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A Review on Phytochemical Study of Pharmacological Design And Traditional Uses of Tamarindus Indica L.

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Abstract: Tamarindus indica L., commonly known as the Tamarind tree, is India's major tropical fruit tree. Tamarindus is a solitary species in the subfamily Caesalpinioideae of the Leguminosae family (Fabaceae). People assumed it was grown on an Indian palm tree because the Persian title "Tamar-I-hind" means "date from India." A marker of age, amlika in Sanskrit. For gonorrhea and pain associated with the disorder, herbalists use it to cure diarrhea and wound healing, among other ailments and ailments. Phosphatidylcholine (PCH) is a naturally occurring phospholipid found in plants. Humans can use plant roots and leaf tips, too. This review will examine its structure, phytochemical makeup, medicinal and pharmacological properties, and multipurpose potential.

Keywords: Tamarindus Indica, Anti-inflammatory, Phytochemical, Pharmacological, Antimicrobial

1. INTRODUCTION

Inflammatory processes protect damaged tissue from further damage as the body's first line of defense against infection or injury. Despite its significance in early infection defense systems, chronic inflammation has long been linked to non-infectious diseases like arthritis [2]. Ibuprofen, as an anti-inflammatory, inhibits the activity of many kinase enzymes[3,4], reducing the host's ability to fight infection. As a result, the ancient practice of using medicinal herbs to cure and regulate inflammation and physiological pain is gaining worldwide popularity. [4]. Medicinal herbs are undeniably important in treating and preventing human inflammatory diseases. *Tamarindus indica*, a common medicinal plant, has potent anti-inflammatory properties[4,5]. Traditional medicine uses this tropical tree to treat rheumatoid arthritis, inflammation, stomach ache, and throat pain. [9–12] The herb has been used to treat wound healing, diarrhea, parasite infestations, fevers, and malaria. It has also been used as an aphrodisiac and to alleviate constipation. Popular food supplement [12, 13]. *T. indica* is widely traded due to its numerous economic and health benefits. Seven, sixteen, and seventeen all fit this bill. Phytochemicals identified in T. indica's various parts are linked to its medicinal effects and use in traditional folk medicine. [18, 19, 20] There has been numerous peer-reviewed journal research on its medicinal application for treating inflammation and physiological pain. This review examined the anti-inflammatory and analgesic mechanisms of *T. indica* phytochemicals and extracts.

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Plant description & Morphology

Tamarindus indica [Figure 1] is a 24 m tall and 7 m wide evergreen tree. New morphological and molecular research will assist clarify Tamarindus' exact place within its assumed related genera. [3–7] Except in the Himalayas and dry western regions, it is grown as a big evergreen tree with an extraordinarily lovely spreading crown. [8] The leaflets are narrowly oblong, 12-32 mm, with fine hairs on the petiole and rachis; the midrib and net veining are more or less visible on both surfaces. The plant is covered in 2.5 cm broad pale yellow or pinkish flowers. The pomegranate is a subcylindrical indehiscent pod with a velvety brown interior and flaky skin. It contains a sticky edible pulp that can be eaten raw or cooked. The testa is solid, lustrous, and smooth, with 3-10 1.6 cm long seeds.

Fig: 1 *Tamarindus indica*

Vernacular name

Tamarinds were traded all across the world when in high demand. Archaeological evidence dates the cultivation of *Tamarindus indica* to the 4th century B.C. This name came about when traders from Arabian countries noticed the fruit's sticky black pulp and seeds resembling their native date palm. Hence, they merged the two Arabic names 'tamr' and 'Hindi,' which means 'Indian fruit' from which the scientific name Tamarindus comes.

Species Profile

Geography and distribution

Tamarind has been widely farmed since the dawn of civilization. Thus its origin is unknown. Its natural habitat appears to be Africa and Madagascar. However, it is found all across the tropics. It was once cultivated but has subsequently become an invasive weed.

Description

Overview: A 30 m tall tree with a 12 m wide crown spreads outwards.

Leaves: Up to 15 cm of leaflets are organized in pairs along a central axis, each of which closes at night.

Flowers: They have three golden petals with crimson veins and two thin thread-like petals that are hardly visible. The inflorescences can reach 20 cm.
Fruits: Due to their acidity, the brown, short-haired, sausage-like fruits are used in sweets, curries, and pickles.

Uses

Because of its widespread use and cultivation, the sticky, sour pulp of the tamarind tree has been used in cuisine for millennia. Eat the fruits fresh, especially the pulp, in curries, pickles, confections, and fermented beverages. The seeds are good raw or cooked. Tamarind wood can be used for fuel and charcoal. Ornamental application of the plant is widespread.

Cultivation

Tamarindus indica is grown at Kew using semi-ripe apical or internodal cuttings. Initially, they are heated and sprayed with fog in a misting unit. Plants are potted into a loam- or organic compost mixture after rooting. They are then kept between 18 and 28^0 c. The watering schedule keeps the substrate wet but not soggy. The mealybug is a hazard to this species and is physically removed.

Chemical constituents

T. indica contains active phenolic compounds, cardiac glycosides, L-(-)mallic acid, tartaric acid, mucilage and pectin, arabinose, xylose, galactose, glucose, and uronic acid. [24,25] Tetrahydrocannabinol (T. indica) ethanolic extract contains fatty acids and trace elements like arsenic and calcium. [26]

The seed polysaccharides contain pyrazines (trans-2-hexenal) and certain thiazoles (2-ethyl thiazole or 2-methyl thiazole) as aromatic compounds[27]. The leaves included two triterpenes, lupanone, and lupeol. [28]

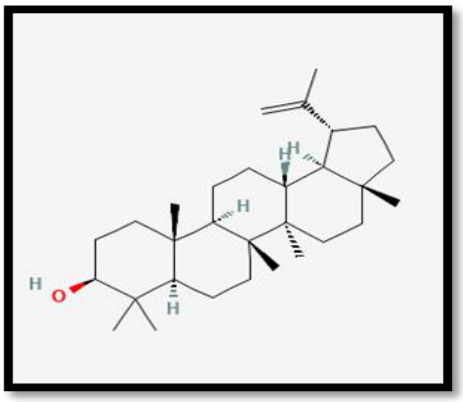

Fig: 2 structure of Lupeol

The leaf oil's 13 constituents include limonene and benzyl benzoate. [29] Phytochemical analysis of *T. indica* root bark revealed n-hexacosane, eicosanoic acid, b-sitosterol, octacosanyl ferulate, 21-oxobehenic acid, and (+)-pinitol. This plant contains (+)-pinitol for the first time. [30] The fruit pulp included furan derivatives (44.4%) and carboxylic acid (33.3%). [31] Seeds contained eicosanoic and palmitic acids and oleic, linoleic, and palmitic acids. Unsaponifiable components from *T. indica* seed oil contained -amyrin, campesterol, and seven hydrocarbons. The plant's aerial parts contain tartaric and acetic acids, pectin and sugar, tannins, alkaloids, flavonoids, sesquiterpenoids, and glycosides. [32–35] *T. indica* seeds and pericarp contain phenolic antioxidants.

Tamarind pericarp proanthocyanidins dominated polyphenolic profile in various forms, including apigenin [Figure 3], catechin [Figure 4], procyanidin B2, epicatechin [Figure 5],

procyanidin dimer [Figure 6a], procyanidin trimer [Figure 6b], along with taxifolin, eriodictyol, and naringenin [Figures 7–9]. Tamarind seeds contained procyanidins solely, principally oligomeric procyanidin tetramer, hexamer, and pentamer, with little procyanidin B2 epicatechin. [36]

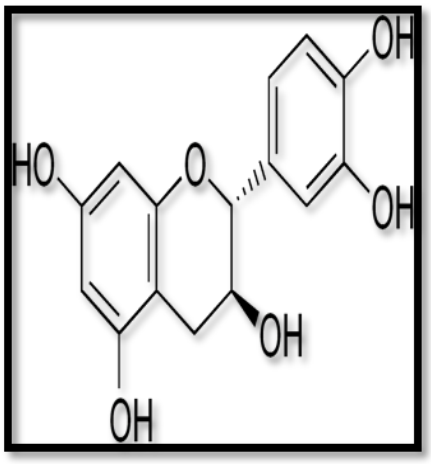

Fig: 3 Apigenin structure

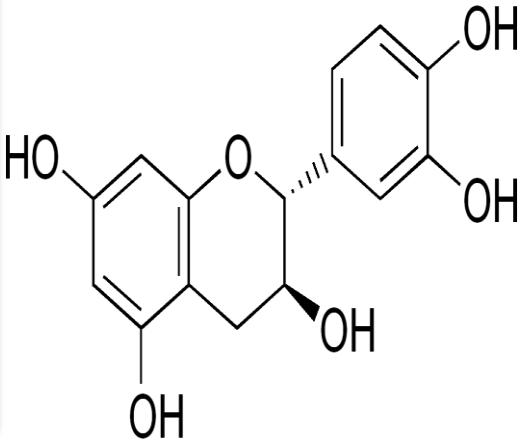

Fig: 4 Catechin structure

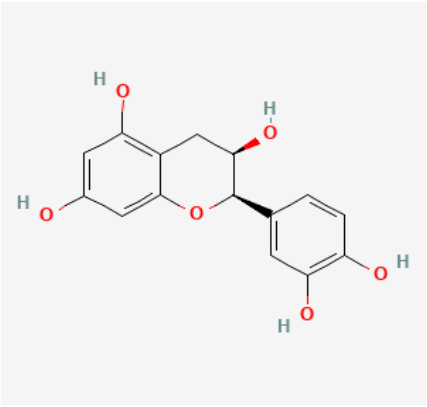

Fig: 5 Structure of Epicatechin

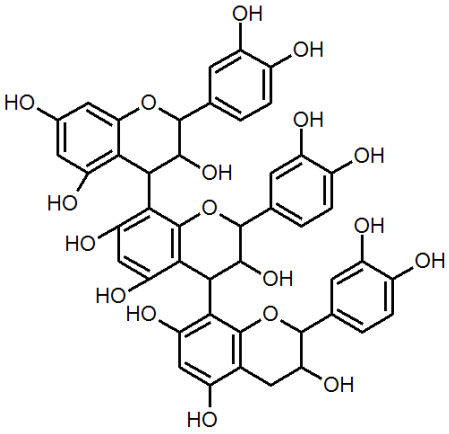

Fig: 6(A) Structure of Procyanidin Dimer

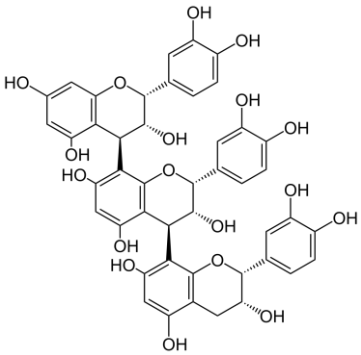

Fig: 6 (B) Structure of Procyanidin trimer

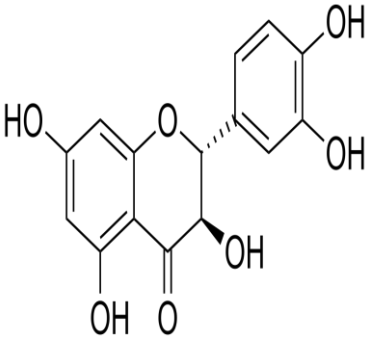

Fig: 7 Structure of Taxifolin

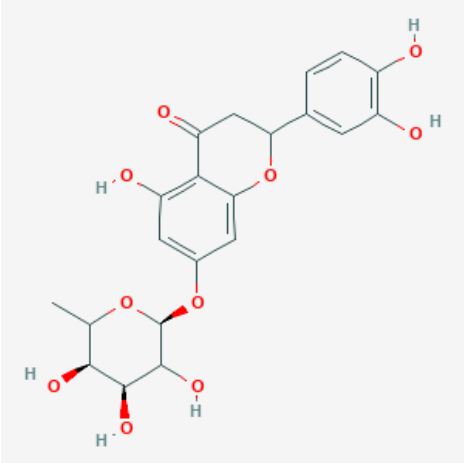

Fig: 8 Structure of Eriodictin

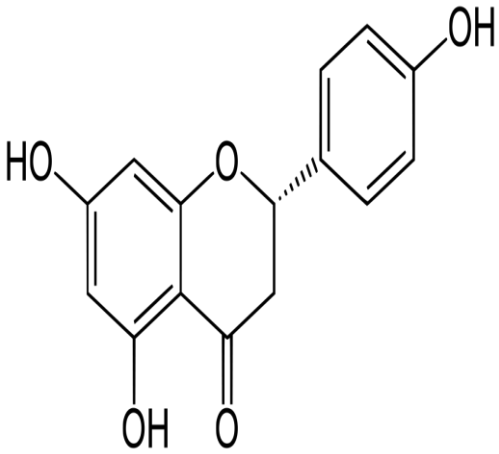

Fig: 9 Structure of Naringenin

T. indica has been found to have anti-diabetic and antibacterial properties, antioxidant and antimalarial properties, and laxative and antihyperlipidemic properties. *T. indica* has also been found to have anti-diabetic and antimicrobial properties.

- **Anti-diabetic activity:** An aqueous extract of *Tamarindus indica* seeds had a substantial anti-diabetic effect on streptozotocin-induced diabetic male rats. The aqueous extract of seeds reduced hyperglycemia in rats with mild and severe diabetes.
- **Antimicrobial activity:** *Tamarindus indica* has antibacterial properties. The leaf extracts killed Salmonella paratyphi, Bacillus subtilis, Salmonella typhi, and Staphylococcus aureus.
- **Analgesic activity and anti-inflammatory:** T. indica stem bark ether extract showed anti-inflammatory and analgesic activities in animal models and tests such as the hot plate and acetic acid-induced writing tests. Analgesic properties are due to sterols and triterpenes discovered in a preliminary phytochemical investigation.
- **Hepatoprotective and anti-asthmatic activity:** Research on the anti-histaminic, adaptogenic, and mast cell stabilizing properties of methanolic leaf extracts from *Tamarindus indica* has shown significant results in animals. The hepato-regenerative effects of aqueous extracts from Tamarindus leaves, fruits, and seeds were demonstrated.
- **Anti-venom activity:** Venom enzyme activity was significantly decreased, and myotoxic effects such as hemorrhage and edema were neutralized by the seed extract, making it an option for serum treatment.

Uses of *Tamarindus indica*

Fruit pulp

Like many other fruits, tamarind has numerous uses at home and in business. In native locations, the tree makes curries, chutneys, ice cream, and sherbet. [38–40] Indians eat the pulp raw, sweetened with sugar. Tamarind balls are created with tamarind pulp and sweetmeats. It makes tamarind pulp powder, tamarind juice concentrate, and tamarind pulp acid. [43,44]

Seed

The tamarind fruit's seed coat (testa) and kernel (endosperm) are by-products of its commercial use (70-75 percent). [45,46] But it has many uses. It can be used to improve food viscosity and texture. [47] The seed polysaccharide is called "jellose" since it can make jelly and is a carbohydrate. [48,49] The seed oil is considered appetizing and culinary quality and

can be used as a stabilizer in ice cream, mayo, and cheese. [50] [51,52] Oil is used to varnish idols and light lamps.

Leaves and Flowers

Leaf, flower, and young pods are all edible. Curries, salads, stews, and soups use the leaves and petals. [55] Many Thai dishes exploit its sourness and aroma. Acid leaves and fig tree gum are used in Gambia's [45]. [56] Leaf and floral mordants The plant's yellow dye turns wool red and indigo-dyed silk green. [52,54] It is used to bleach "buri" (Corypha alata) leaves. [57].

Wood

Tamarind wood is used for furniture, wheels, mallets, rice pounders, mortars, and pestles. Axes and shafts for carts, tent pegs, canoe side planks, and wells can be made from it. [58,59] In North America, tamarind is known as "Madeira mahogany." [60] It is in gunpowder—[42,60,61] Ash hair from animal skins. Vinegar and fruit pulp brighten brass and copper [38,54].

Seed testa and bark

Tamarind tannin, which is found in the seed testa, can be utilized to make heavy-soled shoes, bags, and other types of leather goods. The seed husk can potentially be used as a fish poison. [63,64] To make ink and fix colors, bark tannins are commonly employed in the process.

Powder of Tamarind kernel

In addition, Tamarind Kernel Powder (TKP) is regularly listed in commercial digests. They are preventing the rancidity and browning of TKP by defatting it. TKP is used in India for paper and textile sizing, weaving and jute product production[46–52], and textile printing.

2. CONCLUSION

Inflammatory illnesses are a significant global health issue that requires all possible measures to tackle. *T. indica* has long been utilized as an anti-inflammatory and analgesic herb. Several biological pathways, including NF-B activation and leukotriene production, are involved in T. indica's anti-inflammatory and analgesic activities. Aside from that, *T. indica* contains flavonoids, which have been demonstrated to have anti-inflammatory and analgesic properties, although not directly isolated and studied. As a result, we suggest additional research on *T. indica* pulps, leaves, and stem bark for anti-inflammatory and analgesic activities. However, clinical trials are still required to improve future drug development to treat inflammatory disorders and body pain. More pre-clinical sub-chronic and chronic toxicity studies are required before *T. indica* can treat rheumatological disorders, including osteoarthritis and body discomfort.

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