

CHAPTER 10

Food and medicinal uses of *Bauhinia purpurea* L.

Satish Sampatrao Tambe¹, Jogdand SK², Sanjeet Kumar³, and Sweta Mishra³ and Chavan Radheshyam Thavara^{4*}

¹Department of Botany, MGV'S Loknete Vyankatrao Hiray Arts Science and Commerce College, Panchavati Nashik, Maharashtra, India

²Department of Botany, Mrs. KSK College, Beed, Maharashtra, India

³Ambika Prasad Research Foundation, Odisha, India

⁴Department of Botany, Swami Ramanand Teerth Marathwada University, Nanded, Maharashtra, India

*Email ID: rtcbotany@gmail.com



Licensed under a Creative Commons Attribution 4.0 International License

ABSTRACT

Bauhinia purpurea L., commonly known as Kachnar or Orchid tree, is a multipurpose plant widely recognized for its nutritional and therapeutic applications in traditional medicine across India, Sri Lanka, Pakistan, and Southeast Asia. Various plant parts are utilized for both dietary and medicinal purposes. Young leaves, buds, and pods are consumed as leafy vegetables, especially among tribal communities, providing a rich source of dietary fiber, vitamins, and minerals. Medicinally, the plant exhibits a wide spectrum of therapeutic properties such as anti-inflammatory, antidiabetic, antioxidant, antimicrobial, and wound-healing activity. Traditional uses encompass treatment of ailments like ulcers, wounds, glandular swellings, diarrhoea, dysentery, diabetes, jaundice, leprosy, rheumatism, and stomach tumours. The plant's bioactive compounds, particularly polyphenolics, contribute to its pharmacological significance. This review highlights the medicinal and food values of *B. purpurea* with detailed morphological characters.

KEYWORDS: Orchid tree, medicinal uses, food values, pharmacological properties

INTRODUCTION

About 600 species of *Bauhinia* (Fabaceae) grow in the tropical regions of the world (Larson 1974). India has about 15 species that include trees, shrubs, and one climber. *Bauhinia purpurea* Linn, among them, is a medicinal plant that has been used for centuries to treat a wide range of ailments (Wakchoure et al. 2023a; Wakchoure et al. 2023b). *B. purpurea*, commonly known as Kachnar or Orchid tree, is one of the most important in traditional medicine, widely utilized by tribal communities not only for medicinal purposes but also as cattle fodder (Arora et al. 2020). Traditionally, various parts of this plant have been used to manage conditions such as dropsy, delirium, fever, anasarca, rheumatism, and as an analgesic, anti-inflammatory, antiepileptic, anticonvulsant, as well as an antidote for snake bites, animal bites, and scorpion stings (Kumar et al. 2019). It is well known as a source of leafy vegetables in various parts of India and Southeast Asia. The young tender leaves, flower buds, and immature pods are commonly harvested and used in local cuisines, either as stir-fried greens, in curries, or mixed with lentils (Shreedhara et al. 2009). Phytochemical investigations have revealed the presence of flavonoids, steroids, tannins, coumarins, carbohydrates, and reducing sugars, which are believed to collectively contribute to its diverse pharmacological activities (Marimuthu and Dhanalakshmi 2014). Extracts of *Bauhinia purpurea* leaves have demonstrated antipyretic, anti-inflammatory, analgesic, antifungal, antispasmodic, antimicrobial, and antitumor properties (Kumar and Chandrashekar 2011). Fresh and dried flower buds of *Bauhinia* are consumed as food, while various species are used in traditional medicines across Africa, Asia, and the Americas (Awasthi and Verma 2020). Owing to its rich phytoconstituent profile, particularly in flowers, this plant is considered a key resource in the pharmaceutical and nutraceutical industries. In recent years, the global search for new, high-quality, yet affordable sources of protein, oil, and energy has intensified, particularly in developing nations striving to meet nutritional needs. Research efforts have thus been directed towards exploring underutilized legume crops as alternative food sources.

MORPHOLOGY

Bauhinia purpurea is a fast-growing, small to medium-sized deciduous tree or large shrub, typically reaching heights of up to 10 meters. It forms a rounded, symmetrical crown with moderately dense foliage. In drier forest regions, its growth is often stunted, resulting in smaller specimens. The bark is pale grey-brown, generally smooth, but may develop slight fissures and a scaly texture

with age. Young branches are slender, angled, light green, and slightly hairy, becoming glabrous as they mature to a brownish-grey color. The heartwood is brown, hard, and known for its durability. The leaves are simple, alternate, and broadly ovate, measuring up to 12 cm in both length and width. The leaf base is rounded to shallowly cordate, while the apex is deeply divided into two lobes, extending about one-third to half the leaf's length. Both leaf surfaces are smooth and hairless, with 9 to 11 prominent veins radiating from the base. The lobe tips are rounded, obtuse, or slightly pointed. Minute stipules of about 1–2 mm are present. Leaf stalks are slender, 2.5 to 3.5 cm long, and vary from slightly hairy to nearly glabrous. The inflorescences appear in terminal panicles, each bearing 6 to 10 flowers arranged in racemes. Flower buds are club-shaped, velvety to touch, and measure approximately 3 to 4 cm before blooming. The flowers are strikingly beautiful, with shades ranging from deep purple to pale lilac or even nearly white, often marked with purple streaks. The floral tube (hypanthium) is short and turbinate, while the calyx is tubular, splitting open along one side as the corolla expands. When fully open, the calyx divides into two valves with five small teeth. Each flower comprises five narrow, oblong petals, 3 to 5 cm long, constricted at the base into claw-like structures (5–10 mm long). The banner petal is distinct with purple striations and about 7 mm wide. The flower bears three to four fertile stamens with versatile anthers approximately 6 mm in length, while the ovary is superior. During the flowering season, from September to November, *Bauhinia purpurea* transforms into a visual spectacle, adorned with clusters of large, orchid-like blossoms, each about five inches wide. The vivid display of purple, pink, and lavender petals against the backdrop of autumnal foliage creates a stunning landscape feature. These fragrant flowers often remain on the tree until just before the leaves begin to fall. Following the flowering period, slender, elongated seed pods develop rapidly, often appearing on trees still in bloom. The fruits are brown, flat, strap-like legumes, measuring 15 to 30 cm in length and 1.5 to 2.5 cm in width. Each pod contains 10 to 15 flat, rounded seeds, which are shiny-brown and glabrous, measuring 13 to 16 mm in diameter and 1 to 2 mm thick. As the pods mature, they twist and dehisce (split open) to release the seeds. Most pods open during the dry winter months, although some may persist on the tree until the following flowering season (Makwana et al. 2014; Murugesan et al. 2017; Kumar et al. 2022; Dabadi et al. 2024; Figure 1).

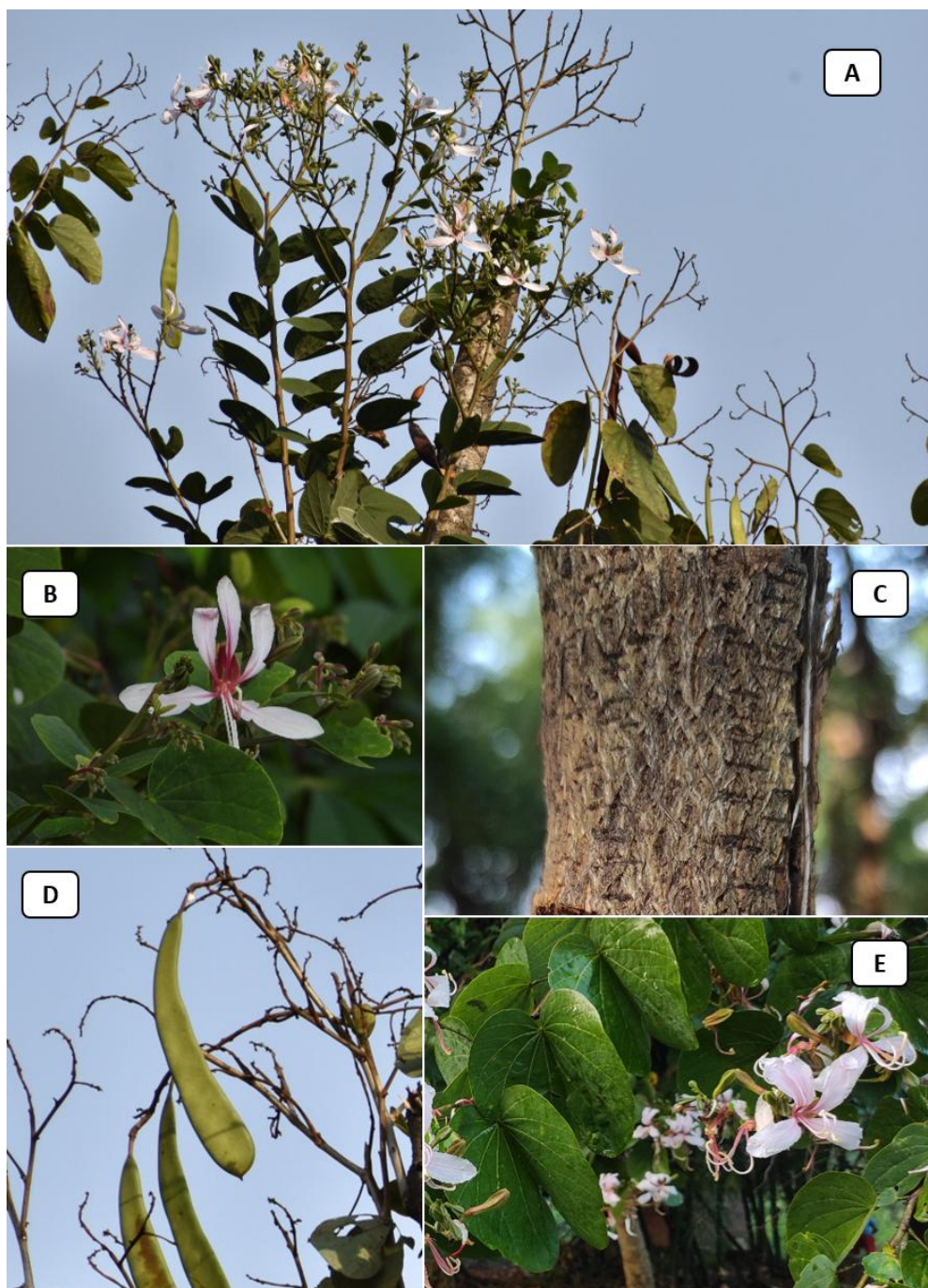


Figure 1: Vegetative parts of *B. purpurea*; A) Canopy, B) Flower, C) Bark, D) Fruit, E) Leaves with flowers

TRADITIONAL MEDICINAL USES

B. purpurea is a traditionally valued medicinal tree with various parts, leaves, flowers, buds, pods, stems, bark, and roots, being extensively used in folk medicine across India, Sri Lanka, Pakistan, and Southeast Asia. The leaves are commonly applied to cure wounds and are known for their antifungal, anti-inflammatory, and antimalarial properties (Chanchal et al. 2015; Arora et al. 2020). They are also used to treat epilepsy, convulsions, and digestive issues. The flowers and flower buds are consumed as food and are known to possess laxative properties; their paste is traditionally applied to treat constipation, ulcers, glandular swellings, and skin diseases (Pahwa et al. 2010; Singh et al. 2023). In Pakistan, fresh and dried flower buds are used as a food source, while in Ayurveda, combinations of flowers, bark, and rice water are used for boils and abscesses (Chanchal et al. 2015; Prabhu et al. 2021). The young pods and mature seeds are eaten by tribal communities like the Kathkors and Gondas of India, both as a vegetable and for their medicinal value in addressing digestive ailments. The stem and bark decoction are traditionally used to treat dysentery, diarrhoea, ulcers, and glandular diseases, with the bark paste applied for scorpion bites, rheumatism, and as an astringent wash (Dabadi et al. 2024). The roots are used for treating jaundice, leprosy, cough, carminative disorders, ulcers, boils, and abscesses (Wakchoure et al. 2023a). Root decoctions are also administered to expel gases and relieve griping stomach pains. Overall, various parts of *Bauhinia purpurea* are integral in treating conditions such as infections, pain, diabetes, fever, rheumatism, dropsy, delirium, septicaemia, and stomach tumors, making it a highly revered medicinal plant in traditional healing practices (Gupta et al. 2012; Prabhu et al. 2021).

FOOD VALUES

B. purpurea, a plant of high nutritional and nutraceutical significance. Traditionally, the young leaves, flower buds, flowers, and tender pods are consumed as leafy vegetables in various Indian and Southeast Asian cuisines (Awasthi and Verma 2020). These edible parts are rich in essential nutrients like dietary fiber, proteins, vitamins (especially Vitamin C), and minerals such as calcium and iron, making them a valuable addition to rural diets. Beyond its nutritional value, *B. purpurea* is endowed with potent bioactive compounds, including flavonoids, polyphenols, tannins, and saponins, which impart significant health benefits (Dhyani and Gupta 2016). These phytoconstituents are responsible for the plant's antioxidant, anti-inflammatory, antidiabetic, hepatoprotective, and antimicrobial properties.

Regular consumption of *B. purpurea* as part of the diet aids in digestion, boosts immunity, and helps in the management of metabolic disorders like diabetes and hyperlipidemia. Its traditional use as a functional food aligns with the modern concept of nutraceuticals, where food not only provides nutrition but also offers therapeutic effects. *B. purpurea* serves as an excellent example of a plant that bridges traditional culinary practices with preventive healthcare, highlighting its potential for future development into value-added functional food and nutraceutical products (Dhyani and Gupta 2016; Awasthi and Verma 2020).

PHARMACOLOGICAL VALUES

Anti-diabetic activity

Extracts of *B. purpurea* have demonstrated the ability to lower elevated blood glucose levels, suggesting potential in managing diabetes. Studies, including one employing a methanol extract of the bark on diabetic rats, showed a dose-dependent decrease in blood sugar, indicating that as the concentration of the extract increased, its anti-diabetic effect also became more pronounced. This activity may be due to increased glucose uptake at the cellular level, improved pancreatic beta-cell function, or a reduction in the absorption of glucose from the intestine (Meshram et al. 2013; Wakchoure et al. 2023c).

Anti-inflammatory and anti-arthritic activity

B. purpurea extracts have been shown to possess anti-inflammatory properties, particularly in studies using animal models for induced inflammation and arthritis. A hydroalcoholic extract of the stem bark significantly reduced paw edema and decreased levels of pro-inflammatory cytokines like TNF- α and IL-1 β , while increasing the anti-inflammatory cytokine IL-10. The presence of flavonoids, steroids, and tannins in the plant may contribute to these effects, as these compounds are known to inhibit inflammatory pathways (Shreedhara et al. 2009).

Antioxidant activity

B. purpurea exhibits antioxidant activity due to the presence of flavonoids and phenolic compounds. These antioxidants help protect the body from damage caused by free radicals and oxidative stress. Studies have shown that extracts of *Bauhinia purpurea* can scavenge free radicals, reduce lipid peroxidation, and enhance antioxidant enzyme activity. Leaves are a potential source of natural antioxidants (Krishnaveni 2014; Revathy et al. 2019)

Wound healing activity

Extracts of *B. purpurea* leaves have demonstrated wound-healing properties in various animal models, including excision, incision, burn, and dead space wounds. Methanol and chloroform extracts significantly accelerated wound closure and epithelization (formation of new skin tissue). They also increased the breaking strength of the incision wounds and promoted the formation and quality of granulation tissue, a key component in wound healing (Ananth et al. 2010).

Anti-ulcer activity

The chloroform and methanol extracts of *B. purpurea* leaves have shown anti-ulcer activity in animal studies. These extracts reduced ulcer formation induced by ethanol and indomethacin, demonstrating their gastroprotective effects. This activity may be linked to the presence of flavonoids and tannins in the plant, which may act by increasing gastric wall mucus production and reducing gastric acid secretion (Zakaria et al. 2011).

Antimicrobial activity

B. purpurea extracts have been shown to inhibit the growth of certain bacteria and fungi. Studies on methanol extracts revealed significant activity against some Gram-positive bacteria like *Bacillus subtilis* and *Staphylococcus aureus*. This activity is potentially attributed to the presence of various phytochemicals, including flavonoids and phenolic compounds (Negi et al. 2012; Shukla 2019).

CONCLUSION

B. purpurea L. holds significant value as a traditional food and medicinal plant, serving as a vital link between nutrition and health in rural and tribal communities. Its edible parts, particularly the leaves, buds, and pods, are integral components of local diets, while its medicinal applications span a broad range of ailments, showcasing its versatility as a therapeutic agent. The presence of bioactive compounds such as polyphenols underlines its pharmacological potential, supporting its traditional use in managing inflammatory conditions, digestive disorders, glandular diseases, and infections. Given its widespread traditional usage and ethnopharmacological relevance, *B. purpurea* offers promising prospects for further scientific validation and development of nutraceuticals and herbal formulations, thereby

reinforcing its importance in sustainable health practices and traditional food systems.

REFERENCES

- Ananth KV, Asad M, Kumar NP, Asdaq SMB and Rao GS. (2010). Evaluation of wound healing potential of *Bauhinia purpurea* leaf extracts in rats. *Indian Journal of Pharmaceutical Sciences*. 72 (1): 122-127.
- Arora SK, Hussain M, Yende SR, Moharir K, Pande V and Ittadwar A. (2020). *Bauhinia purpurea*: An Updated Pharmacological Profile. *Journal of Ayurvedic and Herbal Medicine*. 6(2): 81-85
- Awasthi M and Verma R. (2020). Medicinal and nutritional potential of *Bauhinia* species. *Medicinal Plants*. 12: 472-476.
- Chanchal DK, Niranjana PS, Alok S and Rashmi S. (2016). Evaluation of macroscopical and microscopical study, phytochemical analysis, TLC and HPTLC fingerprinting of *Bauhinia purpurea* Linn. leaves. *International Journal of Pharmaceutical Sciences and Research*. 7(8): 3539-3544.
- Dabadi P, Krupanidhi AM and Chandana M. (2024). A review on biocompounds and pharmacological activities of *Bauhinia purpurea*. *International Journal of Research in Pharmacy and Pharmaceutical Sciences*. 9(3):6-13.
- Dhyani N and Gupta A (2016). Nutritional composition of dehydrated *Bauhinia* leaves (*Bauhinia purpurea*) powder. *International Journal of Home Science*. 2(2): 363-364.
- Gupta D, Chandrashekar, Lobo R, Yogendra and Gupta N. (2012). In-vitro Antidiabetic activity of stem bark of *Bauhinia purpurea* Linn. *Der Pharmacia Lettre*. 4 (2): 614-619.
- Krishnaveni M. (2014). Antioxidant potential of *Bauhinia purpurea* (L.) leaf. *International Journal of Pharmacy and Pharmaceutical Sciences*. 6(7): 558–560.
- Kumar S, Kumar R, Gupta YK and Singh S. (2019). *In vivo* anti-arthritis activity of *Bauhinia purpurea* Linn. Bark Extract. *Indian Journal of Pharmacology*. 51(1):25-30.

- Kumar S, Mishra S, Mishra AK and Kumar SN. (2022). Floral diversity of Koira & Barsuan Ranges of Bonai Forest Division, Odisha. Bonai Forest Division, Odisha and Ambika Prasad Research Foundation, Odisha, India.
- Kumar T and Chandrashekar KS. (2011). *Bauhinia purpurea* Linn. A review of its ethnobotany, phytochemical and pharmacological profile. Research Journal of Medicinal Plant. 5(4): 420-431.
- Larson SS. (1974). Pollen morphology of Thai species of *Bauhinia* (Caesalpiniaceae). Grana. 14: 114-131.
- Makwana P, Albert S, Contractor K and Singh AK. (2014). Morphological characterization in interspecies of *Bauhinia* species. Current Horticulture. 2(1): 28–33.
- Marimuthu K and Dhanalakshmi R. (2014). A Study on Phytochemicals in *Bauhinia purpurea* L. Leaf and Flower. International Journal of Pharmaceutical Sciences Review and Research. 29(2): 72-76.
- Meshram SS, Itankar PR and Patil AT. (2013). To Study Antidiabetic Activity of Stem Bark of *Bauhinia Purpurea* Linn. Journal of Pharmacognosy and Phytochemistry. 2(1):171-175.
- Murugesan SK, Dhanapaul V and Rakkan P. (2017). Comparison of two *Bauhinia* species based on the morphological, antimicrobial and protein markers. Journal of Pharmacognosy and Phytochemistry. 6(6): 306-309.
- Negi BS, Dave BP and Agarwal YK. (2012). Evaluation of antimicrobial activity of *Bauhinia purpurea* leaves under in Vitro conditions. Indian Journal of Microbiology. 52(3):360-365.
- Pahwa S, Mazumder R, Bhattacharya S, Kumari S, Mazumder A and Singh DP. (2010). Pharmacognostical and phytochemical evaluation of the leaves of *Bauhinia purpurea* Linn. Ancient Science of Life. 30(2):28-32.
- Prabhu S, Vijayakumar S, Ramasubbu R, Praseetha PK, Karthikeyan K. Thiyagarajan G, Sureshkumar J and Prakash N. (2021). Traditional uses, phytochemistry and pharmacology of *Bauhinia racemosa* Lam.: a comprehensive review. Future Journal of Pharmaceutical Sciences. 7:101.

- Prabhu S, Vijayakumar S, Ramasubbu R, Praseetha PK, Karthikeyan K, Thiagarajan G, Sureshkumar J and Prakash N. (2021). Traditional uses, phytochemistry and pharmacology of *Bauhinia racemosa* Lam.: a comprehensive review. *Future Journal of Pharmaceutical Sciences*. 7: 101.
- Revathy RN, Joseph L and Rahees T. (2017). Role of Ethanolic Extract of *Bauhinia purpurea* leaves on amelioration of hyperthyroidism in L-thyroxine induced female albino Wistar rats. *Journal of Pharmacovigilance and Pharmacotherapeutics*. 103. DOI: 10.29011/JPPT-103. 100103
- Shreedhara CS, Vaidya VP, Vagdevi HM, Latha KP, Muralikrishna KS, and Krupanidhi AM. (2009). Screening of *Bauhinia purpurea* Linn. for analgesic and anti-inflammatory activities. *Indian Journal of Pharmacology*. 41(2):75-79.
- Shukla R. (2019). Anti-microbial potential of hydroalcoholic extract of *Bauhinia purpurea* against some selective microbes. *International Journal of Pharmaceutics & Drug Research*. 7 (2): 67-72.
- Singh SK, Singh S, Kumar R, Sharma A and Karwasra R. (2023). An updated review on multidimensional uses of *Bauhinia purpurea* Linn. *European Chemical Bulletin*. 12(Special Issue 5): 493 – 501.
- Wakchoure S, Jadhav S, Raut P, Tribhuvne B, Chaudhari BV. (2023c). Review on pharmacological activity of *Bauhinia purpurea* L. flower. *International Journal of Novel Research and Development*. 8(3): 518-527.
- Wakchoure S, Raut P and Tribhuvne B. (2023a). Review on pharmacological activity of *Bauhinia purpurea* L. flower. *International Journal of Pharmacognosy*. 10(8): 463-469.
- Wakchoure SM, Jadav S, Raut PG, Chaudhari B and Tribhuvane B. (2023b). Evaluation of anthelmintic activity of *Bauhinia purpurea* L. flower in different solvent extract. *International Journal of Pharmacognosy and Pharmaceutical Sciences*. 5(1): 101-104.
- Zakaria ZA, Hisam EEA, Rofiee MS, Norhafizah M, Somchit MN, The LK and Salleh MZ. (2011). In vivo antiulcer activity of the aqueous extract of *Bauhinia purpurea* leaf. *Journal of Ethnopharmacology*. 137(2):1047-1054.