

## Terminalia arjuna

arjun

(Roxb. ex DC.) Wight & Arn.

Combretaceae

### LOCAL NAMES

Bengali (arjhan); English (white marudah, tropical almond, arjun, Malabar almond, arjuna); Gujarati (vellamatta, sadado, sadada); Hindi (koha, arjun, arjuna, arjan, kahu); Tamil (vellai maruthu, vellamatta marutae); Thai (dhanvi, rok faa khaao, kakubha); Trade name (arjun)

### BOTANIC DESCRIPTION

*Terminalia arjuna* is a deciduous large-sized fluted tree to 30 m tall and 2-2.5 m dbh, 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 two glands at petiole apex

Inflorescences are short axillary spikes or small terminal panicles, 9-13 cm long with 2.5-6 cm long branches. The rachis short, white and pubescent. Lower receptacle 0.8-1.5 mm long, short sericeous, upper receptacle 1.5-1.75 mm long, glabrous except at base where slightly pubescent. 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.

The generic name *Terminalia* comes from Latin word 'terminus' or 'terminalis' (ending), and refers to the habit of the leaves being crowded or borne on the tips of the shoots.

### BIOLOGY

*T. arjuna* is usually an evergreen tree with new leaves appearing in the hot season (February to April) before leaf fall. Trees sometimes may be leafless for a very short period before flowering. Fruit bearing begins 6-7 years after planting.

Flowering begins in April and extends to May with the fruit ripening the following February-May, nearly a year after the appearance of the flowers. Generally, every third year is a good seed year. The pattern of flowering and fruiting is not markedly different in different regions.



fruits (David Lee, Professor and Chairperson, Department of Biological Sciences, Florida International Unive)



flower (David Lee, Professor and Chairperson, Department of Biological Sciences, Florida International Unive)



Leaves and branches (David Lee, Professor and Chairperson, Department of Biological Sciences, Florida International Unive)

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### ECOLOGY

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

### 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 and drainage.

### DOCUMENTED SPECIES DISTRIBUTION

Native: India, Sri Lanka

Exotic: Bangladesh, China, Cuba, Ghana, Indonesia, Kenya, Malaysia, Mauritius, Nepal, Pakistan, Thailand



The map above shows countries where the species has been planted. It does neither suggest that the species can be planted in every ecological zone within that country, nor that the species can not be planted in other countries than those depicted. Since some tree species are invasive, you need to follow biosafety procedures that apply to your planting site.

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**PRODUCTS**

**Fuel:** It makes excellent charcoal and firewood, with calorific values of 5030 Kcal/kg and 5128 Kcal/kg for the sapwood and heartwood, respectively.

**Medicine:** *T. arjuna* has been widely used in Ayurvedic medicine for the treatment of cancer, dermatological and gynaecological complaints, heart diseases and urinary disorders. The bark is acrid, an astringent and tonic, and is useful in treatment of high blood pressure and ulcers. The cancer cell growth inhibitory constituent (luteolin) has been isolated from bark, stem and leaves of *T. arjuna*. Luteolin has also been shown to have specific anti-bacterial activity against *Neisseria gonorrhoea*. It can also be used as alexiteric, styptic, tonic and anthelmintic and it is useful in fractures, inflammation and wounds and ulcers.

**Timber:** The sapwood is pinkish-white and the heartwood is brown to dark-brown, very hard, lustrous, strong and heavy (specific gravity 0.74; weight 816-865 kg/m<sup>3</sup>). The odourless, coarse-textured wood is streaked with dark lines and has irregularly inter-locked grains. Timber is locally used for carts, agricultural implements, water troughs, traps, boat building, house building, electric poles, tool-handles and jetty-piles. It also provides satisfactory rayon-grade pulp in mixture with other woods.

**Fodder:** It is widely planted for raising tassar silkworm and livestock fodder in India where leaves are heavily lopped. The leaves contain 9-11% crude protein and 14-20% crude fibre.

**Tannin or dyestuff:** The bark (22–24%), primarily, and fruit (7–20%) are used as tanning and dyeing material. The tannage can be used for making fine upper leather and excellent sole leather of light-brown or buff colour with a red tint. It yields up to 45 kg dry bark chips on a three-year cycle without injury, as it is reproduced after 2 rainy seasons.

**Other products:** The bark, containing large amount of lime (calcium carbonate), is often burnt to produce lime for chewing with betel. The bark is also used to assist precipitation of mud from turbid water

**SERVICES**

**Erosion control:** The species is commonly found and planted along the banks of rivers, streams, old irrigation channels, edges of tank bunds and alluvial bars in seasonally dry water courses, helping to reduce soil erosion on the banks through its root-mass.

**Shade:** It is planted for shade or ornament in avenues and parks.

**Intercropping:** *T. arjuna* is an agroforestry species, often intercropped with coconut and citrus. It is also an excellent shade tree, especially in coffee plantations.

**Ornamental:** This tree is often planted on roadsides and, and is also used for ornamentation.

**Reclamation:** Arjan is usually used in agro and social forestry for reclamation of saline, alkaline soils and deep ravines as well as in sand dune afforestation programmes with *Casuarina* species.

**Pollution control:** It is also planted near wells as roots of *T. arjuna* are believed to purify and cool the water in the wells.

**Other services:** The leaves or flowers have sacred value in India. The astrologers associate the plant with constellation Swati whose presiding deity is Vayu.

**TREE MANAGEMENT**

Arjun, an initial slow-grower, later grows very fast to attain 2–3 m height in 3 years. Weeding and protection from fire and frost is needed for the first two years. Pruning is required to remove the weaker shoots when forking takes place due to frost damage. Selection management systems can be utilized to extract timber, which is 50-60 cm dbh.

Arjun has been successfully grown in taungya plantations. Plantations established in India for tasar sericulture, have a spacing of 1 x 2 m, and are managed by repeated pollarding. It also coppices strongly if cut when smaller than approximately 76 cm dbh, yielding poles, posts and firewood. It produces root suckers and is suitable for pollarding.

**GERMPLASM MANAGEMENT**

Ripe fruits can be collected from the trees themselves or from the ground below trees. They are usually dried in the shade for a month, and the fibrous ribs are usually reduced by rubbing with the hands.

Seed storage behaviour is orthodox. The mature seeds are viable for 1 year when stored in dry gunny bags or in open or closed glass bottles

**PESTS AND DISEASES**

Incidence of powdery mildew caused by *Phyllactinia terminalae* and white fibrous rot due to *Polystictus affinis* have been reported. Larvae of *Apoderus tranquebaricus* feed inside rolled leaves, whilst larvae of *Gelasma goniaria* and *Lymantria mathura* cause defoliation of the plant. Also the presence of *Ceroplastes ceriferus* (white wax insects) on the leaves has been reported.

Seed damage by *Psittacula krameri* birds has been reported in India. Seedlings of *T. arjuna* are susceptible to fire, drought and frost. Frost damage can cause forking of the stem and the development of a bushy habit. Heavy shade is also injurious to seedlings resulting in die-back for several years, again leading to a bushy tree.

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**SUGGESTED CITATION**

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