Journal of Pharmacognosy and Phytochemistry
Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
www.phytojournal.com
JPP 2021; 10(2): 121-124
Received: 13-01-2021
Accepted: 17-02-2021

Memona Fatima
Department of Pharmacognosy, Faculty of Pharmacy and Pharmaceutical Sciences, University of Karachi, Karachi-75270, Pakistan

Salman Ahmed
Department of Pharmacognosy, Faculty of Pharmacy and Pharmaceutical Sciences, University of Karachi, Karachi-75270, Pakistan

Maaz Uddin Ahmed Siddiqui
Department of Pharmacognosy, Faculty of Pharmacy and Pharmaceutical Sciences, University of Karachi, Karachi-75270, Pakistan

Muhammad Mohtasheem ul Hasan
Department of Pharmacognosy, Faculty of Pharmacy and Pharmaceutical Sciences, University of Karachi, Karachi-75270, Pakistan

Corresponding Author:
Memona Fatima
Department of Pharmacognosy, Faculty of Pharmacy and Pharmaceutical Sciences, University of Karachi, Karachi-75270, Pakistan

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

Memona Fatima, Salman Ahmed, Maaz Uddin Ahmed Siddiqui and Muhammad Mohtasheem ul Hasan

DOI: https://doi.org/10.22271/phyto.2021.v10.i2b.13972

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-amyrin, 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	*Bauhinia*
Species	*Racemosa*

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.

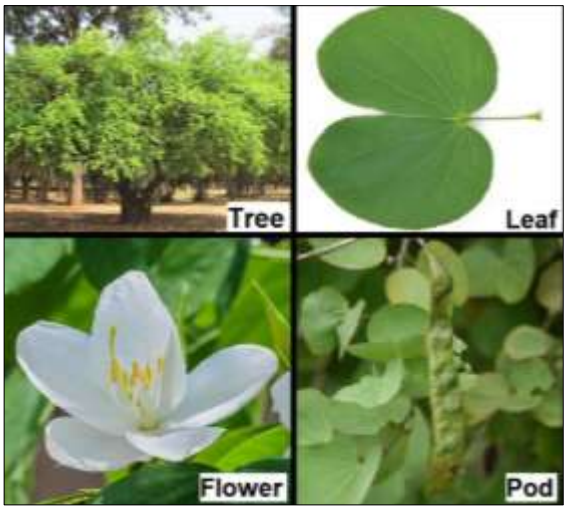

Fig 1: *Bauhinia racemosa* Lam.

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-amyrin, 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-amyrin [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, chlolroform, 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	Antihelmintic [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.

References

1. Pandey M, Debnath M, Gupta M, Chikara SK. Phytomedicine: An ancient approach turning into future potential source of therapeutics. J Pharmacognosy and Phytotherapy 2011;3:27-37.
2. Panda P, Das D, Dash P, Ghosh G. Therapeutic potential of Bauhinia racemosa-a mini review. Int J Pharm Sci Rev Res 2015;32(2):169-179.
3. Rastogi RP, Mehrotra BN. Compendium of Indian Medicinal Plants. Vol.3. (New Delhi, India: Central Drug Research Institute, Lucknow and National Institute of Science Communication) 1993, 188-189.
4. Khare CP. Indian Medicinal Plants. (New Delhi, India: An Illustrated Dictionary Springer publication) 2007, 90.
5. Anonymous. Flora of Maharashtra State, Monocotyledones. Sharma BD ed. (Calcutta, India: Botanical Survey of India) 1996, 412.
6. Ali SI. *Caesalpiniaceae*. Flora of west Pakistan. Fascicle 1973, 54.
7. Davey MS, Atlee C, Ashok SRS, Bharathi Mohamed F. Antianxiety effect of methanolic extract of *B.racemosa* (lamk) stems bark in mice. Int J Pharma and Bio Sci. 2011;2:217-224.
8. Gupta M, Mazumder UK, Kumar RS, Kumar TS. Antitumor activity and antioxident role of *B. racemosa* against Ehrlich ascites carcinoma in Swiss albino mice. Acta Pharmacol Sin 2004;25(8):1070-1076.
9. Nirmal SA, Laware RB, Rathi RA, Dhasade VV, Kuchekar BS. Antihistaminic effect of *Bauhinia racemosa* leaves. J Young Pharm 2011;3(2):129-131.
10. Kuma T, Alexander AA, Dewangan, Junaid DK, Sharma Mukesh. Investigation of *in-vitro* anthelmintic activity of *B.racemosa* linn. J Applied Pharmaceutical Sci 2011;1:73-75.
11. Kirtikar KR, Basu BD. Indian medicinal plants. 2nd ed. (Dehradun, India: Bishen Mahendra pal singh). International book distribution 1975;**2**(2):894-895.
12. Jain SK. Wild plants foods of the tribals of Bastar (Madhya Pradesh). Proc Nat Inst. Sci India 1964;30(2):56-80.

13. Anonymous. The Wealth of India. (New Delhi, India: National Institute of Science Communications and Information Resources, Council of Scientific and Industrial Research) 1985, 114.
14. Nadkarni KM, Nadkarni AK. Indian Material Medica. 3 rd ed. (Bombay, U.K.: Popular Prakashan, Pvt. Ltd). 2000;1:435.
15. Alex AM, Joghee S. Phytochemistry and Therapeutic potential of *Bauhinia racemosa* Lam. - A Concise Review, International Journal of Research in Pharmaceutical Sciences 2020;11(1):1045-1050.
16. Jain R, Alam S, Saxena U. A new tetracyclic phenol and other constituents from the roots of *Bauhinia racemosa*. Indian Journal of Chemistry- Section B Organic and Medicinal Chemistry 2002.
17. Anjaneyulu ASR, Reddy AVR, Reddy DSK, Ward RS, Adhikesavalu D, Cameron TS. A new dibenzo (2,3-6,7) oxepin derivative from *Bauhinia racemosa*. *Tetrahedron*. 1984;40:4245-4252.
18. El-Hossary GA, Selim MA, Sayed AE, Khaleel AE. Study of the flavonoid content of *Bassia muricata* and *Bauhinia racemosa*, Bulletin of the Faculty of Pharmacy-Cairo University 2000;38:93-97.
19. Koneni VS, Singh SP, Misra S, Gupta J, Misra BS. Galactolipids from *Bauhinia racemosa* as a new class of antifilarial agents against human lymphatic filarial parasite Brugia malayi, European Journal of Medicinal Chemistry 2012;50:230-235.
20. Mulik MB, Katekhaye SD, Laddha KS. Quantification of β amyrin in *Bauhinia racemosa* Lam. flower buds using HPTLC. Indian Drugs 2015;52(3):34-36.
21. Iribarren AM, Pomilo AB. Phytochemical Studies on *Bauhinia racemosa* Lam. *Bauhinia purpurea* Linn. and *Hardwickia binata* Roxb. J Chemistry 2007;4(1):21-31.
22. Kumar G, Karthik L, Rao KVB. Phytochemical composition and *in vitro* antimicrobial activity of *Bauhinia racemosa* lamk (caesalpiniaceae). Int J Pharma Sci Res 2010, 151-58.
23. Sharanabasappa GK, Santosh MK, Shaila D, Seetharam YN, Sanjeevarao I. Phytochemical Studies on *Bauhinia racemosa* Lam. Bauhinia purpurea Linn. and Hardwickia binata Roxb. EJournal of Chemistry 2007;4(1):21-31.
24. Jain R, Yadava N, Bhagchandania T, Jain SC. A new pentacyclic phenol and other constituents from the root bark *of Bauhinia racemosa* Lamk, Natural Product Research 2013;27(20):1870-1876.
25. Prabhakar P, Gandhidasan R, Raman PV, Krishnasamy NR, Nanduri S. De-omethylracemosol - a tetracyclic 2,2-dimethylchroman from the roots of *Bauhinia racemosa*, Phytochemistry 1994;36(3):817-818.
26. Girija B, Bhalke RD, Lodha KR, Karmase BC, Londhe CG. Phytochemical investigation and *in vitro* anthelmintic activity of *Bauhinia racemosa* linn (leguminaceae), Pharmacologyonline 2009;1:300-303.
27. Dahikar SB, Bhutada SA, Tambekar DH. *In-vitro* antibacterial efficacy of solvent extracts of leaves of *Bauhinia racemosa* Lam. (Caesalpiniaceae) against enteric bacterial pathogens, International Journal of Pharmaceutical Sciences and Drug Research 2011;3(1):32- 34.
28. Sashidhara KV, Singh SP, Misra S, Gupta J, Misra-Bhattacharya S. Galactolipids from *Bauhinia racemosa* as a new class of anti filarial agents against the human lymphatic filarial para-site, Brugiamalayi. European Journal of Medicinal Chemistry 2012;50:230-235.
29. Vidwanathaswamy AHM. Antihyperglycemic and antihyperlipidemic activity of Plectrantus amboinicusion normal and alloxan induced diabetic rats. Indian J Pharmacuetical Sci 2011;73:139-145.
30. Kesavan D, Chellaram C. Pharmacological properties of *Bauhinia racemosa* Lam. International journal of biometrics and bioinformatics 2011;3(11):520-522.
31. Kokate CK, Purohit AP, Gokhale SB. Pharmacognosy. 31st edition. Nirali Prakashan 2005, 810.
32. Borikar VI, Jangde CR, Philip P, Rekhe DS. Study of antipyretic activity of *Bauhinia racemosa* Lam. in rats, Veterinary World 2009;**2**(6):217-218.
33. Gupta M. Anti-inflammatory, analgesic and antipyretic effects of methanol extract from *Bauhinia racemosa* stem bark in animal models. Journal of Ethnopharmacology. 2005;98(3):267-273.
34. Khaled R, Meng-TL, Lin TZ, Yong TZ. Anti-HIV-1 potential of *B.racemosa* Lam. (Caesalpiniaceae) and Phytochemical profile. Topclass J Herbal Med. 2013;2:95-102.
35. Gupta M, Mazumder UK, Siva KT, Gomathi P, Kumar RS. Antioxidant and Hepatoprotective Effects of *Bauhinia racemosa* against Paracetamol and Carbon Tetrachloride Induced Liver Damage in Rats, International Journal of Pharmacy and Technology 2004;3:12-20.
36. Prusty KB, Rao JV, Subudhi SK, Reddy PA, Raj KJ. Anti hyperglycemic activity of extracts of leaves of *Bauhinia racemosa* Lamk (Family-Caesalpineaceae) on normal and alloxan-induced diabetic rats, International journal of Pharmaceutical Research and Allied Sciences 2012;1:94-99.
37. Kumar RS, Sunderam RS, Sivakumar T. Effect of *Bauhinia racemosa* stem bark on N-nitrosodiethylamine-induced hepatocarcinogenesis in rats, American Journal of Chinese Medicine 2007;35(1):103-114.
38. Rashe K, Butnariu M. Antimicrobial and antioxidant activities of *Bauhinia racemosa* Lam. and chemical content. Iran. J. Pharm. Res 2014;13(3):1073-1080.
39. Gawade B, Farooqui M. Screening of phytochemicals and *in vitro* antidiabetic activity of *bauhinia racemosa* lam. Leaves, Asian J Pharm Clin Res 2018;11(6):190-193.