreen tree growing upto 15 m., with short, drooping branches somewhat like a cypress. Its long narrow, glossy leaves with wavy edges are distinctive, but the flowers and fruit are concealed within the foliage and are seldom noticed.

**Bark** is grey to brown, dark, becoming scabby and vertically fissured with age.

**Leaves** are arranged alternately, narrow, up

to 28 cm long with distinctive wavy margins. The tip of each leaf is long drawn-out and gently tapering, the base broadly v-shaped, smooth on both surface, slightly glossier above. The midrib is prominent, but the side-veins are very faint.

**Flowers** star-shaped, pale greenish yellow, in dense clusters along the branchlets. Each flower has a slender stalk about 2 cm long, a flower cup of 3 short triangular segments and 6 narrow, pointy petals up to 2.5 cm long. The flowers are usually well hidden within the foliage.

**Fruit** in clusters of 8-20 growing from the end of a common stalk, the entire cluster produced from a single flower. Each fruit is about the size of a small grape, shiny and smooth green at first turning deep purple.

## Natural Habitat

It is found scattered as an under storey or main canopy tree in both evergreen and monsoon forests, sometimes along riverine systems. It is fairly drought hardy and quick growing and makes a good city tree because it remains near-evergreen even in very dry conditions.

## Phenology

Leaves renewed in late March or early April. Another green flush in the rains. Flowers in late March or early April but last only a short time. Fruit ripen between late June and early August.

## Geographical Distribution

**Native:** Sri Lanka and India.

**Exotic:** Widely cultivated throughout tropical countries of the world.

## Biophysical Limits

**Altitude:** 0-1800 m

**Mean Annual Temperature:** 0-48 °C

**Mean Annual Rainfall:** 300-1000 mm

**Soil Type:** It can grow well in loamy soils and alluvial soils with good aeration and moisture level.

## Silvicultural Characteristics

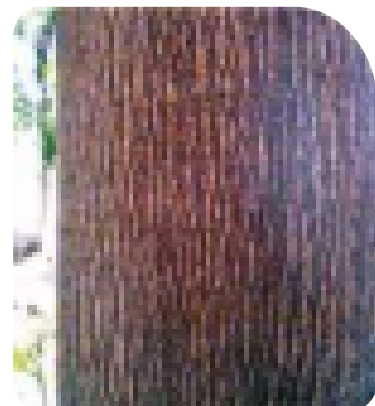
- Light demander & drought hardy.
- Fastest growing tree.
- Frost hardy & resistant to water-logging.

## Uses

- The ripening fruit is avidly eaten by flying foxes, birds and monkeys.
- The bark is used medicinally to allay fevers.
- The startlingly white, even grained wood is hollowed out to make drums in South India and for making pencils & small boxes.
- Leaves used in Hindu marriage ceremonies to decorate gateways.
- Widely cultivated throughout India as ornamental tree.

## Occurrence in Punjab

- Wildlife Sanctuaries: WLS-6 and WLS-9
- Reserve Forests: RF-1, RF-4 and RF-5
- Wetland: Harike
- Zoological Parks: ZP1, ZP-2, ZP-3 ZP-4 and ZP-5
- Botanical Gardens: Baradari Garden, Patiala and Ram Bagg, Amritsar
- Road: NH-1A(Seg.1)
- Universities: AU, BFRUHS, DAV, DBU, GADVASU, GKU, GNDU, GRAU, LPU, PAU, PTU, PbiU and TU



# Pongamia pinnata (Sukhchain)

## Scientific Name

*Pongamia pinnata* L. Pierre.

**Family:** Anacardiaceae.

**Synonyms:** *Millettia pinnata* Linn.

**Common Name:** Indian beach tree

**Vernacular Name:** Sukhchain

## Botanical Description

*Pongamia pinnata* is a medium-sized evergreen or briefly deciduous, glabrous shrub or tree 15-25 m high with broad crown of spreading or drooping branches.

**Bark** grey-brown, smooth or faintly vertically fissured. Branchlets hairless with pale stipule scars.

**Leaves** alternate, imparipinnate with long slender leafstalk, hairless, pinkish-red when young, glossy dark green above and dull green with prominent veins beneath when mature. Leaflets 5-9, paired except at end, short-stalked, ovate elliptical or oblong, 5-25 × 2.5-15 cm, obtuse-acuminate at apex, rounded to cuneate at base, not toothed at the edges, slightly thickened.

**Flower** clusters at base of and shorter than leaves, to 15 cm long, slender, drooping. Flowers 2-4 together, short-stalked, pea-shaped, 15-18 mm long. Inflorescence raceme-like, axillary, 6-27 cm long, bearing pairs of strongly fragrant flowers; calyx campanulate, 4-5 mm long, truncate, finely pubescent.

**Fruits** borne in quantities, smooth, oblique oblong to ellipsoid, 3-8 × 2-3.5 × 1-1.5 cm, flattened but slightly swollen, slightly curved with short, curved point (beaked), brown, thick-walled, thick leathery to subwoody, hard, indehiscent, 1-2 seeded, short stalked. Seed compressed ovoid or elliptical, bean-like, 1.5-2.5 × 1.2-2 × 0.8 cm, with a brittle coat long, flattened, dark brown, oily.

## Natural Habitat

*P. pinnata* is native to humid and sub-tropic environments; common along waterways or seashores, with its roots in fresh or saltwater. It is very tolerant of saline conditions and alkalinity, and occurs naturally in lowland forest on limestone and rocky coral outcrops on the coast, along the edges of mangrove forest and along tidal streams and rivers.

## Phenology

It sheds its leaves in April and develops new leaves and flowers from May onwards. In India, seed ripens from February to May. Pod production starts 5-7 years after sowing. They do not open naturally, and must decay before seeds can germinate.



## Biophysical Limits

**Altitude:** 0-1500 m

**Mean Annual Temperature:** 37-46°C

**Mean Annual Rainfall:** 1500-5000 mm

**Soil Type:** It can grow well in soils having good moisture availability. However it can tolerate saline and acidic soils.

## Geographical Distribution

**Native:** Bangladesh, India, Myanmar, Nepal, Thailand.

**Exotic:** Australia, China, Egypt, Fiji, Indonesia, Japan, Malaysia, Mauritius, New Zealand, Pakistan, Papua, New Guinea, Philippines, Sri Lanka, Sudan, USA.

## Silvicultural Characteristics

- It is a shade bearer.
- Drought resistant and well adapted to adverse climatic and soil conditions.
- In its natural habitat, the species tolerates a wide temperature range.
- Mature trees withstand light frost, waterlogging and tolerate temperatures of up to 50 °C.

## Uses

- The press cake, when applied to the soil is valued as a pesticide, particularly against nematodes.
- It tolerates moderate levels of salinity, hence good for reclamation of saline soils.
- Leaves can be used as a fodder
- *P. pinnata* flowers are considered a

good source of pollen for honeybees in India and they yield adequate nectar.

- The bark fibre is made into string, twine or rope, and the wood provides paper pulp.
- Oil from the seeds is used for leather dressing in tanning industries.
- Seed paste is spread on sores and rheumatic parts.
- An infusion of the leaves is used to relieve rheumatism, a decoction is a cough remedy, expressed juice is used on herpes and itches.

## Occurrence in Punjab

- Wildlife Sanctuaries : WLS-1, WLS-6, WLS-9 and WLS-10
- Reserve Forests: RF-1, RF-4, RF-5 and RF-6
- Wetland: Harike
- River : Satluj
- Zoological Parks: ZP-1, ZP-2, ZP-3, ZP-4 and ZP-5
- Botanical Gardens: Baradari Garden, Patiala and Ram Bagg, Amritsar
- Roads: SH-11, SH-15, SH-16, SH-19, SH-20, SH-20 (Seg.1, Seg.2, Seg.3), SH-22, NH-1A (Seg.1), NH-15 (Seg.1, Seg.2, Seg.3), NH-64 (Seg.3), NH-71 (Seg.1, Seg.2, Seg.3) and NH-95
- Universities: AU, BFRUHS, GADVASU, GKU, GNDU, LPU, PAU, PTU, PbiU and SGGSWU

# Populus deltoides (Poplar)

## Scientific Name

*Populus deltoides* Bartr. Ex Marsh

**Family:** Salicaceae

**Synonyms :** *Populus regenerata* Hort.

## Common Names

Caroline poplar, Cottonwood, Eastern Cottonwood, Necklace poplar.

**Vernacular Name:** Poplar

## Botanic Description

*Populus deltoides* is a medium-sized to large tree, 20-30 m tall.

**Bark** is grayish-green and smooth at first, later blackish and furrowed.

**Leaves** are broadly deltoid, 8-15 cm long and nearly as broad, glabrous on both sides, short-acuminate, dentate.

**Flowers** in the shape of bracts, catkins fringed or fimbriate, the divisions narrow; staminate aments 7.5-12.5 cm long, thick.

**Fruits** in the forms of catkins, mature seed catkins are 15-25 cm long; stalk hairless; capsules ovoid, 6-10 mm long, glabrous, green.

## Natural Habitat

*P. deltoides* tolerates frost, heavy soil, sand, slope, and waterlogging. Because of its intolerance to competition and the absence of suitable seed beds under existing stands, it does not usually succeed.

## Phenology

Tree remains leafless from October to March in winter season. New leaves appear at spring. Leaves turn golden yellow before they shed. Tree flowers at an age of 10-16 years. Anthesis occurs usually at spring and seed ripens afterwards. Seed dispersed through wind.

## Geographical Distribution

**Native:** Canada, United States of America

**Exotic:** Australia, China, India, Nepal, Netherlands, New Zealand, Pakistan, Sweden, United Kingdom.

## Biophysical Limits

**Altitude:** Up to 1000 m

**Mean Annual Temperature:** 8-14°C

**Mean Annual Rainfall:** 600-1500 mm

**Soil Type:** Persist on infertile sands, fine, sandy loams, and fairly stiff clays, but thrives on moist, well-drained, fine, sandy loams or silts close to streams, pH of 4.5-8.



## Silvicultural Characteristics

- Light demander & frost hardy
- Intolerant to water logging
- Fire-tender and susceptible to light fires.
- Tolerate very low temperature.
- It is drought sensitive.

## Uses

- The timber is used principally for lumber, veneer, pulpwood and excelsior.
- Wood is used for fuel.
- Source of good fibre and pulp.
- Salicylic acid, derivable from species used as a coupling agent in dye intermediates.
- Extensively used as a fodder species for sheep, goats and other livestock.

## Occurrence in Punjab

- Wildlife Sanctuaries : WLS-8, WLS-9, WLS-12 and WLS-13
- Reserve Forests: RF-1, RF-3, RF-4 and RF-5
- Wetland : Harike
- River : Ravi
- Zoological Parks: ZP-2, ZP-4 and ZP-5
- Botanical Garden: Baradari Garden, Patiala
- Roads: SH-11, SH-16, SH-20, NH-1A (Seg.1, Seg.3), NH-15 (Seg.8) and NH-95
- Universities: AU, BFRUHS, DBU, GADVASU, GKU, GNDU, GRAU LPU, PAU, PbiU and TU

# Prosopis cineraria (Jand)

## Scientific Name

*Prosopis cineraria* (Linn.) Druce

**Family:** Fabaceae - Mimosoideae

## Synonyms

*Mimosa cineraria* Linn.

*Prosopis spicigera* Linn.

**Common Name:** Jand

**Vernacular Name:** Jand

## Botanical Description

*Prosopis cineraria* is a tree to 6.5 m high; cortex cinereous; prickles internodal, scattered, straight, somewhat macroscopic, conical with broad bases. Tap root to more than 3 m long.

**Leaves** alternate, bipinnate, rachis 1.2-5 cm long; pinnae 1-2 pairs, 2.5-8.0 cm, long, leaflets 7-12 pairs, more or less sessile, c. 3-5 mm long and c. 2-4 mm broad, oblong, oblique, apex usually mucronate, base rounded, 3 nerved.

**Flowers** yellow, glabrous; calyx truncate, 0.8-1.2 mm long; corolla 3.5 mm long, glabrous, the petals rolled back in age; anthers 0.8-1 mm long; pistil glabrous. Inflorescence is a Racemes spiciform, 5-13 cm long, several together, sub paniculate; peduncle with amplexicaul bract (or 2 bracts united), this caducous and leaving an oblique scar, 1.5-2 mm long; bractlets ovate, sessile, 0.5 - 0.8 mm long, caducous; pedicels 0.5 mm, to 1.5 mm long when mature.

**Fruit** slender, elongate, 8-19 cm long (including the stipe 0.8-2 cm), subcylindrical-torulose, 4-7 mm in diameter, glabrous; pericarp thin, brittle; endocarp segments thin, longitudinal, little developed; seeds distant, longitudinal, ovate, 6 mm long, the tegument with open horse-shoe fissural line on faces, 10-15 in a pod, brown.

## Natural Habitat

In the areas of its natural distribution, the climate is dry to arid characterized by extremes of temperature. It is a

characteristic tree of secondary dry deciduous forest, desert thorn forest, ravine thorn forest, *Zizyphus* scrub, and desert dune scrub.

## Phenology

The trees start flowering and fruiting at an early age; five years old coppice shoots produce as fertile seed as the older trees. New leaves appear before or simultaneously with the fall of the old leaves in summer. The small, yellow flowers appear from March to May after the new flush of leaves. The pods ripen from June to August. Growth of new foliage, flowering and fruiting occurs during the driest months (March-June) when other plants become leafless and dormant.

## Geographical Distribution

**Native:** Afghanistan, India, Iran, Pakistan, Sri Lanka.

**Exotic:** United Arab Emirates.

## Biophysical Limits

**Altitude:** 1500 m

**Mean Annual Temperature:** -6-50°C.

**Mean Annual Rainfall:** 120-250 mm.

**Soil Type:** In its natural range, it grows on coarse sandy soils. It can however, grow on a variety of soils.

## Silvicultural Characteristics

- Strong light demander.
- Young plants are sensitive to drought and frost.
- Mature plant is drought resistant due to its deep penetrating taproot.
- The tree can withstand hottest winds and driest season.
- Proportion of root to shoot is very high.

## Uses

- *P. cineraria* pods are used as vegetable in the dried and green form.
- The leafy portion, is used as dry fodder for animals and is sometimes mixed with animal feed.
- Purplish brown heartwood is an excellent fuel, also give high-quality charcoal.
- Wood used for boat frames, houses, posts & tool handles.
- The tree yields a pale to amber coloured gum with properties similar of gum acacias.
- Bark and leaf galls used for tanning.
- Reported to be astringent, demulcent, and pectoral, it is a folk remedy for various ailments.
- The bark, considered anthelmintic, refrigerant, and tonic, is used for asthma, bronchitis, dysentery, leucoderma, leprosy, muscle tremors.
- The trees are planted for sand dune stabilization and reclamation.

## Occurrence in Punjab

- Wildlife Sanctuaries : WLS-1, WLS-5, WLS-6, WLS-7, WLS-8 and WLS-9
- Reserve Forest : RF-1
- Wetland : Harike
- River : Beas
- Zoological Parks: ZP-1 and ZP-2
- Roads: SH-15, SH-20 (Seg.1, Seg.3, Seg.4), NH-15 (Seg.4, Seg.5, Seg.6, Seg.8), NH-64 (Seg.2) and NH-71 (Seg.1, Seg.2)
- Universities: BFRUHS, CU, GADVASU, GNDU and PAU



# Prosopis juliflora (Mesquite)

## Scientific Name

*Prosopis juliflora* (Sw.) DC.

**Family:** Fabaceae -Mimosoideae

## Synonyms

*Algarobia juliflora* (Swartz) Benth.ex Heynh.

*Mimosa juliflora* Swartz.

*Mimosa salinarum* Vahl.

*Netuma juliflora* (Swartz) Raf.

*Prosopis cumanensis* Kunth.

*Prosopis dominguensis* DC.

*Prosopis vitaliana* Naves.

**Common Name:** Mesquite

**Vernacular Name:** Mesquite

## Botanical Description

*Prosopis juliflora* is an evergreen tree with a large crown and an open canopy, growing to a height of 5-10 m. Stem green-brown, sinuous and twisted, with axial thorns situated on both sides of the nodes and branches.

**Bark** is somewhat rough; dull red. The root system includes a deep taproot.

**Leaves** are compound; leaflets in 13-25 pairs, oblong (3 × 1.7 mm) and dark green, bipinnate.

**Flower** are lateral to the axis with a tubular, light greenish-yellow, 1.5 mm wide calyx with hooded teeth; corolla light greenish-yellow.

**Fruit** is a non-dehiscent pod, straight, linear, falcate to annular, with a coraceous mesocarp.

## Natural Habitat

*P. juliflora* is xerophytic and is adapted to many soil types under a wide range of moisture conditions. The value of the tree lies in its exceptional tolerance of drought and marginal soils. It tolerates strongly saline soils and seasonal water-logging.

## Phenology

Evergreen, some are quite leafless in winters. It stands flower at age of 3-4 year. Pods have a tough pericarp enclosing the seeds in a lementaceous segment. It flowers in India twice a year i.e. February-March and August-September.

## Geographical Distribution

**Native:** Argentina, Chile, Colombia, Costa Rica, Ecuador, Mexico, Panama, Peru, United States of America.

**Exotic:** Australia, Brazil, Cambodia, Cuba,

India, Indonesia, Iran, Kenya, Malaysia, Myanmar, Pakistan, Papua New Guinea, Philippines, Puerto Rico, Senegal, South Africa, Sri Lanka, Sudan, Tanzania, Thailand, Uganda, Vietnam.

## Biophysical Limits

**Altitude:** 0-1500 m

**Mean Annual Temperature:** 14-34° C

**Mean Annual Rainfall:** 50-1200 mm

**Soil Type:** It can grow on a variety of soils including rocky hills, saline flats, on shifting sand dunes and coastal sand.

## Silvicultural Characteristics

- Strong light demanders and with stand isolation and exposure.
- It is fire-tender.
- It has strong drought resistance capacity and grows at area having water table 30 m or more deep.

## Uses

- A rich, delicious flour can be made from pulverized pods.
- For dairy cows, the flour may make up 40-60% of concentrate rations.
- This species is a major honey source in Pakistan, western Australia and elsewhere.
- Crooked stems and branches make

good firewood and provide excellent charcoal.

- Used as a source for fibre in the production of paper, paperboard and hardboard.

- Syrup prepared from ground pods has various medicinal values.

## Occurrence in Punjab

- Wildlife Sanctuaries : WLS-1, WLS-2, WLS-3, WLS-4, WLS-5, WLS-6, WLS-7, WLS-8, WLS-9 and WLS-12
- Reserve Forests: RF-1, RF-3, RF-4, RF-5 and RF-6
- Wetlands: Harike, Kanjli and Ropar
- River: Sutlej
- Zoological Parks: ZP-1, ZP-2 and ZP-5
- Roads: SH-11, SH-15, SH-16, SH-20, SH-20 (Seg.1, Seg.2, Seg.3, Seg.4), NH-1, NH-1A (Seg.1), NH-15 (Seg.1, Seg.2, Seg.4, Seg.5, Seg.7, Seg.8), NH-64 (Seg.1, Seg.3), NH-71 (Seg.1, Seg.2, Seg.3) and NH-95
- Universities: GADVASU, GNDU and PAU



# *Prunus dulcis* (Badam)

## Scientific Name

*Prunus dulcis* (Mill.) D.A. Webb.

**Family:** Rosaceae

**Synonyms:** *Prunus amygdalus* Batsch

**Common Name:** Almond

**Vernacular Name:** Badam

## Botanical Description

The almond is a deciduous tree, growing 4-10 m in height.

**Bark** blackish, rough.

**Leaves** narrow, finely toothed.

Folded in the middle to form a V-shaped valley; base tapering, pointed tip.

**Flowers** pink or pale rose, fading to white; often in pairs, appearing before the leaves; 5 petals with pink stamens.

**Fruit** grey-green, with a downy coat; flesh leathery; a hard pitted stone at the centre, containing the almond

## Natural Habitat

The almond is native to the Mediterranean climate region of the Middle East, eastward as far as the Indus. It was spread by humans in ancient times along the shores of the Mediterranean into northern Africa and southern Europe.

## Phenology

Tree starts flowering in March followed by fruiting. Almonds begin bearing an economic crop in the third year after planting. Trees reach full bearing five to six years after planting. The fruit matures in the autumn, 7-8 months after flowering.

## Biophysical Limits

**Altitude:** 0-1900 m

**Mean Annual Temperature:** -2.1 to 43° C

**Mean Annual Rainfall:** 620 mm

**Soil Type:** Suitable for light (sandy), medium (loamy) and heavy (clay) soils and prefers well drained soil. Suitable pH: acid, neutral and basic (alkaline) soils.

## Geographical Distribution

**Native:** Middle East, India, Northern Africa, Southern Europe & USA.

**Exotic:** Iran & Russia.



## Silvicultural Characteristics

- Strong light demander.
- Sensitive to frost and high velocity winds especially at flowering.
- Tolerant to drought conditions.
- Needs dry weather at pollination time and during the growing season.
- Does not tolerate poor drainage.

## Uses

- The whole seed can also be sprouted, roasted seeds are used in cakes, confectionery and pastry items.
- The sweet-flavoured forms have a delicious flavour.

- The seed is somewhat difficult to digest and so needs to be thoroughly masticated. It can be blended with water to make almond milk.
- Edible oil is obtained from the seed. It is used mainly as a food flavouring and in cooking.
- An edible gum is obtained from points of damage on the stems.

## Occurrence in Punjab

- Reserve Forest: RF-4
- University: PAU

# Psidium guajava (Amrood)

**Scientific Name:** *Psidium guajava* Mill.

**Family:** Myrtaceae

**Synonyms**

- P. calyptropsidium* O. Berg
- P. corynemyrtus* (Kiaersk.) Mattos
- P. cuiavus* Trew
- P. episzygium* Sues. & A. Ludw.
- P. guayaba* Noronha
- P. mitropsidium* Burret

**Common Name:** Guava

**Vernacular Name:** Amrood

**Botanical Description**

*Psidium guajava* is a large dicotyledonous shrub or small evergreen tree, generally 3-10 m high, many branches; stems crooked.

**Bark** light to reddish brown, thin, smooth, continuously flaking; root system generally superficial and very extensive, frequently extending well beyond the canopy.

**Leaves** opposite, simple; stipules absent, petiole short, 3-10 mm long; blade oblong to elliptic, 5-15 × 4-6 cm, apex obtuse to bluntly acuminate, base rounded to subcuneate, margins entire, somewhat thick and leathery, dull grey to yellow-green above, slightly downy below, veins prominent, gland dotted.

**Flowers** are borne on newly emerging lateral shoots. Trees reach full bearing after 5-8 years, depending on growing conditions and spacing. Bats are the main fruit dispersal agents. Calyx splitting irregularly into 2-4 lobes, whitish and sparsely hairy within; petals 4-5, white, linear-ovate c. 2 cm long, delicate; stamens numerous, filaments pale white, about 12 mm long, erect or spreading, anther straw coloured; ovary inferior, ovules numerous, style about 10 cm long, stigma green, capitate.

**Fruit** an ovoid or pear-shaped berry, 4-12 cm

long, weighing up to 500 g; skin yellow when ripe, sometimes flushed with red; pulp juicy, creamy-white or creamy-yellow to pink or red; mesocarp thick, edible, the soft pulp enveloping numerous, cream to brown, kidney-shaped or flattened seeds.

**Natural Habitat**

*P. guajava* appears to have evolved in relatively open areas, such as savannah/shrub transitional zones, or in frequently disturbed areas where it is a strong competitor in early secondary growth. *P. guajava* is considered a noxious weed in many tropical pasture lands.

**Phenology**

In India the blossoms occur in May and June. Seedlings may flower within 2 years; clonally propagated trees often begin to bear during the first year after planting. Trees reach full bearing after 5-8 years, depending on growing conditions and spacing.

**Biophysical Limits**

**Altitude:** 0-2000 m

**Mean Annual Temperature:** 15-45° C

**Mean Annual Rainfall:** 1000-2000 mm

**Soil Type:** It grows well on poor soils with reasonably good drainage, however, growth and production are better on rich clay loams.

**Geographical Distribution**

**Native:** Colombia, Mexico, Peru, USA.

**Exotic:** Australia, Bangladesh, China, Costa Rica, Cuba, Ecuador, Ethiopia, Fiji, Gabon, Gambia, Greece, Guyana, India, Indonesia, Israel, Kenya, Malaysia, Myanmar, Nigeria, Pakistan, Panama, Philippines, Puerto Rico, Senegal, South Africa, Sri Lanka, Sudan, Tanzania, Thailand, Uganda, Venezuela & Vietnam.

**Silvicultural Characteristics**

- Can stand a wide range of temperatures; the highest yields are

recorded at mean temperatures of 23-28°C.

- In the subtropics, quiescent trees withstand light frost.
- More drought-resistant than most tropical fruit crops.
- Sensitive to water-logging and browsing damages.

**Uses**

- The whole fruit is edible and can be used for wine making on commercial scale.
- White fragrant flowers secrete nectar in excess all day attracting bees, which also collect juice from the damaged fruits.
- Wood makes excellent firewood and good for charcoal.
- Wood is used for tool handle, fence posts and in carpentry & turnery.
- Guava exhibits antibacterial action against intestinal pathogens such as *Staphylococcus*.
- The dried ripe fruits are recommended as a remedy for dysentery, while the leaves and fruits are used as a cure for diarrhoea.
- Oil contains bisabolene and flavinoides that exhibit anti-inflammatory properties.

**Occurrence in Punjab**

- Wildlife Sanctuaries: WLS-4, WLS-9, WLS-10, WLS-11, WLS-12 and WLS-13
- Reserve Forests: RF-4, RF-5 and RF-6
- Wetland: Harike
- Zoological Parks: ZP-3, ZP-4 and ZP-5
- Roads: SH-20, SH-22, NH-1 and NH-1A (Seg.2)
- Universities: DBU, GNDU, GRAU, LPU, PAU and RGU





# *Pterospermum acerifolium* (Kanak champa)

## Scientific Name

*Pterospermum acerifolium* Linn. Wild

**Family:** Malvaceae

## Synonyms

*Cavanilla acerifolia* (L.) J.F.Gmel

**Common Name:** Karnikara tree

**Vernacular Name:** Kanak champa

## Botanical Description

**Large** deciduous tree attains 30 m height.

**Bark** pale brown, smooth, without distinctive character.

**Leaves** smooth, glossy, 7-18 cm long variable in shape, narrowed at both ends; edges finely toothed, slightly wavy.

**Flowers** large, showy, fragrant; petals 5-12, overlapping bright yellow; stamens numerous, yellow.

**Fruit** green at first, turning black; seated on a bright-red fruit cup.

## Natural Habitat

A typical pioneer tree tending to regenerate in gaps in the forest. In dry areas, it grows near swamps. It is normally evergreen in its natural, moist habitat but goes bare for a brief period in dry situations.

## Phenology

Tree shed its leaves in late February or early March, followed soon after by new leaves. Flowers appear in March, with some trees still in flower at the end of April. Fruits take nearly a year to develop, releasing their seeds in February- March.

## Biophysical Limits

**Altitude:** 0-1200 m

**Mean Annual Temperature:** 0-48 °C

**Mean Annual Rainfall:** 500-1500 mm

**Soil Type:** It can grow in variety of soils but grow well in loamy silt soils with good water holding capacity.

## Geographical Distribution

**Native:** India, Myanmar, Thailand.

**Exotic:** China, Indonesia, Sri Lanka & Europe.

## Silvicultural Characteristics

- Strong light demander.
- Tolerates frost to some extent.



- Fairly drought resistant.
- Ability to withstand saline and water-logging conditions.

## Uses

- Mature leaves are very large, can be used as dinner plates or as packaging and storage.
- The leaves can also serve as a primitive method of re-enforcing roofs and preventing leaks.
- The pubescent under surface of the leaves is said to stop bleeding.
- The flowers can serve as a pleasant perfume and can even keep away insects.
- The timber is durable, moderately hard and strong and is used for high class joinery, paneling, flooring, furniture and toys.
- Flowers are used to cure ulcers, tumors, leprosy and blood disease.

## Occurrence in Punjab

- Reserve Forest : RF-5
- Zoological Parks: ZP-2 and ZP-4
- Botanical Gardens: Baradari Garden, Patiala and Ram Bagg, Amritsar
- Road : SH-22
- Universities: GNDU, PAU, PbiU and TU

# Putranjiva roxburghii (Putranjiva)

## Scientific Name

*Putranjiva roxburghii* (Wall.) Hurusawa

**Family:** Euphorbiaceae

## Synonyms

*Putranjiva roxburghii* Wall

*Nageia putranjiva* Roxb.

**Common Name:** Putranjiva

**Vernacular Name:** Putranjiva

## Botanical Distribution

An evergreen middle size tree 10-12 m height with long, drooping branchlets bearing dark, glossy leaves. Lacking conspicuous flowers, the attraction of tree lies in the grace and geometry of its foliage. It is often kept clipped down to form a beautiful, dense hedge.

**Bark** grey or yellowish, somewhat corky, not very rough. Studded with tiny white lenticel specks arranged in horizontal ranks.

**Leaves** up to 13 cm long, thin textured dark green and glossy on top, paler and dull beneath. New leaves start out conspicuously lighter green. The edge of the leaf is very finely toothed and usually wavy as well. The base of the leaf is noticeably a symmetrical.

**Flower** yellow, small monoecious male and female on

different trees; male small, short, pedicelled in dense rounded axillary cluster, yellowish; female flower solitary or in group of 2-3, greenish, long pedicelled.

**Fruit** is a drupe, small, one seeded, green at first, turning dun or pale grey as it ripens. The stone inside is wrinkled and very hard.

## Natural Habitat

Primarily found in moist evergreen forests up to about 1000 m. In drier forests, it seeks out shady river banks or swampy ground. In dry climate, *Putranjiva* remains somewhat stunted but otherwise shows no ill effects. Cultivated in warm climates, but not very common

## Phenology

Leaves evergreen, with paler new flushes in April and again in

early July. Flowers in early April. Fruit form quickly (only on female trees) after the flowers but do not ripen till February or March of the following year.

## Geographical Distribution

**Native:** Sri Lanka, Myanmar, Malaysia, India & China.

**Exotic:** Australia, West Indies, Zimbabwe, South Africa.

## Biophysical Limits

**Altitude:** 0-1000 m

**Mean Annual Temperature:** -3 to 45° C

**Mean Annual Rainfall:** 500-1500 mm

**Soil Type:** Grows well in alluvial soils having good nutrient proportion and also grow well in loamy silt soils.

## Silvicultural Characteristics

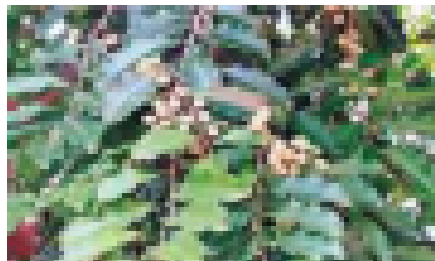
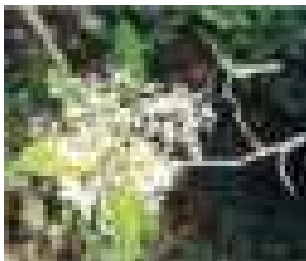
- Light demander & frost hardy.
- Drought hardy at tree stage.
- Browsed by cattle & fire susceptible.

## Uses

- *Putranjiva* makes the best clipped evergreen hedges of all Indian plants.
- In traditional medicine, the leaves and crushed stones of the fruit are used to treat colds, fevers and rheumatism.
- The leaves make a good cattle fodder.
- The hard stones are strung together in rosaries and necklaces.
- The wood is grey and used for tool handles, small articles, for house-building and turnery.

## Occurrence in Punjab

- Reserve Forest : RF-1
- Zoological Park : ZP-5
- Botanical Garden : Baradari Garden, Patiala
- University: BFRUHS, GNDU, RGU and PAU



# Roystonea regia (Royal palm)

## Botanical Name

*Roystonea regia* (Kunth) O.F. Cook

**Family:** Arecaceae

## Synonyms

*Oreodoxa regia* Kunth

*Oenocarpus regius* (Kunth) Spreng.

*Palma elata* W. Bartram

*Roystonea floridana* O.F. Cook

*Euterpe jenmanii* C.H. Wright

*Euterpe ventricosa* C.H. Wright

*Roystonea jenmanii* (C.H. Wright) Burret

*Roystonea elata* (W. Bartram) F. Harper

## Associated Species

*Dypsis lutescens*

*Hyophorevela genicaulis*

*Listivonia chinensis*

*Rhapis excelsa*

*Wodyetia bifurcata*

**Common Name:** Florida royal palm

**Vernacular Name:** Royal palm

## Botanical Description

Tall feather-leaved palm, reaches a height of 22-30 m and evergreen. Trunk is often with a slight bulge. Even though palms are generally classified as trees, however, botanically palms are not trees.

**Bark** pale grey, smooth, faintly ringed.

**Leaves** about 3m long, feather compound,

arching, leaflets long, narrow, folded at base; smooth, green crown shaft above stem formed by leaf bases.

**Flowers** tiny, in clusters, creamy yellow

**Fruit** small, more or less round, dark red when ripe.

## Natural Habitat

In their native habitat, royal palms tolerate flooding for short periods and prefer quite a lot of rainfall but are also reasonably drought-tolerant. They adapt to most kinds of soil and prefer bright, sunny conditions.

## Phenology

Leaves are evergreen and fall (with a resounding crash) and are renewed throughout the year. Flowers appear in May-June or just after the rains in late September or October. Fruit in October or December (depending on when it has flowered).

## Geographical Distribution

**Native:** Cuba, Honduras, Mexico & USA.

**Exotic:** Extensively planted in the hot tropics throughout the world including India.

## Biophysical Limits

**Altitude:** 0-1000 m

**Mean Annual Temperature:** 2-45°C

**Mean Annual Rainfall:** 500-2500 mm

**Soil Type:** Widely adaptable to all types of soils.

## Silvicultural Characteristics

- It is a light demander.
- Drought tolerant & susceptible to water logging.
- Tolerant to saline conditions.

## Uses

- The fruit is fed to pigs and the trunks furnish a light timber.
- It is planted throughout the tropics and subtropics as an ornamental tree.
- The seed is used as a source of oil and for livestock feed.
- Leaves are used for thatching and the wood for construction.
- The roots are used as a diuretic, are also used as a treatment for diabetes.

## Occurrence in Punjab

- Zoological Parks: ZP-3, ZP-4 and ZP-5
- Botanical Garden: Ram Bag, Amritsar
- Universities: DAV, DBU, LPU, PAU, RGU, SGGSWU and TU



# Salix alba (Bisbhushan)

**Scientific Name:** *Salix alba* L.

**Family:** Salicaceae

**Synonyms:** None

**Common Name:** White willow

**Vernacular Name:** Bisbhushan

**Botanical Description:** *Salix alba* is a moderate to large deciduous tree. It attains a height upto 25 m.

**Bark** is reddish green or brown, smooth in younger trees fissuring longitudinally with age.

**Leaves** are large lanceolate, acuminate, silky, grayish green, silvery white underneath, finely serrated, petiole about 1 cm.

**Flowers** male and female in separate catkins.

**Fruits** ovoid-conic capsules seed minute, yellow ovoid with silky hairs.

#### Natural Habitat

It has a wide natural distribution over whole Europe (except in extreme North Europe), occurring in western Asia and small part of North Africa. It is species of moist temperate area.

#### Phenology

It is a deciduous tree. Shed leaves during December-January & leaves appear in spring. Flowers appears during March-April and Fruits ripen in May-June.

#### Biophysical limits

**Altitude:** 1200-2400 m

**Mean annual temperature:** -2°-32°C

**Mean annual rainfall:** 600-1000 mm

**Soil type:** It requires perpetually moist, well drained, deep, fertile, rich loamy soils which are never subject to drought or prolonged water logging.

#### Geographical Distribution

**Native:** Western Europe

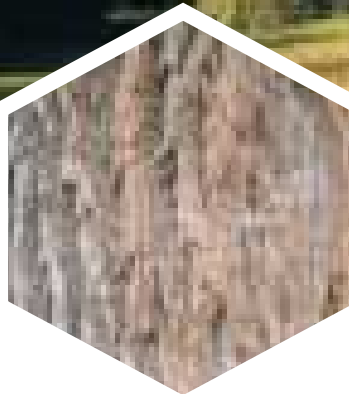
**Exotic:** USA, Mexico & India.

#### Silvicultural Characteristics

- It is a strong demander
- It coppice and pollards well.
- It is sensitive to drought, prefers wet conditions and strong winds & heavy snow causes breakage of stems.
- *Salix alba* is frost hardy.

#### Uses

- Willow timber is primarily used for cricket bats and polo balls, fruit boxes, artificial limbs, match wood,



honey comb frames, tool handles, fibre boards and agricultural implements, etc.

- Wood is good fuel wood.
- Leaves are used as fodder.

- Tender shoots are woven into baskets and ropes.

#### Occurrence in Punjab

- University: GADVASU

# Salix babylonica (Gausam)

**Scientific Name:** *Salix babylonica* Linn.

**Family:** Salicaceae

**Synonyms:** *S. pantandra* L. *S. fragilis* L.

**Common Name:** Weeping willow

**Vernacular Name:** Gausam

## Botanical Description

*Salix babylonica* is a deciduous, short-lived tree to 20 m tall. Stem furrowed, usually dividing near the ground, crown open, branches pendulous.

**Bark** is grey-black.

**Leaves** are lanceolate to linear lanceolate, 9-16 cm long, 0.5-1.5 cm wide, margins finely serrate, slightly shiny, dark green above, grey-green with distinctly reticulate venation beneath. Leaf stalk 5-10 mm long, pubescent.

**Flowers** in short, terminal catkins on leafy peduncles. Male catkin is 1.8-3 cm long, 0.5-1 cm wide. Female catkin 1.5-2.5 cm long, 0.5 cm wide, appearing with leaves in April-May.

**Fruit** a yellowish-brown capsule, narrowly conic to 3-4 mm long, glabrous.

## Natural Habitat

*S. babylonica* prefers moist environments and commonly occurs along water courses, on damp valley bottoms, and in depressions amidst sand.

## Phenology

Weeping willow grows nearly all year round. Its sap normally begins to flow in mid-February while leaves begin to expand at the beginning of March. Leaf fall starts at the end of December. Blossoming starts prior to leaves or at the same time. Full-blossom appears about March and fruit usually ripens from the middle and end of April to the beginning of May.

## Geographical Distribution

**Native:** China

**Exotic:** Argentina, Australia, France, Germany, Hungary, Italy, Nepal, Netherlands, New Zealand, South Africa, Spain & India.

## Biophysical Limits

**Altitude:** 5-2000

**Mean Annual Temperature:** 2-15°C

**Mean Annual Rainfall:** 553 - 1680 mm

**Soil Type:** *S. babylonica* can grow on a variety of soils, such as clay, sand and sludge deposit soils on beaches.

## Silvicultural Characteristics

- Weeping willow is a light-demanding species, so it has difficulty in regenerating under forest canopies.
- It can even grow on wetlands.

- It tolerates flooding and in extreme cases even submergence.
- Around lakes and beaches, weeping willow often forms a mixed willow-reed plant community.

## Uses

- The flowers are a good source of honey.
- *S. babylonica* is a source of pulpwood. Branches are used for basket making.
- Wood is widely used for furniture, packing cases, agricultural tools, fibreboard, plywood and mine poles.
- Weeping willow is an important tree species for farmland shelterbelts.
- Leaves and bark have astringent and tonic properties.
- *S. babylonica* is also valuable as an ornamental garden and park tree.

## Occurrence in Punjab

- Wildlife Sanctuaries : WLS-9, WLS-10 and WLS-12
- Reserve Forests: RF-2 and RF-4
- Wetland : Harike
- Zoological Parks: ZP-2 and ZP-5
- Road : SH-22
- University: PAU



# Salix tetrasperma (Walunj)

**Scientific Name:** *Salix tetrasperma* Roxb.

**Family:** Salicaceae

**Synonyms**

*Salix azaolana* Blanco

*Pleieina tetrasperma* (Roxb.) N. Chao & G T Gong

**Common Name:** Indian willow

**Vernacular Name:** Walunj

**Botanical Description**

A large deciduous tree attains height of 25 m.

**Bark** is brown or grey, rough with deep, vertical fissures.

**Leaves** are slim, tapering to a point; undersurface pale, young leaves are silky. Leaves are 8-15 cm long and ovate.

**Flowers** tiny, densely crowded in bottlebrush like spikes, male and female on separate trees; male flowers yellowish faintly scented in spike up to 5-10 cm long; female spikes slightly longer (8-12 cm), greenish.

**Fruit** a small, green capsule splitting open to release seeds stipulated in groups of 3 - 4.

**Phenology**

Leaves shed in end December; renewed in late January. Flowering begins between the middle and end of January and individual trees may still be in flower in late February.

**Natural Habitat**

Occasional on hill slopes, in most moist places and watercourses. A characteristic, slim-leaved willow found naturally on river banks and in moist, swampy places in India and SE Asia.

**Geographical Distribution**

**Native:** Sri Lanka, Myanmar, South-East Asia, India & Malaysia.

**Exotic:** Australia, South Africa, Afghanistan, Indonesia, Phillipines

**Biophysical Limits**

**Altitude:** 0-1800 m

**Mean Annual Temperature:** 0-42°C

**Mean Annual Rainfall:** 1000-3500 mm

**Soil Type:** Grows well in alluvial soils having good nutrient proportion and also grow well in loamy silt soils.

**Silvicultural Characteristics**

- It is a light demander & frost hardy.
- Drought resistant but susceptible to saline and water logging conditions.
- Susceptible to fire and browsing damages.
- Coppices and pollards well.
- It can withstand inundation for some period.

**Uses**

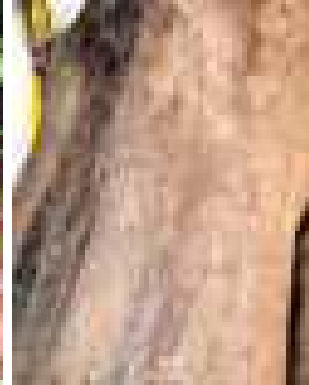
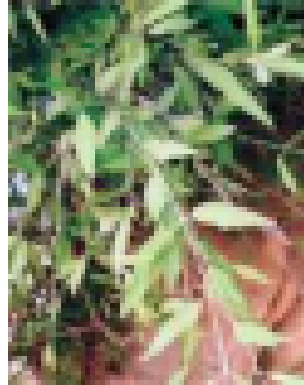
- Leaves and bark used as remedy for aches and fever.
- Decoction of leaf and root used for whooping cough in children.
- Decoction of dried root taken internally for treatment of hepatitis.
- Sap of stem taken orally for dysmenorrhea.
- Planted along water courses to prevent erosion.
- Used for making cricket bats and light furniture.

**Occurrence in Punjab**

- University: PAU



# *Salvadora oleoides* (Peelu)



**Scientific Name:** *Salvadora oleoides* Decne

**Family:** Salvadoraceae

**Synonyms:** *Salvadora persica* L.

**Common Name:** Vann

**Vernacular Name:** Peelu

**Botanical Description**

It is an evergreen shrub or a small tree with numerous, stiff divergent and whitish branches, lower ones drooping and often touching the ground. It seldom exceeds 9-12 m in height and has a short twisted trunk.

**Bark** is grey and rough.

**Leaves** linear lanceolate, 3.8 to 7.5 cm by 0.3 to 1.3 cm, ash green, fleshy when mature.

**Flowers** greenish-white, minute, sessile, in erect compact panicles.

**Fruit** a drupe 0.5 cm in diameter, globose, yellow, when ripe reddish-brown, dry.

**Natural Habitat**

The occurrence of *S. oleoides* is in all habitats, particularly in low-lying depressional zones. It is a facultative halophyte which has remarkable tolerance to aridity, salinity, and water-logging.

**Phenology**

New leaves appear about April, small greenish-white flowers appear in March-April, and fruits ripen in June.

**Geographical Distribution**

**Native:** India, Pakistan

**Exotic:** Information not available

**Biophysical limits**

**Altitude:** 0-1000 m

**Mean Annual Temperature:** 25-47.5°C

**Mean Annual Rainfall:** 350-650 mm



**Soil Type:** It is found in saline soils having pH 8.46-8.61 and organic content of 0.2-0.78%.

**Silvicultural Characters**

- It is light-demander though the seedlings prefer shade to a certain extent.
- It is drought-hardy and salt-tolerant.
- It suffers from frost but resists browsing considerably.

**Uses**

- The leaves are lopped as fodder for camels and goats.
- The fruits, locally called peelu, are edible and said to increase the yield of milk when fed to cattle.
- Oil is suitable as cattle feed.
- The leaves of the tree are used as a purgative and as remedies for cough.

**Occurrence in Punjab**

- Zoological Park: ZP-2
- University: CU

# Salvadora persica (Peelu)

**Scientific Name:** *Salvadora persica* Linn.

**Family:** Salvadoraceae

**Synonyms**

*Salvadora indica* Wight

**Common Name:** Tooth brush tree

**Vernacular Name:** Peelu

**Botanical Description**

It is a small desert tree attains height upto 3-10 m, ranging from Arabia into dry of N and W India. Becoming rare and confined to relict patches of original forest that have somehow escaped development.

**Bark** pale brown or grey, irregularly warty and rough but not deeply fissured.

**Leaves** in opposite pairs, each leaf up to 7 cm long, shaped like a lance with a broad base tapering to a blunt apex. Smooth in texture and somewhat fleshy so that the veins are only faintly visible.

**Flowers** greenish or yellow, very small arranged in loose branching clusters mostly near the ends of the branchlets.

**Fruit** tiny, round, single seeded berries, varying from pale transparent pink to deep ruby-red.

**Phenology**

Leaves nearly evergreen but with a distinctly thin phase in February. Flowers sometime between December and April, erratically and differing widely from tree to tree. Fruit appear very quickly after the flowers.

**Natural Habitat**

A characteristic tree of hot, arid parts of India but only where water is available, such as stream banks and marshes. It shows a marked tolerance for clay and saline soils.

**Geographical Distribution**

**Native:** Algeria, Cameroon, Chad, Egypt, India, Iran, Israel, Kenya, Mauritania, Mozambique, Nigeria, Pakistan, Palestine, Saudi Arabia, Somalia, South Africa, Sri Lanka, Sudan.

**Exotic:** Myanmar, Pakistan & Bangladesh.

**Biophysical Limits**

**Altitude:** 0-1800 m

**Mean Annual Temperature:** 0-48°C

**Mean Annual Rainfall:** 300-1000 mm

**Soil Type:** Adapted to alkaline or very saline soils, usually clay-rich and soils without salt.

**Silvicultural Characteristics**

- It is light demander & drought resistant.
- Susceptible to water-logging.
- It coppices well and immediately produce new shoots.
- The tree has potential for reclaiming saline soils.

**Uses**

- Young branches and leaves are used as camel and sheep fodder.
- Across its range, the tree is chiefly known for the chewing sticks which are made from its twigs.
- A decoction of the root and bark is

employed to treat gonorrhoea and diseases of the spleen and stomach.

- The timber is white, soft and easy to work.
- The tree is often used to reclaim saline lands and is planted as a shelter belt tree to arrest marching sand dunes.

**Occurrence in Punjab**

- Reserve Forests: RF-1, RF-4 and RF-5
- Zoological Parks: ZP-3 and ZP-5
- University: PAU





# *Santalum album* (Chandan)

## Scientific Name

*Santalum album* (R.Br.) DC.

**Family:** Santalaceae

## Synonyms

*Santalum ellipticum* var. *latifolium*  
*Santalum indicum*

**Common Name:** Sandalwood tree

**Vernacular Name:** Chandan

## Botanical Description

*Santalum album* is typically an erect small tree or shrub, 3-8 m tall. The tree crown is greyish.

**Bark** is rough, fibrous and furrowed on the lower parts of the tree but the upper limbs are grey or blue and smooth.

**Leaves** linear, about 1.3 × 0.2 cm, blunt ended. In seedlings, leaves opposite to sub opposite, shortly petiolate, lanceolate, to 3 × 1 cm, with a small bulbous portion near the stem base.

**Flowers** small, bisexual, green-red colored. Each flower is subtended by a small caducous bract. Perianth in four fleshy segments, each bearing a tuft of hairs behind the stamens. Anthers 2-celled, filaments short and incurved. Ovary inferior with a short bilobed stigma.

**Fruits** are short peduncled drupes 2 cm in diameter, orange-red when ripe. The perianth and disc persist until the fruit is nearly ripe.

## Natural Habitat

Sandalwood distribution is mainly in the warm semi-arid climatic zone having low rainfall for most of the year. The species occurs in a wide range of forest types from woodland to low open-woodlands. Sandalwood trees are a root parasite on many species.

## Phenology

Flowering is sporadic because of the irregular rainfall in most areas in its native range. Flowers are carrion-scented and nectariferous, attracting a wide range of insect pollinators. Fruits ripen from June-December.

## Biophysical Limits

**Altitude:** 0-700 m

**Mean Annual Temperature:** 5 to 48° C

**Mean Annual Rainfall:** 500-3000 mm

**Soil Type:** Sandalwood grows on a variety of soils from calcareous red earths to red sands in colonized brown soils.

## Geographical Distribution

**Native:** India, China, Sri Lanka, Indonesia, Malaysia, Philippines and Northern Australia.

**Exotic:** Kenya

## Silvicultural Characteristics

- It is a light demander.
- Sensitive to water-logging and drought.
- Resistant to salinity.
- Frost hardy, but young seedling dies out of severe frost.
- Tolerant of wind damages.
- Withstand a variable degree of temperature.
- Root parasitism.

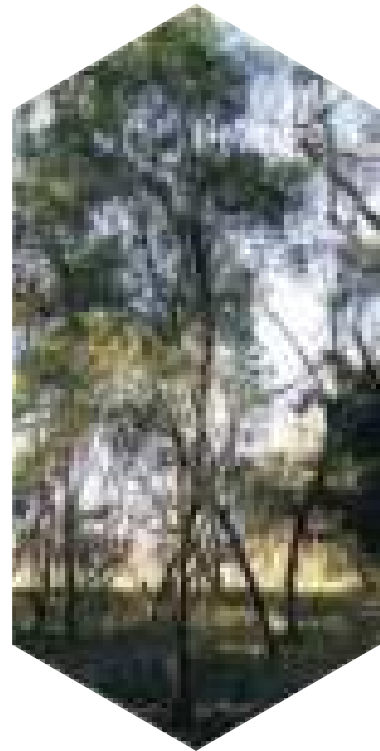
## Uses

- The wood is an excellent fuel. The wood is used for carvings and the production of napkin rings, small boxes and fans.

- Sandalwood is used for a variety of purposes. In powdered form, it is used in the manufacture of joy sticks.
- Aromatic oil distilled, mainly from the tree butts and roots, used as a fixative for perfumes and in high quality soaps.

## Occurrence in Punjab

- Reserve Forest: RF-4
- Zoological Park: ZP-5
- University: PAU



# Sapindus mukorossi (Reetha)

**Scientific Name:** *Sapindus mukorossi* Linn.

**Family:** Sapindaceae

**Synonyms:** *Sapindus delavai* Hook

**Common Name:** Soapnut tree

**Vernacular Name:** Reetha

### Botanical Description

*Sapindus mukorossi* is a fairly large, deciduous tree, usually up to 12 m in height, sometimes attaining a height of 20 m, with a globose crown and rather fine leathery foliage.

**Bark** dark to pale yellow, fairly smooth, with many vertical lines of lenticels and fine fissures exfoliating in irregular wood scales. Blaze 0.8-1.3 cm, hard, not fibrous, pale orange brown, brittle and granular.

**Leaves** are 30-50 cm long, alternate, paripinnate; common petiole very narrowly bordered, glabrous; leaflets 5-10 pairs, opposite or alternate, 5-18 by 2.5-5 cm, lanceolate, acuminate, entire, glabrous, often slightly falcate or oblique; petioles 2-5 m long.

**Flower** are arranged in a compound terminal panicle, 30 cm or more in length, with pubescent branches. Flowers about 5 mm across, polygamous, greenish white, subsessile, numerous, mostly bisexual. Sepals 5, each with a woolly scale on either side above the claw.

**Fruit** is a globose, fleshy, 1-seeded drupe, sometimes 2 drupes together, about 1.8-2.5 cm across. Seed 0.8-1.3 cm in diameter, globose, smooth, black, loose in dry fruit.

### Natural Habitat

The species is native to China and Japan. The species is widely grown in upper

reaches of the Indo-Gangetic plains, Shivaliks and sub-Himalayan tracts at altitudes from 200 m to 1500 m.

### Phenology

The new leaves appear in March-April and it flowers during May-June. The fruit appears in July-August and ripens by November-December.

### Geographical Distribution

**Native:** China & Japan.

**Exotic:** India.

### Biophysical Limits

**Altitude:** 200-1500 m

**Mean Annual Temperature:** 2-15°C

**Mean Annual Rainfall:** 800-1800 mm

**Soil Type:** *Sapindus mukorossi* grows on a variety of soils. It grows better on sandy loamy soils with appropriate moisture content.

### Silvicultural Characteristics

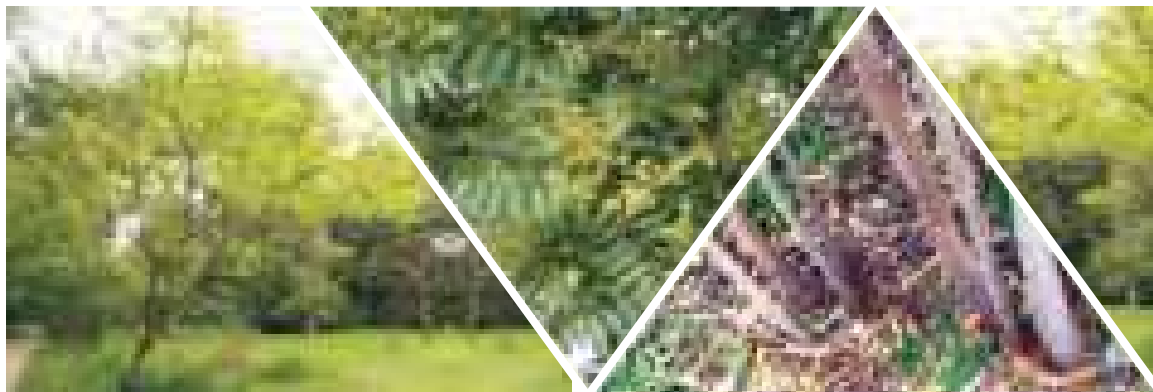
- It is a light demander.
- Fairly drought tolerant.
- Frost hardy but seedling can survive a limited frost.

### Uses

- The leaves are used as fodder for cattle.
- Honey water-white of mild flavor and good aroma.
- The wood is used for charcoal production and as firewood.
- The wood is light yellow, compact, close-grained and fairly hard.
- The fruit and seeds are regarded as a cure for epilepsy in northern India.
- A decoction of the fruit is used as an expectorant.
- The fruit is considered to be haemolytic.
- *S. mukorossi* is cultivated throughout northern India as an ornamental.
- Seed kernels which are a by-product of the oil extraction from the pericarp and shells can be used as fertilizer.
- Seeds contain 23% oil of which 92% is triglycerides.
- A surfactant obtained from the fruit pericarp of *S. mukorossi* has proved effective in the remediation of contaminated soils.

### Occurrence in Punjab

- Wildlife Sanctuary : WLS-4
- Reserve Forests : RF-5 and RF-6
- Zoological Parks: ZP-2 and ZP-5
- Road: SH-22
- Universities: GNDU, PAU and TU



# *Sapium sebiferum* (Vegetable tallow tree)

## Botanical Name

*Sapium sebiferum* (Linn.) Roxb.

**Family:** Euphorbiaceae

## Synonyms

*Croton sebiferum* Linn.

*Triadica sebifera* (Linn.) Small

**Common Name:** Chinese tallow tree

**Vernacular Name:** Vegetable tallow tree

## Botanical Description

A small deciduous tree with height of 9-10 m.

**Bark** is light brown to brown, deeply fissured, small lenticels.

**Leaves** rhomboid, acuminate, entire, membranous, pale or somewhat glaucous beneath.

**Flowers** greenish- yellow, monoecious, in terminal spiciform racemes; female flowers few, stoutly pedicelled, at the base of racemes bearing male flowers; male flowers at ends of racemes or forming racemes entirely of their own kind.

**Fruit** are in the form of capsule, sub-globose, glaucous; seeds 3, attached to a central column which splits into 3 slender divisions, enclosed in a thick layer of white fatty substance.

## Natural Habitat

It commonly occurs on disturbed sites such as spoil banks, roadsides, agricultural lands, urban areas and storm-damaged forests. Chinese tallow is also known to occur in riparian areas of central California, USA.

## Phenology

Flowering occurs in June-August. The flowers typically mature from April to June and the fruit ripens from September to October.

## Geographical Distribution

**Native:** China and Japan.

**Exotic:** USA & India.

## Biophysical Limits

**Altitude:** 0-1000 m

**Mean Annual Temperature:** 18-47° C

**Mean Annual Rainfall:** 750- 3500 mm

**Soil Type:** It can grow in any type of soil having good drainage.

## Silvicultural Characteristics

- Shade bearer.
- Trees are deciduous with a strong, deep taproots. This enables young trees to withstand periods of drought.

- Small trees are sensitive but mature trees are resistant to fire.

## Uses

- Cultivated as shade tree and along roadsides as an avenue tree.
- Fatty seed covering is used for candle wax and soap.
- Seeds give oil and leave yield a black dye.
- A major honey plant for beekeepers.
- The tree grows well in urban areas, and is very good for "sidewalk holes" along busy roads with a lot of traffic where most trees will not grow well.
- It can provide shade to counter the heat island effect of mainly-concrete areas, as well as habitat for urban animals such as lizards and birds.

## Occurrence in Punjab

- Universities: GNDU and PAU



# *Schleichera oleosa* (Kusum Tree)

## Scientific Name

*Schleichera oleosa* (Lour) Oken

**Family:** Sapindaceae

**Synonyms:** *Schleichera trijuga* Willd.

**Common Name:** Ceylon oak

**Vernacular Name:** Kusum tree

## Botanical Description

**Large** deciduous tree attains height upto 30 m.

**Bark** grey or pale brown, more or less smooth

**Leaves** are feather like and compound with 2-4 pairs of opposite, stalkless leaflets, becoming larger towards the apex

**Flowers** are tiny, yellowish, in dense clusters; no petals.

**Fruit** is grape or olive shaped with a pointed beak, up to 3 cm long; smooth or slightly prickly.

## Natural Habitat

Commonly found in Monsoon forests. It prefers light, well- drained soils and is well adapted to gravelly, boulder or sandy loam.

## Phenology

Leaves start to yellow and fall by late February. New bright-red leaves in mid March. The red phase ends by mid April and is triggered afresh by the rains. Flowers appear with the young leaves or just before. Fruit ripen between late June and August.

## Geographical Distribution

**Native:** Central and South India, Sri Lanka & Bangladesh.

**Exotic:** Myanmar, Malaysia, China & Indonesia.

## Biophysical Limits

**Altitude:** 0-1000 m

**Mean Annual Temperature:** 5-46° C

**Mean Annual Rainfall:** 750- 3500 mm

**Soil Type:** It can grow well in light, well-drained soils and is well adapted to gravelly, boulder or sandy loam.

## Silvicultural Characteristics

- Drought & frost hardy.
- Light demander but tolerates moderate type of shade.
- Sensitive to water-logging.

## Uses

- One of the primary host trees of the lac insect and said to yield the finest quality of shellac.



- Oil expressed from the seeds is used for treating rheumatism, headaches and skin diseases.
- The leaves are lopped for fodder.
- Wood is used to make mineshaft props, tool handles, bullock-carts and ploughs.
- It also makes good charcoal.

## Occurrence in Punjab

- Botanical Garden: Ram Bag, Amritsar
- Roads: SH-20 (Seg.2) and NH-15 (Seg.1)
- Universities: GADVASU, LPU, PAU, Pbi. U, RGU and TU

# *Senna siamea* (Kassod)

## Botanical Name

*Senna siamea* (Lam.) Irwin and Barneby

**Family:** Fabaceae

## Synonyms

*Cassia arayatensis* Naves

*Cassia arborea* Macfad.

*Cassia gigantea* DC.

*Cassia siamea* Lam.

*Cassia sumatrana* DC.

**Common Name:** Senna

**Vernacular Name:** Kassod

## Botanical Description

*Senna siamea* is middle-sized, evergreen ornamental tree attain height of 10-12 m. It has a dense, round, spreading crown.

**Bark** light grey, becoming cracked and rough.

**Leaves** are alternate 15-30 cm long, with up to 6-14 pairs of dark-green leaflets, oblong 3-7 cm long, 12-20 mm wide, dark green, glossy, midrib ending in a bristle.

**Flowers** pale yellow in large clusters at branch ends, 5 unequal petals, 10 stamens of different size.

**Fruit** a flat, narrow pod up to 30 cm long.

## Phenology

Leaves start to fall towards late January, most trees straggly through February, most of March. New leaves appear in late March or early April. Flowering occurs in two

distinct peaks the major one after the rains lasting in December and a shorter one in May. Fruits ripen towards late February.

## Natural Habitat

This tree can found in lowland dry forests with more than 65 cm rain. Normally evergreen, it goes straggly for a short time in very dry conditions. *S. siamea* can grow in a range of climatic conditions but is particularly suited to lowland tropics with a monsoon climate. It can grow only when its roots have access to groundwater and the maximum length of the dry period should not exceed 4-8 months.

## Geographical Distribution

**Native:** Brunei, Cambodia, China, India, Laos, Malaysia, Myanmar, Nepal, Philippines, Sri Lanka, Thailand, Vietnam.

**Exotic:** Cuba, Dominican Republic, Ethiopia, Ghana, Nigeria, Puerto Rico, South Africa, Tanzania, Uganda, Zambia.

## Biophysical Limits

**Altitude:** 0-1200 m

**Mean Annual Temperature:** 21-39°C

**Mean Annual Rainfall:** 400-2800 mm

**Soil Type:** Performs best on deep well-drained fertile soils with pH 5.5-7.5, but will grow on degraded lateritic soils provided drainage is not impeded. The species is intolerant of saline soils.

## Silvicultural Characteristics

- Drought & frost hardy.
- Strong light demander & tolerant to water-logging.

## Uses

- The leaves and seeds are eaten by cattle and sheep but are toxic to non-ruminants.
- The roots are used to treat intestinal worms.
- The bark contains tannin.
- Cultivated as a nurse shade tree in coffee/tea plantations.
- Useful for afforesting degraded tracks and as a windbreak.
- The dark heartwood-known as Bombay blackwood is hard & heavy with beautiful partridge feather mottling. It is used for cabinet work, helms, mallets and walking sticks.

## Occurrence in Punjab

- Wildlife Sanctuary : WLS-5
- Zoological Parks: ZP-2, ZP-4 & ZP-5
- Botanical Garden: Baradari Garden, Patiala
- Reserve Forests : RF-1 & RF-4
- Universities: BFRUHS, GNDU, PAU, Pbi.U, PTU and TU



# *Spathodea campanulata* (Nandi flame)

## Scientific Name

*Spathodea campanulata* Pall.

**Family:** Bignoniaceae

**Synonyms:** *S. nilotica* Seem.

**Common Name:** Tulip tree

**Vernacular Name:** Nandi flame

## Botanical Description

A medium sized deciduous tree with height of 15-18 m. Stem is light grey and fibrous.

**Bark** is light brown in colour, less fissured, small lenticels.

**Leaves** are large, opposite, imparipinnate, opposite; leaflets 9-19, ovate-lanceolate or elliptic, abruptly short-acuminate, glabrous or somewhat pubescent beneath when young.

**Flowers** are orange or red, in terminal few-flowered panicles.

**Fruit** is a capsule, woody, long pointed, containing many winged seeds.

## Natural Habitat

Originally from tropical Africa, it is now planted in many parts of Tropical World, both as decoration and for shade.

## Phenology

Definite flowering period between October and December. Flowering stretches over a 5 or 6 month period, and the pods mature and begin releasing their seeds about 5 months after flowering.

## Geographical Distribution

**Native :** Angola, Ethiopia, Ghana, Kenya, Sudan, Tanzania, Uganda, Zambia.

**Exotic :** Colombia, Costa Rica, Cuba, India, Jamaica, Puerto Rico, Sri Lanka, Zanzibar.

## Biophysical Limits

**Altitude:** 200-1800 m

**Mean Annual Temperature:** 19-45°C

**Mean Annual Rainfall:** 1000-2000 mm

**Soil Type:** It develops best in fertile, deep, well-drained loams. Soil texture may range from loamy sands to clays, pH is between 4.5-8 and soil drainage may vary from poor to excessive.

## Silvicultural Characteristics

- Drought & salinity tolerant.
- Sensitive to water-logging.
- Sensitive to fire & browsing damages.

## Uses

- Cultivated as an ornamental tree along road sides and in the parks & gardens in the plains.
- The wood is difficult to burn and makes poor firewood, but due to this property it is ideal for constructing the sides of blacksmiths bellows.

- The seeds are edible and used in many parts of Africa.
- The soft, light brownish-white wood is used for carving and making drums.
- The bark has laxative and antiseptic properties.

## Occurrence in Punjab

- Botanical Garden: Baradari Garden, Patiala
- Universities: PAU, PbiU and TU



# *Sterculia alata* (Buddha's coconut)

**Scientific Name:** *Sterculia alata* Roxb.

**Family:** Sterculiaceae

**Synonyms**

*S. Haynii* Bedd

*Pterygota alata* R.Br.

**Common Name:** Tropical chestnut

**Vernacular Name:** Buddha's coconut

**Botanical Description**

A large deciduous tree attains height of upto 30 m.

**Bark** is smooth and grey.

**Leaves** form a cordata base, broadly-ovate, entire, both surfaces glabrous, 5 or 7-nerved, prominent beneath, the middle one with 4 pair of secondary nerves.

**Flowers** unisexual, in short rusty-tomentose; racemes.

**Fruit** follicles, stalked, woody, nearly globose.

**Seeds** oblong, with a large obovate thick spongy terminal wing.

**Natural Habitat**

Moist, deciduous forest, evergreen and semi-evergreen forests.

**Phenology**

Flowering occurs from February to March.

From April the tree remains leafless. New leaves appear in May. Fruit ripen during April to May.

**Geographical Distribution**

**Native:** Andaman (India), Bangladesh, Malaysia & Myanmar.

**Exotic:** Vietnam, Thailand, China, Australia.

**Biophysical Limits**

**Altitude:** 0-700 m

**Mean Annual Temperature:** 7-42°C

**Mean Annual Rainfall:** 1000 mm

**Soil Type:** It can grow well in sandy loamy soils having pH between 5-7 and good aeration & moisture content.

**Silvicultural Characteristics**

- Light demander & drought tolerant.
- Tolerant to salinity & water-logging.

- Susceptible to fire damages.
- Resistant to browsing damages.

**Uses**

- Cultivated as an ornamental tree.
- Wood is used for making agricultural implements.
- Gum obtained from bark and leaves used as a bulk-forming laxative for treating constipation and chronic diarrhea caused by diverticular disease.
- Forage is browsed by cattle.

**Occurrence in Punjab**

- Zoological Park: ZP-4
- Botanical Garden: Ram Bagg, Amritsar
- University: GNDU



# *Swietenia mahagoni* (Mahogany)

**Scientific Name:** *Swietenia mahagoni* (Linn.) Jacq.

**Family:** Meliaceae

**Synonyms:** *Swietenia macrophylla* King

**Common Name:** West Indian mahogany

**Vernacular Name:** Mahogany

**Botanical Description**

A tall evergreen tree attains a height upto 20 m.

**Bark** is bitter in taste, brown in colour.

**Leaves** paripinnate, glabrous.

**Leaflets** 4-10, obliquely ovate or lanceolate, opposite, long acuminate.

**Flowers** are greenish to yellow in colour, in large terminal panicles.

**Fruit** is a capsule, subglobose. Seeds many, winged.

**Natural Habitat**

Found in dry or moist forest, often on limestone.

**Phenology:** Flowering occurs from April-May. Fruit capsules ripens in June to July. Seeds after dehiscence falls on ground.

**Geographical Distribution**

**Native:** Central America, Cuba, West Indies.

**Exotic:** Tropical Regions of Asia including India and America.

**Biophysical Limits**

**Altitude:** 0-1400 m

**Mean Annual Temperature:** 10-42° C

**Mean Annual Rainfall:** 1000-2000 mm

**Soil Type:** Wide variety of soil types and soil conditions.

**Silvicultural Characteristics**

- Light demander but can tolerate some shade.
- Salinity & drought tolerant.
- Sensitive to water logging.

**Uses**

- Cultivated as an ornamental tree.
- Timber is used for ship-building, etc.
- There has been some research into the acaricidal effects of its leaves and bark for control of the honey bee pest *Varroa destructor*.

**Occurrence in Punjab**

- Universities: BFRUHS, GNDU, LPU, PAU and TU





# *Syzygium cumini* (Jamun)

## Scientific Name

*Syzygium cumini* (Linn.) Skeels

## Family: Myrtaceae

## Synonyms

*Eugenia cumini* (Linn.) Druce

*Eugenia jambolana* Lamk.

*Syzygium jambolanum* DC

## Associated Species

*Syzygium nervosum*

## Common Name

Black plum, Malabar plum

## Vernacular Name: Jamun

## Botanical Description

*Syzygium cumini* is a medium-sized tree 10-30 m high, with a straight to crooked, short, stout trunk.

**Bark** up to 2.5 cm thick, brown or dark grey, fairly smooth; inner bark with thin green outer layer, mottled light brown, astringent and bitter to the taste.

**Leaves** are entire with narrow transparent margin, 7-18 cm long, 3-9 cm broad, opposite, thick, coriaceous, glabrous, broadly obovate, elliptic or elliptic-oblong, upper surface dark green, lower surface yellowish and dull.

**Flower** clusters on old twigs at the back of leaves, 5-6 cm long and wide, with many paired stout forks at nearly right angles, end flower opening first; flowers white or pink, many, small.

**Fruits** ovoid-oblong or elliptical berries, numerous, crowded in clusters, almost stalkless along twigs at the back of leaves.

## Natural Habitat

*S. cumini* is one of the most widely distributed trees of India, occurring in the major forest groups except in the very arid regions. It is present in both moist and dry situations, occurring in the tropical wet evergreen forests, tropical semi-evergreen forests, tropical moist deciduous forests, littoral and swamp, tropical dry deciduous, tropical dry evergreen, subtropical broad leaved hills, and subtropical pine forests. The tree favours moist, damp or marshy situations, where it tends to form gregarious crops.

## Phenology

It flowers from March to May. Flowering is followed by fruiting. Fruits ripen from June to August.

## Geographic Distribution

**Native:** India, Malaysia, Myanmar, Philippines, Sri Lanka, Thailand.

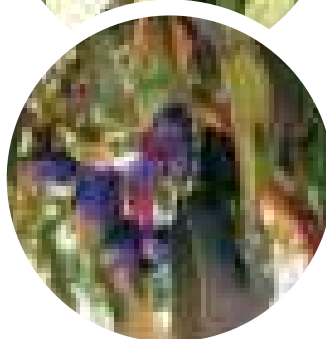
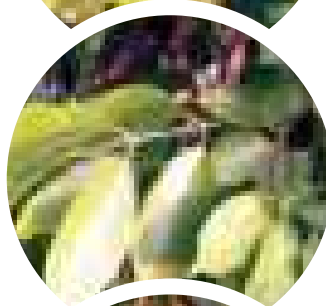
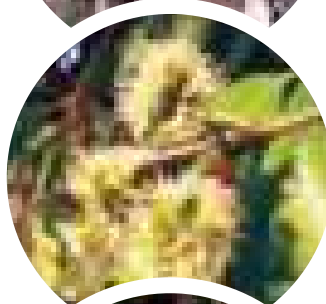
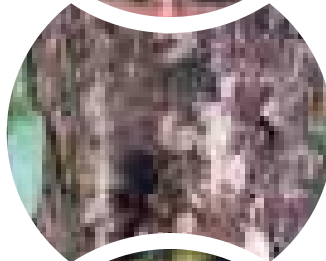
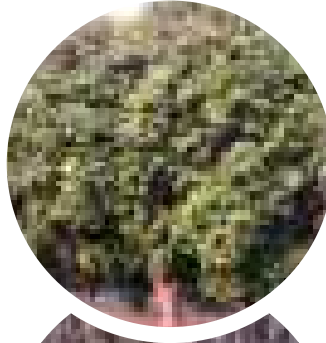
**Exotic:** Australia, Philippines, Kenya & USA.

## Biophysical Limits

**Altitude:** 0-1000 m

**Mean Annual Temperature:** 2-48°C

**Mean Annual Rainfall:** 1000- 3000 mm



**Soil type:** It prefers clay loam soils, but will grow on sandy alluvial soils near rivers; it is not suitable for dry sandy or gravelly soils or stiff clays.

## Silvicultural Characteristics

- It tolerates prolonged flooding, and once established, it can tolerate drought.
- In dry sites, it generally confines itself to the vicinity of watercourses.
- It can grow on shallow, rocky soils provided the rainfall is sufficient.
- It is frost hardy at maturity and sensitive during initial years.

## Uses

- Ripe fruit is usually eaten fresh. *S. cumini* flowers are rich in nectar and yield high-quality honey. Bark of *S. cumini* used in tanning fishnets. The seeds and bark are used for the treatment of dysentery and in control of hyper glycaemia and glycosuria in diabetic patients. Fruits are used as a relief for colic
- It provides excellent firewood and charcoal. Wood is durable in water, resistant to termites and is used for construction, boat building, commercial tea packing, agricultural implements, tool handles, cart wheels, well curbs and troughs, sleepers, furniture.
- *S. cumini* provide good shade, used to shelter coffee trees, chicken yards and livestock pastures.
- *S. cumini* is one of the most popular avenue trees in India.

## Occurrence in Punjab

- Wildlife Sanctuaries : WLS-2, WLS-4, WLS-5, WLS-7, WLS-8, WLS-9, WLS-10, WLS-11 and WLS-12
- Reserve Forests: RF-1, RF-2, RF-3, RF-4, RF-5 and RF-6
- Wetlands: Harike, Kanjli and Ropar
- River: Sutlej
- Zoological Parks: ZP-2, ZP-3, ZP-4 and ZP-5
- Botanical Gardens: Baradari Garden, Patiala and Ram Bagg, Amritsar
- Roads: SH-15, SH-20, SH-20 (Seg.1, Seg.2), SH-22, NH-1, NH-1A (Seg.1), NH-1 (Seg.1, Seg.2, Seg.3), NH-15 (Seg.2, Seg.4, Seg.6), NH-64 (Seg.3), NH-71 (Seg.1), NH-71 (Seg.2) and NH-71 (Seg.3)
- Universities: BFRUHS, CU, DBU, GDVASU, GKU, GNDU, GRAU, LPU, PAU, PTU, PbiU, SGGSWU and TU

# Tabebuia aurea (Tree of Gold)

## Botanical Name

*Tabebuia aurea* Benth. & Hook.f. ex S.Moore

**Family:** Bignoniaceae

## Synonyms

*Handroanthus caraiba* (Mart.) Mattos  
*Tabebuia argentea* (Bureau & K. Schum.) Britt.  
*Tabebuia caraiba* (Mart.) Bureau  
*Tecoma argentea* Bur. & K. Sch.  
*Tecoma caraiba* Mart.  
*Tecoma caraiba* var. *squamellulosa* (DC.) Bur. & K. Sch.  
*Tecoma squamellulosa* DC.

**Common Name:** Caribbean trumpet tree

**Vernacular Name:** Tree of Gold

## Botanical Description

It is a small deciduous tree attains a height upto 8 m.

**Bark** pale grey, with thick, vertical ridges of cork.

**Leaves** palmately compound with 5-7 narrow leaflets on long stalks of their own; smooth, sometimes covered with minute silvery scales.

**Flowers** showy, bright yellow trumpets growing in dense clusters at the ends of branches

**Fruit** a pale brown capsule, narrowed at both ends, about 10 cm long, splitting open to release winged seeds.

## Natural Habitat

This tree is common in the savannas in wet, sandy and stony soils and marginal areas for other species of trees.

It is associated with palm-savannas of *Copernicia alba* and sometimes forms pure wooded savannas known as paratodale.

## Phenology

Leaves start to thin out in February; trees are quite bare by mid March. New leaves appear in early April. Flowers appear in the second week of March, reaching a spectacular crescendo in early April. Brief bursts of flowering also seen between July and December. Fruit ripen in May.

## Geographical Distribution

**Native:** Brazil, Bolivia and Argentina.

**Exotic:** India, Pakistan, Myanmar, Thailand.



## Biophysical Limits

**Altitude:** 200-1500 mm

**Mean annual temperature:** 3-49° C

**Mean annual rainfall:** 300-2000 mm.

**Soil type:** *T. aurea* grows well in a wide variety of soils and requires little maintenance.

## Silvicultural Characteristics

- Highly tolerant to drought and salt stress.
- Newly planted trees may shed all their leaves in response to transplant shock.

## Uses

- Wood is used for preparing agricultural implements.
- It is cultivated as an ornamental tree.
- Used as a treatment for a number of human ailments.
- It is also grown as honey plants.

## Occurrence in Punjab

- Universities: GNDU and PAU

# Tamarindus indica

## (Imli)

**Scientific Name:** *Tamarindus indica* Linn.

**Family:** Fabaceae

**Synonyms**

*Tamarindus occidentalis* Gaertn.

**Common Name:** Tamarind tree

**Vernacular Name:** Imli

**Botanical Description**

Tamarind is a large evergreen tree attaining a height of 15 m.

**Bark** is moderately thick and dark grey with numerous longitudinal fissures and horizontal fissures and horizontal cracks.

**Leaves** 5 to 15cm long, paripinnate, alternate with 10 to 20 pairs of sessile leaflets, 1.5-2.5 cm long 0.5-0.6 cm broad, opposite.

**Flowers** are pale yellow borne in terminal few flowered racemes.

**Fruit** are in the form of pods, size 7.5 to 20 cm×2.5 cm, brown, slightly curved, indehiscent with brittle epicarp.

**Natural Habitat**

It generally grows in tropical and subtropical dry regions. It prefers semi arid areas and wooded grassland, and can also be found growing along stream and river banks. It does not penetrate into the rainforest. It's extensive root system contributes to its resistance to drought and wind. It also tolerates fog and saline air in coastal districts and even monsoon climates, where it has proved its value for plantations.

**Phenology**

The thick leaves cast dense shade inspite of the small size of the leaflets remain evergreen but sheds its leaves for a short period in the very hot and dry regions. The small yellow flowers streaked with red appear shortly after the new flush of leaves from April to June. The pods ripen from February to April of the following year.

**Geographical Distribution**

**Native:** Burkina Faso, Central African Republic, Chad, Eritrea, Ethiopia, Gambia, Guinea, Kenya, Madagascar, Mali, Mozambique, Niger, Nigeria, Senegal, Sudan, Tanzania, Uganda, Zimbabwe

**Exotic:** Throughout the world except in its native range.

**Biophysical Limits**

**Altitude:** 0-1000 m

**Mean Annual Temperature:** 35-46°C

**Mean Annual Rainfall:** 750-1900 mm



**Soil Type:** It can grow well in deep loamy and alluvial soils with adequate supply of moisture.

**Silvicultural Characters**

- Tamarind is a strong light demander and cannot grow under shade.
- Thick weed growth suppresses and kills the seedling.
- The seedlings are frost tender.
- Resistant to drought and remains unaffected by the severe droughts.
- Due to the acidic reaction of its leaves, nothing grows under its shade.

**Uses**

- Wood is used for cart-wheels & rice pounders.
- Wood yields excellent charcoal which is particularly valuable for gun powder.

- Fruits are excellent source of Vitamin B and C and are used for various food preparations and sharbats.
- Bark and leaves are used as tonic against inflammation on wounds.
- Pulp of pods is used for cleaning metal utensils.
- Tamarind powder is used as sizing in textile industry and as a filler for adhesives in plywood industries.

**Occurrence in Punjab**

- Reserve Forest : RF-5
- Zoological Parks : ZP-4 and ZP-5
- Botanical Garden: Baradari Garden, Patiala
- Road : NH-71 (Seg.1)
- Universities: BFRUHS and PAU

# Tamarix aphylla (Farash)

**Botanical Name:** *Tamarix aphylla* Linn.

**Family:** Tamaricaceae

**Synonyms**

*Tamarix articulata* Vahl; *T. orientalis* Linn.

**Common Name:** Athle pine

**Vernacular Name:** Farash

**Botanical Description**

*Tamarix aphylla* is a fast growing, moderate sized evergreen tree, up to 18 m high with erect tapering trunk.

**Bark** is light grey-brown or reddish-brown, rough, becoming thick and deeply furrowed into long narrow hard ridges. A deep and extensive root system, about 10 m vertically and 34 m horizontally.

**Leaves** are bluish-green, alternate, reduced to tiny scales ensheathing wiry twigs and ending in points, hairless, often with epidermal salt glands each forming a joint along the twig.

**Flowers** are many, nearly stalkless, tiny, whitish-pink, in racemes 3-6 mm long, 4-5 mm broad at end of twigs, drooping.

**Fruit** is a small capsule, many, narrow, pointed, 5 mm long, splitting into 3 parts. Seeds many, 0.5 mm long, brown, each with tuft of whitish hairs 3 mm long.

**Natural Habitat**

Popular habitats include sand dunes, canals, riverbanks, salty deserts, salt marshes and coastal plains. The tree is drought, heat, salt and frost tolerant.

**Phenology**

Leaves and branchlets are shed during cold season. Shoots and flowers appear in May and July respectively. Seeds ripen in the middle of July to November.

**Geographical Distribution**

**Native:** Algeria, Chad, Egypt, Eritrea, Ethiopia, India, Iran, Iraq, Israel, Jordan, Kenya, Kuwait, Morocco, Niger, Oman, Pakistan, Saudi Arabia, Senegal, Sri Lanka, Sudan, Tanzania, Tunisia, Uganda, Yemen.

**Exotic:** Australia, Canada, Mexico, South Africa, US.

**Biophysical Limits**

**Altitude:** 2500-5000 m

**Mean Annual Temperature:** -10 to 50° C

**Mean Annual Rainfall:** 75-500 mm

**Soil Type:** Found in loamy, stiff clay and sandy soils.

**Silvicultural Characteristics**

- It is a light demander & drought resistant.
- It is frost hardy & high heat tolerance capacity.



- Withstand saline conditions.
  - Susceptible to fire and browsing damages.
  - Fairly tolerant to water-logging.
  - Galls, mainly from flowers are used for tanning leather.
  - The bark is also a rich source of tannin and mordant for dyeing.
- Uses**
- The species is highly valued for stabilizing sand dunes. Tender branches and leaves provide high value forage, particularly during the dry period.
  - It is a good source of dark brown honey with a mint aroma.
  - Wood is useful for making ploughs, wheels, carts, construction, tool handles, brush-backs, ornaments, carpentry, furniture, turnery and fruit boxes.
- Occurrence in Punjab**
- Wildlife Sanctuary: WLS-9
  - Reserve Forest: RF-1
  - Wetland: Harike
  - Universities: BFRUHS and PAU

# Taxodium distichum (Swamp cedar)

## Scientific Name

*Taxodium distichum* (L.) Rich.

**Family:** Taxodiaceae

## Synonyms

*Cupressus disticha* Linn.

**Common Names :** Bald cypress, Southern-cypress, White-cypress, Tidewater red cypress, Gulf-cypress, Red-cypress

**Vernacular Name:** Swamp cedar

## Botanical Description

It is a large tree, attains a height of 25-40 m rarely 44 m.

**Bark** is gray-brown to red-brown, shallowly vertically fissured, with a stringy texture.

**Leaves** are borne on deciduous branchlets that are spirally arranged on the stem, but twisted at the base to lie in two horizontal ranks, 1-2 cm long and 1-2 mm broad. It is monoecious.

**Flowers** Male and female flowers forming slender tassel like structures near the edge of the branchlets. Male and female strobili mature in about 12 months; they are produced from buds formed in the late fall, with pollination in early winter.

**Fruits** seed cones are green maturing gray-brown, globular, and 2-3.5 cm in diameter. They have from 20 to 30 spirally arranged, four-sided scales, each bearing one or two (rarely three) triangular seeds. The number of seeds per cone ranges from 20 to 40. The cones disintegrate when mature to release the large seeds. The seeds are 5-10 mm long, the largest of any species in the cypress family, and are produced every year, but with heavy crops every three to five years. The seedlings have three to 9 (most often six) cotyledons.

## Natural Habitat

The native range extends along the lower Atlantic Coastal Plain to Southern Florida (USA).

## Geographical Distribution

**Native:** USA

**Exotic:** India and South East Asia.

## Biophysical Limits

**Altitude:** 30-150 m

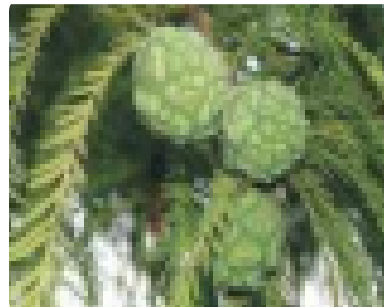
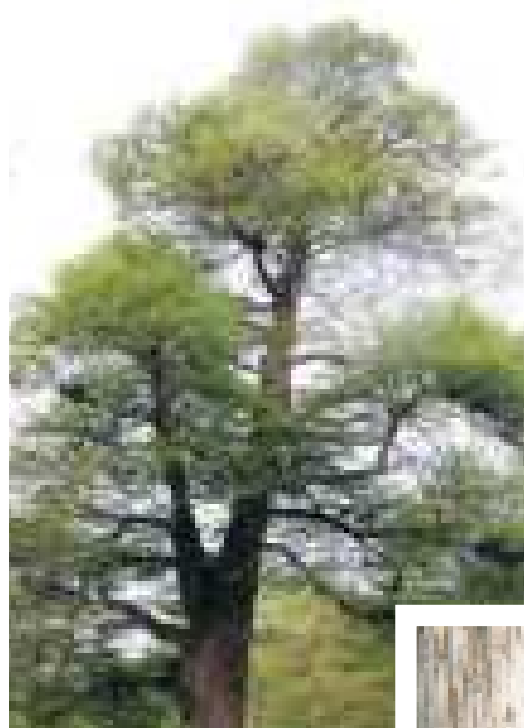
**Mean Annual Temperature:** 18°-47°C across natural range

**Mean Annual Rainfall:** 1120-1630 mm

**Soil Types:** Normally, found on intermittently flooded and very poorly drained phases of Spodosols, Ultisols, Inceptisols, Alfisols and Entisols. The native range of the species is in the thermic and hyperthermic soil temperature regimes.

## Silvicultural Characteristics

- Canopy thinning has been reported as the best management practice for regenerating cypress.



- Thinning controls competition and allows overhead light for newly germinated seedlings.
- Cypress is intermediate in shade tolerance.
- Best growth occurs under a high degree of overhead light, but the tree persists under partial shade.
- Resistant to water logging & cattle browsing.

## Uses

- The wood has long been favoured in the building construction, fences, planking in boats, river pilings,

furniture, interior trim, cabinetry, sills, rafters, siding, flooring and shingles, garden boxes, greenhouses, and many other uses.

- Reduce damage from floods and act as sediment and pollutant traps.
- It is currently being planted on a large scale as an amenity tree in China.

## Occurrence in Punjab

- University: PAU

# Tecomella undulata (Roheda)

## Scientific Name

*Tecomella undulata* (Sm.) Seem

**Family:** Bignoniaceae

## Synonyms

*Bignonia glauca* Decne.

*Bignonia tropaeolum* Jacquem. ex DC.

*Bignonia undulata* Sm.

*Gelseminum undulatum* (Sm.)

Kuntze

*Tecoma glauca* DC.

*Tecoma undulata* (Sm.) G. Don

**Associated Species:** *Tecoma argentea*

**Common Name:** Desert teak

**Vernacular Name:** Roheda

## Botanical Description

Small deciduous tree attains a height of 10-14 m.

**Bark** is dark grey brown, rough with shallow furrows; often missing in broad strips.

**Leaves** in opposite or near opposite pairs, grayish-green, 5-12 cm long; margins slightly wavy.

**Flowers** up to 8 cm long, trumpet-shaped, in small clusters; pale to deep orange, with paler throat.

**Fruit** a long, thin, slightly curved capsule up to 20 cm long, with winged seeds.

## Natural Habitat

*Tecomella undulata* is a deciduous or nearly evergreen tree of arid and semi arid regions. It occurs on flat and undulating areas including gentle hill slopes and sometimes also in ravines. The species thrives very well on stabilized sand dunes, which experience extreme low and high temperatures.

## Phenology

Leaves shed in January, renewed in mid February, but also at other time the tree appears to be highly responsive to rain. Flower begin erratically in the middle of March, usually peaking by March end. Fruit ripen in June.

## Geographical Distribution

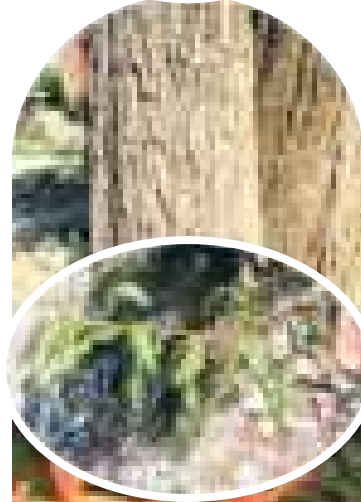
**Native:** Drier parts of South Arabia, Southern Pakistan and North-West India.

**Exotic:** Drier regions of Myanmar, Bhutan, Thailand, Malaysia.

## Biophysical Limits

**Altitude:** 0-1300 m

**Mean Annual Temperature:** -2 to 48°C



**Mean Annual Rainfall:** 150-500 mm

**Soil Type:** It is well adapted to drained loamy to sandy loam soil having pH 6.5-8.0.

## Silvicultural Characteristics

- The tree is a strong light demander.
- It is drought, frost, fire and wind hardy.
- It coppices well.
- Sensitive to browsing damages.

## Uses

- *Tecomella undulata* is mainly used as a source of timber. Its wood is strong, tough and durable. It takes a fine finish.
- Heartwood contains quinoid.
- The wood is excellent for firewood and charcoal.
- Camels, goats and sheep consume flowers and pods.
- *Tecomella undulata* plays an important role in ecology. It acts as a soil-binding tree by spreading a network of lateral roots on the top surface of the soil.
- It is used to create wind break to helps in stabilizing shifting sand dunes. It is considered as the home of birds and provides shelter for other desert wildlife.
- Shade of tree crown is shelter for the cattle, goats and sheep during summer days.
- The bark obtained from the stem is used as a remedy for syphilis.
- Bark is also used in curing urinary disorders, enlargement of spleen, gonorrhoea, leucoderma and liver diseases.

## Occurrence in Punjab

- Universities: CU, PAU and SGGSWU

*Notified as a threatened species on the 'verge of extinction' in Punjab by Ministry of Environment and Forests, Govt. of India vide Notification No. S.O. 402(E), Dated 04-02-2014 under Section 38 of Biological Diversity Act, 2002*

# Tectona grandis (Teak)

**Scientific Name:** *Tectona grandis* L.f.

**Family:** Verbenaceae

**Synonyms:** None

**Common Name:** Teak

**Vernacular Name:** Sagwan

## Botanical Description

*Tectona grandis* is a large, deciduous tree attains height up to 30 m. The bole is often buttressed and may be fluted, up to 15 m long below the 1st branches.

**Bark** is brown, distinctly fibrous with shallow, longitudinal fissures.

**Leaves** are very large, 4-sided leaves are shed for 3-4 months during the latter half of the dry season, leaving the branchlets bare. Shiny above, hairy below, vein network clear, about 30 x 20 cm but young leaves up to 1 m long.

**Flowers** small, about 8 mm across, mauve to white and arranged in large, flowering heads, about 45 cm long; found on the topmost branches in the unshaded part of the crown.

**Fruits** are a drupe with 4 chambers; round, hard and woody, enclosed in an inflated, bladder-like covering; pale green at first, then brown at maturity. Each fruit may contain 0 to 4 seeds.

## Natural Habitat

The natural habitat of teak is between 10°N and 25°N on the Indian subcontinent and in south East Asia, India, Burma, Thailand, Laos, Combia, Vietnam and Indonesia.

## Phenology

Teak is deciduous tree, losing its leaves in November, December or early January in the dry and hot situations. The tree remains green till March in moist areas. The new leaves appear in May. It flowers from June to August. Fruit ripens in April-May.

## Biophysical Limits

**Altitude:** 0-1300m

**Mean Annual Temperature:** 21-28 deg.C

**Mean Annual Rainfall:** 600-4000 mm

**Soil Type:** Teak grows best on deep, well-drained alluvial soils derived from limestone, schist, gneiss, shale.

## Geographical Distribution

**Native:** India, Indonesia, Laos, Myanmar, Thailand

**Exotic:** Sri Lanka, Bangladesh and China in Asia; Ghana, Nigeria, Ivory Coast, Senegal, Togo and Benin in West Africa; Sudan and Tanzania in East Africa;

Trinidad, Puerto Rico and Panama in Central America; Brazil and Ecuador in South America

## Silvicultural Characteristics

- It is a strong light demander.
- It is sensitive to water logging, drought & frost.
- It coppice and pollards vigorously up to considerable age.
- It suffers from wind damage.

## Uses

- Its wood is highly priced for manufacturing of furniture and house building industries.
- Teakwood has been used in the manufacture of charcoal and as fuel wood.
- Tannin or dyestuff: Both the root bark and the young leaves produce a yellowish-brown or reddish dye, which is used for paper, clothes and matting.
- Wood powder paste has been used against bilious headaches and swellings and internally against dermatitis or as a vermifuge. The charred wood soaked in poppy juice and made into a paste has been used to relieve the swelling of the eyelids.



- The bark has been used as an astringent and the wood as a hair tonic.
- The wood is excellent timber for furniture, bridge building and other construction work in contact with water such as docks, quays, piers and floodgates in fresh water.

## Occurrence in Punjab

- Wildlife Sanctuaries: WLS-5, WLS-8, WLS-9 and WLS-10
- Reserve Forests: RF-4, RF-5 & RF-6
- Wetland: Harike
- River: Beas
- Zoological Parks: ZP-2, ZP-3, ZP-4 and ZP-5
- Roads: SH-11, SH-20 (Seg.1, Seg.2), SH-22, NH-1A (Seg.1, Seg.2), NH-15 (Seg.1) and NH-95
- Universities: AU, BFRUHS, GKU, GNDU, PAU and PbiU

# Terminalia arjuna (Arjun)

## Scientific Name

*Terminalia arjuna* (Roxb.)  
Wight & Arn (Bedd.)

**Family:** Combretaceae

## Synonyms

*Terminalia moluccana* Lamk.  
*Terminalia mauritiana* Blanco

**Common Name:** Arjun

**Vernacular Name:** Arjun

## Botanical Description

*Terminalia arjuna* is a deciduous large-sized fluted tree to 30 m tall, with an often buttressed trunk. Its superficial, shallow root system spreads radially along stream banks. The large, spreading crown produces drooping branches.

**Bark** grey or pinkish-green, thick, smooth and exfoliating in thin irregular sheets.

**Leaves** simple, opposite to sub-opposite, 5-25 × 4-9 cm, oblong or elliptic oblong, glabrous, hard, often inequilateral, margin often crenulate, apex obtuse or sub-acute, base rounded or sometimes cordate. The petiole is short (2-4 cm long), sericeous, with 2 (or 1) prominent glands at petiole apex. Inflorescence are short axillary spikes or small terminal panicles, 9-13 cm long with 2.5-6 cm long branches.

**Flowers** are small, cup-shaped, regular, sessile, polygamous, white, creamy or greenish-white and strongly honey-scented.

**Fruit** 2.5-6 × 1.8-2.8 cm long, obovoid-oblong, dark brown to reddish-brown fibrous woody, indehiscent drupe, glabrous with 5-7 equal thick narrow stiff-wings and striated with numerous upwards-curved veins.

## Natural Habitat

It occurs naturally along banks of streams and rivers and seasonally dry water courses at low elevations. The species is a characteristic component of dry tropical riverine forests and tropical moist and dry deciduous forests

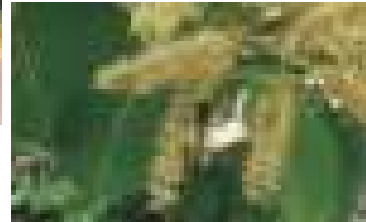
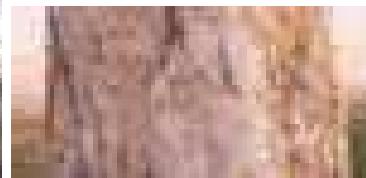
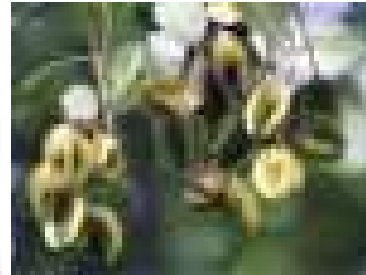
## Phenology

Leaves shed towards mid April, renewed in late April or May. Flowers appear in late April, lasting through most of May. Fruit ripen nearly a year after flowering, dropping sometime between February and June.

## Geographical Distribution

**Native:** India, Sri Lanka.

**Exotic:** Bangladesh, China, Cuba, Ghana, Indonesia, Kenya, Malaysia, Mauritius, Nepal, Pakistan, Thailand.



## Biophysical Limits

**Altitude:** 0 - 1200 m

**Mean Annual Rainfall:** 750 - 1900 mm

**Mean Annual Temperature:** 20-30° C

**Soil Types:** It grows well on fertile, neutral (pH 6.5 - 7.0) soils, especially loose, moist, alluvial loam with good water supply & drainage.

## Silvicultural Characteristics

- Strong light demander & drought resistant.
- Frost hardy but young plants are frost sensitive.
- Sensitive to fire and browsing damages.
- Susceptible to water logging.

## Uses

- It is widely planted for raising tasar silkworm and livestock fodder in India.
- It makes excellent charcoal and firewood. It also provides satisfactory rayon grade pulp in mixture with other woods.
- Timber is locally used for carts, agricultural implements, water troughs, traps, boat building, house building, electric poles, tool-handles.
- It is planted for shade or ornament in avenues and parks.
- The bark (22-24%), primarily, and fruit (7-20%) are used as tanning of leather.

- *T. arjuna* has been widely used in ayurvedic medicine for the treatment of cancer, dermatological and gynecological complaints, heart diseases, urinary disorders and treatment of high blood pressure and ulcers.
- This tree is often planted on roadsides and often inter cropped with coconut and coffee plantations as shade tree.
- It is also planted near wells as roots of *T. arjuna* are believed to purify and cool the water in the well.

## Occurrence in Punjab

- Wildlife Sanctuaries : WLS-2, WLS-4, WLS-5, WLS-6, WLS-7, WLS-8, WLS-9, WLS-11 and WLS-13
- Reserve Forests: RF-1, RF-2, RF-4, RF-5 and RF-6
- Wetland: Harike
- Zoological Parks: ZP-1, ZP-2, ZP-3, ZP-4 and ZP-5
- Botanical Garden: Ram Bagg, Amritsar
- Roads: SH-15, SH-20, SH-20 (Seg.1), SH-20 (Seg.2), NH-1 (Seg.1, Seg.2), NH-15 (Seg.3, Seg.6) and NH-64 (Seg.1, Seg.2, Seg.3)
- Universities: BFRUHS, CU, DAV, DBU, GKU, GNDU, LPU, PAU, PbiU, SGGSWU and TU



# Terminalia bellirica (Baheda)

## Scientific Name

*Terminalia bellirica* (Gaertn.) Roxb.

**Family:** Combretaceae

## Synonyms

*Terminalia moluccana* Lamk.

*Terminalia mauritiana* Blanco

**Common Name:** Bastard myrobalan

**Vernacular Name:** Baheda

## Botanical Description

*Terminalia bellirica* is a large deciduous tree to 50 m tall. The frequently buttressed bole at the base is branchless up to 20 m.

**Bark** is bluish or ashy-grey covered with numerous fine longitudinal cracks, the inner bark yellowish.

**Leaves** are large, simple, glabrous, alternate, broadly elliptic to obovate-elliptical, 4-24 cm × 2-11 cm. Secondary and tertiary venation prominent on both surfaces, clustered towards the ends of branchlets. Petiole 2.5-8 cm long. Young leaves copper-red, soon becoming parrot green, then dark green.

**Flowers** solitary, small, 3-15 cm long, greenish white, simple, axillary spikes; calyx tube densely sericeous or tomentulose; flowers appear along with new leaves and have a strong honey-like smell.

**Fruit** sub-globular to broadly ellipsoid, 2-4×1.8-2.2 cm, densely velutinous or sericeous, light-yellow, obscurely 5-angled and minutely brown tomentosa.

## Natural Habitat

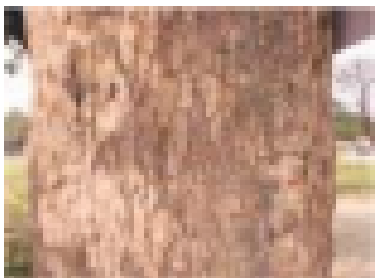
It is frequently found in monsoon forests, mixed deciduous forests or dry deciduous dipterocarp forests, associated with teak (*Tectona grandis*).

## Phenology

Leaves start to yellow and droop either early or late March. New leaves appear (deep red) in early April, completely renewed by the third week. Flowers developed on branches along with the new leaves towards end April, Fruit ripen in winter.

## Geographical Distribution

**Native:** Bangladesh, Bhutan, Cambodia, China, India, Indonesia, Laos, Malaysia,



Nepal, Pakistan, Sri Lanka, Thailand, Vietnam.

**Exotic:** Africa & Australia.

## Biophysical Limits

**Altitude:** 0-1000 m

**Mean Annual Rainfall:** 900-3000 mm

**Mean Annual Temperature:** 22-28°C

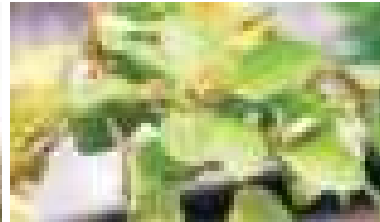
**Soil Type:** It grows best on fertile, loam soils with good drainage.

## Silvicultural Characteristics

- The species is a light demander and fairly drought resistant.
- It coppices well after pollarding especially if planted on a wide spacing.
- Spacing of 3-4 m apart in pure plantation is common.
- Good protection from grazing is required.

## Uses

- The kernels of the fruit can be eaten but are somewhat dangerous due to narcotic effect.



- The leaves are highly valued and extensively used as fodder.
- The tree yields a good-quality firewood and charcoal.
- The wood is steeped in water to make it more durable then used for making boxes, furniture and construction.
- The fruit produces tannins and dyes used for leather tanning, dyeing of clothes, matting and inks.
- The kernel produces a non-edible oil used in toilet soap and is good for hair.
- The fruit rind (pericarp) is astringent, laxative, anthelmintic, pungent, germicidal and antipyretic. It is applied in a diverse range of conditions including cough, tuberculosis, eye diseases, anti-HIV-1, dyspepsia, diarrhoea, dysentery, inflammation of the small intestine, biliousness, flatulence, liver disease, leprosy, cleanse the blood and promote hair growth in the Ayurvedic drug. Fruit extracts have anti-bacterial activity against *Micrococcus pyogenes* and *Escherichia coli*.
- It is grown as an avenue tree.

## Occurrence in Punjab

- Wildlife Sanctuaries : WLS-11 and WLS-13
- Reserve Forests: RF-4, RF-5, RF-6
- Zoological Parks: ZP-2, ZP-4 and ZP-5
- Botanical Garden : Ram Bagg, Amritsar
- Roads: SH-22 and NH-1A (Seg.3)
- Universities: BFRUHS, GNDU, LPU, PAU and PTU

# Terminalia catappa (Bengal almonds)

**Scientific Name:** *Terminalia catappa* Linn.

**Family:** Combretaceae

**Synonyms**

*Terminalia moluccana* Lamk.

*Terminalia mauritiana* Blanco

**Common Name:** Tropical almonds

**Vernacular Name:** Bengal almonds

**Botanical Description**

*Terminalia catappa* is a tall deciduous and erect tree reaching 15-25 m, trunk often buttressed at the base.

**Bark** grey-brown, rough with age.

**Leaves** alternate obovate with short petioles, spirally clustered at the branch tips, 15-36 cm long, 8-24 cm wide, dark green above, paler beneath, leathery and glossy. They turn bright scarlet, dark red, dark purplish-red, or yellow.

**Flowers** slightly fetid, greenish-white, very small, with no petals but 10-12 conspicuous stamens, arranged in several slender spikes 15-25 cm long in the leaf axils. The majority of the flowers are male and borne towards the apex, while a few hermaphroditic ones appear below. Some spikes have only male flowers.

**Fruit** hard, green-red, rounded and flattened, egg-shaped, with 2 ridges but no wings, 2.5 x 3-6 cm long, yellow or reddish when ripe. The cylindrical, oil-containing seeds are encased in a tough, fibrous husk within a fleshy pericarp. There are about 24 fresh fruits and 160 nuts per kg.

**Natural Habitat**

A conspicuous semi-deciduous tree of coastal areas throughout the warm tropics. Grows best in moist tropical climates. The tree is well adapted to sandy and rocky coasts and flourishes on oolitic limestone.

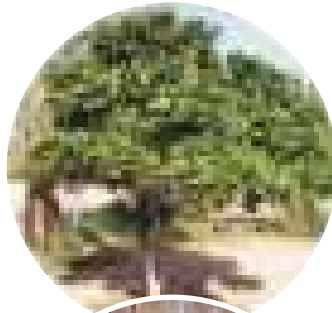
**Phenology**

The species loses its leaves twice a year in most areas, with a brilliant red and yellow display of leaf colour before doing so. Leaf loss helps it tolerate 1 or 2 annual dry seasons when it occurs.

**Geographical Distribution**

**Native:** Australia, Cambodia, India, Japan, Laos, Malaysia, Thailand, Vietnam.

**Exotic:** Afghanistan, Bangladesh, Brazil, Bermuda, Colombia, Costa Rica, Cuba, Dominican Republic, Fiji, Gabon, Ghana, Grenada, Haiti, Indonesia, Jamaica, Kenya,



Madagascar, Myanmar, Netherlands, Pakistan, Peru, Philippines, Puerto Rico, Singapore, Sri Lanka, Sudan, China, Tanzania, Trinidad and Tobago & USA.

**Biophysical Limits**

**Altitude:** 1-400 m

**Mean Annual Temperature:** 17-32° C

**Mean Annual Rainfall:** 1000-3500 mm

**Soil Type:** It naturally occurs in various coastal soils especially raised sandy and rocky beaches. It is adapted to a wide range of lighter- textured soil types, including brackish/saline and alkaline sands over limestone.

**Silvicultural Characteristics**

- The tree grows most rapidly in full sun and regenerates mainly in open.
- Seedlings and sapling tolerate moderate shade levels but requires high light levels to grow satisfactorily, and mature trees prefer full sunlight.
- It is resistant to low to medium intensity fires.
- It can withstand saline conditions.
- Tropical almond is adapted to strong, steady coastal winds.

**Uses**

- It is grown as an ornamental tree, fruit is edible, taste slightly acidic.
- The wood is red and solid, and has high water resistance.
- The leaves contain several flavonoids (such as kaempferol or quercetin), several tannins (such as punicalin, punicalagin or tercatin), saponines and phytosterols. Due to this chemical richness, the leaves (and the bark) are used in different herbal medicines for various purposes.
- Keeping the leaves in an aquarium may lower the pH and heavy metal content of the water. It has been used by fish breeders as it is effective against some parasites and bacterial pathogens. It is also believed to help prevent fungus forming on the eggs of the fish.

**Occurrence in Punjab**

- Universities: GNDU and PAU

# *Terminalia chebula* (Harar)

**Scientific Name:** *Terminalia chebula* Retz.

**Family:** Combretaceae

**Synonyms**

*Terminalia zelanica* Van Heruck & Mull. Argi

**Common Name:** Harar

**Vernacular Name:** Harar

**Botanical Description:** It is a deciduous tree growing to 30 m in height. It has frequently buttressed bole at the base.

**Bark:** It is bluish or ashy-grey covered with numerous fine longitudinal cracks, elliptic-oblong, acute tip and cordate base and inner bark is yellowish.

**Leaves** are alternate to sub opposite in arrangement, 7-8-cm long and 4.5-10.00 cm broad with 1-3 cm petioles. Margins entire, glabrous above with a yellow pubescence below.

**Flowers** are monoecious, dull white to yellow, strong unpleasant odour, borne in terminal spikes or short panicles.

**Fruit** is drupe like, 2-4.5 cm long and 1.2-2.5 cm broad, blackish, with five longitudinal ridges. Yellow to orange brown in colour.

**Natural Habitat**

It is frequently found in monsoon forests, mixed deciduous forests or deciduous dipterocarpus forests associated with teak.

**Phenology**

It flowers from March-May. New flush of leaves appears in from March-May and old leaves are shed from December, appearing in March. Fruits ripen from November to March.

**Biophysical Limits**

**Altitude:** 0-1000 m

**Mean Annual Temperature:** 22-28°C

**Mean Annual Rainfall:** 900-3000 mm

**Soil Type:** It grows best on fertile, loam soils with good drainage.

**Geographical Distribution**

**Native:** It is native to Southern Asia. From India and Nepal east to south western China, and south to Sri Lanka, Malaysia and Vietnam.

**Exotic:** Information not available.

**Silvicultural Characteristics**

- It is a light demander.
- It is fairly frost and drought hardy.
- It is fire resistant & coppices well.

**Uses**

- It's leaves are used as fodder.
- Fruits are used to prepare murabba which is reported to cure blindness, besides this, its fruit has digestive, anti-inflammatory, anti-helminthic, carditonic & aphrodisiac properties.

**Occurrence in Punjab**

- Botanical Garden : Ram Bagg, Amritsar
- University : PAU



# Terminalia myriocarpa (Hollock)

## Scientific Name

*Terminalia myriocarpa* Van Heurck & Mull. Arg.

**Family:** Combretaceae

## Synonyms

*Myryobalanus myriocarpa* Heurck and Muell. - Arg.

**Common Name:** Eat Indian almond

**Vernacular Name:** Hollock

## Botanical Description

It is a large evergreen tree 20-45m tall.

**Bark** is grayish-brown, branch lets black to brownish.

**Leaves** sub opposite oblong, elliptic-oblong to oblong lanceolate, 10-25 cm long, petiole with one or two prominent glands at the top.

**Flowers** small, pink, in long slender spikes arranged in long terminal panicles, bracts very short.

**Fruits** 4-5 mm long, 3-cornered, two lateral angles expanded in to wings.

## Natural Habitat

The tree is distributed in tropical moist deciduous, semi-evergreen and evergreen forests of south-east Asia.

## Phenology

Flowers bisexual. The panicles appear in October to November and fruits mature in December to February. The tree normally bears a regular heavy seed crop each year, but occasionally a poor seed year may intervene.

## Geographical Distribution

**Native:** China, Nepal, Bhutan, Bangladesh, eastern India, Laos, Cambodia, Southern Vietnam, Myanmar, Thailand, Malaysia and Indonesia.

**Exotic:** Australia

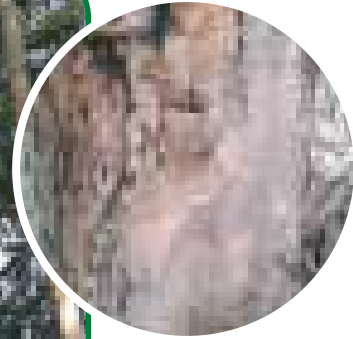
## Biophysical Limits

**Altitude:** 0-2100 m

**Mean Annual Temperature:** 4-7°C to 32-39°C

**Mean Annual Rainfall:** 1800-5000 mm

**Soil Type :** The tree grows best on soil with silt but with good drainage. It grows best in moist areas near the river banks with rich



soil. In rocky and stony areas, the tree occurs locally in patches.

## Silvicultural Characteristics

- Strong light demander.
- Drought & frost hardy.
- Susceptible to fire and browsing damages & coppices well.

## Uses

- It yields valuable timber for furniture and house construction in the form of scantlings, beams, rafters and for heavy packing cases.
- It is also suitable for manufacture of plywood for general purposes, tea chests & match-boxes.
- Timber is suitable for making jute-mill rollers and for construction of lorry bodies. The plant is often cultivated as an avenue tree.

- It's bark has medicinal value.
- Bark extract is diuretic, cardiac stimulant and antioxidant used in various drug preparations.

## Occurrence in Punjab

- Zoological Park : ZP-2
- University: PbiU

# Toona ciliata

## (Toon)

### Scientific Name

*Toona ciliata* M. Roem.

**Family:** Meliaceae

### Synonyms

*Toona australis* (Kuntze) Harms

*Cedrela australis* F. Muell.

*Cedrela toona* Roxb. ex Willd. var.

*australis* (F. Muell.) C. DC.

*Cedrela velutina* DC.

### Associated Species

*Cedrela fissilis*

**Common Name:** Red cedar

**Vernacular Name:** Toon

### Botanical Description

*Toona ciliata* is a large deciduous tree with a spreading crown, commonly attaining a height of 20-30 m.

**Bark** dark grey or reddish-brown, smooth up to middle age, afterwards rough, with shallow reticulate cracks exfoliating in irregular woody scales.

**Leaves** 30-50 cm long, on young trees up to 90 cm long, usually imparipinnate, sometimes paripinnate by the abortion of the terminal leaflet; leaflets 11-29, opposite or alternate, 5-15 × 2-6 cm, lanceolate or ovate-lanceolate, acuminate, glabrous, pubescent, margin entire or wavy, base oblique; petiolules 0.3-1.3 cm long.

**Flowers** small, honey scented, cream coloured, in drooping or sub-erect terminal panicles, usually shorter than the leaves. Calyx divided nearly to the base. Petals 5 mm long, ovate-oblong, sub-acute, with ciliate margins.

**Fruit** Capsule dark brown, 1.8-2.5 × 0.5-0.8 cm, oblong, usually smooth outside, sometimes sparsely lenticellate. Seeds pale brown, very light, winged at both ends, 1.3-1.5 cm long including the wing.

### Natural Habitat

A tree of subtropical climates, *T. ciliata* grows in moist localities such as ravines, banks of streams and even swamps.

### Phenology

In areas with a marked dry season all the foliage is shed for a part of the year. *T. ciliata* is reported to bear ripe fruit throughout the year. The seeds are released from the capsules at intervals. Seeds are light and wind dispersed.

### Geographical Distribution

**Native :** Bangladesh, Cambodia, China, India, Indonesia, Laos, Malaysia,



Myanmar, Nepal, Pakistan, Philippines, Thailand, Vietnam.

**Exotic :** Australia, Kenya, Mauritania, Sierra Leone, South Africa, Tanzania, Uganda, United States of America, Zambia, Zimbabwe.

### Biophysical Limits

**Altitude:** Up to 1500 m

**Mean Annual Temperature:** 1-45° C

**Mean Annual Rainfall:** 750-4000 mm

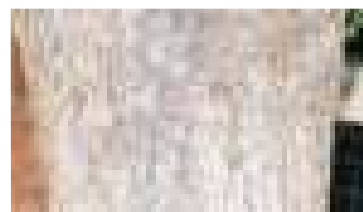
**Soil Type:** Prefers well-drained, deep, fertile soils and does not do well on wet, compacted or poor sandy ones.

### Silvicultural Characteristics

- Toon is a moderate light demander; however, the young plants require some side protection from direct sun.
- Seedlings are sensitive to fire, cannot withstand severe drought and are susceptible to suppression by weeds.
- The tree is frost hardy.
- It coppices well and produces plentiful root suckers.

### Uses

- *T. ciliata* has been planted for reforestation.
- In South East Asia, the leaves are used as a vegetable.
- An important bee plant; it is one the species for honey production in Bangladesh.
- The wood has a variety of uses such as for boat building, cabinet making, cigar boxes, matchboxes, decorative plywood and veneer, food containers, furniture, interior trim, joinery, musical instruments, ornamental work, panelling, boxes and crates, building materials, exterior uses, millwork, mouldings.
- Trees may be planted as firebreaks.



- Various parts of the plant, but especially the bark is used medicinally, e.g. as an astringent and tonic to treat dysentery and to heal wounds.
- A popular avenue tree planted along roadsides in north India.
- An aromatic oil can be extracted from the fruit.

### Occurrence in Punjab

- Wildlife Sanctuaries : WLS-1, WLS-8, WLS-9, WLS-10 and WLS-12
- Reserve Forests: RF-1, RF-3, RF-4, RF-5 and RF-6
- Zoological Parks: ZP-2, ZP-3, ZP-4 and ZP-5
- Botanical Garden: Baradari Garden, Patiala
- Roads: SH-15, SH-16, SH-20 (Seg.4), SH-22, NH-1, NH-1 (Seg.2), NH-15 (Seg.3), NH-15 (Seg.4), NH-15 (Seg.6), NH-15 (Seg.7) and NH-71 (Seg.1)
- Universities: BFRUHS, DBU, GADVASU, GKU, GNDU, GRAU, LPU, Pbi.U, PAU, PTU, RGU and TU

# Zizyphus mauritiana (Ber)

## Scientific Name

*Zizyphus mauritiana* Lamk.

## Synonyms

*Zizyphus abyssinica* Hochst. ex A. Rich.

*Zizyphus angolito* Standl

## Family: Rhamnaceae

**Common Name:** Indian plum

**Vernacular Name:** Ber

## Botanical Description

Bush or small deciduous tree grows upto 3-8 m.

**Bark** nearly black, with wavy ridges and deep, vertical furrows; inner bark red-brown

**Spins** in pairs, one straight, the other short and hooked

**Leaves** broadly oval; glossy green on top, white-downy below; margins very finely toothed; 3-veined at base

**Flowers** are pale greenish to yellow; 5 starry segments of the flower cup alternating with 5 tiny petals, arranged around a central cushion.

**Fruit** cherry or olive like, up to 3 cm long; green at first, ripening yellow or reddish; fleshy, surrounding a hard stone. There are numerous cultivated varieties.

## Natural Habitat

They are temperate or tropical plants, having a great range. Prefers locations with a high temperature coupled with humidity. This genus is adapted mostly to high rainfall and humidity, but some species are deciduous living in mediterranean humid climate. They grow mostly in tropical forests but has also been found in stubbles, pastures, in the coastal ranges, tropical mountain areas and interior in wet areas to dry regions. The family is distributed throughout tropical, subtropical areas.

## Phenology

Leaves shed sometime between late March and early May; new leaves in late June or early July. Flowers appear from July-August to October. Fruit ripen December to March.

## Geographical Distribution

**Native:** India, Pakistan, Burma, Sri Lanka, China.

**Exotic:** Southern Africa, Indomalaya, China and Australasia & Pacific Islands.

## Biophysical Limits

**Altitude:** 0-1000 m

**Mean Annual Temperature:** 4-48°C

**Mean Annual Rainfall:** 760-2000 mm

**Soil Type:** The plant grow well in deep



soil, fresh, soft, siliceous-calcareous nature or limestone-clay-silica-clay and subsurface permeable, with pH between 5.5 and 7.8.

## Silvicultural Characteristics

- Very sensitive to drought.
- Frost hardy but severe frost may damage the plant.
- Susceptible to water logging.
- Strong light demander but can tolerate some shade also.
- Tree coppices well and produces root suckers.

## Uses

- It is considered as good fodder for cattle and goats.
- Fruits are eaten by birds, animals and are good for human consumption.
- A drug extracted from plant considered to be sweet and sour in taste and neutral in action. It is believed to nourish the heart and augment the liver blood and calm the spirit. It is used to treat irritability, insomnia and heart palpitations.

## Occurrence in Punjab

- Wildlife Sanctuaries: WLS-1, WLS-2, WLS-3, WLS-4, WLS-5, WLS-6, WLS-8, WLS-9, WLS-12 & WLS-13
- Reserve Forests: RF-1, RF-3, RF-4, RF-5 and RF-6

- Wetlands: Harike, Kanjli and Ropar
- Rivers : Beas, Ravi and Satluj
- Zoological Parks: ZP-1, ZP-2, ZP-3, ZP-4 and ZP-5
- Botanical Garden: Baradari Garden, Patiala
- Roads: SH-16, SH-20 (Seg.1, Seg.2, Seg.4), NH-1 A (Seg.3), NH-15 (Seg.1), NH-15 (Seg.2), NH-15 (Seg.5), NH-71 (Seg.2) and NH-95
- Universities: BFRUHS, CU, GADVASU, GKU, GNDU, PAU, PbiU and TU

## Abbreviations

The following abbreviations used in the directory constitute the draft index of author abbreviations 1984 of the Royal Botanic Gardens, Kew, U.K. The figures in the parenthesis indicate year of birth and death as per the draft index.

Sr. No.	Abbreviation	Name of Author	Sr. No.	Abbreviation	Name of Author
1	<b>A. Cunn.</b>	Allan Cunningham (1791–1839)	31	<b>M.Roem.</b>	Max Joseph Roemer (1791–1849)
2	<b>A. Juss.</b>	Adrien-Henri de Jussieu (1797–1853)	32	<b>Marsh</b>	Charles Dwight Marsh (1855–1932)
3	<b>A.St.-Hil.</b>	Augustin Saint-Hilaire (1799–1853)	33	<b>Mart.</b>	Carl Friedrich Philipp von Martius (1794–1868)
4	<b>Arn.</b>	George Arnott Walker Arnott (1799–1868)	34	<b>Mill.</b>	Philip Miller (1691–1771)
5	<b>Bartram</b>	John Bartram (1699–1777)	35	<b>Miq.</b>	Friedrich Anton Wilhelm Miquel (1811–1871)
6	<b>Bedd.</b>	Richard Henry Beddome (1830–1911)	36	<b>Müll.Arg.</b>	Johannes Müller Argoviensis (1828–1896)
7	<b>Benth.</b>	George Bentham (1800–1884)	37	<b>O.F.Cook</b>	Orator F. Cook (1867–1949)
8	<b>Buch.-Ham.</b>	Francis Buchanan-Hamilton (1762–1829)	38	<b>Oken</b>	Lorenz Oken (1779–1851)
9	<b>Curtis</b>	William Curtis (1746–1799)	39	<b>Pall.</b>	Peter Simon von Pallas (1741–1811)
10	<b>D.A.Webb</b>	David Allardice Webb (1912–1994)	40	<b>Pierre</b>	Jean Baptiste Louis Pierre (1833–1905)
11	<b>D.Don</b>	David Don (1799–1841)	41	<b>Planch.</b>	Jules Émile Planchon (1823–1888)
12	<b>DC.</b>	Augustin Pyramus de Candolle (1778–1841)	42	<b>Poit.</b>	Pierre Antoine Poiteau (1766–1854)
13	<b>de Wit</b>	Hendrik de Wit (1909–1999)	43	<b>Raf.</b>	Constantine Samuel Rafinesque-Schmaltz (1783–1840)
14	<b>Del-Delile</b>	Alire Raffeneau Delile (1778–1850)	44	<b>R.Br.</b>	Robert Brown (1773–1858)
15	<b>Druce</b>	George Claridge Druce (1850–1932)	45	<b>Retz.</b>	Anders Johan Retzius (1742–1821)
16	<b>Forst.</b>	Georg Forster (1754–1794)	46	<b>Risso</b>	Antoine Risso (1777–1845)
17	<b>Gaertn.</b>	Joseph Gaertner (1732–1791)	47	<b>Roxb.</b>	William Roxburgh (1751–1815)
18	<b>Heurck.</b>	Henri Ferdinand Van Heurck (1839–1909)	48	<b>Sarg.</b>	Charles Sprague Sargent (1841–1927)
19	<b>Hook.</b>	William Jackson Hooker (1785–1865)	49	<b>S.Moore</b>	Spencer Le Marchant Moore (1850–1931)
20	<b>Hurus.</b>	Isao Hurusawa (born 1916)	50	<b>Seem.</b>	Berthold Carl Seemann (1825–1871)
21	<b>Jacq.</b>	Nikolaus Joseph von Jacquin (1727–1817)	51	<b>Skeels</b>	Homer Collar Skeels (1873–1934)
22	<b>J.C</b>	John Carey (1797–1880)	52	<b>Sm.</b>	James Edward Smith (1759–1828)
23	<b>Korth.</b>	Pieter Willem Korthals (1807–1892)	53	<b>Sonn.</b>	Pierre Sonnerat (1748–1814)
24	<b>Kunth</b>	Carl Sigismund Kunth (1788–1850)	54	<b>Sw.</b>	Olof Peter Swartz (1760–1818)
25	<b>Linn.</b>	Carl Linnaeus (or Carolus Linnaeus) (1707–1778)	55	<b>Taub.</b>	Paul Hermann Wilhelm Taubert (1862–1897)
26	<b>L.f.</b>	Carolus Linnaeus (1741–1783)	56	<b>Wall.</b>	Nathaniel Wallich (1786–1854)
27	<b>Labill.</b>	Jacques Labillardière (1755–1834)	57	<b>Wight</b>	Robert Wight (1796–1872)
28	<b>Lamk.</b>	Jean-Baptiste Lamarck (1744–1829)	58	<b>Wild</b>	Hiram Wild (1917–1982)
29	<b>Laxm.</b>	Erich G. Laxmann (1737–1796)	59	<b>Willd.</b>	Carl Ludwig von Willdenow (1765–1812)
30	<b>Lour.</b>	João de Loureiro (1717–1791)			

## Glossary

<b>Accrescent</b>	:	Enlarging with age.
<b>Achene</b>	:	Any hard, simple, one-seeded indehiscent dry fruit that develops from a monocarpellary ovary.
<b>Acicular</b>	:	Needle shaped, like the leave of conifers, eg. <i>Araucarias</i> , Pines, etc.
<b>Aculeate</b>	:	Armed with prickles like the stem of rose.
<b>Acuminate</b>	:	Gradually tapering to a point.
<b>Acute</b>	:	With a sharp-pointed but not extended apex.
<b>Adnate</b>	:	Describing unlike organs that are joined together by their whole length.
<b>Adventitious</b>	:	Describing organs that arise in unexpected position, such as roots growing from stem; or the abnormal buds which are not produced in axils of leaves.
<b>Aerial roots</b>	:	A root that arises above soil level. The term is usually applied to the tangled masses of roots developed by epiphytes, which hang down in moist air.
<b>Aggregate Fruit</b>	:	A fruit like structure that has developed from the carpels of a single flower & is composed of a number of separate fruits.
<b>Alkaloids</b>	:	A class of nitrogen containing usually basic plant products, which are often poisonous. Many alkaloids, eg. morphine, codeine, nicotine, and cocaine have been utilized in medicine and other fields.
<b>Alternate</b>	:	Describing a form of leaf arrangement in which there is one leaf at each node. This pattern is found in most plants.
<b>Angiosperms</b>	:	A class of vascular plants having seeds enclosed within an ovary.
<b>Annual</b>	:	A plant which germinates from a seed, grows, flowers, produces seeds and then dies within a single season or year eg. marigold.
<b>Anthesis</b>	:	The period from flower opening to fruit set.
<b>Apiculate</b>	:	Having a small broad point at the apex.
<b>Appressed</b>	:	Applied to a leaf or the organ that lies flat for its whole length of another organs, also refers to hairs.
<b>Argenteus</b>	:	Silvery.
<b>Aril</b>	:	A fleshy or hairy outgrowth of a seed or fertilized ovule, commonly developed from funiculus & more or less enveloping the seed.
<b>Armed</b>	:	Provided with thorns or pickles.
<b>Articulated</b>	:	Jointed.
<b>Arvensis</b>	:	Applied to plants of arable land.
<b>Axil</b>	:	The upper angle formed by the junction of leaf or similar organ with the stem. Organs such as flowers, leaf, inflorescence, buds are termed axillary or lateral.
<b>Axillary</b>	:	Borne in an axil.
<b>Bark</b>	:	All the tissues, collectively, lying outside the vascular cambium in the stem & roots of plants showing secondary growth.
<b>Berry</b>	:	A many seeded fleshy indehiscent fruit with the seeds immersed, like a grape.
<b>Biennial</b>	:	A plant that takes two years to complete its life cycle. It grows vegetatively in first year and usually flowering & fruiting during the second year.
<b>Bifid</b>	:	Cleft half-way into two.
<b>Bifoliate</b>	:	Two-leaved.
<b>Bipinnate</b>	:	A pinnate leaf in which leaflets themselves are further subdivided in a pinnate fashion.
<b>Blade</b>	:	The flat or expanded part of a leaf or petal.



<b>Botanical Garden</b>	:	An area in which a wide range of plants are grown for scientific, educational and aesthetic purposes.
<b>Bud</b>	:	An undeveloped condensed region of a shoot. Flower buds contain the immature flower.
<b>Caducous</b>	:	Parts that fall off easily or at an early stage.
<b>Campestris</b>	:	Growing in or pertaining to fields.
<b>Capitale</b>	:	Head-shaped.
<b>Capsule</b>	:	Any dry dehiscent fruit developed from two or more many-seeded fused carpels.
<b>Carpel</b>	:	The structure that bears and encloses the ovules in flowering plants. It consists of three parts i.e. ovary, style & stigma.
<b>Catkin</b>	:	A pendulous inflorescence modified for wind pollination. It is a loose spike made up of numerous unisexual flowers as in Oaks & Willows.
<b>Caudex</b>	:	The trunk of a Palm; or the swollen stem base of herbaceous perennials.
<b>Caudate</b>	:	Tailed.
<b>Chartaceous</b>	:	Of papery texture.
<b>Ciliate</b>	:	Describing a structure fringed with fine hairs, such as a leaf margin.
<b>Clavate</b>	:	Cub-shaped.
<b>Coma</b>	:	A tuft of hairs, applied to such as are found attached to the seeds of willows, etc.
<b>Comose</b>	:	With tufts of hairs.
<b>Connate</b>	:	Similar organs that are joined together.
<b>Cordate</b>	:	Heart-shaped.
<b>Coriaceous</b>	:	Having a leathery texture.
<b>Corymb</b>	:	An inflorescence, which has the lower flower-stalks longer than the upper, so as to bring all the flowers to about the same level.
<b>Corymbose</b>	:	Arranged in corymbs.
<b>Crenate</b>	:	Describing leaves that are wedge-shaped with the point of the wedge forming the base of the lamina.
<b>Cuspidate</b>	:	Suddenly narrowing to a point.
<b>Cyme</b>	:	(Cymose, Definite inflorescence): An inflorescence in which apical tissues of the main stem & laterals lose their meristematic capacity & differentiate into flowers.
<b>Deciduous</b>	:	Describing woody perennial plants that shed their leaves before the winter or dry season.
<b>Decussate (Opposite)</b>	:	Describing an arrangement of leaves in which leaves arise in pairs at each node. If each pair is at right angles to the pairs above & below it, the arrangement is termed decussate.
<b>Dehiscence</b>	:	The mode of splitting open along predetermined lines of certain plant organs such as anther, capsules & fruits to release their contents.
<b>Dentate</b>	:	A leaf margin that is toothed, with outward, pointing notches. Leaf margins finely toothed in this way are termed Denticulate.
<b>Diffuse</b>	:	Widely or loosely spreading.
<b>Digitate</b>	:	Applied to a compound leaf, of which all leaflets are borne on the apex of the petiole, i.e. from a single point.
<b>Distichous</b>	:	A form of leaf arrangement in which successive leaves arise on opposite sides of the stem so that two vertical rows of leaves are formed.
<b>Drupe</b>	:	A fleshy indehiscent fruit in which seeds are surrounded by a hard endocarp as in pulm.

<b>Echinate</b>	:	Beset with prickles.
<b>Elliptic</b>	:	Shaped like an ellipse.
<b>Emarginate</b>	:	Describing a leaf or petal that is indented at its tip.
<b>Entire</b>	:	Describing a leaf or petal with a smooth undivided outline.
<b>Essential oil</b>	:	Any of the volatile oils secreted by aromatic plants that give them their characteristic taste or odour.
<b>Evergreen</b>	:	A woody perennial plant that retains its foliage throughout the year by continuously hedding and replacing a few leaves at a time.
<b>Exotic (Alien)</b>	:	An organism that has originated from another region and is not native to the area in question.
<b>Falcate</b>	:	Sickle-shaped.
<b>Family</b>	:	A major category in taxonomic hierarchy, comprising groups of similar genera.
<b>Fascicles</b>	:	A cluster or bundle.
<b>Fastigate</b>	:	Describing a tree in which the branches grow almost vertically.
<b>Ferrugineus</b>	:	Rust-coloured.
<b>Fistular</b>	:	Hollow throughout its length like leaf & stem of onion.
<b>Follicle</b>	:	A dry dehiscent many seeded fruit derived from one carpel, which on ripening dehisces only from one side (usually ventral suture), to release seeds.
<b>Fruit</b>	:	The mature ovary or the structure that develops from ovary wall (pericarp), and its contents, together with any external or internal portion of it.
<b>Funiculus (Funcile)</b>	:	The stalk connecting the ovule & later the seeds to the placenta or ovary wall.
<b>Glabrous</b>	:	Smooth, devoid of any hair or projections.
<b>Glabrescent</b>	:	Becoming glabrous or nearly so
<b>Gland</b>	:	A definite secreting structure on the surface of an organ.
<b>Glaucous</b>	:	Surface with a waxy grayish-blue bloom, i.e., sea-green.
<b>Globose</b>	:	Somewhat spherical.
<b>Gnar</b>	:	Lump or knot in a tree.
<b>Gnaried</b>	:	Knotty or Contorted.
<b>Gum</b>	:	Any substance that swells in water to form gel or sticky solutions.
<b>Gymnosperm</b>	:	A class of vascular plants including conifers, which have naked ovules (seeds).
<b>Habit</b>	:	The general appearance of a plant.
<b>Habitat</b>	:	The area/locality in which an organism live(s).
<b>Hard seed</b>	:	A seed with tough impervious outer coat that does not allow the entry of water.
<b>Hastate</b>	:	Leaf shaped like the head of spear.
<b>Heartwood (Duramen)</b>	:	The hard, central, non-functional wood part of a tree.
<b>Herbaceous</b>	:	Plants which do not form a persistent woody stem.
<b>Hispid</b>	:	Covered with stiff or rough hairs or bristles.
<b>Hygroscopic</b>	:	Showing readiness to absorb moisture from the surroundings.
<b>Imparipinnate</b>	:	Describing a pinnate leaf having a centrally placed unpaired (i.e. odd) terminal leaflet.
<b>Indehiscent</b>	:	A fruit or fruiting body not opening to dispense its contents.
<b>Indigenous</b>	:	An organism that is native to an area, i.e. it has not been introduced from another area.
<b>Inflorescence</b>	:	An arrangement of flowers on a plant axis.
<b>Internode</b>	:	The part of stem lying between two adjacent nodes.

<b>Involucre</b>	:	A whorl of bracts surrounding many flowers.
<b>Lamine (Blade)</b>	:	The flattened blade like portion of a leaf, as distinct from the petiole & the leaf base.
<b>Lanceolate</b>	:	Narrow and tapering at both ends.
<b>Linear</b>	:	Leaves that are elongated and parallel sided for much of their length, as in grasses.
<b>Lobed</b>	:	Describing a leaf that is divided into curved or rounded parts connected to each other by an undivided central area.
<b>Loculicidal</b>	:	Fruit dehiscence from back, i.e., dorsal suture.
<b>Moniliform</b>	:	Necklace-shaped.
<b>Monoecious</b>	:	Having female & male reproductive organs separated in different floral structures on the same plant.
<b>Mucronate</b>	:	Having an abrupt small fine point at the tip.
<b>Muricate</b>	:	Having a surface covered with hard sharp points or short projections or prickles.
<b>Node</b>	:	A point on the stem from which one or more leaves arise.
<b>Nut</b>	:	A dry, hard, indehiscent one-seeded fruit.
<b>Obcordate</b>	:	Heart-Shaped with the notch at apex.
<b>Oblate</b>	:	Flattened at both ends.
<b>Obovate</b>	:	Ovate with broader end towards apex.
<b>Obtuse</b>	:	Having a blunt or rounded leaf apex.
<b>Orbicular</b>	:	Almost circular & flattened.
<b>Oval</b>	:	Broadly elliptic.
<b>Ovary</b>	:	The swollen basal part of carpel in angiosperms, which contains the ovules.
<b>Ovate</b>	:	Shaped like an egg, with broader end at the base.
<b>Ovule</b>	:	Female gamete & its protective & nutritive tissue, i.e. the young seed in the ovary before fertilization.
<b>Panicle</b>	:	A racemose inflorescence in which the flowers are formed on stalks (peduncles) arising spirally or alternately from the main axis.
<b>Paniculate</b>	:	Bearing panicles.
<b>Papillose</b>	:	Covered with minute superficial projections.
<b>Pappus</b>	:	A modified calyx made up of a ring of fine hairs, scales, teeth that persist after fertilization & aid in dispersal of fruit.
<b>Pedicel</b>	:	The stalk of individual flower attaching to the main axis (Peduncle) of the inflorescence.
<b>Pedicellate</b>	:	Bearing pedicels.
<b>Peduncle</b>	:	Main axis of inflorescence.
<b>Pellucid</b>	:	Transparent.
<b>Peltate</b>	:	A structure that is circular, with the stalk inserted in middle, e.g. leaf of Garden Nasturtium.
<b>Perennial</b>	:	A plant that lives for many years.
<b>Pericarp</b>	:	Wall of fruit, derived from maturing ovary wall.
<b>Petiole</b>	:	The stalk that attaches leaf lamina to the stem.
<b>Phyllode</b>	:	A more or less flattened petiole resembling and performing the function of leaf.
<b>Pilose</b>	:	Having soft long hairs.
<b>Pinna</b>	:	One of a number of first order leaflets in a compound leaf.

<b>Pinnate</b>	:	A compound leaf in which leaflets (pinnae) are arranged in two rows, one on each side of the midrib.
<b>Pinnule</b>	:	One of a number of second order leaflets in a compound leaf.
<b>Pistil</b>	:	The female organs of a flower collectively. It consists of either a single carpel (simple pistil) or a group of fused carpels (compound pistil).
<b>Placenta</b>	:	The tissue by which ovules are attached in the ovary.
<b>Pod (legume)</b>	:	A dry dehiscent fruit containing one or more seeds. It develops from a single carpel, which on opening splits along ventral and dorsal sutures to form 2-valves.
<b>Podocarpus</b>	:	With a stalked fruit.
<b>Pole</b>	:	Young tree from the time when the lower branches begins to fall off to the time when the rate of height growth begin to slow down and crown expansion becomes marked.
<b>Procerus</b>	:	Tall.
<b>Puberulous</b>	:	Slightly or minutely hairy.
<b>Pubescent</b>	:	Having fine short hairs.
<b>Raceme</b>	:	A racemose inflorescence in which the flowers are formed on individual pedicels on the main axis.
<b>Racemose inflorescence: (Indifinete Inflorescence)</b>	:	An inflorescence in which meristematic activity continues at the apex of the main stem and flowers are developed from the axillary meristems.
<b>Receptacles (Torus, Thalamus)</b>	:	The expanded region at the end of peduncle to which the floral parts are attached.
<b>Reniform</b>	:	Kidney-shaped.
<b>Rufous</b>	:	Pale reddish-brown.
<b>Rugged</b>	:	Uneven, irregular and rough.
<b>Rugose</b>	:	Wrinkled.
<b>Samara</b>	:	An indehiscent winged fruit in which pericarp (fruit wall) is extended into a membranous wing.
<b>Sapling</b>	:	Young tree from the time when it reaches about one meter in height till the lower branches begin to fall. A sapling is characterized by the absence of dead bark and its vigorous height growth.
<b>Sapwood (Alburnum)</b>	:	The outer functional portion of the secondary xylem as compared to the central non-functional heart-wood.
<b>Scabrid</b>	:	Rough.
<b>Sebiferous</b>	:	Producing vegetable wax.
<b>Seedling</b>	:	Seedling is a plant grown from seed till it attains a height of about one meter, i.e. before it reaches the sapling stage.
<b>Septifragal</b>	:	Mode of dehiscence in which valves break away from dissepiments.
<b>Serrate</b>	:	Leaf margin that is toothed with forward-pointing notches. Leaf margins finely toothed in this manner are termed Serrulate.
<b>Sessile</b>	:	Without a stalk i.e. unstalked.
<b>Sinuate</b>	:	With a deep wavy margin.
<b>Spathulate (Spatulate)</b>	:	Structure having broad apex and a long narrow base, i.e. obovate with the lower end attenuated.
<b>Spike</b>	:	A form of indefinite (racemose) inflorescence in which the flowers are sessile and borne on elongated axis, as in wheat. Catkin is a type of spike.

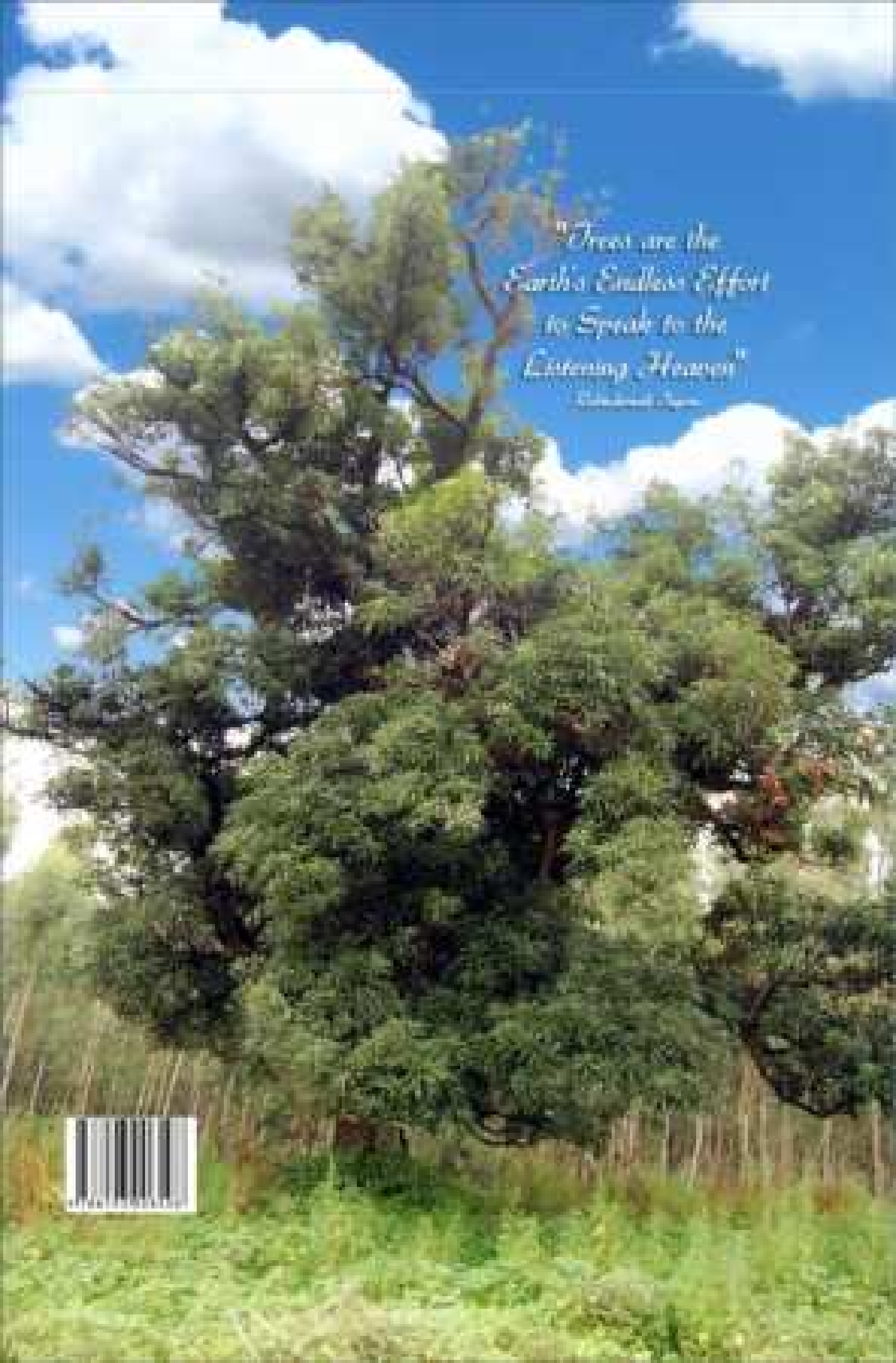
<b>Spikelet</b>	:	A secondary spike, also applied to ultimate cluster of florets, as in grasses.
<b>Spine</b>	:	A modified leaf or part of a leaf forming a sharp pointed structure.
<b>Spinose</b>	:	Furnished with spines.
<b>Squamose</b>	:	Scaly or scale like.
<b>Squarrose</b>	:	Rough with spreading and projecting processes.
<b>Strigose</b>	:	Beset with appressed, straight and stiff hairs or bristles.
<b>Style</b>	:	The usually attenuated portion of a pistil or a carpel between the ovary and the stigma.
<b>Subulate</b>	:	Awl-shaped.
<b>Suture</b>	:	A junction or seam of union, often indicating a line of dehiscence.
<b>Terete</b>	:	Smooth, cylindrical, and tapering eg. stem of grass.
<b>Thyrse(s)</b>	:	A complex densely branched inflorescence the individual branches of which are dichasia. A dense panicle broadest in the middle, especially one whose lateral branches are cymose.
<b>Trifoliate</b>	:	Describing a compound leaf having three leaflets arising from the same point.
<b>Tripartite</b>	:	Three parted.
<b>Tripinnate</b>	:	Describing a bipinnate leaf in which the secondary leaflets are subdivided.
<b>Truncate</b>	:	Describing a leaf that is squared off at the apex.
<b>Tuberculate (Verrucose)</b>	:	Having a surface covered with small warty projections.
<b>Unarmed</b>	:	Without thorns or prickles.
<b>Undulate</b>	:	Wavy.
<b>Viscid</b>	:	A surface covered with sticky semi-fluid, glutinous, viscous secretions as seen in fruits of mistletoe.
<b>Whorled</b>	:	Describing a form of leaf arrangement in which three or more leaves arise at each node, as in members of Rubiaceae.

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*"Trees are the  
Earth's Endless Effort  
to Speak to the  
Listening Heavens"*

*Richard Powers*

