

**IMLI: A CRAZE LOVELY**

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ABSTRACT

Every part of Tamarind tree, from roots to leaf tips has been utilized to meet different human needs. *Tamarindus indica* (Caesalpinaceae), popularly known as imli is a perennial evergreen tree with a spreading crown, feathery evergreen foliage and fragrant flowers. *Tamarindus indica* is one of the auspicious, versatile tree species in the Indian subcontinent. The pulp of Tamarind finds important place in chutneys, pickles, jams, curries, sauces, ice cream, sharbat and "tamarind fish". It is extensively used in Tamil Nadu, Karnataka and Andhra Pradesh cuisines, particularly in the preparation of Rassam and Sāmbhar. Traditionally, *Tamarindus indica* has been used as an antidiabetic, digestive, expectorant, anti-pyretic and anti-malarial agent. This review article summarizes the phytoconstituents, pharmacological actions, drug interactions encountered and safety profile with the use of Tamarind.

I first fell in love with tamarind fruit, during school summer vacations. There was an elderly lady in my village, who carried delightful tamarind balls. Her tamarind balls were made up of tamarind pulp, sugar, a pinch of salt and ginger. We, children would break the balls apart and suck on the pieces. We'd suck the entire tamarind piece until there was nothing left except the seed to discard. Our craze had nothing to do with the nutritional or medicinal content of the fruit.

KEY WORDS: *Tamarindus indica*, Antioxidant, Antimicrobial, Hypolipidemic, Antidiabetic

INTRODUCTION

Tamarind is the ripe fruit of the *Tamarindus indica* tree, which is used as a condiment, or more precisely as an 'acidulant' like amchur. Each and every part of the Tamarind tree, especially the fruit is beneficial for the society. The sweetish acidic pulp of the fruit is a product of commercial importance. Pulp of Tamarind fruit is an important component in chutneys, pickles, jams, curries, sauces, ice cream, sharbat and "tamarind fish", a special Indian seafood pickle. Tamarind is extensively used in the Indian system of medicine, Ayurveda. Tamarind preparations are universally recognized as refrigerants in fevers and as laxatives. The fruit pulp is used as a digestive, a remedy in bile disorders, to alleviate sunstroke, in datura poisoning and alcoholic intoxication. Tamarind drink is popular all over the world. Formulas for the commercial production of spiced tamarind beverages have been developed in India. The tamarind has recently become popular as bonsai, in Indonesia, Taiwan and the Philippines. The seeds are sometimes used by children in traditional board games such as Chinese checkers (China), Dhakon (Java) etc. Tamarind belonging to family Caesalpinaceae is scientifically known as *Tamarindus indica* Linn. a perennial evergreen tree with a spreading crown; feathery evergreen foliage and fragrant flowers. It grows widely in the tropical and subtropical regions, yielding hard yellowish wood and long pods with edible chocolate-colored acidic pulp. It is cultivated almost in all the states of the country, except in Himalayas and Western dry regions¹. Tamarind is not only a food item but its pulp, leaves, and bark also has medical applications². The sturdiness and density of tamarind heartwood make it useful for the production of furniture and wood flooring. Tamarind fruit pulp has been an important culinary ingredient in India for a very long time. It is extensively used in Tamil Nadu, Karnataka and Andhra Pradesh cuisines, particularly in the preparation of Rassam, Sāmbhar, Vatha Kuzhambu and Puliogare. Tamarind trees provide shade on the country roads and serve also as ornamental trees.

BOTANICAL CLASSIFICATION

Kingdom : Plantae,
Subkingdom : Tracheobionta
Super division : Spermatophyta
Division : Magnoliophyta
Class : Magnoliopsida
Subclass : Rosidae
Superorder : Rosanae
Order : Fabales
Family : Fabaceae
Subfamily : Caesalpinioideae
Genus : *Tamarindus* L.
Species : *T. indica*
Tribe : Detarieae
Binomial name : *Tamarindus indica* L.

INDIAN SYNONYMS

Language	Region	Names
ASSAMESE	Assam	Teteli
BENGALI	West Bengal	Ambli, Tentul
GUJARATI	Gujarat	Ambli, Amlī
HINDI	Haryana, Delhi	Ambli, Imlī
KANNADA	Karnataka	Amla, Amlī, Gotu, Hunase hannu, Hunise mara
MALAYALAM	Kerala	Amlam, Madhurappuli, Puli
MARATHI	Maharashtra	Ambali, Chicha (Chinch)
ORIYA	Orissa	Kainya, Koina, Omlīka
PUNJABI	Punjab	Imbli, Imlī
SANSKRIT	India	Amla, Amlī, Amlīka, Tintiri
TAMIL	Tamil Nadu	Ambilam, Tindiruni, Puli
TELUGU	Andhra Pradesh	Chinta, Chintapandu, Sinnta

INTERNATIONAL SYNONYMS

Afrikaans: Tamarinde
 Arabic: Aradeib, Ardeib, Tamar el hindi, Hhawmar, Humar, Tamar hindi
 Burmese : Ma gyi, Ma jee pen, Ma gyi thi
 Chinese : Da ma lin, Luo huang zi, Luo wang zi
 Danish : Tamarind
 English : Indian date, Sweet tamarind, Tamarind
 Estonian : Tamarindipuu, Tamarind

French : Tamar indien (Assam-India), Tamarin, Tamarinier, Tamarinier des Indes
 German: Indische Dattel, Sauerdattel, Tamarinde, Tamarindenbaum
 Greek : Tamarin
 Indonesian : Asam jawa, Asam kuning
 Italian : Tamarandizio, Tamarindo, Tamarindo dolce.
 Japanese : Tamarindo
 Korean : Ta ma rin du
 Nepalese : Amilii, Titrii
 Pakistani: Imlii
 Philippines: Sampaloc
 Portuguese : Tamarindo (Brazil), Tamarindeiro, Tambarina
 Russian : Finik indiiskii, Indiyiskiy finik, Tamarind, Tamarind indiiskii
 Serbian : Demirindi, Indijska urma, Tamarinda
 Spanish : Tamarindo, Tamarindo de la India.
 Srilanka: Sinhala
 Swahili : Mkwaju, Msisi, Ukwaju.
 Swedish : Tamarind.
 Thai : Bakham somkham, Ma khaam, Ma kham wan

HISTORY

The tree of *T. indica* finds its mention between 1200 and 200 B.C. in the Indian Brahmasamhita scriptures. There are popular stories which explain why the leaves of Imlii tree are composed of many leaflets. It is believed that the leaves were split by arrows shot by Lakshmana, young brother of Lord Sri Ram, during the war against Ravana. The capital of Senegal, Dakar, was named after the local word ('dakhar') for *T. indica*. Tamarind was introduced into the America during the sixteenth century and now a day it is widely grown in Mexico. As early as 400 B.C this species was known and cultivated in Egypt. Early Arab and Persian merchants came across the Imlii tree, while trading in India. These traders and merchants carried the seeds in South East Asia because of its medicinal value and sour taste. Marco Polo has mentioned the presence of this tree in the year 1298 in his writing quotes. Several ancient Ayuvedic granths, like Vagbhata's *Astangahrdaya*, mentions Tamarind as a medicinal ingredient around 600AD. It is generally assumed that Tamarind originated in Africa, although there are evidences of its presence in India as cited in Ayurveda. *T. indica* is a pan tropical species cultivated throughout the world for its medicinal value and commercial uses.

GEOGRAPHICAL DISTRIBUTION

The Tamarind tree is ethnic to eastern tropical Africa, which is spread from Abyssinia to Zambezi. Tamarind grows naturally all over Asia up to an altitude of about 500 m. In the Indian sub-continent, it is mostly grown in central and southern India i.e. from Burma to Afghanistan. Tamarind is often planted with wider spacing considering its growth habit and for few initial years till the canopy closes, lot of interspaces, with other available resources. It is widely used in the Sahel, India, South East Asia, the Caribbean and Central America. It grows in Burkina Faso, Cameroon, Central Africa Republic, Chad, Ethiopia, Gambia, Guinea, Guinea-Bissau, Kenya, Madagascar, Mali, Niger, Nigeria, Senegal, Sudan, Tanzania and Uganda. Farmers commonly cultivate it in parklands in the arid and semiarid zones of West Africa.

Soil and Climate: *T. indica* grows well over a wide range of soil and climatic conditions, occurring in low-altitude woodland; savannah, bush; often associated with termite mounds. It prefers semi-arid areas and wooded grassland. It can also be found growing along stream and riverbanks. It

does not penetrate into the rainforest. It is very adaptable species resistance to drought and coastal winds, due to extensive root system. It also tolerates fog and even monsoon climates, where it has proved its value for plantations. Older trees are more resistant to cold, while only the slight frost destroys the young trees. A long, well-marked dry season is necessary for fruiting.

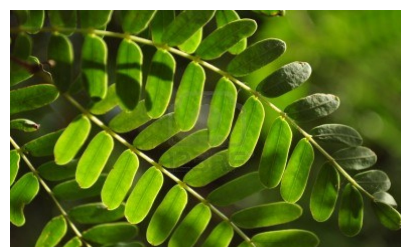
BOTANICAL DESCRIPTION

Habitat: Tamarind is a large, slow growing, long living evergreen tree with a trunk of diameter up to 1.5-2m, which can grow 20-30m high. The bark of Tamarind tree is brown-gray colored. It can tolerate diversity of soils like loam, sandy, clay soil, but well drained slightly acidic soil is best for its growth.



The Tamarind Tree

Foliage: Leaves are elliptical ovular, alternate, pinnate with reticulate venation and is a mass of bright green, dense foliage with feathery appearance. Normally, the leaves are evergreen but during hot season, they may be shed briefly in dry areas. Leaves are 7.5-15 cm in length, each having 10 to 20 pairs of oblong leaflets (1.25-2.5 cm) and 5-6 mm wide. Leaves fold in cold damp weather and after sunset, due to the degradation of lupeol in dark, which is synthesized in light.



Tamarind Leaves

Flowers: The inconspicuous, inch-wide, five-petal flowers are borne in small racemes and are yellow with red streaks. The flower buds are pink due to the outer color of the 4 sepals, which are shed, when the flower opens.



Tamarind Flowers

Fruits: The fruits are usually between 5 to 14 cm in length and approximately 2 cm wide. It is an indehiscent legume,

with a hard, brown shell called as pods. Along with the new branches, there is abundant growth of irregularly curved pods. On maturation of pod, the flesh becomes brown or reddish brown and is filled with somewhat juicy, acidulous pulp. As the fruits ripe fully, the shells are brittle and easily broken. The pulp has a pleasing sweet/sour flavor along with high content of acid and sugar. It is also rich in vitamin B and high in calcium content. The pulp dehydrates to a sticky paste, enclosed by a few coarse strands of fiber. The pods may contain 1 to 12 large, flat, glossy brown, obovate seeds embedded in the brown, edible pulp. There are wide differences in fruit size and flavor in seedling trees. Asian types have longer pods with 6 - 12 seeds, while the African and West Indian types have shorter pods, containing only 3 - 6 seeds.



Tamarind fruit with seeds

Pollination: Pollen grains of Tamarind are dimorphic and pollen sterility is very low in Tamarind, which is less than 2%. Pollens, which are sticky, are ineffective for wind pollination. Honey bees are the natural and effective pollinators. Due to the presence of copious levels of nectar and the floral characteristics of tamarind, it is apparent that tamarind is insect pollinated.

PHYTOCONSTITUENTS

Phytochemical investigations carried out on *T. indica* revealed the presence of many active constituents, such as phenolic compounds, cardiac glycosides, mallic acid, tartaric acid, uronic acid, mucilage, pectin, arabinose, xylose, galactose and glucose³. The ethanolic extract of *T. indica* showed presence of fatty acids, out of which 21 are saturated fatty acids viz. n-heptadecanoate, hexadecanoic acid, n-nonadecanoate etc., along with 11 unsaturated fatty acids such as nenodecenoic acid, 10-octadecenoic acid, heptadecanoate etc. Tamarind plant shows the presence of various essential elements like arsenic, calcium, cadmium, copper, iron, sodium, manganese, magnesium, potassium, phosphorus, lead, and zinc⁴. The fruit pulp contains organic acids, such as tartaric acid, acetic acid, citric acid, formic acid, mallic acid, and succinic acid. The pulp shows the presence of high amounts of ascorbic acid, vitamin B₁, B₃; amino acids, such as alanine, phenylalanine, proline, serine, leucine; invert sugar (25-30%); pectin; proteins; fats; pyrazines (trans-2-hexenal); and some fragrant thiazoles (2-ethylthiazole, 2-methylthiazole). The fruit pulp contains predominantly volatile constituents viz. 44% furan derivatives such as furfural, 2-acetyl furan, 5-methyl furfural and 38% carboxylic acid derivatives such as palmitic acid, oleic acid and phenylacetaldehyde⁵. Pulp also contains alkaloids, glycosides, saponins, sesquiterpenes, flavonoids, tannins and phlobatannins in addition^{6,7}. The high potassium content in tamarind pulp keeps a check on blood pressure. Copper, selenium and vitamin C are some of the heart friendly anti-oxidants that prevent free radicals from plaques deposition in the heart valves. The leaves of the tamarind

contain two triterpenes, lupanone and lupeol⁸. The leaf oil contains 13 components among which limonene and benzyl benzoate were most predominant⁹. The root bark of *T. indica* showed the presence of (+)-pinitol, n-hexacosane, eicosanoic acid, β -sitosterol, octacosanyl ferulate, 21-oxobehenic acid, apigenin and vitexin¹⁰. The major fatty acids of the seeds were palmitic acid, oleic acid, lignoceric acid, behenic acid, linoleic acid, and eicosanoic acid. The unsaponifiable matter from the seed oil of *T. indica* showed presence of β -amyryn, campesterol, β -sitosterol, stigmasterol and seven hydrocarbons¹¹. The seeds also contain tetrazene, furfural, levoglucosan along with furanmethanol, cyclohexasiloxane, dioxolane, butanediol, D-allose and phenolic antioxidants¹². The seed polysaccharides were found to possess a main chain consisting of β -1,4-connected glucose molecules together with xylose (alpha-1,6), galactose and arabinose in the ratio 8:4:2:1; proteins; lipids with fatty oils; and some keto acids¹³. The content of Tamarind seeds comprised procyanidins, represented mainly by oligomeric procyanidin tetramer, procyanidin pentamer, and procyanidin hexamer with small amounts of procyanidin B2 epicatechin. The profile of polyphenolics in Tamarind pericarp was dominated by proanthocyanidins in various forms, such as apigenin, catechin, procyanidin B2, epicatechin, procyanidin dimer, procyanidin trimer, tetramer, pentamer, hexamer, along with taxifolin, eriodictyol, luteolin and naringenin, of total phenols¹⁴. Pericarp also contains C-glycosylflavonoid orientin¹⁵.

TRADITIONAL USES¹⁶

- Laxative and constipation reliever (Ripe and unripe fruit pulp, mixed with milk, honey or lemon juice, due to high amount of maleic acid, tartaric acid and potassium acid tartrate)
- Wound healer (Leaves and bark, due to high amount of tannin, applied externally on the spot as a decoction or as powder)
- Antipyretic (Fresh fruit)
- Antimalarial agent (Tamarind fruit pulp and leaves)
- Aphrodisiac (Different plant parts i.e. flowers, leaves, bark and fruit pulp)
- Abdominal pain reliever (Fresh bark or stem)
- Mouthwash
- Antidiarrheal and Antidysentery agent (Fruit pulp with lemon or milk, leaf juice)
- Antiasthmatic and Antitussive (Bark and Leaves)
- Antileprotic (tamarind fruit)
- Ant scurvy (Vitamin C deficiency causes scurvy, so this fruit supplements Vitamin C)
- Anti-inflammatory (Leaves and Bark, due to high tannin content)
- Astringent (Bark, due to tannin)
- Conjunctivitis
- Anti-stomachic
- Preservative (Fruit)
- Anthelmintic (Bark)
- Antibacterial (Fruit)
- Antidiabetic (Leaves)
- Safe and Cheap Antioxidant
- Hepatoprotective (Leaf and Bark decoction)
- Antihypertensive
- Antiemetic
- Antiepileptic
- Anti-measles and against mumps (leaves or fruits)

- Antidote against snake bites and insect bites (Decoction of leaves applied externally)
- As a contraceptive
- As an ingredient of sunscreens
- Lotion and Poultice of fresh leaves is applied to swellings, boils, cuts for relieving pain and inflammation.

PHARMACOLOGICAL ACTIVITIES

Anti-emetic

Methanolic and butanolic extracts of *Tamarindus indica* leaves exhibited anti-emetic activity comparable to that of marketed medicine viz. chlorpromazine¹⁷.

Anti-histaminic activity

Tayade identified the antihistaminic potential of the leaves of *Tamarindus indica* Linn. in isolated goat tracheal chain preparation and guinea pig ileum, which is found to be beneficial in asthma¹⁸.

Anti-microbial, Anti-fungal, Anti-Melioidosis activity

Tamarindus indica pulp's extract exhibited remarkable antimicrobial activity against *Salmonella typhimurium* (NCIM 2501) and *Staphylococcus aureus* (NCIM 5021), while possessed mild activity against *Aspergillus niger*¹⁹ (NCIM 545). It was revealed from previous studies that ethanolic extract of *Tamarindus indica* leaves and pulp had antifungal activity against *A. Niger*, *A. flavus* along with *F. oxysporum*. Its stem bark slightly inhibited the growth of *A. flavus* and *F. oxysporum*, but the growth inhibition of *A. Niger* was not effective²⁰.

Melioidosis, caused by *Burkholderia pseudomallei*, a gram negative bacterium, is a life-threatening systemic infection common among paddy cultivators in Southeast Asian countries. The methanolic extracts of *T. indica* possessed anti-*B. pseudomallei* inhibitory activity²¹.

Defluoridation activity

Ingestion of Tamarind helps in delaying the progression of fluorosis by increasing the urinary excretion of fluorides. Furthermore, there is a reduction in excretion of zinc, which has a beneficial effect on the skeletal health of persons staying in fluorotic areas, especially children²².

Analgesic, Anti-pyretic and Anti-inflammatory activity

The aqueous extract of *T. indica* elicited significant antinociceptive activity, centrally as well as peripherally, when studied; using acetic acid induced writhing test, hot plate test, formalin test and tail flick method^{23,24}.

Tamarind also possessed antipyretic activity. A polysaccharide obtained from *T. indica* pulp has been shown to possess significant antipyretic activity against yeast induced pyretic rats and lipopolysaccharide (*E.coli*) induced pyrexia in mice. There was a direct correlation between increase in dose of pulp polysaccharide and decrease in rectal temperature of mice²⁵ [25].

Abnormal accumulation of elastase, a serine proteinase from human neutrophil, causes a number of acute and chronic inflammation diseases. It was found that tamarind seeds contained serine proteinase inhibitor, with high inhibitory activities against human neutrophil elastase (HNE)^{26, 27}, which probably explains the anti-inflammatory properties of tamarind.

Anti-viral, Anti-nematodal, Molluscicidal Activity

T. indica plant extracts possess antiviral activity against several types of virus viz. tobacco mosaic viruses, cow pea mosaic viruses and watermelon mosaic viruses. It also possess anti-nematodal activity against *Bursaphelenchus xylophilus*²⁸.

Perhaps the fruit of Tamarind contains saponins, which may be responsible for its molluscicidal activity. Extract of tamarind fruit pulp were found to have significant activity against *Bulinus truncatus* snails²⁹.

Anti-diabetic and Hypolipidemic activity

T. indica seed extract significantly reduced blood glucose levels as well as cholesterol levels^{30, 31}. *Tamarindus indica* crude extract from the pulp fruit, when administered for 10 weeks, evoked significant reduction in total cholesterol (50%), LDL (73%) and triglyceride (60%), along with an increase of high-density lipoprotein (HDL) cholesterol levels (61%), in hypercholesterolemic hamsters. In Bangladesh, fruits of *T. indica* were evaluated for their effects on the lipid profile, systolic and diastolic blood pressure and the body weight of humans. A diet with dried and pulverized pulp of fruits at a dose of 15 mg/kg body weight reduced the total cholesterol level (p 0.031) and LDL cholesterol level (p 0.004). Neither the body weight nor the systolic blood pressure was influenced. Only the diastolic pressure was reduced (p 0.05)³².

Antioxidant activity

The fruit pulp extract of *Tamarindus indica* L. showed free radical scavenging capacity, when assessed in vitro by using 2,2-diphenyl-1-picrylhydrazyl (DPPH), superoxide radicals assays, and the thiobarbituric acid reactive substances (TBARS) assay. It also increased the efficiency of in vivo antioxidant system, when assessed by the superoxide dismutase, catalase and glutathione peroxidase activities. These findings of antioxidant capacity of the fruit pulp, when coupled with hypolipidemic activity reflect the ability of tamarind extracts in diminishing the risk factor for the development of atherosclerosis in humans³⁰.

Cytotoxic Activity

Al-Fatimi et al.³³ reported that methanol extracts of *T. indica* showed remarkable cytotoxic activity against FL-cells, a human amniotic epithelial cell line, with IC50 values below 50 µg/ml.

Anti-venom property

Some experiments have predicted the anti-venom effect of *T. indica* seed extract. Tamarind seed extract inhibited Phospholipase A, protease, hyaluronidase, l-amino acid oxidase and 5'-nucleotidase enzyme activities of venom in a dose dependent manner. The extract neutralized the degradation of the β-chain of the human fibrinogen, the indirect haemolysis as well as edema and hemorrhage like myotoxic effects, caused by the venom. The extract prolonged the clotting time moderately concomitantly. *T. indica* extract acts as an alternative for the anti-venom therapy, as it protected the animals from venom induced toxicity³⁴.

Hepatoprotective activity

Tamarindus indica fruits, leaves (350 mg/kg p.o.) and unroasted seeds (700 mg/kg p.o.) extract, were identified to possess hepatoprotective activity, which is attributed to flavonoids, β-carotene and ascorbic acid content. Protective effect of *T. indica* Linn. (Caesalpinaceae) was evaluated by injecting the rats with paracetamol. The aqueous extracts of different parts of *T. indica*, such as fruits, leaves (350 mg/kg p.o.), and unroasted seeds (700 mg/kg p.o.) produced a significant hepatoregenerative effect. Furthermore, significant decrease in serum ALT and AST levels, indicated decrease in cell necrosis. Improvement in the secretory mechanism of hepatic cells was shown by effective lowering in ALP and bilirubin levels³⁵.

Anthelmintic activity

Effect of *Tamarindus indica* L. leaves juice (100%, 50% and 20%) was investigated for anthelmintic activity. The juice exhibited a dose dependent response. The highest dose (100% conc.) showed least time for paralysis and death, when compared to piperazine citrate. The activity is attributed to the presence of tannins, which was found in the juice on phytochemical evaluation³⁶.

Laxative

The pulp obtained from the pods of the tamarind tree, improves general sluggishness of the bowels, is a gentle laxative. Traditionally it was taken one to two tablespoons of the pulp in the evening. The pulp of tamarind is rich in tartaric and malic acids and in the salt form, potassium acid tartarate. These constituents are responsible for its laxative property. The Wolof people of Senegal used to make Bengal, a form of sweetmeat, from the unripe fruit of tamarind. This Bengal is used as laxative as such or sometimes taken along with honey or lime juice¹⁶.

SAFETY

Tamarind is not known to be toxic. It has been shown to increase the body's ability to absorb certain drugs like aspirin and Ibuprofen. Because of this ability to influence the activity of medicines, it should not be taken as an additional medicine without the advice of a doctor or a professional herbalist.

INTERACTIONS**Interactions of Tamarind with Drugs**

Drugs	Risk
Aspirin, anticoagulants (warfarin or heparin), antiplatelet (clopidogrel), NSAIDs (ibuprofen or naproxen) and herbs like Ginkgo biloba	Increased risk of bleeding
Hypoglycemic drugs in diabetic patients	Hypoglycemia
Topical ophthalmic antibiotics	May result in synergistic effect

Tamarind pulp is used because of its adsorptive properties since ancient times, such as in constipation. This property can be responsible for retention of medicines in the metabolism of humans like aspirin, ibuprofen and chloroquine, too. It can cause a raised bioavailability. One must be careful during co-administration of pulp and medicines, together.

USES OF TAMARIND

Culinary Uses: Pulp of Tamarind is an important component in chutneys, pickles, jams, curries, sauces, ice cream, sharbat and "tamarind fish", a special Indian seafood pickle. Usually Sweet tamarind pulp is often used to make a confection. In India, the tender, sour pods are used for seasoning with rice, meat, fish; while young leaves, flowers and seedlings are consumed in curries or green salad.

Tamarind Beverages: Tamarind drink is popular all over the world. Tamarind ade has long been a popular drink in the tropical regions and is now being bottled in carbonated form in Guatemala and Mexico. Spiced tamarind beverages have been developed commercially in India. In South America 'Jugo' and 'fresco de tamarindo' are favorite tamarind drinks.

Fodder: Leaves of Tamarind are commonly eaten by cattle, goats and silkworms.

Dyeing / Mordant: Leaves and flowers are useful as mordents in dyeing. Yellow dye developed from the leaves colors impart red color to wool and green color to silk.

Nectar: Flowers are rated as a good source of nectar for honeybees in South India.

Lac insect: The tamarind tree is a host for the lac insect. The lac may be harvested and sold as stick-lac for the production of lacquers and varnish.

Seeds: In Indian textile industry, powder from tamarind kernels has been preferred over corn starch as it is cheap.

Wood: It is used for making furniture, paneling, wheels, axles, mill gears, handles, walking sticks, toys, oil presses, sugar presses etc. Due to high calorific value, Tamarind wood is especially a good fuel for brick kilns. It is also used as a thickener in some explosives. The ash is used to remove hair from animal hides and can be mixed with fruit pulp for cleansing and brightening brass, copper vessels.

STRANGE FACTS

- Tamarind is a common ingredient of curries, Rassam, Sāmbhar, chutneys, and vegetables all over India.
- The Tamarind plant has recently become popular as a part of bonsai in Indonesia, Taiwan and Philippines.
- The seeds are sometimes used by children in traditional board games such as Chinese Checkers (China), Dhakon (java) etc.
- The fruit is a useful appetizer for improving one's diet.
- Young stems and slender roots of the Tamarind tree are fashioned into walking sticks.
- The twigs and the bark are sometimes used as "chew sticks".
- The fine silk obtained from the worms fed with Tamarind is superior in quality for embroidery.
- Washing of hairs with water soaked with fruit pulp removes dandruff.
- Tamarind seeds yield amber oil, which is applied as an illuminant and as a varnish especially preferred for painting dolls and idols.
- Tamarind is rich in **tartaric acid**, which imparts a sour taste to eatables.
- Tamarind increases the rate of absorption of certain drugs like Aspirin and Ibuprofen.
- There is a natural craving for tamarind in pregnant women.
- Tamarind is a cheap and powerful antioxidant.

CONCLUSION

Properties possessed by *Tamarindus indica* enjoy a wide range of medicinal applications in human health-care. Phytoconstituents, such as limonene, methyl salicylate, pyrazines, alkylthiazoles and minerals like calcium, iron and zinc account for the medicinal properties of Tamarind. Furthermore, high amounts of vitamins B & C boost the haemopoietic and immune systems of the body. The pulp of Tamarind finds important place in chutneys, pickles, jams, curries, sauces, ice cream and sharbat. The fruit pulp is used for seasoning of various dishes, to flavor confections, and as a major ingredient in cold-drinks, and juices.

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