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Flacourtia jangomas; A Comprehensive Review

[1]Deepthi Krishna M, [2]Mr.Jayachandran TP, [3]Dr.Jyoti Haridran, [4] Arathy Sreenivasan, [5]Aparana PV, [6]Binny Binoy, [7]Sanusha TV

[1]Student M.Pharm, DPSCheruvandoor,[2]Associate professor,[3]Principal Department of Pharmaceutical science,[4-7] Students M.Pharm

ABSTRACT :

Flacourtia jangomas (Lour.) Raeusch., belonging to the family Salicaceae (formerly Flacourtiaceae) and commonly known as Indian coffee plum, is a versatile medicinal plant widely distributed across tropical Asia and Southeast Asia. Botanically, it is a dioecious, deciduous tree characterized by sharp woody thorns on young trunks, glossy ovate-lanceolate leaves, and edible dark purple-red globose berries. Ethnobotanically, various plant parts including leaves, stem bark, fruits, and roots have been traditionally employed in Ayurveda, Unani, and indigenous folk medicine to treat gastrointestinal disorders (diarrhoea and dysentery), respiratory conditions, skin diseases, jaundice, and inflammatory ailments. Phytochemical evaluations demonstrate that F. jangomas is rich in bioactive secondary metabolites, notably polyphenols, flavonoids (quercetin and rutin), hydrolysable tannins, limonoids (Jangomin), terpenoids, and ascorbic acid. Pharmacological investigations confirm its potent antioxidant, anti-inflammatory, antimicrobial, hepatoprotective, and antidiabetic properties. This review provides a comprehensive synthesis of the pharmacognostical, phytochemical, and therapeutic potential of F. jangomas, highlighting its significance for future bioactivity-guided drug discovery and clinical development.

Keywords: Flacourtia jangomas, Ethnobotany, Phytochemistry, Flavonoid, Anti-inflammatory, Pharmacognosy.

INTRODUCTION

Botanical Features

Flacourtia jangomas (Lour.) Raeusch. is a dioecious, deciduous, low-land rain forest tree or shrub belonging to the family Salicaceae (formerly classified under Flacourtiaceae).

Flacourtia jangomas is a small- to medium-sized, dioecious, deciduous tree or arborescent shrub, typically growing to a height of 5 to 10 meters. The bark is relatively smooth, thin, and green-brown to brownish-grey in colour, often flaking off in thin scales as the tree matures (1).

A distinctive feature of young trees and main stems is the presence of dense, sharp, woody, branched thorns. As the tree matures, these thorns gradually diminish or become less prominent on the main trunk. The leaves are arranged alternately along the branches. Simple, ovate to ovate-lanceolate or elliptic-lanceolate in shape, measuring 7–15 cm in length and 3–5 cm in width. The leaf margins are finely serrate or crenate-serrate, with an acuminate (tapering to a long point) apex and a rounded to cuneate base (2). The mature leaves are glabrous, thin-leathery, and glossy dark green above, while the young emerging foliage exhibits a striking reddish-pink to brownish-red hue. Short petioles measuring 4–8 mm in length, which are slightly pubescent or glabrous.

Flowers are borne in short, axillary racemes or sub corymbose clusters. It is a dioecious species, meaning male and female flowers are produced on separate individual trees (3). Flowers are small, fragrant, apetalous (lacking petals), and greenish-white to pale yellow in colour. Consists of 4–5 small, ovate, hairy sepals. Male flowers have prominent annular disc and numerous free stamens with yellow anthers on long, slender filaments. Female flowers Possess a superior, sub globose ovary with 4–8 locules, each containing 1–2 ovules, topped with 4–8 short, spreading styles arranged in a star-like pattern (4).

The fruit is a succulent, globose to sub globose berry, measuring about 1.5–2.5 cm in diameter. Immature fruits are bright green and gradually turn dark red, purplish-red, or deep purple-black upon ripening. The flesh is juicy, brownish-purple, with a sweet-tangy and slightly astringent taste, capped by the persistent star-like remnant of the styles. Each berry contains 4–10 flat, hard, hard-coated seeds (pyrenes) embedded within the pulp (5).

Geographical distribution

Flacourtia jangomas is presumed to have originated in tropical Asia, specifically across the Indian subcontinent and Indo-China regions. It thrives in tropical rainforests, low-land moist forests, riverbanks, and rural agrarian ecosystems up to an elevation of 1,200 meters above sea level (6).

Indian Subcontinent:

India: Widely distributed in the wild as well as cultivated in homestead gardens across the Western Ghats (Kerala, Karnataka, Maharashtra, Tamil Nadu),

North-Eastern states (Assam, Tripura, Manipur, Meghalaya), West Bengal, Bihar, Uttar Pradesh, and the Andaman and Nicobar Islands. Extensively distributed throughout Bangladesh (notably in Chittagong and Sylhet regions), Sri Lanka (low-country regions), Nepal, and Bhutan (7).

Phytochemical Constituents

A. Phenolic Compounds & Flavonoids :

Phenolics and flavonoids represent the primary bioactive responsible for the potent antioxidant and anti-inflammatory properties of F. jangomas.

Flavonoids: Quercetin, rutin, kaempferol, and myricetin derivatives.

Phenolic Acids: Gallic acid, ellagic acid, chlorogenic acid, caffeic acid, and ferulic acid.

Anthocyanins: Cyanidin-3-glucoside and delphinidin derivatives (responsible for the dark reddish-purple colour of ripe fruits).

Quantitative Yield: Quantitative spectrophotometric estimations (Folin-Ciocalteu and $AlCl_3$ assays) demonstrate high Total Phenolic Content (TPC) and Total Flavonoid Content (TFC), particularly in aqueous and methanolic leaf and fruit extracts.

B. Limonoids & Terpenoids:

Specific bitter triterpenoids, notably Jangomin (a unique furanocoumarin/limonoid isolated from the bark and seeds) and Limonin.

Triterpenes & Steroids : beta-sitosterol, stigmasterol, lupeol, alpha-amyrin, and beta amyrin.

C. Tannins & Organic Acids

Hydrolysable tannins (Gallo tannins and ellagitannins) and condensed tannins (proanthocyanidins). These account for the strong astringent taste of the leaves and unripe fruits.

Organic Acids: Ascorbic acid (Vitamin C), citric acid, tartaric acid, and malic acid present in significant quantities in ripe fruits.

D. Alkaloids, Saponins & Glycosides :

Present in moderate amounts in aqueous and methanolic leaf and bark extracts, contributing to antimicrobial and cytotoxic activity. Cardiac Glycosides & Anthraquinones: Detected in trace-to-moderate amounts during preliminary screening of stem bark extracts.

E. Fatty Acids & Fixed Oils

(Seed & Fruit Pulp)GC-MS analysis of seed and fruit oil reveals a rich profile of saturated and unsaturated fatty acids: Unsaturated Fatty Acids: Oleic acid (omega-9), linoleic acid (omega-6), and palmitoleic acid. Saturated Fatty Acids: Palmitic acid and stearic acid (8).

Ethnobotanical Importance

In traditional South Asian and Southeast Asian medicinal systems including Ayurveda, Unani, Folk/Tribal Medicine of the Western Ghats, and Traditional Chinese Medicine (TCM) Flacourtia jangomas is regarded as a versatile medicinal plant.

In Ayurveda, the fruits, leaves, and bark are considered to possess Kashaya (astringent) and Madhura (sweet) tastes, with cooling (Sheeta) properties that help balance Pitta and Kapha doshas. Local healers, indigenous communities, and tribal practitioners utilize every part of the plant (leaves, young shoots, bark, roots, fruits, and seeds) to treat gastrointestinal, respiratory, dermatological, and systemic inflammatory disorders (9).

A. Leaves & Young Shoots :

Gastrointestinal Disorders: An aqueous decoction or infusion of fresh leaves is widely prescribed to treat diarrhoea, dysentery, flatulence, and stomach cramps. The high tannin content provides astringent properties that soothe the intestinal mucosa.

Respiratory Ailments: Powdered dried leaves mixed with honey or warm water are taken orally to relieve symptoms of bronchial asthma, chronic bronchitis, cough, and common cold.

Oral & Throat Infections: Leaf decoctions are used as a gargle to treat stomatitis, bleeding gums, toothache, and throat inflammation.

Metabolic & Liver Support: In traditional Bangladeshi and North-Eastern Indian folk medicine, fresh leaf juice is consumed daily for jaundice, liver disorders, and diabetes management (10).

B. Stem Bark & Trunk Bark

Anti-inflammatory & Analgesic Applications: A paste prepared from the inner stem bark is applied topically over swollen joints, contusions, rheumatic swellings, and skin eruptions to reduce pain and edema.

Fevers & Intermittent Fevers: Decoctions of the bark are administered as an antipyretic agent to treat malaria and intermittent fevers.

Gynaecological & Urinary Health: Bark decoctions are used in traditional postpartum care and to manage uterine haemorrhages, excessive menstrual bleeding, and urinary tract infections (11).

C. Fruits (Ripe & Unripe)

Digestive Tonic & Stomachic: Ripe fruits are eaten raw or processed into syrups and preserves. They act as an appetizing stomachic, digestive stimulant, and astringent tonic that allays nausea, excessive thirst, and biliousness.

Hepatic & Splenic Conditions: Ripe fruits are recommended in traditional diets to relieve spleen enlargement (splenomegaly) and liver congestion (12).

Scurvy & Vitamin Deficiency: Due to their rich organic acid and vitamin C content, the fruits have historically been consumed to prevent scurvy and improve immune health.

D. Roots & Root Bark

Dermatological Conditions: Root pastes mixed with coconut oil or water are applied topically to treat chronic skin diseases, eczema, pruritus, boils, and scabies.

Dental & Throat Ailments: Root bark decoction is used as a wash or gargle for severe toothache, gum inflammation, and tonsillitis (13).

DISCUSSION

The extensive literature on Flacourtia jangomas (Lour.) Raeusch. underscores its significant role in traditional Asian medicine as well as its promising pharmacological profile. Historically utilized across Ayurvedic, Unani, and various indigenous tribal healthcare systems, every plant part including leaves, stem bark, fruits, and roots demonstrates distinct therapeutic virtues.

The versatile biological activities of F. jangomas are directly attributable to its rich and diverse phytochemical repertoire. Quantitative and qualitative analyses reveal that hydroalcoholic, methanolic, and aqueous extracts are rich in polyphenols, flavonoids (such as quercetin, rutin, and kaempferol derivatives), hydrolysable and condensed tannins, limonoids (notably Jangomin), and triterpenoids. The high concentration of phenolic compounds and flavonoids correlates strongly with the plant's robust free radical scavenging capacities observed in in vitro DPPH, ABTS, and nitric oxide assays.

Furthermore, the notable anti-inflammatory potential observed in both in vitro models and in vivo animal models (such as carrageenan- and formaldehyde-induced paw edema) is primarily driven by these bioactive flavonoids and polyphenols. These compounds act by attenuating key inflammatory cascades, inhibiting pro-inflammatory enzymes (such as cyclooxygenase-2 and lipoxygenase), and regulating cellular mediators, which supports the traditional use of its leaves and bark in relieving inflammatory joint disorders, skin eruptions, and systemic fevers. Additionally, the presence of tannins and alkaloids underpins its documented antimicrobial, astringent, and antidiarrheal activities.

Despite these encouraging preclinical findings, several research gaps remain. While preliminary studies validate its traditional uses, detailed mechanistic insights into individual isolated compounds particularly Jangomin and specific anthocyanins are limited. Moreover, comprehensive toxicological profiling, pharmacokinetic evaluation, standardized dose-formulation studies, and clinical trials are essential to transition F. jangomas from ethnomedicinal use into validated, standardized therapeutic agents.

CONCLUSION

Flacourtia jangomas represents a valuable natural reservoir of bioactive secondary metabolites with proven antioxidant, anti-inflammatory, antimicrobial, and hepatoprotective properties. The pharmacological data collected to date strongly supports its ethnobotanical legacy across South and Southeast Asia. To fully capitalize on its therapeutic potential, future research should prioritize bioactivity-guided isolation of pure phytoconstituents, elucidation of exact molecular mechanisms of action, and rigorous evaluation of long-term safety and toxicity profiles. Standardizing extracts and developing modern formulation approaches will be pivotal in translating this traditional medicinal plant into clinical therapeutics and nutraceutical products.

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