

Tamarindus Indica: An Important Medicinal Plants

Ghumare Pramila¹, Dattatraya Jirekar

^{1,2}Anandrao Dhonde Alias Babaji Mahavidyalaya Kada. Dist. Beed, India

Abstract - *Tamarindus indica* is a plant that can be used traditionally in wound healing, snake bite, abdominal pain, colds, inflammations, diarrhea, helminth infections and fever. It may also play a role as antimicrobial, antidiabetic, anti-inflammatory and effects on the control of satiety, playing a potential role in the treatment or prevention of obesity and other chronic diseases. These effects are probably due to the presence of polyphenols *Tamarindus indicus* includes a variety of bioactive compounds in the leaves, seeds, bark, pulp, and flowers with beneficial effects to human health and the possibility of application in the pharmaceutical industry.

Index Terms - *Tamarindus indica*, antioxidant, anti-diabetic, anti-inflammatory.

INTRODUCTION

Herbal medicine plays a powerful part in both traditional and modern system of medicine. In India due to its tropical weather, it is blessed with rich heritage of plant kingdom [1]. The phytochemical is naturally occurring, biologically active chemical compounds in plants, phytochemicals carotenoids, flavonoids, and polyphenols. The most important of the bioactive contains of plants are alkaloids, phenols, terpenoids, flavonoids, glycosides, tannins, protein, steroids, lipids, and amino acid compared many of the indigenous medicines plant are used as spices and food plant. Tamarind is especially useful for managing pain and inflammation on joints. It has been seen that leaves as well as pulp crushed and applied on swollen joints provides great relief and reduces inflammation. Tamarind used for treating sore throat. It is either gargled or drunk as tamarind juice to help relief pain and discomfort of sore throats [2-3]. In Northern Nigeria, the fresh stem bark and leaves are used as decoction variegated with potash for the treatment of stomach disorder, general body pain, jaundice, yellow fever and as a blood tonic and skin cleanser [4]. Various parts have been expansively studied in terms of the pharmacological activity potent antibacterial, antifungal, hypoglycemic, cholesterol emic [5],

hypolipidemic, antioxidant [6], antihepatotoxic, anti-inflammatory [7], and antidiabetic [8] properties. The phytochemicals study in the human system due to their therapeutic properties cure many ailments which cannot be cured by the modern drugs [9]. This may help to advance safer antimicrobial drugs [10]. Flowers are in bunches, yellow in color and boat-shaped [10], seeds are reddish brown, thick [11], bark of the trunk is scaly; leaves are paripinnate and 15 cm in length [12].

Taxonomical classification [13]

Kingdom	:	Plantae
Phylum	:	Spermatophyte
Class	:	Angiosperm
Sub class	:	Dicotyledon
Family	:	Leguminosae
Subfamily	:	Caesalpinieae
Genus	:	<i>Tamarindus</i>
Species	:	<i>indica</i>

Vernacular name [14]

Hindi	:	<i>Ambli, Imlii</i>
English	:	<i>Indian date, sweet tamarind</i>
Afrikaans	:	<i>Tamarindo</i>
Arabic	:	<i>Aradeib, Tamar el hindi.</i>
Burmese	:	<i>Ma gyi, Ma jee pen.</i>
Chinese	:	<i>Da ma lin, Luo huang zi.</i>
Danish	:	<i>Tamarind</i>
Philippines	:	<i>Sampaloc</i>
Estonian	:	<i>Tamarindipuu.</i>
Greek	:	<i>Tamarin</i>
Japanese	:	<i>Tamarindo</i>
Srilinka	:	<i>Sinhala</i>

Properties of *Tamarindus indica*:

Literature brings several studies about tamarind compounds and its effects. Table:1 shows some properties of this plant, the part that are used and the active components present in it [15].

Table 1: Properties and active components of different parts of *T. indica*.

Part of the plant	Properties	Active components
Bark	Antiallergic, antimicrobial, antibiotic,	Rich in tannins and polyphenols: N-Hexacosane, eicosanoic acid, b-sitosterol, octacosanyl ferulate, 21-oxobehenic acid, and (+) - pinitol and phenolic antioxidants for proanthocyanidins in several ways: catechin, procyanidin B2, epicatechin, procyanidin trimer, procyanidin tetramer, procyanidin pentamer, procyanidin hexamer along the taxifolin, apigenin, eriodictyol, luteolin and naringenin.
Seed	Anti-inflammatory activity; Effects on the control of satiety, having a potential for treatment or prevention of obesity; gastroprotective effects.	Source of protein and starch, sulfur amino acids and phenolic antioxidants as proanthocyanidins and epicatechin. Inhibitors of proteinases.
Leaves	Antiemetic activity and protection for the liver.	Source of protein, lipid, fiber and vitamins like thiamine, riboflavin, niacin, ascorbic acid and β-carotene. Composed by 13 essential oils, in which limonene benzoate and benzyl are the most important compounds, followed by pentadecenoyl and hexadecanol.
Fruit/ Pulp	Hypolipidemic activity, antioxidant, anti fluorose, analgesic, hepatoregenerativa and antispasmodic.	B vitamins, minerals, 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).
Stem bark	The tea is used for sore throat. Spasmogenic, analgesic, antimicrobial and hypoglycemic activities.	Flavonoids, cardiac glycosides, alkaloids, saponins and tannins.

PHARMACOLOGICAL PROPERTIES

Antioxidant properties:

The antioxidant activity is specifically related to the presence of phenolic compounds that show specific common structures that allow them to be reducing agents, hydrogen donors and singlet oxygen scavengers, among other reaction mechanisms. At the cellular level, several antioxidant compounds are known to be capable of stabilizing or destroying free radicals, thereby preventing damage to cell structures. Its greatness in human health has been described extensively and many studies have shown they may play various roles as protection against cardiovascular disease (reducing chronic inflammation and improving endothelial function), certain types of cancer and cytotoxic effects.

Methanolic extract of *T. indica* may be an important source of cancer chemo preventive. 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 [16]. Thai *Tamarind* seed coat using solvent extraction with ethanol was found to be the most active in terms of peroxide value [17].

Ethanol extract of fruit pulp of *T. indica* showed significant antioxidant and hypolipidemic activity in hypercholesterolemic hamsters, [18] Antioxidant activity of ethanol 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.

Ethanol extract obtained from the seed coat of *T. indica* exhibited antioxidant activity as measured by the thiocyanate and thio-barbituric method [19]. Ethyl acetate extracts prepared from the seed coat also had strong antioxidant activity. This was confirmed by some authors *T. indica* seed coat, a byproduct of the

Tamarind gum industry, could be used as a safe and low-cost source of antioxidant, although other herbals may be more effective [20].

Antimicrobial activity:

He studied that the methanolic leaf extract for antibacterial activity against *Burkholderia pseudo mallei* and its *in vitro* inhibitory potential suggests further animal studies to understand the role of *T. indica* in treating melioidosis [21]. The antimicrobial activity of the concentrated extracts (aqueous, ethanolic, acetone) was evaluated by determination of the diameter of the zone of inhibition against both gram-positive and gram-negative bacteria and fungi using the paper disc diffusion method. These reported possessing potent antimicrobial activity against *Salmonella paratyphoid*, *Bacillus subtilis*, *Salmonella typhi*, and *Staphylococcus aureus* [22]. Author studied that the Methanol and acetone extracts have shown significant antimicrobial activity against *Klebsiella pneumonia* by agar disc diffusion method [23].

Antidiabetic activity:

An aqueous extract from *T. indica* seeds had a heavy 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 [24]. 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 [25].

Anti-diarrheal & Anti-dysentery activity:

Tamarind is also used for treating diarrhea and dysentery. The Tamarind pulp with lemon is used to treat diarrhea (anti-diarrheal activity), and the root is used to treat dysentery (Anti-dysentery activity). 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 [26].

Hepatoprotective and antiasthmatic 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 [27]. 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 [28].

Anti-inflammatory activity:

Aqueous ethanol and chloroform extracts from *T. indica* were evaluated for anti-inflammatory properties in mice (ear oedema induced by arachidonic acid) and rats (sub plantar oedema induced by carrageenan) after topical or i.e., administration, respectively. Results showed that the plant exhibit anti-inflammatory activity [29].

Laxative properties:

The fruit is used traditionally as a laxative, due to the presence of high amounts of malic and tartaric acids and potassium acid [30]. Children in Madagascar are given whole Tamarind fruits for breakfast to overcome constipation. The laxative can be taken in the form of a sweetmeat, called Bengal by the Wolof people of Senegal, prepared from the unripe fruit of Tamarind and sometimes mixed with lime juice or honey [31]. 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 constipation [32]. Roots, prepared as an extract, are used in the treatment of stomachache or painful abdomen, mainly in East Africa [33].

Hypolipidemic and hypoglycemic properties

Hyperglycemia, hyperlipidemia and overweight or obesity are the main consequences of diabetes mellitus, metabolic syndrome and cardiovascular problems, that are the main causes of death worldwide. In modern medicine there is no therapy efficient enough to release these diseases, and the existent drugs are expensive and present undesirable side effects. Some authors have shown the importance of *T. indica* in the control of these metabolism abnormalities.

Aqueous extract of the seed orally administrated to rats and humans, improvement in the hyperlipidemia, hyperglycemia, and lipid peroxidation and improvement in the antioxidant defense system efficiency. Aqueous extract of the pulp orally given to Hypocholesterolemic hamster they show hepatoprotective activity. Hypocholesterolemic and antioxidant properties. Potential protection against oxidative damage. Ethanolic extract of the pulp orally given to obese rats and hypercholesteremic hamster, there is decrease in body weight, on serum cholesterol and triglycerides and increase in HDL-c levels (treatment of obesity induced by a cafeteria diet) [34].

Anti-pyretic activity:

Tamarind also possesses antipyretic activity. A polysaccharide obtained from *Tamarindus indica* pulp had been shown to possess antipyretic activity against yeast induced pyretic rats and lipopolysaccharide (*E. coli*) induced pyrexia in mice [35].

Anti-malarial activity:

The Fruits of *T. indica* are known as a febrifuge in Madagascar [36], whereas; in Ghana, Tamarind leaves are used for the treatment of malaria [37].

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