Tamarindus indica

L.

tamarind

Fabaceae - Caesalpinioideae

LOCAL NAMES
Afrikaans (tamarinde); Amharic (humer,roka); Arabic (ardeib,aradeib); Bemba (mushishi); Bengali (anbli,amli,nuli,tintul,tintiri,tentul); Burmese (magyee,majee-pen); Creole (tamarenn); English (madeira mahogany,Indian date,tamarind tree); Filipino (sampalok,kalamagi,salomagi); French (tamarinde,tamarinier); Fula (jammeh,jammi,dabe); Gujarati (ambali,amali); Hindi (tentul,chinta,anbli,tamrulhindi,amli,imli); Indonesian (asam,asam jawa,tambaring); Khmer (khoua me,'am'pül,ampil); Lao (Sino-Tibetan) (mak kham,khaam); Luganda (mukoge); Malay (asam jawa); Mandinka (tomi,timbingo,timbimb,tombi); Nepali (imli); Nyanja (mwemba); Sanskrit (amlica,tintiri); Sinhala (siyambala); Somali (rakhai,hamar); Spanish (tamarin,tamarindo); Swahili (msisi,mkwaju); Tamil (amilam,puli,puliamavam); Thai (bakham,makham,somkham); Tigrigna (humer); Tongan (musika); Trade name (tamarind); Urdu (imli); Vietnamese (trai me,me); Wolof (daharg,dakah,dakhar,ndakhar)

Tamarindus indica foliage (Joris de Wolf, Patrick Van Damme, Diego Van Meersschaut)

Tamarindus indica (Patrick Maundu)

Fruits showing sticky pulp around seeds. (Anthony Simons)

BOTANIC DESCRIPTION
Tamarindus indica is a large evergreen tree up to 30 m tall, bole usually 1-2 m, up to 2 m diameter; crown dense, widely spreading, rounded; bark rough, fissured, greyish-brown.

Leaves alternate, compound, with 10-18 pairs of opposite leaflets; leaflets narrowly oblong, 12-32 x 3-11 mm, petiole and rachis finely haired, midrib and net veining more or less conspicuous on both surfaces; apex rounded to almost square, slightly notched; base rounded, asymmetric, with a tuft of yellow hairs; margin entire, fringed with fine hairs. Stipules present, falling very early.

Flowers attractive pale yellow or pinkish, in small, lax spikes about 2.5 cm in width. Flower buds completely enclosed by 2 bracteoles, which fall very early; sepals 4, petals 5, the upper 3 well developed, the lower 2 minute.

Fruit a pod, indehiscent, subcylindrical, 10-18 x 4 cm, straight or curved, velvety, rusty-brown; the shell of the pod is brittle and the seeds are embedded in a sticky edible pulp. Seeds 3-10, approximately 1.6 cm long, irregularly shaped, testa hard, shiny and smooth.

As the dark brown pulp made from the fruit resembles dried dates, the Arabs called it 'tamar-u'l-Hind', meaning 'date of India', and this inspired Linnaeus when he named the tree in the 18th century. Tamarindus is a monospecific genus.

BIOLOGY
Flowering generally occurs in synchrony with new leaf growth, which in most areas is during spring and summer. The hermaphroditic bisexual flowers are probably insect pollinated; however, no specific information has been found on pollinating agents, except that honeybees collect nectar and pollen from the flowers so, presumably, they contribute to pollination. T. indica usually starts bearing fruit at 7-10 years of age, with pod yields stabilizing at approximately 15 years. Fruits are adapted to dispersal by ruminants; in Southeast Asia, monkeys are among the chief dispersal agents. Fruit are leathery, nutritive pods that do not dehisce until they have fallen from the tree, while the seeds are hard and smooth and therefore hard to chew.

ECOLOGY
T. indica grows well over a wide range of soil and climatic conditions, occurring in low-altitude woodland, savannah and bush, often associated with termite mounds. It prefers semi-arid areas and wooded grassland, and can also be found growing along stream and riverbanks. It does not penetrate into the rainforest. Its 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. Young trees are killed by the slightest frost, but older trees seem more cold resistant than mango, avocado or lime. A long, well-marked dry season is necessary for fruiting.

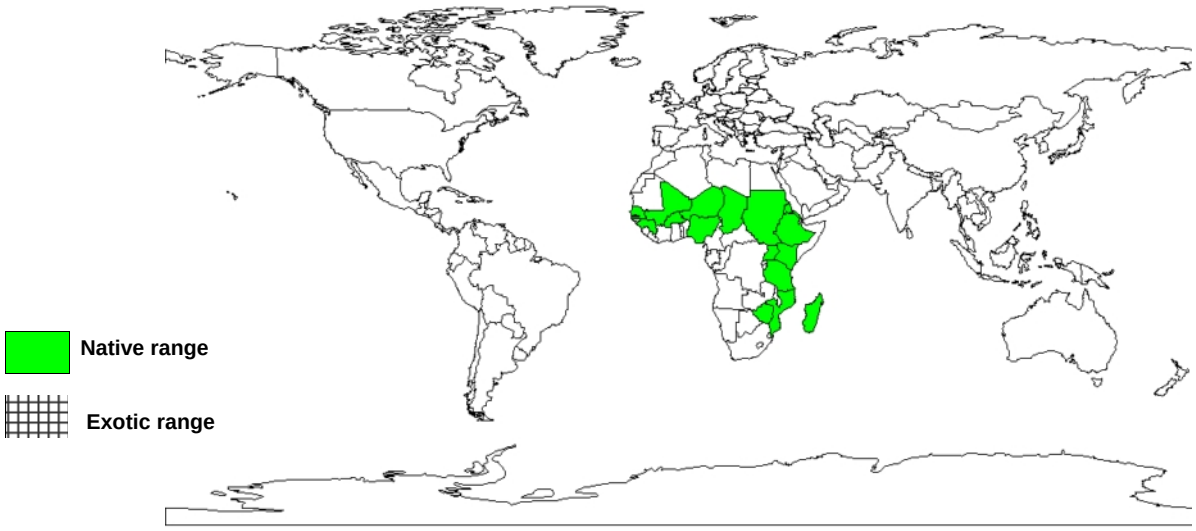
BIOPHYSICAL LIMITS
Altitude: 0-1 500 m, Mean annual temperature : 20-33 deg. C, Mean annual rainfall: 350-2 700 mm

Soil type: It grows in most soils but prefers well-drained deep alluvial soil.

DOCUMENTED SPECIES DISTRIBUTION

Native: Burkina Faso, Central African Republic, Chad, Eritrea, Ethiopia, Gambia, Guinea, Guinea-Bissau, Kenya, Madagascar, Mali, Mozambique, Niger, Nigeria, Senegal, Sudan, Tanzania, Uganda, Zimbabwe

Exotic: Afghanistan, Australia, Bangladesh, Brazil, Brunei, Cambodia, China, Colombia, Cote d'Ivoire, Cuba, Dominican Republic, Egypt, Ghana, Guatemala, Haiti, Honduras, India, Indonesia, Iran, Jamaica, Laos, Liberia, Malaysia, Mauritania, Mexico, Myanmar, Nepal, Nicaragua, Pakistan, Panama, Papua New Guinea, Philippines, Puerto Rico, Sri Lanka, Thailand, Togo, United States of America, Vietnam, Zambia



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.

PRODUCTS

Food: The fruit pulp, mixed with a little salt, is a favourite ingredient of the curries and chutneys popular throughout India, though most of the tamarind imported into Europe today comes from the West Indies, where sugar is added as a preservative. When freshly prepared, the pulp is a light brown colour but darkens with time; it consists of 8-14% tartaric acid and potassium bitartrate, and 30-40% sugar. Acidity is caused by the tartaric acid, which on ripening does not disappear, but is matched more or less by increasing sugar levels. Hence tamarind is said to be simultaneously the most acid and the sweetest fruit. The ripe fruit of the sweet type is usually eaten fresh, whereas the fruits of sour types are made into juice, jam, syrup and candy. Fruit is marketed worldwide in sauces, syrups and processed foods. The juice is an ingredient of Worcestershire Sauce and has a high content of vitamin B (thiamine and niacin) as well as a small amount of carotene and vitamin C. The flowers, leaves and seeds can be eaten and are prepared in a variety of dishes. Tamarind seeds are also edible after soaking in water and boiling to remove the seed coat. Flour from the seed may be made into cake and bread. Roasted seeds are claimed to be superior to groundnuts in flavour.

Fodder: The foliage has a high forage value, though rarely lopped for this purpose because it affects fruit yields. In the southern states of India cooked seeds of Tamarind tree are fed to draught animals regularly.

Apiculture: Flowers are reportedly a good source for honey production.The second grade honey is dark-coloured.

Fuel: Provides good firewood with calorific value of 4 850 kcal/kg, it also produces an excellent charcoal.

Timber: Sapwood is light yellow, heartwood is dark purplish brown; very hard, durable and strong (specific gravity 0.8-0.9g/cubic m), and takes a fine polish. It is used for general carpentry, sugar mills, wheels, hubs, wooden utensils, agricultural tools, mortars, boat planks, toys, panels and furniture. In North America, tamarind wood has been traded under the name of ‘madeira mahogany’.

Lipids: An amber coloured seed oil - which resembles linseed oil - is suitable for making paints and varnishes and for burning in lamps.

Tannin or dyestuff: Both leaves and bark are rich in tannin. The bark tannins can be used in ink or for fixing dyes. Leaves yield a red dye, which is used to give a yellow tint to clothe previously dyed with indigo. Ashes from the wood are used in removing hair from animal hides.

Medicine: The bark is astringent and tonic and its ash may be given internally as a digestive. Incorporated into lotions or poultices, the bark may be used to relives sores, ulcers, boils and rashes. It may also be administered as a decoction against asthma and amenorrhea and as a febrifuge. Leaf extracts exhibit anti-oxidant activity in the liver, and are a common ingredient in cardiac and blood sugar reducing medicines. Young leaves may be used in fomentation for rheumatism, applied to sores and wounds, or administered as a poultice for inflammation of joints to reduce swelling and relieve pain. A sweetened decoction of the leaves is good against throat infection, cough, fever, and even intestinal worms. Filtered hot juice of young leaves and a poultice of the flowers are used for conjunctivitis. The pulp may be used as a massage is used to treat rheumatism, as an acid refrigerant, a mild laxative and also to treat scurvy. Powdered seeds may be given to cure dysentery and diarrhoea.

Other products: The pulp of the fruit, sometimes mixed with sea-salt, is used to polish silver, copper and brass in India and elsewhere. The seed contains pectin that can be used for sizing textiles. Ground, boiled, and mixed with gum, the seeds produce a strong wood cement. In Africa, tamarind is a host of one of the wild silkworms (Hypsoides vuillitii).

SERVICES

Shade or shelter: The extended crown of the tamarind offers shade so that it is used as a ‘rest and consultation tree’ in villages. Because of its resistance to storms it can also be used as a windbreak. It should be considered, however, that T. indica is not very compatible with other plants because of its dense shade, broad spreading crown and allelopathic effects. It is thus more commonly used for firebreaks, as no grass will grow under the trees.

Boundary or barrier or support: T. indica could be inserted into a live fence.

Ornamental: The evergreen habit and the beautiful flowers make it suitable for ornamental planting in parks, along roads and riverbanks.

TREE MANAGEMENT
Growth is generally slow; seedling height increasing by about 60 cm annually. The juvenile phase lasts up to 4-5 years, or longer. Young trees are pruned to allow 3-5 well-spaced branches to develop into the main scaffold structure of the tree. After this, only maintenance pruning is required to remove dead or damaged wood. Trees generally require minimal care, but in orchards in Thailand's central delta, intensive cropping is practised. This is possible because grafted trees come to bear within 3-4 years. Sweet cultivars are planted and good early crops limit extensive growth; presumably the high water table, which prevents deep rooting, also helps to dwarf the trees. Size-control measures include close spacing (about 500 trees/ha) and pruning to rejuvenate the fruiting wood. The trees also respond to coppicing and pollarding.
When establishing a pure plantation, spacing should be at least 13 x 13 m. Distance can be reduced with vegetatively propagated plants, as they do not attain the same size as seeded trees. Smaller trees are easier to harvest. The tree may remain productive until it reaches old age, yielding up to 150 kg/tree or over 2 t/ha a year.

GERMPLASM MANAGEMENT
Seed storage behaviour is orthodox; no loss in viability during 1 years of hermetic storage at 4 deg. C; and viability can be maintained for several years in hermetic storage at 10 deg. C with 7-15% mc. There are approximately 350-1 000 seeds/kg.

PESTS AND DISEASES
The most serious pests of the tamarind are scale insects (Aonidiella orientalis, Aspidiotus destructor and Saisetia oleae), mealy-bugs (Nipaecoccus viridis and Planococcus lilacinus), and a borer (Pachymerus gonagra). Other minor pests in India include lac insects, and bagworms. Beetle larvae cause damage to branches in Brazil, while in Florida and Hawaii beetles attack ripe pods. Termites attack the tree in China. Stored fruit is commonly infested in India. Larvae of the groundnut bruchid beetle are serious pests that attack the fruit and seed in India. In some seasons, fruit borers may inflict serious damage to maturing fruits causing a great reduction in marketable yield.
Diseases which have been reported from India leaf spot, powdery mildews, a sooty mould, stem disease, stem, root and wood rot, stem canker, a bark parasite and a bacterial leaf-spot.

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SUGGESTED CITATION

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