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Medicinal plant *Bauhinia racemosa* its medicinal uses and pharmacological activities

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Abstract

Medicinal herbs have been used since the Vedic era. The Caesalpiniaceae family includes the *Bauhinia racemosa*, Lam. It is a tiny, anfractuous, brist tree with dangled branches; this tree is established all over India. This review tries to connect contemporary scientific results about *Bauhinia racemosa* with traditional ethnomedical knowledge to comprehend their therapeutic potential. Since thousands of years ago, nature has provided therapeutic substances, as well as an astounding variety of modern medications. One of the criticisms raised in herbal medicine is the lack of standardization and QC profiles. Additionally, there is proof that virtually all prehistoric societies employed plants to heal ailments and restore their bodies' systems. *Bauhinia racemosa* is a plant that is also referred to as the "Bidi leaf tree" because bidis are made from its leaves. The medicinal properties of phytochemicals in plants may be attributed to their anti-inflammatory, antibacterial, and antioxidant properties. The root, leaves, stem, flower, and seed of the plant all have pharmacological activity. Flavonoids, crude protein, and lipid, triterpenoids (a-amyirin), stilbenes (resveratrol), tetracyclic lupeol, betulin, B-sitosterol, and tetracyclic 2, 2-dimethyl chroman are chemical components of the plant *Bauhinia racemosa* (Lam). The pharmaceutical industry's drug development programs depend on natural product origins for more than five-hundredths of all contemporary clinical medicine's parts.

Keywords: *Bauhinia racemosa*, caesalpiniaceae, anti-inflammatory, anti HIV

Introduction

The absence of standardization and QC profiles is one of the accusations leveled against herbal medicine. Also, there is evidence that practically all prehistoric civilizations used plants to treat illnesses and rejuvenate their body systems. Plants have long been an important source of natural compounds for preserving human health, especially in the last ten years with more thorough research on natural medicines. The majority of rural residents in developing nations nearly solely treat all illnesses using traditional medicine. The antioxidant, antibacterial, and antipyretic activities of the phytochemicals in plants may be the basis of their therapeutic benefits. Similar to how knowledge of the uses of particular plant species for therapeutic reasons has been passed down through oral tradition, this understanding of medicinal plants has started to deteriorate and become outdated due to a lack of acknowledgment. Traditional medicine uses the *Bauhinia racemosa* shrub to cure a variety of illnesses^[1, 2].

There is a large population of *Bauhinia racemosa* Lam. in Pakistan, India, Sri Lanka, Burma, and China. It is a good species to utilize to fill in gaps in forest plantings because it reduces soil erosion. Trees flourish in coastal California, Florida, Hawaii, Louisiana, and Texas in the United States of America^[3].

The plant *Bauhinia racemosa* is known as Banraj (Bengali), Asundro (Gujrati), Jhinjeri, kachnal, ashta (Hindi), Banne (Kannada), Katapuli (Malaylam), Apta (Marathi), Ombaroda (Oria), Svetakanchana (Sanskrit), Araivatta-atthi (Tamil), Ari (Telugu), Kosundra (Punjabi)^[3, 4].



Fig 1: *Bauhinia racemosa* L. Botanical Description [5, 6]

Parts	Characteristics
Plant	Warm climates support the growth of small, bushy, deciduous trees with drooping limbs and an unbranched trunk.
Stem	Bluish black rough, pinkish-red inside turning brown on exposure. Rough with vertical cracks, young twigs hairy. Longitudinally fissured.
Leaves	Green, longer than it is wide and complex. Oval, rounded at the tip, and when young, pubescent beneath the leaflet. 2–5 cm long, 2.5–7.5 cm wide, separated into two lobes halfway down, glabrous above, hairy below, base typically cordate, 7-9 nerved, and petiole 7.0–18 mm long.
Flower	White or pale yellow, terminal or leaf-opposed racemes. Small flowers are borne in loose racemes, 5 - 10 cm long. Flowers range in diameter from 7.5 to 12.5 cm, and are white, with five narrow lance-shaped petals, ten fertile stamens, and filaments with hairy bases. Hairy ovary; sessile stigma. Bracts are small, linear, sharp, and jointed towards the center of the pedicel, which is 5–10 mm long, hairy, and extremely short. Around 6.0-8.0 mm long, spathaceous, and reflexed calyx.
Pods	Pods 12.5 - 25 cm by 1.7 - 2.5 cm in size are curved, swollen, and rigid.
Seed	Seeds 12 to 20 glabrous dark reddish brown or black, compressed 7-8 mm long.

Chemical constituents [7, 8, 9]

Plant parts	Chemical constituents
Leaf	Flavonols(kaemferole, Quercetin) and coumarine (Scopoletin and scopolin)
Bark	Octacosane, B-amyrin, B-sitosterol
Seed/Fruit	Flavonoids, crude protein, and lipid
Root	Tetra cyclic lupeol, betulin, β -sitosterol, and tetracyclic 2, 2 dimethyl chroman
Heart wood	Stilbene (resveratrol)

Economic importance

The plant *Bauhinia racemosa* is also known as the "Bidi leaf tree" because its leaves are used to make bidis. Both for its intrinsic worth and its breathtaking beauty, *Bauhinia racemosa* is planted. While in flower, the tree is breathtakingly gorgeous and keeps blooming for several months. The plant's white blooms are important for apiculture, as well as being used as a pot herb in curries and being preserved as pickles. Goats, sheep, and cattle are fed on the plant. The tree also produces gum and valuable fibers. The bark is utilized in the tanning and dyeing processes. Because the wood is heavy and hard, it is used to make yokes and plows as well as for fire [3, 10, 11].

Nutritional Importance

The pod morphology, proximate composition, seed protein fractions, amino acid composition, minerals, and antinutritional elements of the Indian tribal pulse of *B. racemosa* were examined. *B. racemosa* seeds had high Ca and Fe content. In the seed protein of *Bauhinia racemosa*, glutelins predominate whereas albumins and globulins are less abundant. Lysine, tyrosine, and phenylalanine were among the necessary amino acids present in quite large

concentrations, although sulfur amino acids were scarce. The fatty acids, linoleic, oleic, and palmitic acids are relatively higher in the seed lipids [3, 12].

Traditional Uses

Traditional medicine uses the *Bauhinia racemosa* plant to cure a variety of ailments. The astringent stem bark is used to cure tumors, skin conditions, headaches, and fever. The bark is effective in the Ayurvedic treatment of malaria, dysentery, and diarrhea [2].

In addition to curing biliousness, urine discharge, thirst headache, quartan fever, vatta, anal fistula, tuberculous glands, skin illnesses, throat problems, blood diseases, and chronic dysentery and diarrhea, leaves are also cooling, antipyretic, astringent, and vermifugal [1]. In the home, *Bauhinia racemosa* stem bark is stored as a snake deterrent. After giving the sufferer a glass of water, two individuals chew on this plant's leaves while blowing air into their ears to treat a scorpion bite. In the Jalgaon, Dhule, and Nandurbar districts of Maharashtra, the water extracted from the plant's bark, leaves, and roots is given twice daily after meals for two to four weeks to treat jaundice. Cattle suffering from food poisoning can be treated with a mixture of crushed leaves

from this plant, *B. racemosa*, Aloe vera, and *p. murex*, given to the animals three times per day [13].

Pharmacological activities

In recent years, the pharmacological effects of crude extracts and metabolites of *B. racemosa* have been studied because it has a high concentration of important metabolites, making it an effective microbicidal agent. Meanwhile, *in vivo* and *in vitro* studies have revealed that *B. racemosa* extracts may have anti-oxidant, antihistaminic, analgesic, antipyretic, anti-ulcer, anti-cancer, hepatoprotective, anti-diabetic, and anti-HIV.

Antibacterial activity:

Only *Staphylococcus epidermidis*, *Staphylococcus aureus*, and *Salmonella typhi* showed the Petroleum ether extract's maximum inhibitory effect on bacteria, while *Escherichia coli*, *Pseudomonas aeruginosa*, *Enterobacter aerogenes*, and *Salmonella typhimurium* showed only moderate antibacterial activity. *Proteus vulgaris* showed only a mild inhibitory effect on bacteria [14]. In the first study of *B. racemosa's* antimicrobial properties, Ali *et al.* [15]. Demonstrated that phenolic compound extracts in methanolic (MeOH) form exhibit strong inhibitory effects against *Salmonella typhi* (96.64%), *Shigella boydii* (80.55%), and *Staphylococcus pyogenes* (81.12) while extracts in hexane showed potential inhibitory effects against *Staphylococcus aureus* (72.51). *Proteus vulgaris*, *Escherichia coli*, *Enterobacter aerogenes*, *Salmonella typhimurium*, *Staphylococcus epidermidis*, and *Staphylococcus aureus* were all significantly inhibited by chloroform extract, however, *Pseudomonas aeruginosa* was only mildly affected [16].

Anti-diabetic activity

Diabetes is a metabolic illness in which the body cannot effectively create or use the hormone insulin, which is needed to turn sugar, carbohydrates, and other foods into energy. Blood glucose levels become abnormal as a result of diabetes [17]. Obesity and lack of physical activity play an important role in diabetes. Thus, scientists are interested in studying medications derived from plants, particularly plant metabolites. In a study conducted in 2012, diabetic rats treated with alloxan were used to assess the anti-diabetic properties of *B. racemosa* leaves. The *B. racemosa* leaf extracts were combined with methanol and aqueous solvents before being administered to the rats [18]. On days 10, 15, and 20 of the trial, the body weight of rats with alloxan-induced hyperglycemia significantly decreased ($p < 0.05$). In comparison to the diabetes control group, daily oral treatment with both extracts resulted in a substantial rise ($p < 0.05$) in body weight at the end of the trial. According to the current research, treating alloxan-induced rats for 20 days with *Bauhinia racemosa* aqueous and methanol extracts might restore normal biotransformation by changing the balance of carbohydrate metabolism. Increased transfer of blood glucose to peripheral tissues or insulin release from remaining beta cells in islets are two possible explanations for improved pancreatic exocrine activity [19].

Anti-oxidant activity

An oxidative stress response would occur if reactive oxygen species (ROS) were to develop within the body. It can harm cells or organ functions in a variety of pathological circumstances. Previous studies have demonstrated that many natural resources contain active metabolites with antioxidant

properties. These active metabolites are now being tested for their antioxidant potential using a variety of chemical-based methods, including the 2,2'-azino-bis (3-ethylbenzothiazoline-6-sulfonic acid) and diphenylpicrylhydrazole (DPPH) radical scavenging potential assay (ABTS) [21]. The antioxidant capacity of the stem bark of *B. racemosa* was examined by Kumar *et al.* [22]. To investigate its potential in oxidative stress, the stem bark of *B. racemosa* is prepared as crude extracts using methanol as the solvent.

Antihistaminic activity

The antihistamine potential of *B. racemosa* foliage was investigated in rodents with Clonidine-induced catalepsy [23]. The ethanol extract suppresses clonidine-induced catalepsy but has no impact on haloperidol-induced catalepsy, according to the findings. This implies that the inhibition is due to an antihistaminic action and that dopamine plays no part. Hence, we concluded that the ethanol extract has significant antihistaminic activity [23].

Antiulcer activity

The antiulcer impact of *B. racemosa* dried fruit powder was studied in Wistar albino rats. In the research, aqueous and alcoholic extracts at dose levels of 100 mg/kg and 200 mg/kg body weight were used. After one hour, all groups received oral paracetamol at a dosage rate of 200 mg/kg body weight. The number of ulcers, ulcer score, percent incidence, ulcer index, and healing index were all noted after 24 hours. According to the findings, aqueous extract at a dose rate of 200mg/kg body weight and alcoholic extract (100 mg/kg and 200 mg/kg body weight) could cause antiulcer activity.

Anti-cancer activity

Cancer is a leading cause of death all over the globe. According to World Health Organization (WHO) reports, the incidence of cancer cases is anticipated to rise by 75% by 2030 due to population growth and lifestyle changes. According to Md. Azizur Rahman *et al.*, a methanolic extract of *Bauhinia racemosa* (Lam.) has potent cytotoxic action against a cancer cell line. The cytotoxic activity and apoptotic effects of a methanolic preparation of *Bauhinia racemosa* (Lam.) on HeLa, a cancer cell line, were assessed using the methyl thiazolyl-tetrazolium assay and the 4',6-diamidino-2-phenylindole staining test, respectively.

Anti-HIV activity

The syncytia formation assay was used to assess the impact of *Bauhinia racemosa* extract on acute HIV-1 infectivity. According to Palshetkar *et al.* [24], 37.9 million people are living with HIV globally, with 36.2 million being adults and 1.7 million being children under the age of 15. In addition, 1.7 million individuals have been newly infected with viral infections. Globally, 770,000 people have died from diseases linked to acquired immunodeficiency syndrome (AIDS). Khaled *et al.* [25] investigated the anti-HIV effects of *B. racemosa* stem and fractions in methanol, ethyl acetate, n-butanol, and aqueous solvents. Methanolic extracts of *B. racemosa* were more effective against HIV, whereas other components were less effective. Phytochemicals have also been investigated in *B. racemosa* preparations extracted in methanol and other solvents. Flavonoids, polyphenols, and terpenes were eventually discovered.

Conclusion

From this review, we concluded that the plant *Bauhinia*

racemosa (Lam.) is a very important plant that has wide applications in the medicinal system. All parts of the plant like root, leaves, stem, flower, and seed possess pharmacological activity. The plant *Bauhinia racemosa* (Lam.) has chemical constituents as flavonoids, crude protein, and lipid, tri-terpenoids (α -amyirin), stilbenes (resveratrol), tetracyclic lupeol, betulin, β -sitosterol, and tetracyclic 2, 2-dimethyl chroman. These active chemical constituents impart a variety of medicinal uses to the plant antioxidant, antiulcer, anticancer, antihistamine, antidiabetic, anthelmintic, antimicrobial, antipyretic, and analgesic. The plant also has nutritional importance. The global scene is now pointing to the use of non-toxic plant products with traditional medicinal uses. Therefore, the development of new drugs should be undertaken for centuries for the control of various diseases.

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