

## A review on pharmacological activities of *Butea Monosperma*

Dr. Prakash Dabadi\*, Dr. A M Krupanidhi, Dhanush CR

Department of Pharmacology, Bapuji Pharmacy College, Davangere, Karnataka, India

### Abstract

Since ancient times, people have used plants for their medicinal and aesthetic qualities. In India, traditional herbal medicine has a long history and is widely used. Since not many studies have been done on *Butea monosperma* (Lam.) Taub, the current review aims to provide up-to-date information on botany, morphology, ecological biodiversity, medicinal applications, phytochemistry, and pharmacological activity on various portions of the plant. For a very long time, this herb has been voluntarily employed in traditional Asian medicines. Numerous ailments, including as diabetes, cancer, diarrhoea, dysentery, fever, and jaundice, have all been treated with it.

Several pharmacological properties have been reported for it, such as anti-inflammatory, antimicrobial, antifungal, antibacterial, antistress, chemo-preventive, haemagglutinating, hepatoprotective, radical scavenging, thyroid inhibitory, antiperoxidative, hypoglycemic, and wound healing activities. It is also said to have anti-convulsive, anti-diarrheal, antiestrogenic, and antifertility properties. *Butea monosperma* comes in a variety of species all over the world. The leaves are big, stipulate, and three foliate. Numerous *Butea* species have been shown to contain a variety of imides, lactones, flavonoids, sterols, and alkaloids.

The current review goes into great detail about the morphology, ethanobotany, phytochemical components, traditional usage, plant products, and pharmacological properties of each plant part.

**Keywords:** *Butea monosperma*, flavonoids, antioxidant, antifungal, pyrocatechin, glycosides

### Introduction

Plants have been employed for their therapeutic and beauty qualities since ancient times. India possesses a wealth of documented and well-applied information regarding ancient herbal therapy. The current review aims to provide current information on botany, morphology, ecological biodiversity, medicinal applications, phytochemistry, and pharmacological activity on various portions of *Butea monosperma* (Lam.) Taub (*B. monosperma*), since there have been few research conducted on this plant<sup>[1]</sup>.

It is believed that 70–80% of people on Earth still primarily rely on medicinal plants when living in the vast rural areas of developing and underdeveloped nations. Flame of the Forest, or *Butea monosperma* (Lam.), is a member of the Fabaceae family. It is known by various local names, including khakara, chichra, dhak, palash, mutthuga, bijasneha, Bastard Teak, Bengal Kino, Nourouc, and is widely available throughout India, Burma, and Ceylon, with the exception of extremely arid regions. It typically grows sporadically in mixed forests and gregariously on open grasslands. Dry and irrigated areas may both support plantations<sup>[1]</sup>.

Before the rains arrive, gather the pods and seed them; root suckers are easily formed and aid in vegetative proliferation. For many years, almost all of the plant's parts have been utilised in medicine and other fields. Herbal remedies are more common than modern medication these days due to their relative lack of side effects, affordability, ease of use, and effectiveness.

Nature is a great example of the remarkable phenomena of symbiosis and has offered a wealth of treatments for human problems; the only thing left to do is to evaluate these remedies via scientific means. *Butea monosperma* is a modern medical marvel that is widely employed in

Ayurveda, Unani, and homoeopathic treatment. The plants of this genus are well known for their colouring matters.

*Butea monosperma* is commonly used as a diuretic, aphrodisiac, tonic, and astringent. Roots can help with tumours, piles, helminthiasis, night blindness, and ulcers. Flowers are astringent, diuretic, depurative, and tonic; they are helpful in diarrhoea. In traditional medicine, the stem bark is used to cure snake bites, ulcers, dyspepsia, diarrhoea, and dysentery. In addition to its therapeutic applications, it has commercial applications as well. For example, leaves can be used to make bowls, trays, cups, and beedi wraps.<sup>3</sup>

### Vernacular Names<sup>[4]</sup>

Ayurveda: Paalasha, Kimshuka

Unani: Dhaak, Kamarkas

Tamil: Palasum, Purasus

Sanskrit: Kimsuka, Karaka

English: Flame of forest, Parrot tree

Kannada: Muthuga

Hindi: Palas, Tesu



Fig 1: Tree



Fig 2: Leaves



Fig 3: Flowers

**Taxonomical classification** <sup>[5]</sup>

Kingdom: Plantae  
 Sub-kingdom: Tracheobionta  
 Super-division: Spermatophyta  
 Division: Magnoliophyta  
 Class: Magnoliopsida  
 Subclass: Rosidae  
 Order: Fabales  
 Family: Fabaceae  
 Genus: *Butea*  
 Species: *Monosperma* (Lam.) Taub

**Morphological Characters** <sup>[6]</sup>

It is an erect, medium sized tree of 12-15 m high, with a crooked trunk and irregular branches. The shoots are clothed with gray or brown silky pubescence. The bark is ash coloured. The leaves 3 foliate, large and stipulate. Petiole is 10-15 cm long. Leaflets are obtuse, glabrous above, finely silky and conspicuously reticulately veined beneath with cuninate or deltoid base. The corolla is long with silky silvery hairs outside and bright orange red. Stamens are diadelphes, anthers uniform. Ovary has 2 ovule, style filiform, curved and stigma capitate. Pods are canesent, narrowed, thickened at the sutures, splitting round the single apical seed, lowest part indehiscent. The seeds are flat, reniform, curved. It is slow growing and attains a height of about 5 to 8 m and diameter of about 20 to 40 cm when mature at the age of about 50 years or so. The bark of palas is fibrous and bluish gray to light brown in color. It exudes a kind of red juice when injured.

**Botanical description** <sup>[7]</sup>

An erect tree 12-15 m high with crooked trunk and irregular branches, bark rough, ash coloured, young parts downy. Leaves 3-foliate, petioles 10-15 cm long, stipules linear lanceolate. Leaflets coriaceous (the terminal 10-20 cm long, broadly ovate from a cuneate base, the lateral smaller, 10-15 by 7.5 – 10 cm, obliquely rounded at the base, equilateral, the lower side the larger), all obtuse, glabrous above when

old, finely silky and conspicuously reticulately veined beneath; petioles 6 mm long, stout-stipels subulate, deciduous. Flowers large, in a rigid racemes 15 cm long, 3 flowers together form the tumid nodes of the dark olive-green velvety rhachis: pedicels about twice as long as the calyx, densely brown-velvety: bracts and bracteoles small, deciduous. Calyx 13 mm long, dark olivegreen, densely velvety outside, clothed with silky hairs within: teeth short, the 2 upper connate, the 3 lower equal, deltoid.

**Phytoconstituents** <sup>[8]</sup>**Flower**

Triterpene, butene, butin, isobutrin, coreopsin, iso-coreopsin (butin 7-glucoside), sulphurein, monospermoside (butein-3-e-D-glucoside) and iso-monospermoside, chalcones, auronnes, flavonoids (palasitrin, prunetin) and steroids.

**Gum**

Tannins, mucilaginous material, pyrocatechin.

**Seed**

Oil (yellow, tasteless), proteolytic and lipolytic enzymes, plant proteinase and polypeptidase. A nitrogenous acidic compound, along with palasonin is present in seeds. It also contains monospermoside (butein-3-e-D-glucoside) and somonospermoside.

**Resin**

Jalaric esters I, II and laccijalaric esters III, IV; Z- amyryn, e-sitosterone its glucoside and sucrose; lactone-n-heneicosanoic acid-delta-lactone.

**Leaves**

Glucoside, Kino-oil containing oleic and linoleic acid, palmitic and lignoceric acid.

**Bark**

Kino-tannic acid, Gallic acid, pyrocatechin. The plant also contains palasitrin, and major glycosides as butrin, alanind, allophanic acid, butolic acid, cyanidin, histidine, lupenone, lupeol, (-)-medicarpin, miroestrol, palasimide and shellolic acid.

**Stem**

3-Z-hydroxyeuph-25-ene and 2, 14-dihydroxy11, 12-dimethyl-8-oxo-octadec-11-enylcyclohexane. Stigmasterol-e-D-glucopyranoside and non-acosanoic acid.

**Traditional uses** <sup>[9]</sup>

**Flowers:** In order to treat Kapha, leprosy, strangury, gout, skin conditions, thirst, and feeling, flowers are astringent to the bowel; flower juice is helpful for eye conditions. The flower is useful for biliousness, inflammation, and gonorrhoea. It is also bitter, aphrodisiac, expectorant, tonic, emmenagogue, and diuretic. The colour helps to expand the spleen. Because they are depurative, flowers are applied topically to reduce oedema and encourage menstrual flow.

**Seeds:** Children eat powdered seeds as a treatment for intestinal worms. Two spoons of the crushed seeds and milk mixture are used orally to relieve urinary symptoms and prevent urinary stones. According to Ayurveda, fruit and seeds are provided for scorpion stings and are also easily digested, aperient, and effective against skin conditions, tumours, and vata and kapha imbalances.

**Leaves:** Leaves are beneficial for ocular diseases. Leaf reduces inflammation and lumbago, treats boils and piles, and is an appetiser, astringent, carminative, anthelmintic, aphrodisiac, and tonic. Chewing petiole and sucking its juice can treat gastrointestinal issues, colds, and coughs. To treat diabetes, two spoons of leaf powder mixed with a cup of water should be consumed daily for a month.

**Gum:** Gum is used to seal shoe sole fissures. For the duration of the illness, two spoons of diluted gum are recommended. Gum is useful for treating pterygium, stomatitis, cough, ocular opacities, and excessive perspiration. It is also astringent to the gut.

**Roots:** The root is helpful in treating elephantiasis and cures night blindness and other visual abnormalities. After heating the root pieces, two to three spoons of the extract are recommended to be taken at night as a treatment for impotence. This regimen is followed for a month. A spoonful of root powder combined with water is consumed as a snake bite remedy.

**Stem bark:** Powdered stem bark is used to axe-related injuries. Human goitre is treated using stem juice. Apply stem bark paste if you have bodily swellings. Bark is bitter, acrid, appetising, aphrodisiac, laxative, anthelmintic, and helpful in treating ulcers, tumours, theanus, dysentery, piles, and hydrocele, Bark helps with biliousness.

## Pharmacological activities

### Antimicrobial activity

The physico-chemical properties, quantitative phytochemical analysis, and antibacterial activity of *B. monosperma* were determined by a study. *B. monosperma* extracts were utilised to treat *Escherichia coli*, *Pseudomonas aeruginosa*, *Staphylococcus aureus*, and *Bacillus subtilis* in ethanol, chloroform, and petroleum ether extracts. Ethanol extract shown efficacy against both *S. aureus* and *B. subtilis*. The *P. aeruginosa* was not inhibited by the petroleum ether extract. No extract of any kind inhibited *E. coli*. The antibacterial properties of *B. monosperma* were shown to be similar to those of ampicillin, a common antibacterial drug, when used as a control. In conclusion, it was proposed that plants exhibiting this kind of antibacterial activity could be utilised in addition to conventional medications. (Dhale *et al.*, 2010).

### Anti-diarrhoeal activity

The anti-diarrhoeal potential of the ethanolic extract of stem bark of *B. monosperma* (Lam) has been evaluated using several experimental models in Wistar albino rats. The extract inhibited castor oil induced diarrhea and PGE2 induced enteropooling in rats; it also reduced gastrointestinal motility after charcoal meal administration. The results obtained establish the efficacy and substantiate the use of this herbal remedy as a non-specific treatment for diarrhea (Gunakkunru *et al.*, 2005) [10].

### Antidiabetic activity

Male rats were given alloxan to cause diabetes, while oral administration of BM leaf ethanolic extract demonstrated anti-diabetic effects. After 45 days of therapy at a dose of 300 mg/kg, BM extract dramatically reduced blood glucose and enhanced the activity of antioxidant enzymes, suggesting that BM leaves had strong hypoglycemic and antioxidant properties [11].

### Anticonvulsant activity

Petroleum ether extract of *BM* has been fractionated with varying polarity such as ethyl acetate, n-hexane and methanol by column chromatography. Fractionated Part of petroleum extract of *BM* exhibited anticonvulsant activity against seizures induced by maximum electroshock (MES), Pentylentetrazole (PTZ) and lithiumsulfate- Pilocarpine nitrate. Additionally, triterpene present in *BM* exhibited anti-depressant effect [11].

### Anti-cancer activity

Choedon *et al.* (2010) have evaluated the aqueous extract obtained from the dried flowers of *B. monosperma* for antioxidative, anti-inflammatory, hepatoprotective, anti-proliferative, pro-apoptotic and anticancer activities in cancer model where it was found to inhibit cell proliferation and accumulation of cells in G1 phase with significant induction of apoptotic cell death suggesting promising anti-cancer properties. Moreover, oral administration of the extract in transgenic mice conferred hepatoprotection.

### The antidopaminergic activity

Velis *et al.* (2008) have studied the antidopaminergic activity of the methanolic extract of *B. monosperma* flowers. The antidopaminergic activity is present in the isoflavone isolated from ethyl acetate soluble fraction of methanolic extract which inhibited the foot shock-induced aggression in rats and potentiated haloperidol-induced catalepsy in a dose dependent manner [12].

### Antitumor activity

The X-15-myc onco mice received an intraperitoneal injection of an aqueous extract of *B. monosperma* flowers, which demonstrated antitumorigenic action by maintaining liver architecture and nuclear morphology while also lowering serum VEGF levels. Anti-ribosomal protein S27a antibody immunohistochemical examination of liver sections revealed post-treatment removal of this proliferation signal from the tumour tissue [13].

### Antifungal activity

The stem bark of *B. monosperma* exhibited antifungal action against *Cladosporium cladosporioides* when extracted with ethyl acetate and petroleum. The antifungal activity is caused by an active component called (-)-medicarpin. *In-vitro* study of *Butea monosperma* seed oil revealed considerable bactericidal and fungicidal effects [14].

### Anticonceptive activity

Oral administration to adult female rats at the doses of 5, 10 and 20 mg/rat from day 1 to day 5 of pregnancy showed anti-implantation activity in 40%, 70% and 90% of the treated animals, respectively. At lower doses, there was a dose-dependent termination of pregnancy and reduction in the number of implantation sites (Bhargava, 1986; Pandey, 2001).

### Anthelmintic activity

There was a dose and time dependent anthelmintic effect observed in sheep naturally infected with mixed species of gastrointestinal nematodes when seeds were given as crude powder at doses of 1, 2, and 3 g/kg. On day 10, following treatment with 3 g/kg, the greatest reduction in eggs per gramme of faeces was seen, measuring 78.4%. A typical

anthelmintic drug, levamisole (7.5 mg/kg), showed a 99.1% reduction in eggs per gramme. Several *Butea* species have been shown to have anthelmintic action against *Ascaridia galli*, *Ascaris lumbricoides*, earthworms, *Toxocara canis*, oxyurids, and *Dipylidium caninum*. (Prashanth *et al.*, 2001) [15].

#### Anti-inflammatory activity

Several animal studies have demonstrated the anti-inflammatory effects of *Butea monosperma* extracts in various models of inflammation, including carrageenan-induced paw edema and cotton pellet-induced granuloma formation. These studies have shown reductions in inflammatory markers and tissue damage following treatment with *Butea monosperma* extract [16].

#### Anti mycobacterial activity

The anti-mycobacterial activity of *Butea monosperma* in animal models has not received much attention, however certain investigations have yielded promising results. Animals are typically administered extracts from *Butea monosperma* after contracting *Mycobacterium TB* to observe how it impacts the infection's course. The results of these studies have shown that giving extracts from *Butea monosperma* to animals reduces their bacterial burdens and improves their disease outcomes [17].

#### The hepatoprotective effect

Wagner *et al.*, demonstrated the hepatoprotective activity of isobutrin and butrin isolated from *B.monosperma* flowers 58. The study also confirmed by Sharma and Shukla, (2010) against CCl<sub>4</sub> induced acute liver injury model in rats. The aqueous extract restored the CCl<sub>4</sub> induced alteration in serum transaminases, protein, albumin, hepatic lipid peroxidation, reduced glutathione and total protein levels to that of control group.

#### Wound healing

The bark of *B. monosperma* has an ethanolic extract that has wound-healing qualities. When given topically to rats' backs with complete excision wounds, the extract hastens the healing process. An increase in DNA, total protein, and total collagen content in granulation tissues confirmed that topical administration causes enhanced cellular proliferation and collagen production at the wound site. In addition, the results showed that, when compared to the control group, the incision wound's tensile strength increased significantly, its granulation tissue weight and hydroxyl proline content increased, and that the excision wound model's wound contraction and epithelialisation time decreased. These findings suggest that the wound may have promising healing properties [19].

#### Thyroid inhibitory and hypoglycemic

After isolating stigmasterol from the bark of *B. monosperma*, Panda *et al.* (2009) investigated its thyroid-inhibiting and hypoglycemic properties. After administering stigmasterol to experimental animals for 20 days, the animals' serum concentrations of triiodothyronine, thyroxin, and glucose decreased while insulin increased concurrently. Additionally, hepatic lipid peroxidation significantly decreased and catalase, superoxide dismutase, and glutathione activities increased after therapy, indicating potential thyroid inhibitory and hypoglycemic effects of stigmasterol [20].

#### The antihyperglycemic activity

Rats with diabetes caused by alloxan and glucose loading were used to test *Butea monosperma* ethanolic extract's (BMEE) antihyperglycemic properties. A single 200 mg/kg p.o. dosage of BMEE markedly enhanced glucose tolerance and decreased blood glucose in rats with alloxan-induced diabetes. Repeated oral administration of BMEE (200 mg/kg/day) for two weeks significantly decreased blood glucose and serum cholesterol while improving HDL-cholesterol and albumin levels when compared to the diabetic control group. (Somani R 2006) [21].

#### Conclusion

*Butea monosperma* possesses a rich library of medicinal properties and applications that warrant further exploration through modern scientific research to fully understand its potential in healthcare. The vast array of studies corroborates its traditional uses and suggests promising avenues for its integration into complementary and alternative medicine practices. Continued research may pave the way for enhanced utilization of *Butea monosperma* in contemporary therapeutic strategies.

#### References

- 1 Maurya R, Yadav DK, Singh G, Bhargavan B, Narayana Murthy PS, Sahai M, *et al.* Osteogenic activity of constituents from *Butea monosperma*. *Bioorg Med Chem Lett*,2009;19:610-3.
- 2 Burli DA, Khade AB. A Comprehensive review on *Butea monosperma* (Lam.) Kuntze. *Pharmacognosy Reviews*, 2007, 1(2).
- 3 Sindhia VR, Bairwa R. Plant review: *Butea monosperma*. *International Journal of Pharmaceutical and Clinical Research*,2010;2(2):90-94.
- 4 Somayaji A, Hegde K. Review on pharmacological profile of *Buteamonosperma*. *International Journal of Phytopharmacology*,2016;7(4):237-249.
- 5 More BH, Sakharwade SN, Tembhurne SV, Sakarkar DM. Ethnobotany and Ethanopharmacology of *Butea Monosperma* (Lam) Kuntze- A Compressive Review. *American Journal of PharmTech Research*,2012;2(5):2249-3387.
- 6 Varsha S. Therapeutic significance of *Butea monosperma*: a review. *Journal of Drug Delivery and Therapeutics*,2011;1(2):63-67.
- 7 Yadav S, Patgiri BJ, Prajapati PK. Review of Bio-active Principle of *Butea monosperma* (Lam.)Kuntze. *Indian Journal of Scientific Research*,2015;1(1):45-51.
- 8 Gaikwad HK, Kapare HS, Gadge SK. *Butea spermatoca*: overview. *Pharmaceutical Resonance*,2022;4(2):53-59.
- 9 Lahori P, Jain S. *Butea monosperma* (Lam.) Taub: review on its chemistry, morphology, ethnomedical uses, phytochemistry and pharmacological activities. *Journal of Innovation and Invention in Pharmaceutical Sciences*,2020;1(2)26-36.
- 10 Akram *et al.* *Butea monosperma* Lam A review. *Journal of Medicinal Plants Research*,2011;5(17)3994-3996.
- 11 More BH, *et al.* "Ethnobotany and Ethanopharmacology of *Butea Monosperma* (Lam) Kuntze-A Compressive Review". *American Journal of Pharmtech Research*, 2012, 138-159.

- 12 Tiwari P, Jena S, Sahu PK. Butea Monosperma: Phytochemistry and Pharmacology. Acta Scientific Pharmaceutical Sciences,2019;3(4):19-26.
- 13 Surin WR, Ananthaswamy K. Recent advances on the pharmacological profile of Butea monosperma.GERF Bulletin of Biosciences,2011;2(1):33-40.
- 14 1313/ Schoeller W, Dohrn M, Hohlweg W. Über eine oestrogene Substanzaus der Knolle der siamesischen Schlingpflanze Butea superba. Naturwissenschaften,1940;28(33):532-533.
- 15 Jain S, Dubey PK. Butea monosperma (Lam.) Taub: review on its chemistry, morphology, ethnomedical uses, phytochemistry and pharmacological activities. Journal of Drug Delivery and Therapeutics,2023;13(4):137-144.
- 16 Bhalerao S A, Verma DR, Teli NC, Gavankar RV. A comprehensive review: butea monosperma (lam.) Kuntze. International Journal of Current Research in Chemistry and Pharmaceutical Sciences,2014;1(4):50-58.
- 17 Gupta A, Singh S, Gaur K, Singh A, Kumar A, IJRAP,2017;8(2):197.
- 18 Kumar A, *et al.* A systemic review on palash (butea monosperma). History of Medicine,2023;9(2):871-899.
- 19 Gavimath CC, Sudeep HV, Sujana Ganapathy PS, Padmalatha Rai S and RamachandraYL. Evaluation of wound healing activity of Butea monosperma Lam. extracts on rats. Pharmacologyonline,2009;2:203-16.
- 20 More BH, Sakharwade SN, Tembhumne SV, Sakarkar DM. Ethnobotany and Ethanopharmacology of Butea Monosperma (Lam) Kuntze- A Compressive Review. American Journal of PharmTech Research,2012;2(5):2249-3387.
- 21 Sharma D. A Comprehensive Review on the Pharmacological Potential of Butea monosperma (Lam).Integrated Publications,2022;5:141-159.