

Review Article

Pharmacological Review of *Flacourtia sepiaria* (Ruxb.)

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Abstract: The medicinal plants are widely used by the traditional medical practitioners for curing various diseases in their day to day practice. *Flacourtia sepiaria* (Flacourtiaceae) is the most useful traditional medicinal plant in India. Although there is no such Phytopharmacological activities has been carried out but, still it is considered as a valuable source of unique natural products for development of medicines and targeting against various diseases. Each part of its allied species i.e., (leaves, bark, stem, fruits, root and even whole plant) of the *Flacourtia indica* has demonstrated several pharmacological activities including Anti-Inflammatory, Antimicrobial, Antioxidant, Hepatoprotective, Antimalarial, Anti-Diabetic, Anti asthmatic and Antibacterial Activity. The present review highlights a literature on botanical and pharmacological discussion of *Flacourtia sepiaria*.

Keywords: *Flacourtia sepiaria*, *Flacourtia indica*, Phytoconstituents, Phytopharmacology, Indigenous medicinal plant.

INTRODUCTION:

A large proportion of the population in many developing countries relies on traditional herbal practitioners to meet their primary health care needs. Amidst wide range of availability of modern i.e. synthetic medicines, herbal medicines more appropriately the herbal drugs or herbals often retain their popularity for their intense historical and cultural values. In view of the increasing demand of these herbal drugs, the issues regarding their safety, efficacy and quality maintenance in industrialized and developing countries as well are cropped up. These herbals and their isolated compounds i.e. the bio-active principles, have demonstrated spectra of biological activities. Therapeutic data on such herbals are much comprehensive from the medico folk lore literatures of many regions as recorded from time to time.

Flacourtia sepiaria (Ruxb.), synonym of *Flacourtia indica* (Burm. f.) Merr, *Flacourtia ramontchi* L'Herit. (Family- Flacourtiaceae), commonly known as 'Tuturi' or 'Bainchi' or 'Katai'. It is an indigenous medicinal plant widely distributed in India and Bangladesh [1]. This plant has been reported as an answer for the treatment of functional disorders like rheumatoid arthritis and gout. The areal part of plant i.e., its fruits are edible; the bark triturated in sesamum oil is used as aliniment in rheumatism. This tree yields an antidote to snake –bites from an infusion of the leaves and roots. In indo china, the liquid from the infusion the roasted or grilled leaves of *Flacourtia sepiaria* given to women after parturition [2]. The allied species of the plant fruits are used as appetizing, diuretic, and digestive, in jaundice and enlarged spleen. Barks are used for the treatment of intermittent fever. Roots are used in nephritic colic and gum is used in

cholera [1, 3]. Previous Phytochemical investigation on its allied species of plant (*F. indica*) resulted in the isolation of β -sitosterol (a well-known phytosterol), β -sitosterol- β -Dglucopyranoside, ramontoside, butyrolactone lignan disaccharide, flacourtin, coumarin such as scoparone and aesculetin [3-5]. Thin layer chromatographic screening and isolation of phytochemicals from *F. indica* showed the presence of flavonoids, poly phenols and other compounds [3-6].

PLANT DESCRIPTION:

1.1.1. Family : Salicaceae

1.2. Taxonomy:

Domain : Eukaryota

Kingdom : Plantae

Subkingdom : Viridiplantae

Phylum : Tracheophyta

Subphylum : Euphyllophytina

Infraphylum : Radiatopses

Class : Magnoliopsida

Subclass : Rosidae

Superorder : Violanae

Order : Malpighiales

Family : Salicaceae

Tribe : Flacourtieae

Genus : *Flacourtia*

Specific epithet : *sepiaria* - Roxb.

Botanical name : *Flacourtia sepiaria* Roxb.

Vernacular Names:

Hindi. : kondai

Eng. : Governors Plum, Madaraskara Plum

Ori. : Tuturi.

Sansk. : kinkini.

Guj. : Kankata

Kan. : Lumanika, Dodda Gejjalakai
Mal. : Conoron.
Mar. : Kaker, Bhekal.
Punj. : kingaro, sherwam
Tam. : Sottaikala, Kanru, Kattukala.
Tel. : Conrew, Mulu Tiruman.

Related Species of *F. sepiaria*

- *Flacourtia afra* Pic.Serm.
- *Flacourtia amalotricha* A.C.Sm.
- *Flacourtia amara* Span.
- *Flacourtia aulacocarpa* Hassk.
- *Flacourtia balansae* Gagnep.
- *Flacourtia benthamii* Tul.
- *Flacourtia calophylla* Benth. ex Eichl.
- *Flacourtia campbelliana* Roxb.
- *Flacourtia camptoceras* Miq.
- *Flacourtia cataphracta*.
- *Flacourtia cavaleriei* H.Lév.
- *Flacourtia celastrina* H.B. & K.
- *Flacourtia cerasifera* Zippel. ex Slooten.
- *Flacourtia chinensis* Clos.
- *Flacourtia cinerea* H.B. & K. ex Hemsl.
- *Flacourtia cordata* H.B. & K.
- *Flacourtia cordifolia* Roxb.
- *Flacourtia corollata* Blanco.
- *Flacourtia crenata* Wall.
- *Flacourtia cuphlebia* Merr.
- *Flacourtia degenori* A.C.Sm.
- *Flacourtia digyna* Benth. ex Eichl.
- *Flacourtia edulis* Schumach. & Thonn.
- *Flacourtia elegans* Tul.
- *Flacourtia elliptica* Warb.
- *Flacourtia euphlebia*.
- *Flacourtia ferox* Wall. ex Voigt.
- *Flacourtia flavescens* Willd.
- *Flacourtia flexuosa* H.B. & K.
- *Flacourtia gambecola* Clos.
- *Flacourtia helferi* Gamble ex Ridl.
- *Flacourtia heterophylla* Turcz.
- *Flacourtia hilsenbergii* C.Presl.
- *Flacourtia hirtiuscula* Oliv.
- *Flacourtia indica*.
- *Flacourtia inermis*.
- *Flacourtia integrifolia* Merr.
- *Flacourtia jangomas*.
- *Flacourtia japonica* Hort. ex Lavall.
- *Flacourtia kelampagine* Eeden.
- *Flacourtia kinabaluensis* Sleumer.
- *Flacourtia kirkii* Burt Davy.
- *Flacourtia lanceolata* Slooten.
- *Flacourtia latifolia* T.Cooke.
- *Flacourtia lenis* Craib.
- *Flacourtia lucida* Salisb.
- *Flacourtia ludiifolia* H.Perrier.
- *Flacourtia magallanensis* Elmer.
- *Flacourtia megaphylla* Ridl.
- *Flacourtia mollipila* Sleumer.
- *Flacourtia mollis* Hook.f. & Thomson
- *Flacourtia montana* Zipp. ex Span.
- *Flacourtia nitida* Benth.
- *Flacourtia nivea* Moon
- *Flacourtia obcordata* Roxb.
- *Flacourtia obtusa* Hochst. ex Clos
- *Flacourtia obtusata* Hochst. ex A.Rich.
- *Flacourtia occidentalis* Blatt.
- *Flacourtia oppositifolia* Gagnep.
- *Flacourtia ovata* Gillespie
- *Flacourtia papuana* Pulle
- *Flacourtia parviflora* Blanco
- *Flacourtia parvifolia* Merr.
- *Flacourtia peninsularis* Elmer ex Merr.
- *Flacourtia perrottetiana* Clos.
- *Flacourtia prunifolia* H.B. & K.
- *Flacourtia quintuplinervis* Turcz.
- *Flacourtia racemosa* Siebold & Zucc.
- *Flacourtia ramontchi*
- *Flacourtia rhamnoides* Burclt. ex DC.
- *Flacourtia rindjanica* Slooten.
- *Flacourtia rotundifolia* Roxb.
- *Flacourtia rukam*.
- *Flacourtia sapida* Roxb.
- *Flacourtia spiculifera* Tul.
- *Flacourtia stigmarota* Wall.
- *Flacourtia subintegra* A.C.Sm.
- *Flacourtia sulcata* Elmer.
- *Flacourtia sumatrana* Planch. ex Hook.f.
- *Flacourtia territorialis* Airy Shaw.
- *Flacourtia thorelii* Gagnep.
- *Flacourtia timorensis* Zipp. ex Span.
- *Flacourtia tomentella* Miq.
- *Flacourtia tomentosa* C.Presl.
- *Flacourtia velutina* Tul.
- *Flacourtia vitiensis* (Seem.) A.C.Sm.
- *Flacourtia vogelii* Hook.f.
- *Flacourtia wightiana* Wall.
- *Flacourtia zippelii* Slooten

F. sepiaria is a species found from the Punjab eastward to Bihar, the Deccan and the southern Peninsula. This plant is an erect branched, more or less spiny bushy shrub of small tree, growing to a height of 3 meters. Spines are slender and scattered, up to 2 cm long. A small shrub bearing purplish, sweetish fruit about the size of a small cherry, and is edible. Fruit of the plant is red or brown, dark pinky when ripe. Again its fruit has a pleasant, subacid flavor when perfectly ripe, but the unripe fruit is extremely astringent. The bark of *F. sepiaria* is yellowish-red thin. This tree yields an antidote to snake-bites from an infusion of the leaves and roots: the bark triturated in sesamum oil is used as a liniment in rheumatism. However its allied species i.e.,

F. indica are given in jaundice and enlarged spleen. After child birth among the poor the seeds are grind to powder with turmeric and rubbed all over the body to prevent rheumatic pains from exposure to damp winds. Gum is administered along with other ingredients in cholera [7].

Trees or shrubs, deciduous or rarely evergreen, dioecious, rarely polygamous. Leaves alternate, rarely subopposite, usually petiolate, simple; stipules persistent or caducous. Catkins erect or pendulous; each flower usually with a cupular disc or 1 or 2(or 3) nectariferous glands. Male flowers with 2-many stamens; filaments filiform, free or united; to connate; anthers 2(or 4) -loculed, dehiscent longitudinally. Female flowers with 1 pistil, sessile or stipitate; ovary superior, 1- or 2-loculed; ovules several to many, anatropous, with a 1 integument; style 1, 2 in *Chosenia*; stigmas 2-4. Capsule dehiscent by 2-4(or 5) valves; placenta and inside wall of ovary with long hairs. Seeds 4-numerous, glabrous; hairs and seeds simultaneously deciduous when capsule matures. Three genera and about 620 species: mainly N hemisphere, a few in S hemisphere; three genera and 347 species (236 endemic) in China, including at least nine hybrids and at least one introduced speies.

Phytochemical studies

From literature, there is presence of one phytochemical constitute i.e., phenolic glycoside was established where as phytochemical studies carried out on *Flacourtia indica* have reported the identification of some phytoconstituents like: Phenolic glycosides, lignan and sterol like β -sitosterol, polysaccharide, Flavonoids and Condensed tannins, Alkaloids, terpenoids and sugars, Coumarin such as scoparone and aesculetin ,other compounds like Flacourtin, Pyrocatechol, Homaloside D, Poliothryoside, β -sitosterol, β -D-glucopyranoside, Ramantosite & Butyrolactone lignan disaccharides.

Folkloric / ethnomedicinal claims:

- In Madagascar, the bark triturated in sesamum oil is used as aliniment in rheumatism and gout.
- As an antidote to snake –bites from an infusion of the leaves and roots.
- In indo china, the liquid from the infusion the roosted or grilled leaves given to women after parturition.
- The ashes of the roots are used for kidney ailment.
- The fruit is used for appetizing, carminative, bilious disorders and to relieve nausea and vomiting.
- The leaves are useful in pruritus scabies.
- The fruit is a pleasant, acidic taste and is very refreshing.

- Dried leaves are used in asthma, bronchitis and hepatic disorders.

Edible uses : In India, fruits consumed as food by local people.

Useful parts : Leaves, barks and roots.
: Fruit is astringent.
: Dried leaves considered

carminative, tonic and astringent.

Mode of application : External / Internal.

THERAPEUTIC USES:

The leaves and barks of *F. sepiaria* are used as various disorders like liver disorder, rheumatoid arthritis and treatment of gout. However, its allied species i.e., the roots of *F. indica* are sweet, refrigerant, depurative, alexipharmic and diuretic. They are useful in vitiated conditions of pitta and vata apathies, poisonous bites, skin diseases, pruritus, erysipelas, strangury, nephropathy and psychopathy. The leaves are useful in pruritus and scabies. The fruits are sweet, appetizer, digestive and diuretic, and are useful in stranguery jaundice, gastropathy and splenomegaly.

PHARMACOLOGICAL ACTIVITIES:

From the literatures, only one pharmacological activity was established for *F.sepiaria*. However, the various pharmacological activities of its other allied species i.e., *F. indica* and *F. jangomas* as imbibed from literatures are accounted as follows.

In vitro Antioxidant Activity [9]

Tyagi et al. reported screening of *in vitro* antioxidant activity on *F. indica* leaves. The results of phytochemical tests showed the presence of alkaloids, tannins, saponins, flavonoids, glycosides, phenolic compounds, terpenoids and steroids. The antioxidant activity was evaluated using methanolic and aqueous extracts. *F. indica* was found to possess potent free radical scavenging and antioxidant activity.

Hepatoprotective Activity [10,11,12]

Varkey et al. [10] reported that *F. indica* leaves possess activity methotrexate induced hepatotoxicity on rats. The acute toxicity study was performed in petroleum ether extract of aerial parts, results indicated that dose of 1750 mg/ kg was tolerated in mice. Methotrexate induced hepatotoxicity characterized by significant alterations in marker enzymes for liver function and oxidative stress were observed. *F. indica* treatment in a dose of 350mg/kg orally for 5 days significantly improved level of marker enzymes for liver function and oxidative stress. Histopathological studies revealed a relative degree of reversal of Methotrexate induced necrosis was observed.

Nazneen et al. [11] reported hepatoprotective properties of the petroleum ether, ethyl acetate and

methanol extracts of aerial parts of *F. indica* in rat models. The significant reduction of the SGOT and SGPT were exhibited by petroleum ether and ethyl acetate extracts at a single oral dose of 1.5 g/kg of body weight with a reduction of 29.0% SGOT & 24.0% SGPT level by petroleum ether extract, and 10.57% SGOT & 6.7% SGPT level by ethyl acetate extract when compared to paracetamol (3 g/kg of body weight) treated animals. Petroleum ether and ethyl acetate extracts showed good recovery of paracetamol induced necrosis in histopathological examination. The methanol extract obtained by successive cold extraction did not show any remarkable effect. It was reported that hepatoprotective effects exhibited by petroleum ether and ethyl acetate extract might be mediated by the inhibition of microsomal drug metabolizing enzymes.

Gnanaprakash *et al.* [12] reported hepatoprotective activity of aqueous extract of leaves of *F. indica* against carbon tetrachloride induced hepatotoxicity. Animals were pretreated with the aqueous extract of *F. indica* (250 & 500 mg/kg body weight) for one week and then challenged with CCl₄ (1.5 ml/kg BW) in olive oil (1:1, v/v) on 7th day. Serum marker enzymes (ALP, AST, ALT, Total protein, Total Bilirubin) and TBARS level were estimated in all the study groups. Alteration in the levels of biochemical markers of hepatic damage like AST, ALT, ALP, Total Protein, Total Bilirubin and lipid peroxides (TBARS) were tested in both CCl₄ treated and extract.

Antimalarial Activity [13]

A M Kaou *et al.* [13] reported phytochemical studies on the aerial parts of *F. indica* and investigated three compounds pyrocatechol, homaloside D and poliothryoside isolated from this plant. The *in vitro* antiplasmodial activity on the chloroquine-resistant strain of *Plasmodium falciparum* and the cytotoxicity on two complementary human cells lines (THP1, HepG2), of AcOEt extract obtained after liquid/liquid extraction of the decoction and pure compounds were evaluated. The results elucidated as the poliothryoside isolated from the extract had strong antiplasmodial activity and a good selectivity index (>28) similar to chloroquine.

Antibacterial Activity [14]

G C Sarker *et al.* [14] reported *in vitro* antibacterial screening by disc diffusion method against two Gram positive and two Gram negative bacteria by chloroform soluble fraction of *Flacourtia jangomas* and *Flacourtia sepiaria*. Chloroform fraction of *Flacourtia indica* found to possess no activity against *E. coli* and *Bacillus cereus*.

Anti-Diabetic Activity [15]

A K Singh *et al.* [15] investigated the acute and subacute antidiabetic effect of the two different doses (200 and 400 mg/kg b.w.) of *Flacourtia jangomas* extracts in streptozotocin induced diabetic rats. Fasting blood glucose level, body weight and serum lipid profiles were evaluated in normal and diabetic rats. The extract significantly reduces the fasting blood glucose

level and increases the glycogen level as compared to diabetic control. Serum lipid profile had shown a significant improvement in the treatment group.

Anti-Inflammatory and Antimicrobial Activity [16]

S Lalsarea *et al.* [16] evaluated anti-inflammatory activity and antimicrobial activity of *Flacourtia ramontchi* by Carrageenan induced rat paw model and cup and plate method respectively with chloroform, methanol and hydromethanolic extracts. The results indicated that all extracts chloroform, methanol and hydromethanolic of the leaves have anti-inflammatory activity. Methanol extract possess broad-spectrum antimicrobial activity at concentration 10000 g/ml whereas hydromethanolic and chloroform extracts having less antimicrobial activity.

Anti-Asthmatic Potential [17]

S Tyagi *et al.* [17] reported that ethanolic extract showed anti-asthmatic activity. When guinea pigs exposed to histamine significant increase in preconvulsion time was observed due to pretreatment with *F. indica*. The bronchodilating effect was comparable to ketotifen fumarate. The antiasthmatic effect suggested that anti-asthmatic activity could be due to its bronchodilator and cell stabilising property.

CONCLUSION

Flacourtia sepiaria (Flacourtiaceae) is the most useful traditional medicinal plant in India. Although there is no such Phytopharmacological activities has been carried out but, still it is considered as a valuable source of unique natural products for development of medicines and targeting against various diseases. Each part of its allied species *i.e.*, (leaves, bark, stem, fruits, root and even whole plant) of *Flacourtia indica* has demonstrated several pharmacological activities including Anti-Inflammatory, Antimicrobial, Antioxidant, Hepatoprotective, Antimalarial, Anti-Diabetic, Anti asthmatic and Antibacterial Activities and Most of therapeutic effects explained due to the presence of glycosides, tannins, Sugar, flacourtin, β -sitosterol, β -sitosterol- β -D-glucopyranoside, ramontoside, butyrolactone lignan disaccharide, coumarin such as scoparone and aesculetin etc. So its quantification of the individual phytoconstituents as well as pharmacological profile based on *in vitro*, *in vivo* studies and on clinical trials should be further investigated.

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