

Chapter 2

Butea monosperma (Lam.) Kuntze and its ethnobotanical significance

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Abstract: *Butea monosperma* (Lam.) Kuntze, commonly known as Flame of the Forest, holds significant ethnobotanical importance across various traditional medicine systems. The plant is extensively utilized for its therapeutic properties, with its flowers, leaves, stem bark, seeds, gum, and roots playing crucial roles in treating a variety of ailments. These parts are rich in phytoconstituents such as flavonoids, tannins, glycosides, triterpenes, and fatty acids, which contribute to its anti-inflammatory, antioxidant, antidiabetic, and antimicrobial activities. Ethnobotanical studies highlight its use in managing gastrointestinal issues, skin diseases, diabetes, and infections, as well as its application in wound healing. Communities across the world have utilized this plant for centuries in traditional medicine, reflecting its cultural and medicinal significance.

Keywords: *Butea monosperma*, ethnobotany, traditional medicine, phytoconstituents, anti-inflammatory, antioxidant, therapeutic potential

Introduction

Butea monosperma, belonging to the family Fabaceae, is locally known by Palash, Bastard Teak, Bengal Kino, and Nourouc. It is commonly known as Flame of the Forest, and is a well-known medicinal tree distributed widely in India, Burma, and other Asian regions (Burli and Khade, 2007; Saroj and Shah, 2023). It has been a cornerstone in traditional medicine practices for centuries, with references found in ancient mythological and medical texts such as the Upanishads, Vedas, Sushruta Samhita, and Charaka Samhita (Singh and Srivastava, 2022). In mythology, it is associated with Agnidev, the God of Fire, and carries cultural significance. The palash flowers are used for 'Holi' i.e. festival of color in India. Utensils are made from the wood of *B. monosperma*. The dried stem is used to make sacred fire (Jhade *et al.*, 2009; Gupta *et al.*, 2017). The plant grows on open grasslands and scattered in mixed forests. It is a medium-sized deciduous tree, often reaching heights of up to 50 feet. It bears stunning orange-red flower clusters from January to March, shedding its leaves during this period. The twisted and gnarled trunk adds to its aesthetic appeal. The plant's flowers, leaves, bark, and seeds have diverse uses, both medicinal and practical. The flowers are rich in flavonoids such as butein, butrin, isobutrin, coreopsin, and isocoreopsin. Other compounds isolated include palasitrin, sulphuresin, monospermoside, and 7,3,4-trihydroxyflavone. The stem yields euphane triterpenoids like 3a-hydroxyeuph-25-ene, while the pods contain the imide palasimide (Mishra *et al.*, 2012). Flowers of *B. monosperma* are used as antioxidant, diuretic, antileprotic, anti-inflammatory, antiulcer, astringent, eye disorder, diarrhea, depurative, tonic, leprosy and skin diseases (Hegde *et al.*, 2014). The plant is having numerous medicinal properties. As per Ayurveda, *B. monosperma* also has the property of reducing Kapha and Vata (Tiwari *et al.*, 2019). *Butea monosperma* exemplifies the symbiotic relationship between nature and

mankind. Its widespread availability, coupled with its myriad medicinal and practical uses, highlights its importance. While its traditional uses are well-documented, there is a need for continued scientific evaluation to fully harness its therapeutic potential.

Morphology

It is a medium-sized deciduous tree, usually growing up to 12–15 meters in height. Often seen as a spreading tree in dry regions. The tree is known for its striking appearance when in full bloom (Singh and Srivastava, 2022; Nayak and Kumar, 2023; Mukherjee and Mishra, 2024; Plate 1).

Stem: The stem is generally irregular, crooked, and covered with ashy-gray or brownish bark that is slightly rough. The young stems are hairy, giving them a velvety appearance.

Leaves: Compound leaves, pinnately trifoliate. Leaflets are broadly ovate or rhomboid in shape, with the terminal leaflet larger than the lateral ones. Leaflets are leathery, pubescent, and about 10–20 cm long. Petioles long about 5–10 cm, stout, and slightly hairy. The leaves are shed in winter, and new foliage emerges before the flowering season.

Inflorescence: Raceme, found in axillary clusters or terminal racemes. The inflorescence consists of bright orange-red flowers, making the tree highly attractive.

Flowers: Papilionaceous. medium-sized, about 2.5–5 cm long, bright orange or scarlet.

Calyx: Bell-shaped, covered with dense hairs.

Corolla: Consists of a standard, wings, and keel, with the standard petal being large and showy.



Plate 1: Vegetative parts of *B. monosperma*; a) Flowers, b) bark, c) leaves, d) fruit

Androecium: 10 stamens, diadelphous.

Gynoecium: A single carpel with a superior ovary.

Fruit: Flat legume (pod), about 15–20 cm long. The pod is densely hairy, containing a single seed (hence the name monosperma). Green when young, turning brown and woody at maturity.

Seed: Flat and reniform, about 2–3 cm in length.

Traditional medicinal uses

Leaves: Leaves are used to treat gastrointestinal issues, common cold, and cough. Powdered leaves taken with water helps to manage diabetes. It is beneficial for treating sore throats and killing intestinal worms. It is Effective in checking irregular menstrual bleeding. It acts as an astringent, tonic, diuretic, and aphrodisiac properties. Cures boils, pimples, hemorrhoids, and piles (Singh and Srivastava, 2022).

Stem: Stem paste treats injuries and body swelling. Juice helps to treat goiter. Bark is used to treat burning sensations and skin diseases. Decoction of bark useful in cold, cough, fever, and menstrual disorders. Bark is astringent, bitter, aphrodisiac, antihelmintic, and beneficial for tumors, ulcers, and bleeding piles. Bark of *B. monosperma* is also used for diarrhea, dysentery, ulcers, and snake bites in Nepal (Jhade *et al.*, 2009; Lahori and Jain, 2020).

Roots: Root paste treats snake bites. Juice acts as an antidote for snake bites. Treats ulcers, septic sore throats, and congested throats. Useful for night blindness and elephantiasis. Applied in sprue, piles, ulcers, tumors, and dropsy. It may cause temporary sterility in women (Jhade *et al.*, 2009; Gaikwad *et al.*, 2022).

Gum: Gum is used for diarrhea, dysentery, phthisis, and hemorrhage. It treats leucorrhoea, ringworm and substitutes gum Kino. Gum is astringent to the intestines, beneficial in stomatitis, cough, ocular-opacities, and relieves excessive sweating (Mukherjee and Mishra, 2024).

Flowers: Flowers are astringent, diuretic, depurative, aphrodisiac, tonic. Used for leprosy, strangury, gout, skin diseases, thirst and burning sensations. Juice is helpful in treating eye diseases and chronic fever. Reduces body heat when mixed with milk and sugar. It treats leucorrhoea when infused in water overnight. Effective in diarrhea, hematuria, and menstrual flow disorders. Promotes swelling reduction in human and veterinary applications (Yadav *et al.*, 2020; Gaikwad *et al.*, 2022).

Fruit and Seeds: It treats urinary discharges, piles, skin diseases, tumors, and abdominal troubles. Also Used for scorpion stings (Nayak and Kumar, 2023).

Pharmacological potential

B. monosperma, exhibits a wide range of pharmacological properties due to its rich bioactive phytochemical composition (Figure 1).

Antimicrobial activity: Extracts from the bark, gum, and flowers demonstrate significant antimicrobial activity against bacterial and fungal pathogens. Stem bark and gum are particularly effective against *E. coli*, *Staphylococcus aureus*, *Candida albicans* and other pathogens (Tiware *et al.*, 2019).

Antidiabetic potential: Leaf powder and extracts reduce blood sugar levels and improve insulin sensitivity. Flavonoids, tannins, and alkaloids contribute to hypoglycemic effects. Effective in managing diabetes-related complications such as neuropathy and nephropathy (Burli and Khade, 2007).

Anti-inflammatory and analgesic activity: Bark and root extracts exhibit anti-inflammatory effects by inhibiting key inflammatory mediators (e.g., COX enzymes). Effective in treating conditions like arthritis, swelling, and injuries (Burli and Khade, 2007).

Antioxidant properties: Rich in phenolic compounds, flavonoids and tannins that neutralize reactive oxygen species (ROS). Protects cells from oxidative stress, preventing aging and chronic diseases like cancer and cardiovascular diseases (Tiwari *et al.*, 2019).

Anticancer activity: Certain bioactive compounds (e.g. butin, flavonoids) exhibit cytotoxic effects on cancer cell lines. Treat breast, colon, and lung cancers. It induces apoptosis and inhibits cancer cell proliferation by regulating signaling pathways (Pattanayak *et al.*, 2017).

Hepatoprotective effects: Root, flower and seed extracts protect liver cells from toxin-induced damage. Effective in treating liver disorders like jaundice and hepatitis. Reduces oxidative damage to hepatic cells (Singh and Srivastava, 2022).

Anthelmintic activity: Leaves, seeds and pods are traditionally used to eliminate intestinal worms. Exhibits strong anthelmintic activity against *Ascaris* and *Hymenolepis nana* (Borkar *et al.*, 2010).

Wound healing potential: Bark paste and leaf extracts promote faster wound healing. Exhibits antibacterial activity to prevent infections in wounds (Singh and Srivastava, 2022).

Cardioprotective effects: Antioxidant properties protect the cardiovascular system by reducing lipid peroxidation. Prevents heart-related complications due to diabetes or oxidative stress (Sutariya and Saraf, 2015).

Bioactive compounds

B. monosperma contains diverse phytoconstituents in its different parts. The flowers are rich in triterpenes, flavonoids (butin, isobutrin, coreopsin, isocoreopsin, monospermoside, chalcones, aurones), glycosides, glucose, fructose, and amino acids like histidine and phenylalanine. The leaves contain kino-oil with oleic, linoleic, lignoceric, and palmitic acids. The stem bark has kino-tannic acid, gallic acid, pyrocatechin, glucosides, lupenone, lupeol, medicarpin, and shellolic acid.

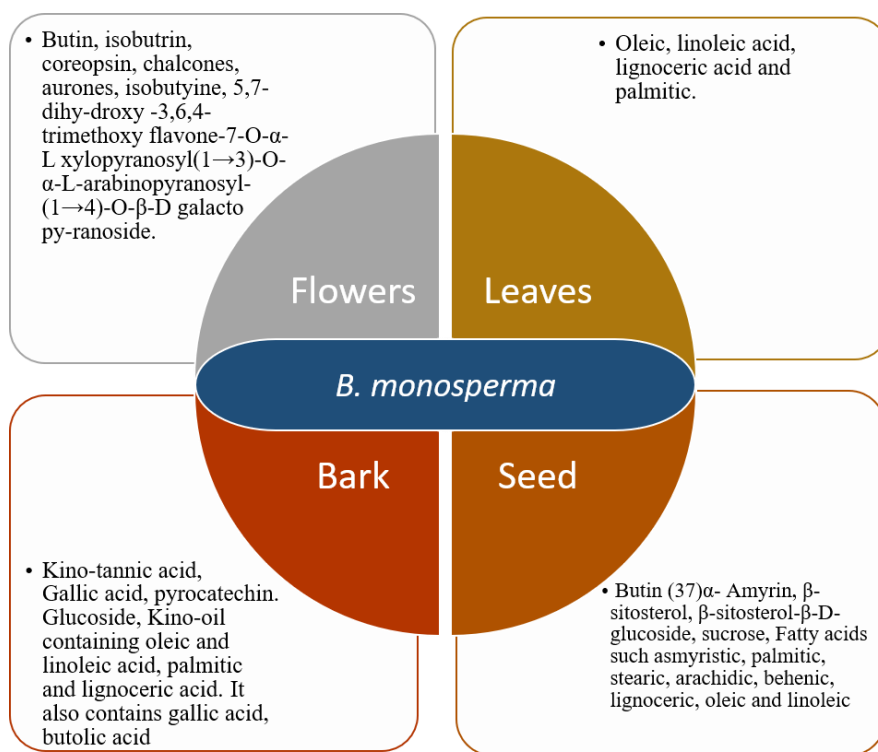


Figure 1: Bioactive compounds present in *B. monosperma*

The gum includes mucilaginous material, pyrocatechin and tannins. The seeds are rich in flavonoids, palasonin, sucrose and fatty acids like myristic, stearic, arachidic, and oleic, along with β -sitosterol and nitrogenous acidic compounds. The roots contain glucose, glycine, lupenone, lupeol, sitosterol

and isoflavones like prunetin and 5-methoxygenistein. These bioactive compounds underline its medicinal significance (Mukherjee and Mishra, 2024).

Conclusion

Butea monosperma serves as a cornerstone of ethnobotanical practices due to its extensive medicinal applications and cultural significance. Being rich in bioactive compounds, the plant demonstrates a wide range of therapeutic properties that have been harnessed by traditional healers for generations. Its documented uses in treating inflammation, diabetes, gastrointestinal disorders, and infections underline its pharmacological relevance. More ethnobotanical and phytochemical studies can help make it possible for it to be used in modern medicines, which will protect it and make sure that it is used for many years to come.

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