

Tectona grandis L.f.

Family: Lamiaceae (also placed in Verbenaceae)

Vernacular names: India: segun (Bengal), saga, sagan (Hindi), tega, thekku (southern states); Myanmar: kyun; Thailand: mai-sak, sak; Laos: sak; Sri Lanka: tech; Vietnam: c[aa]y t[ees]ch gi[as]t[ij]; Bangladesh: segun; Indonesia and Malaysia: jati; English: teak

Distribution and habitat: Natural distribution of teak ranges from the Indian sub-continent through Myanmar and Thailand to Lao PDR. It is common in deciduous forests and well-drained alluvial soils. India has one-third of the natural distribution. It is discontinuously distributed throughout Peninsular India below the latitude of 24°N, in the states of Madhya Pradesh, Maharashtra, Tamilnadu, Karnataka and Kerala.

In Myanmar, the species is distributed throughout the country up to latitude 25°N. In Thailand, it occurs naturally up to 17.5°N and from 97° to 101°E in the watershed areas of Mae Khong, Salween and Chao Phya rivers, extending to Lao PDR. Teak has been introduced as a plantation species in as many as 36 tropical countries across tropical Asia, Africa and South and Central America.



Teak is naturally distributed from India through Myanmar and Thailand to Laos

Uses: Teak is a pre-eminent tropical timber with sterling wood properties, having an average wood density of 650 kg/m³. Because of its natural durability and dimensional stability, it is widely used for boat and shipbuilding in addition to construction, decorative veneers, joinery, furniture, cabinets, musical instruments and handicrafts/woodcarving.

Description: Teak trees can attain a very large size; up to 45 m in height and 190 cm in diameter. Stem usually

cylindrical but becoming fluted and slightly buttressed at base when mature. Bark light brown or grey, thin, with shallow longitudinal furrows and flaking in narrow vertical strips. Inner bark white. Leaves usually 15–60 x 12–35 cm, broadly ovate or oval with shortly pointed or blunt tip and tapering base, but without teeth on rim. Leaf arrangement opposite and decussate. Flowers bisexual, 0.7–0.9 cm, white or cream-coloured; occur in large, loose, terminal inflorescences up to 50 cm long. Calyx about 0.3 cm, bell-shaped with 6 (occasionally 5) reflexed lobes, densely hairy outside. Corolla funnel-shaped at base with 6 (occasionally 5) spreading lobes that curled backward, hairy outside and glabrous inside. Equal stamens attached near base of corolla. Forked stigma has style as long as stamens. Fruit about 2 cm enveloped in a thin, inflated calyx. Silky-hairy exocarp covering stone fruit with 4 chambers each containing one seed.



Teak flowers

Reproductive biology: Flowering occurs mainly during the rainy season (which varies from country to country) though a few trees flower erratically during summer. Though thousands of buds and flowers are produced, only less than one percent develops to mature fruits. The main reasons are the inadequate pollinator activity especially during heavy rain, self-incompatibility and fruit abortion due to dominant effect of first flowers that opened as well as due to fungal infections. In general, teak is partially self-incompatible and artificial cross pollinations are more effective than artificial self pollinations. Selfing occurs as most of the pollinators spend their time among the inflorescences of a single tree, except a few insects like wasps, which take inter tree flights. Hence, though teak prefers cross pollination it is compelled to accept selfing also. Though there are four locules in a fruit, only one or two contain seeds. The time between flowering and seed set is approximately six months. Fruit is enclosed in an inflated dry calyx, which assists in the wind dispersal. During rainy season, the calyx helps the fruits to float on water and to be dispersed further.



Twigs with fruits

Tree improvement: Genetic improvement programmes for teak were initiated in the 1960s in almost all countries where teak occurs naturally. Plus tree selection and establishment of seed orchards and seed production areas progressed very well in the beginning. However, scarce fruit production in seed orchards hampered the improvement programmes. Teak improvement programmes in Thailand, India and Indonesia were initiated with the assistance of Danida that helped to organize coordinated international provenance trials at 48 sites with 75 provenances from different countries as a part of the action programme formulated by the FAO Panel of Experts on Forest Gene Resources. The most promising provenances were identified and were indicated in the evaluation reports. Recently, teak improvement programmes have received renewed attention especially in the field of clonal selection and mass multiplication. Clonal propagation of teak has been standardized and high-yielding clones have been selected and are being mass-multiplied through micropropagation or macropropagation.

Ecology and genetic conservation status: The area of natural teak forests has drastically reduced over the last 50 years and the remaining forests are threatened by illegal logging and other forms of forest destruction. The impact of these anthropogenic disturbances on the continued existence of teak in its natural habitats is still unknown. Research is in progress to understand the genetic diversity, mating system, migration pattern and contemporary as well as long-term gene flow. The genetic diversity between 10 populations in peninsular India has been reported to be higher (Nicodemus *et al.* 2003) than that found in Thailand (Changtragoon and Szmidi 2000). In contrast, polymorphism exhibited in plantations and natural teak areas in India is around 50% (Nicodemus *et al.* 2003).

Within the genus *Tectona* there are also two other species that have small area of distribution and need conservation; their potential value for teak breeding is yet to be investigated. *T. hamiltoniana* is naturally occurring in rocky hills of the dry zone in Myanmar. It is not a valuable timber species. A few trees have been introduced to India on a trial basis. *T. philippinensis* is a medium-sized tree naturally occurring on dry exposed ridges in Iling Island in the Philippines.

Agencies active in genetic conservation of *Tectona grandis*: India: Indian Council of Forestry Research and Education (ICFRE), Kerala Forest Research Institute (KFRI); Thailand: The Silviculture Research Group, National Park, Wildlife and Plant Conservation Department, Kasetsart University; Indonesia: Perum Perhutani, Jakarta, Bogor Agriculture University, Bogor; France: Cirad Foret; Denmark: Danida Forest Seed Centre (DFSC)

Bibliography:

- Changtragoon, S. and A.E. Szmidi.** 2000. Genetic diversity of Teak (*Tectona grandis* L.f.) in Thailand revealed by Random Amplified Polymorphic DNA (RAPD) markers. Paper presented at IUFRO Conference on Tropical Species Breeding and Genetic Resources: Forest Genetics for the Next Millennium, during 8–13th October 2000 at International Conference Centre, Durban, South Africa.
- Hedegart, T.** 1973. Pollination of teak (*Tectona grandis* L.). *Silvae Genet.* 22: 124–128.
- Hedegart, T.** 1976. Breeding systems, variation and genetic improvement of teak (*Tectona grandis* L.f.). Pp. 109–122 in *Tropical trees: variation, breeding and conservation* (J. Burley and B.T. Styles, eds.). Academic Press, London.
- Indira, E.P. and K. Mohanadas.** 2002. Intrinsic and extrinsic factors affecting pollination and fruit productivity in teak (*Tectona grandis* L.f.). *Indian J. Genetics & Plant Breeding* 62(3): 208–214.
- Keiding H., H. Wellendorf and E.B. Lauridsen.** 1986. Evaluation of an international series of teak provenance trials. DANIDA Forest Seed Centre, Humlebaek, Denmark.
- Kjaer, E.D., E.B. Lauridsen and H. Wellendorf.** 1995. Second evaluation of an international series of teak provenance trials. DANIDA Forest Seed Centre, Humlebaek, Denmark. 118p.
- Nicodemus, A., B. Nagarajan, C. Narayanan, M. Varghese and K. Subramanian.** 2003. RAPD variation in Indian Teak populations and its implications for breeding and conservation. Paper presented at the International Conference on Quality Timber Products of Teak from Sustainable Forest Management, 2–5th December 2003 at Kerala Forest Research Institute, Peechi, India.
- Palupi E.R. and J.N. Owens.** 1996. Reproductive biology of teak (*Tectona grandis* Linn. F.) in east Java, Indonesia. Pp. 255–260 in *Tree improvement for sustainable tropical forestry* (M.J. Dieters, A.C. Matheson, D.G. Nikles, C.E. Harwood and S.M. Walker, eds.). Proc. QFRI-IUFRO Conf., Queensland, Australia, 27th Oct.–1st Nov.1996. QFRI, Caloundra
- Tangmitcharoen, S. and J.N. Owens.** 1996. Floral biology, pollination and pollen tube growth in relation to low fruit production of teak (*Tectona grandis* Linn.f.) in Thailand. Pp. 265–270 in *Tree improvement for sustainable tropical forestry* (M.J. Dieters, A.C. Matheson, D.G. Nikles, C.E. Harwood and S.M. Walker, eds.). Proc. QFRI-IUFRO Conf., Queensland, Australia, 27th Oct.–1st Nov.1996 QFRI, Caloundra.

This note was prepared by K. M. Bhat and E. P. Indira of Kerala Forest Research Institute, India

APFORGEN Priority Species Information Sheet is published by the APFORGEN Secretariat. For copies please write to:

**APFORGEN Secretariat
c/o APAFRI Secretariat
FRIM, Kepong, 52109 Kuala Lumpur, Malaysia
Tel: +60-3-62722516 Fax: +60-3-62773249
E-mail: secretariat@apforgen.org**

APFORGEN Priority Species Information Sheets are also downloadable from the website www.apforgen.org