

TAMARIND - THE BROWN GOLD - A TREE OF UNTAPPED POTENTIAL

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Tamarind (*Tamarindus indica* L.), a hardy tree of tropical African origin, is found through out the tropics. It belongs to the family Cesalpiniaceae.

At present tamarind is cultivated in 54 countries, 18 in its native source and 36 other countries where it has become naturalized. The major productions come from Asian and American continents. Tamarind tree is one of the most important multipurpose tree species in Indian subcontinent. It is a large evergreen tree with an exceptionally beautiful spreading crown and is being cultivated almost through out the country except in the Himalayas and western dry regions (ICFRE 1993). It is a highly adaptive tree that can thrive well in the temperature range varying from 30-40°C with an annual rainfall of 500-2000 mm. Tamarind is suited for growing in semi-arid situations. The crop thrives well in

sodic and saline soil as well as in degraded soil. India is the world's largest producer of tamarind. Thailand, Mexico, Africa, Cost Rica, Puerto Rico are producing tamarind commercially. The tree is mostly grown wild but it is cultivated to a limited extent in drier states, mainly in Madhya Pradesh, Bihar, Andhra Pradesh, Karnataka, Tamil Nadu and West Bengal. In some parts of India it is naturally grown on wet lands and forest lands.

The total production of tamarind pulp in India is 3,00,000 metric tonnes of which about 10-12 thousand tonnes are exported, that earns around 10-12 crores of rupees foreign exchange.

Botany

It is a long lived, magnificent large evergreen or semi evergreen tree growing upto 30m tall with beautiful spreading crown upto 12 meter in diameter. The trunk is short with fissured bark light gray to brown, very

rough and scaly. Leaves are alternate, even and paripinnately compound, 7-15 cm long with pulvinus at the base and 6-20 pairs of opposite leaf lets. Inflorescence racemes are small 5-10 cm long, terminal and lateral drooping and often paniced, flowers bisexual, fruit (pod) is pendulous, pods are 5-10 cm x 2 cm oblong or sausage shaped, curved or straight with rounded ends.

Cultivars

Two high yielding selections viz. Prathisthan and No. 263, were released from Fruit Research Station, Himayat bagh, Aurangabad (Maharashtra) for commercial exploitation. The Forest Department of Karnataka has released six clones and University of Agricultural Sciences three more for commercial cultivation for meeting the requirement at Karnataka.

Local type called 'Cumbum' or 'Lower camp' was reported to be

popular in Cumbum area of Tamil Nadu. Another type 'Urigam' of Tamil Nadu has also been very popular. In India the diversity of tamarind is more in the south. Based on colour and taste of pulp tamarind is classified as sweet and red type. A red fleshed variety was released as 'Yogeswari'. Horticultural College and Research Institute, (Tamil Nadu Agricultural University), Periakulam, has released a selection, PKM 1 tamarind, in 1992. Another selection DTS - 1 has been released from UAS (Dharwad), Karnataka.

Uses

The fruit pulp of tamarind forms the 'Tamarind of Commerce', which is the richest source of tartaric acid (8-18 per cent) and is the chief acidulant used in the preparation of food in India and in many Asian countries. The pulp constitutes 30-50 per cent of the ripe fruit (Purseglove 1987, Shankaracharya 1998) the shell and fibre accounts for 11-30 per cent and the seed about 25-40 per cent (Shankaracharya 1998). The major industrial products are tamarind juice, juice concentrate, tamarind powder, pickles and pastes (Shankaracharya, 1998). Another major industrial product of tamarind is the seed kernal powder, which is an important material used in sizing of textiles, paper and jute. The seeds are gaining importance as a rich source of protein and also has potential substitute of cereals in live stock food. The leaves are an important source of food and herb and medicine and the edible pulp of the ripe fruits is used as a flavouring agent in cooking, soups, jams, chutneys, souces, juices etc.

A number of other miscellaneous uses are reported from the fruit that

are widely used. Tamarind pulp mixed with common salt has been used to polish brass and copper and silver. The fruit pulp may be used as a fixative with turmeric and anatto in dying and was also used to coagulate rubber latex. The fruits are reported to have antifungal and antibacterial properties. Tamarind extracts has also been reported to have an inhibitory effect on plant diseases.

The seed testa contains 23 per cent tannin, which is useful in tanning leather and imparting colour fast shades of wool. Tamarind tanin gives highly coloured leather. Anti-oxidative activity of tamarind seed coat would be used as a safe and low cost source of antioxidant. The seed is also used as a filler for adhesives in plywood industry, as a binder for sawdust briquettes, and as thickner for explosives.

Medicinal uses

Tamarind is well known for its medicinal properties. The product of tamarind, leaves, fruit, seeds, flowers,

Table 1 Average composition of tamarind fruit

Constituents	Amount (per 100 gm)
Water	17.8-35.8 g
Protein	2-3 g
Fat	0.6 g
Carbohydrates	41.1-61.4 g
Fibre	2.9
Ash	2.6-3.9 g
Calcium	34-94 mg
Phosphorus	34-78 mg
Iron	0.2-0.9 mg
Thiamine	0.33 mg
Riboflavin	0.1 mg
Niacin	1.0 mg
Vitamin C	44 mg

roots have been extensively used in the traditional medicines in India and Africa and several medicinal properties are claimed for the various preparations of tamarind. Laxative

Table 2 Composition of tamarind seed, kernel and testa (%)

Constituent	Whole seed	Seed kernel (cotylendons)	Testa (seed coat)
Moisture	9.4-11.3	11.4-22.7	11.0
Protein	13.3-26.9	15.0-20.9	
Fat/oil	4.5-16.2	3.9-16.2	
Crude fibre	7.4-8.8	2.5-8.2	21.6
Carbohydrates	50.0-57.0	65.1-72.2	
Total Ash	1.60-4.2	2.4-4.2	7.4
Nitrogen-free extract	59.0		
Yield of TKP	50.0-60.0		
Calories/100 g	340.3		
Total sugar	11.3-25.3		
Reducing sugars	7.4		
Starch	33.1		
Tannin			20.2

Source : Anon (1976), Ishola *et al.*, (1990); Bhattacharya *et al.*, (1994)

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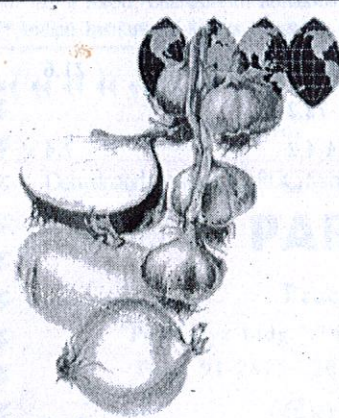
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Table 3 Patents on processes, products and uses of tamarind

Patents granted/Application field	Assignee/Applicant	Year
Patents granted (India)		
Method of preparation of tamarind kernal powder	Chankrapani S and Chankrapani J	1974
A new process for the preparation of TKP	CISIR	1974
A simple process for obtaining a good tanning material from tamarind seed testa	CISIR	1978
Purification of tamarind gum by air classification	General Mills Chemicals Inc.	1979
A enzymatic process for the preparation of tamarind juice concentrate	CISIR	1985
Patents application (India)		
Process for making tamarind pickles	Dilip Shanthnaran Dahanukar	1995
Process for preparing tamarind extract in the form of paste/jam	Shoki Kobayashi	1996
A manufacturing process for tamarind paste and concentrate	Yelantinaga	1996
A new process for recovery of tartaric acid and other products from tamarind pulp	CISIR	1996
Patents granted (USPTO)		
Purification of tamarind gum	General mills Chemicals Inc., USA	1978
Use of TKP as an anti-migrant	Merck & Co. Inc., USA	1982
Clarified tamarind kernel powder	Merck & Co. Inc., USA	1984
Process for separating polysaccharides from tamarind seeds	Shikibo Ltd., Japan	1990
Methods for preparing tamarind oligosaccharides	Lafayette Applied Chemistry Inc., USA	1995
Beverages using tamarind extract and methods of making such beverages	Nutra Sweet Co., USA	1995

Source : TIFAC Bulletin - Intellectual Property Rights (IPR) Vol. 3 No. 9 1997



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properties of pulp and the diuretic properties of leaf sap are well known. Fruit pulp was used as a laxative, the pulp is said to improve the loss of appetite. Tamarind has been used in the treatment of a number of ailments, such as alleviation of sunstroke, *Datura* poisoning and the intoxicating effect of alcohol and ganja. It is said to aid in the restoration of sensation in cases of paralysis, cure malarial fever, treat leprosy and also used as liniment for rheumatism. Both the fruit pulp and leaf are regarded as purgative, diaphoretic and emollient. Powdered seed is often made into paste for the treatment of most external ailments, boils, dysentery, eye diseases and ulcers.

Oil extracted from seed is used as a hair dressing. Leaves are ground into powder and used in lotions or infusions, leaf extracts exhibit anti-oxidant activity in liver when taken internally, leaves are used in cardiac and blood sugar reducing medicines. The leaves are also used to treat ulcers, rheumatic and external swelling.

Tamarind flower, bark and root are also have the medicinal properties. Bark is astringent and is used as a tonic and in lotions. A poultice of flowers is used in the treatment of eye diseases and conjunctivitis. Flowers are also used internally as a remedy for jaundice and bleeding piles.

Tamarind fruit and food products

The pulp of tamarind is used in the manufacture of several products, such as tamarind juice concentrate, pulp powder, pectins, pickle, jam, syrup, candy, tartaric acid, pectin, tartarates,

alcohols, refreshing tamarind drink and tamarind fruit processed into balls (Champog). The product of seed is the kernal powder.

The tree remains under exploited but has extensive domestic and industrial use, though a number of products of tamarind are in use. Product diversification is taking place in countries such as Thailand, Indonesia, Philippines and some African countries. However, this high potential under utilized species has not reached the level of full commercial exploitation in India.

Tamarind-Related Patents

The table 3 shows patents issued for tamarind So far-Eight patents were issued in India and these relates to the preparation of TKP as a sizing agent, tannin material, preparation of gum, preparation of juice and health care applications.

The US patent and trade mark officer (USPTO) granted thirty patents between 1978 and 1997 that relates mainly to the utilization of TKP as a gum and binding agent (Gunasena and Hughes 2001).

In spite of the potential, which is recognized, tamarind has a wide range of domestic and industrial use, still this important tree remains under exploited.

Tamarind is a tree that is easy to cultivate, free from serious pest and diseases, having long life span, and assured income. At the same time product development and diversification is required for commercial exploitation.

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