

Review Article

TAMARINDUS INDICA: A POTENT MEDICINAL HERB.

V. Asha Jyothi* And K. Amtul Raouf Qazi

*Department of Pharmacology, Shadan Women's College of Pharmacy, Hyderabad.

Email: ashajothivadlapudi@gmail.com

ABSTRACT

Tamarindus indica is used as traditional medicine in India, Africa, Pakistan, Bangladesh, Nigeria, and most of the tropical countries. It is used traditionally in abdominal pain, diarrhea and dysentery, helminthes infections, wound healing, malaria and fever, constipation, inflammation, cell cytotoxicity, gonorrhea, and eye diseases. It has numerous chemical values and is rich in phytochemicals, and hence the plant is reported to possess antidiabetic activity, antimicrobial activity, antivenomic activity, antioxidant activity, antimalarial activity, hepatoprotective activity, antiasthmatic activity, laxative activity, and anti-hyperlipidemic activity. Every part of the plant from root to leaf tips is useful for human needs. Thus, the aim of the present review is to describe its morphology, and explore the phytochemical constituents, commercial utilization of the parts of the plant, and medicinal and pharmacologic activities so that T. indica's potential as multipurpose.^[1,2]

KEY WORDS

Tamarind, Tamarindus indica, Medicinal herb

INTRODUCTION:

HISTORY:

Medicinal plants are the back bone of Traditional medicine. Traditionally, the use of plant preparation as sources of drug are based on the experience and superstitions passed from generation to generation, virtually by the word-of-mouth. Research on medicinal plant has increased recently all over the world. Medicinal plants have been used in various systems, as they have potential against numerous diseases. The movement of Tamarind to Asia must have taken place in the first millennium BC. Cultivation of Tamarind in Egypt by 400 BC has been documented and it was mentioned in the Indian Brahmasamhita Scriptures between 1200 and 200 BC. About 370-287 BC, Theophrastus wrote on plants and two descriptions refer to Tamarind, his sources were probably from East Africa the origin of T. indica is unknown.^[2,3]

VERNACULAR NAME: Imli, tamarind^[3]

SYNONYM(s):

Tamarindus occidentalis Gaertn.

Tamarindus officinalis Hook.

Tamarindus umbrosa Salisb.^[2]

COMMON NAMES:

Afrikaans: tamarinde

Amharic: humer, roka

Arabic: aradeib, ardeib

Bemba: mushishi

Bengali: amlı, anbli, nuli, tentul, tintiri, tintul

English: Indian date, madeira mahogany, tamarind tree

French: tamarinde, tamarinier

Fula: dabe, jammeh, jammi

Hindi: amlı, anbli, imli, tamrulhindi

Indonesian: asam, asam jawa, tambaring

Nepali: imli

Spanish: tamarin, tamarindo

Trade name: tamarind^[1,2,3]

CURRENT NAME: Tamarindus indica

Authority: L.

Family: Fabaceae – Caesalpinioideae^[1]

ORIGIN: Tropical Africa & India ^[1]

TAXONOMICAL CLASSIFICATION:

Kingdom: *Plantae*

Phylum: *Spermatophyte*

Class: *Angiosperm*

Sub class: *Dicotyledone*

Family: *Leguminosae*

Subfamily: *Caesalpinieae*

Genus: *Tamarindus*

Species: *indica*^[2,3]

BOTANIC DESCRIPTION:

Tamarindus is a monotypic genus within the Caesalpinieae subfamily of legumes. It consists of dried fruits of Tamarindus indica belonging to family leguminosae. It is a large tree averaging 20 to 25 meters in height and 1 m in diameter. It has

a wide, spreading crown and a short, stout trunk. The bark is strongly fissured and scaly grey on the stem and smooth on the branches. Leaves are alternate and paripinnate—each with 9 to 12 pairs of small leaflets. Small yellow flowers streaked with pink are contained in groups of 5 to 10 in drooping racemes 3 to 5 cm long. The pods are typically leguminous in appearance, oblong, straight or slightly curved, turning from green to dark brown as they ripen.^[2,4,7]

HABIT: 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.^[5]

HABITAT: Tropical seasonally dry forest, woodland and wooded grassland, often found along rivers.^[3]

STANDARD VALUES:

S.NO.	CONSTITUENTS	PULP	SEEDS
1	Saponification value (mgKOH/g)	266.6	266.6
2	Iodine Value	78.1	78.1
3	Unsaponified matter (g/kg)	31.3	31.3
4	Acid value (g/kg)	292.6	292.6
5	Free fatty acid (g/kg)	46.3	46.3
6	Peroxide value (m Eq/kg)	98.9	98.9

PHYTOCHEMICAL INVESTIGATION OF TAMARINDUS INDICA:

Phytochemical investigation carried out on T. indica revealed the presence of many active constituents, such as phenolic compounds, cardiac glycosides, L-(-) malic acid, tartaric acid, the mucilage and pectin, arabinose, xylose, galactose, glucose, and uronic acid. The ethanolic extract of T. indica showed presence of fatty

acids and various essential elements like arsenic, calcium, cadmium, copper, iron, sodium, manganese, magnesium, potassium, phosphorus, lead, and zinc.^[4,5,6,8]

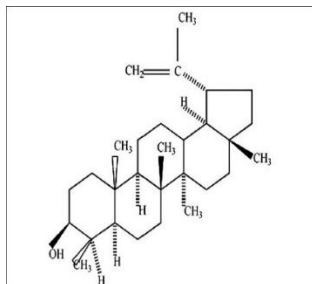
CHEMICAL CONSTITUENTS OF TAMARINDUS INDICA:

The pulp contains organic acids, such as tartaric acid, acetic acid, citric acid, formic acid, malic

acid, and succinic acid; amino acids; invert sugar (25-30%); pectin; protein; fat; some pyrazines (trans-2-hexenal); and some thiazoles (2-ethylthiazole, 2-methylthiazole) as fragrant; and the seed polysaccharides are found with a main

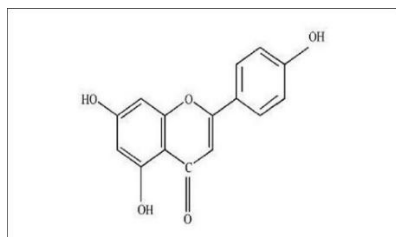
chain consisting of β -1,4-connected glucose molecules together with xylose (α -1,6) and galactose; total protein; lipids with fatty oils; and some keto acids. In the leaves of the plant, two triterpenes, lupanone and lupeol were found.

1) LUPEOL

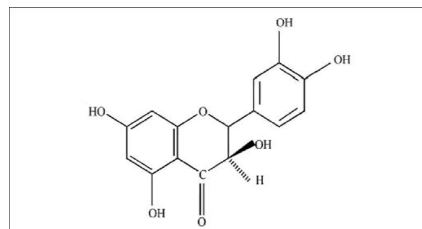


The leaf oil contains 13 components among which linonene and benzyl benzoate were most predominant. Phytochemical investigation of the root bark of *T. indica* showed the presence of n-hexacosane, eicosanoic acid, apigenin, catechin, eriodictin and taxifolin. The presence of the bioactive compound (+)-pinitol in this plant is being reported for the first time. The major fatty acids of seeds were palmitic acid, oleic acid, linoleic acid, and eicosanoic acid. The unsaponifiable matter from the seed oil of *T. indica* showed presence of β -amyrin, campesterol, β -sitosterol and seven hydrocarbons.^[5,7,9,11]

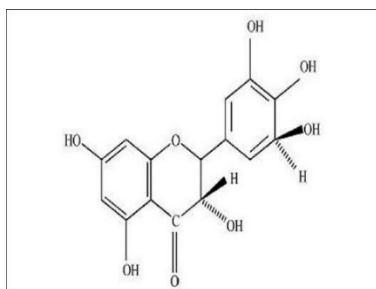
2) Apigenin



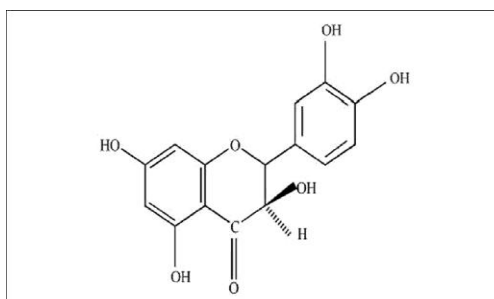
3) Catechin



4) Eriodictin



5) Taxifolin



MEDICINAL & PHARMACOLOGICAL PROPERTIES:

1) ANTIMICROBIAL ACTIVITY:

T. indica has a broad spectrum of antibacterial activity. The methanolic leaf extract of T. indica was assessed for antibacterial activity against *Burkholderia pseudo mallei*, and its name in vitro inhibitory potential suggests further animal studies to understand the role of T. indica in treating melioidosis. Methanol and acetone extracts of T. indica have showed significant antimicrobial activity against *Klebsiella pneumoniae* the antibacterial activity was done by agar disk diffusion method. The activity was compared with standard antimicrobials Amikacin and Piperacillin. The antimicrobial activity of the concentrated extracts (aqueous, ethanolic, acetone extract) were evaluated by determination of the diameter of zone of inhibition against both gram-negative and gram-positive bacteria and fungi using the paper disk diffusion method. These have potent antimicrobial activity against *Salmonella paratyphi*, *Bacillus subtilis*, *Salmonella typhi*, and *Staphylococcus aureus* etc.^[10,11]

2) ANTIOXIDANT ACTIVITY:

The seed and pericarp of T. indica contain phenolic antioxidant compound. Soxhlet methanolic extract of T. indica may be an important source of cancer chemopreventive. All extracts of T. indica exhibited good antioxidant activity (64.5–71.7%) against the linoleic acid emulsion system and the values were lower and higher than the synthetic antioxidant, butylated hydroxyl anisole and ascorbic acid. Thai Tamarind seed coat using solvent extraction with ethanol was found to be the most active in terms of peroxide value. Ethanolic extract of fruit pulp of T. indica showed significant antioxidant and hypolipidemic activity in hypercholesterolemic hamsters, Antioxidant activity of ethanolic

extract of seed coat of T. indica by DPPH (2,2-diphenyl-1-picrylhydrazyl) free radical scavenging method using ascorbic acid as a standard. This activity of T. indica extract may be attributed to its free radical-scavenging ability.^[12,13]

3) LAXATIVE PROPERTIES:

The fruit of T. indica is used traditionally as a laxative, due to the presence of high amounts of malic and tartaric acids and potassium acid. Tamarind use as a laxative refers to the use of its fruit, and also the use of a macerate of its leaves with potash has been reported in northern Nigeria.^[13]

4) ABDOMINAL PAINS:

Abdominal pain is not a specific disorder but a complaint, which refers to a painful abdomen and which may have a wide variety of causes, including constipation or diarrhea. Soaked fruits are also eaten by rural Fulani in Nigeria, to relieve pain.^[13]

5) WOUND HEALING:

T. indica is often cited in the literature concerning the treatment of cuts, wounds, and abscesses. T. indica, bark or leaves are most commonly used, is applied externally on the spot, either as a decoction or as a powder or poultice, alone or in combination with other species. Tamarind bark is mostly sold for wound healing purposes, occasionally other Tamarind plant parts are found in wound healing medicine, such as the fruit, the pod husks, or the gum. A decoction of T. indica leaves is one of the most important agents to clean wounds caused by Guinea worm infections.^[14]

6) MALARIA & FEVER:

Fruits of Tamarind are known as a febrifuge in Madagascar; in Ghana, malaria is treated with Tamarind leaves, and the fruit pulp is used as a febrifuge and laxative.^[12]

7)ANTIDIABETIC AGENT:

An aqueous extract from *T. indica* seeds had a potent antidiabetogenic activity in Streptozotocin-induced diabetic male rats. The aqueous extract of *T. indica* seeds was given to mild diabetic and severe diabetic rats, and hyperglycemia was significantly reduced, measured by fasting blood glucose levels. Similarly, hyperlipidemia was found to be reduced, measured by different contents of cholesterol. This rat model may shed some light on the basis of ancient herbal therapy in India.

[13,14]

8)EFFECT ON CELLULAR SYSTEM:

T. indica has shown to have an effect on the cellular system. The methanolic extract of *T. indica* fruit L-(-)-Di-n-butyl maleate was isolated and it exhibited a pronounced cytotoxicity against sea urchin embryo cells. A polysaccharide isolated and purified from *T. indica* showed immunomodulatory properties like phagocytic enhancement and inhibition of leukocyte migration during cell proliferation. Phenolic flavonoids from the seed coat extract showed inhibitory effect on nitric oxide production. In a murine macrophage-like cell line RAW 264.7 and in mouse peritoneal macrophages the extract significantly attenuated the nitric oxide production with 68%, in a concentration dependent manner. [12,14]

9)HEPATOPROTECTIVE & ANTI-ASTHMATIC ACTIVITY:

Some experimental studies have predicted that *T. indica* shows antiasthmatic and hepatoprotective effect. The methanolic extract of leaves of *T. indica* Linn, exhibited significant antihistaminic, adaptogenic, and mast cell stabilizing activity in laboratory animals. Protective effect of *T. indica* Linn. (Caesalpiniaceae) 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.) were administered and a significant hepatoregenerative effect was observed for the aqueous extracts of Tamarind leaves, fruits, and unroasted seeds as judged from the parameters studied. [12]

10)ANTIINFLAMMATORY & ANALGESIC:

T. indica bark is used in the treatment of pain traditionally, and the present work was undertaken to prove this scientifically by using suitable animal screening models, such as hot plate test and acetic acid induced writhing test at the dose of 50 mg/kg, i.p. Petroleum ether extract showed significant increase in reaction time as compared with other extracts. Preliminary phytochemicals test showed presence of sterols and triterpenes in the extract; hence these compounds might be responsible for analgesic activity. [13]

11)EFFECT ON ENZYME:

Proteinase inhibitors with high inhibitory activities against human neutrophil elastase were found in seeds of the Tamarind tree (*T. indica*). A serine proteinase inhibitor denoted PG50 was purified using ammonium sulfate and acetone precipitation activity showed that PG50 preferentially affected elastase release by platelet activating factor stimuli and this may indicate selective inhibition on platelet activating factor (PAF) receptors. [12,13]

12)HELMINTH INFECTION:

Tamarind leaves are used in the extraction of Guinea worms, and afterward in the treatment of wounds, left by the parasite macerate of the seeds is used as vermifuge, and also the fruits are used for this purpose. An extract of the leaves and the root is used to treat ankylostomiasis (hookworm) in some parts of Tanzania. [13]

13) DIARRHEA & DYSENTRY

Tamarind is also used for treating diarrhea and dysentery. Dysentery is a type of diarrhea

containing mucus or blood, usually caused by an infection of the intestine. When diarrhea is not treated properly, the patient has risks of dehydration and death. The Tamarind pulp with lemon is used to treat diarrhea, and the root is used to treat dysentery.^[14]

SAFETY PROFILE: Tamarind has no known reported cases of allergic or toxicity, and may be safely used in pregnancy and in nursing mothers. There is no proven safe or effective dose of tamarind. However, 10 grams daily for up to three weeks has been used to delay the progression of fluorosis by enhancing excretion of fluoride. As a laxative, 10-50 grams of tamarind paste as fermented fruit cubes has been used.^[15]

REFERENCE:

1)Text Book of Pharmacognosy by C. K. Kokate, page no 275-278.

2) Text Book of Pharmacognosy by Treas and Evans,page no 175.

3)Text Book of Pharmacognosy by T. E. Walis; page no 225

4)Fundamentals of Pharmacognosy and Phytotherapy by Michael Heinrich, Joanne Barnes, Simon Gibbons, Elizabeth M. Williamson

5)www.springerlink.com/phytochemistry on tamarindus indica/article.asp.

6). www.ijpsonline.com/article.asp?issn=0250-474X;year

7) www.ijpsonline.com/article.asp?issn=0250-474X;year...6;

8) www.ncbi.nlm.nih.gov > ... > Pharmacogn Rev > v.5(9); Jan-Jun 2011

9) Dietary Supplementation Health and Education Act of 1994, Public Law No. 103-417

10)Blumenthal, M. ed. Complete German Commission E monographs; Therapeutic guide to herbal medicines. Austin Tex: American Botanical Council, 1998

11)Natural Medicines Comprehensive Database 2006

12)www.NaturalDatabase.com

13)http://www.herbmed.org

14)www.herbalgram.org