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# A Review on the traditional and pharmacological applications of the seeds of *Tamarindus indica*

**Malathi R* & Indira M. N.**

Department of Life Sciences, Kristu Jayanti College (Autonomous), Bengaluru, Karnataka, India-560077

## ABSTRACT

*Tamarindus indica* is traditionally used as for its pharmacological importance. The seeds of Tamarind comprise of campesterol, β-amyrin, β-sitosterol, palmitic acid, oleic acid, linoleic acid and eicosanoicacid, mucilage, arabinose, xylose, galactose pectin, glucose and uronic acid, bufadienolide (Scilliroside 3-O-β-D glucopyranosyl - (1-2)-Lrhamnopyranoside) and a cardenolide (uzarigenin-3-O-β-Dxylopyranosyl (1-2)-α-Lrhamnopyranoside). The presence of the chemical and biochemical constituents confer the different pharmacological activies such as anti-oxidant activity, antidiabetic activity, antivenom activity, hepatoprotective activity, ophthalmological activity, cytotoxic activity, effect on enzymes, anti-inflammatory activity etc.

**KEY WORDS:** *Tamarindus indica* seeds extract, pharmacological activities, Palmitic acid, Campesterol, β-amyrin

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## 1. INTRODUCTION

*Tamarindus indica* L. is natural to tropical Africa and unusual to Asia and Central America. It belongs to the family fabaceae, commonly known as tamarind. *Tamarindus indica* is edible as fresh (ripe or unripe) and it can be consumed and processed into different products. Two main varieties of tamarind are sour and sweet. It encompasses invert sugar, citric acid, oleic acid, linoleic acid, volatile oils (geraniol, limonene), pipecolic acid, lupeol, orientin, vitamin B3, vitamin C, vitexin, phenylalanine, leucine, potassium, Campesterol, β-amyrin, β-sitosterol, Tannins, saponins, glycosides. Because of its composition it possess a range of medicinal uses and thus used to treat diseases like liver, as an acid refrigerant, as a gentle laxative, in yellow fever, as a blood tonic, usefulness in jaundice, and as a skin cleanser *(Zohrameena S et al., 2017).*

Tamarind is used in herbal medicine in many parts of the world *(Siddhuraju P, 1995)*. Medicinal uses of tamarind can be found in many cultures and have wide applications. The leaves, fruits and seeds have been extensively used in traditional medicines. *T. indica* is used in the treatment of abdominal pain, diarrhea, dysentery, infections caused by helminthes. It also possesses wound healing, antimalarial and antifebrile properties. It is sued to cure constipation, inflammation, cell cytotoxicity, gonorrhoea, and eye diseases. Tamarind seeds are rich in phytochemicals, and hence are known to possess antidiabetic, antimicrobial, anti-venomic, anti-asthmatic, and anti-hyperlipidemic properties *(Bhadoriya SS et al., 2011).* Recent surveys have listed local folk uses of tamarind as remedies for a number of diseases *(Rimbau V et al., 1999).* The seeds of *Tamarindus indica* contain Campesterol, β-amyrin, β-sitosterol, palmitic acid, oleic acid, linoleic acid and eicosanoicacid, mucilage, arabinose, xylose, galactose pectin, glucose and uronic acid *(Ibrahim E amd Abbas SAE, 1995).*

A new bufadienolide (Scilliroside 3-O-β-D glucopyranosyl-(1-2)-Lrhamnopyranoside) and a cardenolide (uzarigenin-3-O-β-Dxylopyranosyl (1-2)-α-Lrhamnopyranoside) were identified from the seed extract *(Yadara RN and Yadav SV, 1999)*. In this review article, different ethno-botanical and pharmacological activities of seeds of *Tamarindus indica* are discussed.

## 2. TRADITIONAL USE OF SEEDS

The seeds of Tamarind are mostly wasted in the past and even today. The seeds of tamarind are a by-product of the tamarind pulp. It is used as tamarind kernel powder (TKP). The presence of tannins and other dyeing matter in the testa make the entire seed unsuitable for direct consumption. The seeds are soaked and boiled in water, to remove the seed coat, which further makes it edible *(El-Siddig K et al., 2006).*

The powdered seeds are ground into a paste and, with or without cumin seeds and palm sugar, are prescribed for chronic diarrhea and dysentery. The seed coat has astringent properties and is specified for the latter disorders. An infusion of the roots is believed to have curative effect in chest complaints and is an ingredient in prescriptions for leprosy *(Morton Julia F and Curtis F Dowling, 1987).* The seed testa contains tannins which is used to make leathers, heavy soles, suitcases and also used in the preparation of ink. The husk of the seed too has been found to be effective on fish poison *(Morton Julia F and Curtis F Dowling, 1987)*.Tamarind seed is also the raw material used in the manufacture of polysaccharide (Cellulose), adhesive and tannin. The gelling and adhesive nature of the decorticated seed powder has been recommended for use as a stabilizer in ice cream, mayonnaise and cheese, and as an ingredient or agent in a number of pharmaceutical products *(Morton Julia F and Curtis F Dowling, 1987; El-Siddig K et al., 2006; Kumar CS and Bhattacharya S, 2008).* Roasted seeds are supposedly to be superior to groundnuts in flavor *(ICRAF, 2007).* In view of the rich nutrient and chemical composition, tamarind seeds may be substituted as an inexpensive alternative protein source to alleviate malnutrition among traditional people living in developing countries *(Siddhuraju P et al., 1995).* In Ethiopia, a macerate of the seeds is used as vermifuge *(Le Floc'h E et al., 1985),* Crushed and boiled seeds used to treat urinary schistosomiasis *(Hewlett BS and Cline BL, 2001).*

*Author for correspondence: Malathi R | Email: malathi@kristujayanti.com

## 3. PHARMACOLOGICAL ACTIVITIES:

### 3.1 Anti-Oxidant Activity:

Studies show that the seed has high phenolic antioxidant. The phenolic content confers many properties which makes the seed to be used for medicinal purposes. The ethanolic extract of seed coat was assessed for DPPH (2, 2-diphenyl-1-picrylhydrazyl) free radical scavenging property using ascorbic acid as a standard. This confirms the ability of the seed coat extract to act as antioxidant *(Yadara RN and Yadav SV, 2009)*. Phenolic flavonoids from the seed coat extract also 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 diminished the production of nitric oxide, in a concentration-dependent manner *(Kumutarin T et al., 2004)*.

### 3.2 Anti-diabetic activity:

Aqueous seed extract of *Tamarindus indica* has potent anti-diabetic activity. The study showed that the aqueous seeds extract has shown significant reduction in the hyperglycemia in rats with mild to moderate diabetes mellitus induced with Streptozotocin. This extract also has lipid reducing effect in hyperlipidemia *(Maiti R et al., 2004)*.

### 3.3 Anti-venom activity:

Tamarind seed extract dose dependently inhibited the protease, PLA (2), hyaluronidase, l-amino acid oxidase and 5'- nucleotidase enzyme activities of venom. These are the main hydrolytic enzymes responsible for the primary effects of envenomation, such as local tissue damage, inflammation, and hypotension. The seed extract neutralized the degradation of the beta chain of human fibrinogen which indirectly inhibits hemolysis caused by venom *(Ushanandini S et al., 2006)*.

### 3.4 Hepatoprotective Activity:

The aqueous extract of seeds (700 mg/kg p.o.) was administered for 9 days after giving the third dose of paracetamol. The Biochemical parameters were estimation such as aspartate transaminase, alanine transaminase, alkaline phosphate, bilirubin and total protein and recorded on 4th and 13th day. Liver weight variation, thiopentone-induced sleeping time and histopathology were studied on the 13th day. Silymarin (100 mg/kg p.o.) was used as standard. The aqueous extract of Tamarind showed a marked hepato- generative effect. The unroasted seeds ($p< 0.05$) as adjudged from the parameters studied *(Pimple B et al., 2007)*.

### 3.5 Ophthalmological activity:

The polysaccharide present in the seeds of *T. indica* used as eye drops to treat eye problems such as dry eye syndrome, ocular burning ,trouble blinking, and sensation of having something in one's eye *(Sahelian R, 2007)*.

### 3.6 Cytotoxic activity:

The tamarind seed polysaccharide's carcinogenic potential was examined in both sexes of B6C3F1 mice. The results of the study demonstrated that its polysaccharide is not carcinogenic in B6C3F1 mice of either sex. The methanolic extract of seeds of tamarind was found to have L di-n-butyl maleate which is a cytotoxic agent against the embryo cells of sea urchin *(Sano M et al., 1996)*.

### 3.7 Effect on enzymes:

The high inhibitory activity against human neutrophil elastase was found in seeds due to the presence of Proteinase inhibitors. A serine proteinase inhibitor PG50 was purified using ammonium sulfate and acetone precipitation activity, showed that PG50 specially affected elastase release by platelet activating factor stimuli and this may indicate selective inhibition on platelet activating factor (PAF) receptors *(Fook JM et al., 2005)*.

### 3.8 Anti-inflammatory activity:

The 95% ethanolic extract of *T. indica* seed was detected to be a potent reducer of pro-inflammatory mediators, arthritis-mediated cartilage and bone degradation in adult Wistar rats at a dosage range of 25–50 mg/kg per day after 15 days of treatment *(Sundaram SM et al., 2015)*. In additional *in vivo* study, the ethyl acetate seed extract and the petroleum ether fraction of *T. indica* seeds significantly ($p < 0.01$) increased latency to tail flick in the tail immersion method in Wistar rats, and increased the mean basal reaction time in the hot plate method at a particular doses of 50 mg/kg and 100 mg/kg body weight. Similarly, the methanolic seed extract of *T. indica* significantly ($p < 0.01$) reduced paw edema stimulated by carrageenan in Wistar albino rats at doses of 100 mg/kg, 200 mg/kg and 400 mg/kg body weight *(Hivrale GM et al., 2013)* and also exhibited a marked anti-inflammatory and central analgesic activity ($p < 0.05$) in a dose-dependent manner in rat models *(Bandawane D et al., 2013)*.

## 4. CONCLUSION

The tamarind seeds are traditionally used for different purposes including preparation of ink, heavy soles, an ingredient in leprosy prescription, seed husk for fish poison, as gelling agent, as adhesive, as a stabilizer in ice cream, mayonnaise and cheese. It has been used as flavoring agent, alternative protein to alleviate malnutrition. This seed power has been used as an ingredient in different pharmaceutical products, as vermifuge and also to treat schistosomiasis. The different pharmacological activities found in the seed extract are anti- oxidant activity, anti-diabetic activity, anti-venom activity, hepatoprotective activity, ophthamological activity and anti-inflammatory activity. The extract also has inhibitory activity against the human neutrophil elastase. Thus the extract of seeds can be used in treating different disorders and can be used as fortifying agent for proteins and also can be used as adhesives at low cost.

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## CONFLICTS OF INTERESTS

The authors have no conflicts of interest regarding this investigation.

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