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Medicinal uses, phytochemistry and pharmacology of *Bauhinia racemosa* lam

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Abstract

Bauhinia racemosa Lam. is a tall sized tree growing throughout Srilanka, China, India and Pakistan. Various parts of the plant have great medicinal potential in folklore medicine and used in diarrhoea, fever, skin diseases, cough, malaria etc. Analgesic, anti-inflammatory, antipyretic, antispasmodic, antiulcer, cytotoxicity and hypotensive activities of *Bauhinia racemosa* have been reported. Different parts of this plant contain β -amyryn, β -sitosterol, kaempferol, quercetin, scopoletin, scopolin and tannins.

Keywords: *Bauhinia racemosa*, medicinal uses, phytochemistry, pharmacology

Introduction

Plants have always played a major role in the prevention and cure of diseases in human worldwide. The use of medicinal plants is increasing day by day in both developed and developing countries due to increase in recognition of natural products [1]. Genus *Bauhinia* has played a significant role in human civilization since ancient times. Genus *Bauhinia* is comprised of trees and shrubs which grow in warm climate. About 300 species of *Bauhinia* are found in tropical regions with 5-7 m tall tree in deciduous forests. It is generally planted in gardens and along the roadsides for its beautiful white flowers. Many species are widely planted in the tropics as orchid trees, particularly in northern India, southeastern China and Vietnam. *Bauhinia racemosa* Lam. is widely distributed in Pakistan, India, Srilanka, Burma and China. It is a useful species for filling blanks in forest plantings and helps in preventing soil erosion. In the United States of America, the trees grow in coastal California, Florida, Hawaii, Louisiana and Texas [2].

Table 1: Name of *Bauhinia racemosa* Lam. in different languages [2, 3]

Bengali	Banraji
English	Mountain ebony
Gujrati	Asundro
Hindi	Ashta, Jhinjeri, Katmauli, Kachnal
Punjabi	Kosundra
Sanskrit	Yugmapatra, Yamalapatrakah, Ashmantaka, Kanchini
Tamil	Atti, Kokku mandarai, Tataki
Telugu	Tella arechettu
Urdu	Kachnaar

Table 2: Taxonomy [4]

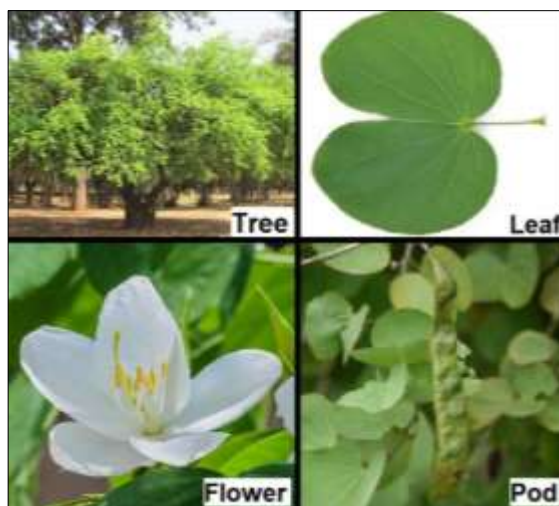
Kingdom	Plantae
Division	Magnoliophyta
Class	Magnoliopsida
Order	Fabales
Family	Caesalpiniaceae (Gulmohar family)
Genus	<i>Bauhinia</i>
Species	<i>Racemosa</i>

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Table 3: Botanical description [5, 6]

Parts	Characteristics
Plant	Small bushy, deciduous tree with a short unbranched trunk, drooping branches grows in warm climate.
Stem	Bluish black rough, pinkish red inside turning brown on exposure. Rough with vertical cracks, young twigs hairy. Longitudinally fissured.
Leaves	Green in colour, broader than long and compound. leaflet, ovate, rounded at apex, pubescent beneath when young. 2-5 cm long, 2.5-7.5 cm broad, divided half way down into two lobes, glabrous above, hairy below, base usually cordate, 7-9 nerved, petiole 7.0-18 mm long.
Flowers	White or pale yellow in colour, terminal or leaf-opposed racemes. Small flowers are borne in loose racemes, 5 - 10 cm long. Flowers are 7.5-12.5 cm in diameter, white in colour, petals are 5, narrow lance like, stamens 10, all fertile, filaments hairy at the base. Ovary hairy, stigma sessile. Pedicel 5-10 mm long, hairy, jointed near the middle, bracts short, linear, acute, hypanthium very short. Calyx c. 6.0-8.0 mm long, spathaceous, reflexed.
Pods	Pods 12.5 - 25 cm by 1.7 - 2.5 cm in size curved, swollen, rigid.
Seeds	Seeds 12 to 20 glabrous dark reddish brown or black, compressed 7-8 mm long.

**Fig 1:** *Bauhinia racemosa* Lam.**Nutritional importance**

The seeds of *Bauhinia racemosa* are rich in calcium, potassium, magnesium, zinc, manganese and iron. Glutelins is predominated whereas albumins and globulins are less in seed protein of *Bauhinia racemosa*. Essential amino acids like isoleucine, lysine, phenylalanine and tyrosine are high where as the contents of sulphur amino acids are limiting in the seed proteins. The fatty acids, linoleic, oleic and palmitic acid are relatively higher in the seed lipids [7, 8, 9].

Economic importance

The leaves of *Bauhinia racemosa* are used for making bidis,

thus the plant is commonly known as Bidi leaf tree. *Bauhinia racemosa* is planted for its value as well as for its extreme beauty. The tree is staggeringly beautiful when in bloom and it blooms for several months. The flowers can be found in white colour and the flowers of the plant are of much importance in apiculture and also as a pot herb in curries and made into pickle. The plant is used as fodder for goats, sheep and cattle. The tree also yields useful fibers and gum. The bark is used for tanning and dyeing. The wood is hard and heavy, thus used for making plough and yokes and also used as fuel [8, 10].

Table 4: Ethnomedicine

Parts	Uses
Bark	Headache, malaria, dysentery, diarrhea, fever, skin diseases, tumors, wash abscesses, warts, wound, skin disorders, diarrhea and dysentery [11,12]
Leaves	Thirst, urinary discharges, quartan fever, headache, skin diseases, tumors, troubles, diseases of the blood, diarrhea [13,14].
Flower	Cough, bronchitis [11]
Fruit	Astringent to the bowels [11]
Fiber	To stitch wounds. [11]

Table 5: Phytochemistry

Parts	Compounds
Heartwood	Resveratrol(3,5,4'-trihydroxy trans-stilbene), Phytoalexin [15]; Pacharin {1,7-Dihydroxy-3- Methoxy-2-methyl-Dibenzo (2, 3-6, 7) Oxepine} [16, 17]; Coumarins, Flavonoids, Alkaloids, Steroids, Triterpenoids, Tetracyclic phenol, Tannin, Carbohydrates, Racemosol [17, 18].
Stem bark	Luteolin, Octacosane [2], β -amyirin, β -sitosterol [15], Oleanoic acid, Ursolic acid, Ellagic acid, Gallic acid Quercetin, 3-O- β -glucoside, Myricetin 3-O- β -glucoside [18].
Leaves	Kaempferol, Galactolipids [2]; Hydroquinone, Catechol, 4-nitrophenol [15], Scopolin, Scopoletin and Quercetin [18] (2S)-1,2-di-O-linolenoyl-3-O-a-galactopyranosyl-(1/6)-Ob-galactopyranosyl glycerol ; (2S)-1-O-linolenoyl-2-O-palmitoyl-3-O-a-galactopyranosyl-(1/6)-O-b-galactopyranosyl glycerol ; (2S)-1-O-oleoyl2-O-palmitoyl-3-O-a-galactopyranosyl-(1/6)-O-

	bgalactopyranosyl glycerol, (-)epiafzelechin, (-)-epicatechin, (-)-catechin, Protocatechuic acid ^[19] .
Flower	β -amyirin ^[20] .
Seeds	Lipid ^[2] , Crude protein ^[17, 18] , Flavonoids ^[21, 22] .
Seed oil	Lysophosphotidylethanolamine ^[15] , Phosphatidylcholine, Phosphatidylinositol ^[23] .
Roots	Octacosyl ferulate, β -sitosteryl stearate ; Betulin ^[2] , 1,7,8,12b tetrahydro-2,2,4-trimethyl-10-methoxy-2H-benzo ^[6, 7] cyclohepta[1,2,3-de] ^[1] benzopyran-5,9-diol (racemosol); 1,7,8,12b-tetrahydro-2,2,4-trimethyl-2Hbenzo ^[6, 7] cyclohepta[1,2,3-de] ^[1] benzopyran- 5,10,11- triol; 1,7,8,12b-tetrahydro-2,2,4-trimethyl-2Hbenzo ^[6, 7] cyclohepta [1,2,3-de] ^[1] benzopyran-5,9,10- triol (de-O-methyl racemosol) ^[16] Lupeol, N-Tetracosane, Sitosterol stearate, Stigmasterol, Eicosanoic acid, Racemosolone ^[24] , 2, 2-dimethylchroman derivative de-O-methylracemosol ^[23, 25] .

Table 6: Pharmacology

Part	Extract	Pharmacological activity
Leaves	Petroleum ether, chlolorform, ethylacetate, methanol	Anthelmintic ^[26] Antibacterial ^[27]
	Ethanol, n-hexane, chloroform, n-Butanol	Antifilarial ^[28]
	Aqueous, methanol	Antihyperglycaemic ^[29]
	Ethanol	Antihistaminic ^[9] , Anti-inflammatory, Antidiarrhoeal ^[30]
		Antispasmodic ^[31]
Bark	Alcoholic	Antipyretic ^[32]
	Aqueous and alcoholic	Antiulcer ^[32]
	Methanol	Antitumor ^[8] Analgesic ^[15]
		Anti-inflammatory ^[33] Anti-HIV activity ^[34] Antioxidant, Hepatoprotective ^[35]
Fruit	Aqueous, alcoholic	Antiulcer ^[33]
Whole plant	Petroleum ether, ethanol, aqueous	Antihistaminic ^[9]
	Aqueous, alcoholic	Antihyperglycemic ^[36]
	Ethanol	Anthelmintic ^[10]
	Methanolic	Anxiolytic ^[7] , Antitumor ^[37]

Table 7: Bioactive phytochemicals present in various parts of *Bauhinia racemosa* Lam

Parts	Constituents	Pharmacological activity
Aerial parts	Methyl gallate, Gallic acid, Kaempferol, Quercetin, Quercetin 3-O- α -rhamnoside, Kaempferol 3-O- β -glucoside, Myricetin-3-O- β -glucoside, Quercetin-3-O-rutinoside (Rutin)	Anti-microbial ^[38]
Stem bark	Quercetin, Naringin, Silymarin, Anthocyanosides, Sophoradin, Saponins, Tannins	Anti-ulcer ^[15, 32]
Leaves	Galactolipid, Catechin class of compounds	Anti-filarial ^[15, 28]
	Phenol,2,4-bis(1,1-dimethylethyl)-, mome inositol, Neophytadiene, 6-octen-1-ol,3,7-dimethyl-,Propanoate, 16-heptadecenal, citronellyl butyrate	Anti-diabetic ^[39]
Roots	Racemosol, de-o-methyl racemosol	Anti-bacterial, anti-fungal, anti-viral ^[2]

Conclusion

The traditional medicinal uses, phytochemistry and pharmacology of *Bauhinia racemosa* presented in this review could be helpful for future studies and research. The plant has good future prospective for discovery of new molecules and pharmacological activities.

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