



REVIEW ARTICLE

A REVIEW ON BUTEA MONOSPERMA: A PHARMACOLOGICALLY POTENT PLANT

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ABSTRACT:

Butea monosperma (Lam.) Taub belong to family fabaceae. There are various species of *Butea monosperma* available over the world. Plant is highly used by the rural and tribal people in curing various disorders. It finds use both medicinally and commercially with each part of the plant having utility. It has been used for the treatment of different ailments such as cancer, diabetes, diarrhoea, dysentery, fever and jaundice. The leaves 3 foliate, large and instruct. Number of constituents belonging to imides, lactones, flavonoids, sterols, and alkaloids has been reported from various species of *Butea*. *Butea monosperma* is considered as a good source for products such as fodder, fuel, fiber, timber, gum or resin, dyestuff and traditionally in number of ailments. Pharmacologically *Butea monosperma* has been reported for various activities such as anthelmintic, anticonceptive, anticonvulsive, antidiabetic, antidiarrhoeal, antiestrogenic and antifertility, antiinflammatory, antimicrobial, antifungal, antibacterial, antistress, chemopreventive, haemagglutinating, hepatoprotective, radical scavenging, thyroid inhibitory, antiperoxidative and hypoglycemic effects and wound healing activities. The present review discuss the, phytochemical constituents, medicinal use, chemical constituents and traditional uses of each parts of plant as well products of plant and pharmacological activities of each part of plant.

Keywords: *Butea monosperma*, fabaceae, Pharmacological activities.

INTRODUCTION:

Butea monosperma is commonly known as Flame of forest, belonging to the family Fabaceae. It is locally called as palas, palash, mutthuga, bijasneha, dhak, khakara, chichra, Bastard Teak, Bengal Kino, Nourouc and is common throughout India and Burma. The pods should be collected and shown before the commencement of rains, root suckers are freely produced and help in vegetative propagation The genus *Butea* includes *Butea monosperma* parviflora, *Butea minor* and *Butea superba* widely distributed throughout India. The flowers are widely used in treatment of hepatic disorders, viral hepatitis, diarrhea, depurative and tonic. The flowers are also good source of flavonoids. The contents of flowers are Butein, Butrin, Isobutrin, Plastron, coreipsin, and Isocoreipsin.¹ *Butea monosperma* (Lam) is a medicinal plant growing in Burma, India and Sri Lanka; the flowers are tonic, astringent, aprodiastic and diuretic. The decoction of the bark is traditionally used in cold, cough, fever, various forms of haemorrhages, in menstrual disorders and in the preparation of tonics and elixirs. The stem bark is reported to possess antitumor, antiulcer, antifungal and antidiarrhoeal activities.^{2,3} It is also reported that the powder of the stem bark is used to apply on injury caused due to an axe, the juice of the stem is applied on goiter of human beings and the paste of the stem bark is applied in case of body swellings.⁴ The roots are reported in the treatment of filariasis, night blindness, helmenthiasis, piles, ulcers, and tumors.⁵



***Butea monosperma* plant**

Classification of *Butea Monosperma*

Kingdom - Plantae

Sub-kingdom - Tracheobionta

Super-division - Spermatophyta

Division - Magnoliophyta

Class - Magnoliopsida

Subclass - Rosidae

Order - Fabales

Family - Fabaceae

Genus - *Butea*

Species- *B. monosperma*

Sanskrit - Palasa

Hindi - Dhak, Palas

English - Bastard Teak

Bengali - Mal & Mar

Gujarati - Khakharo

Marathi - Kakracha

Telugu - Mooduga, Palasamu

Tamil - Parasa

Kannada - Muttuga

Malyalam - Brahmavriksham, Kimshuka

Punjabi - Chichra, dhak, palas

TRADITIONAL USES

Flower of *B. monosperma* is traditionally used as anticonvulsant, antioxidant, antistress, memory and behaviour stimulant, antigout, diuretic, antileprotic, antiinflammatory, antiulcer, astringent and anti hepatotoxic. Flower is also used to treat enlarged spleen, menstrual disturbances, burning sensation and eye diseases. Leaf of *B. monosperma* is traditionally used as anti inflammatory, antitumor, diuretic, anti diabetic, antimicrobial,

Jain *et al.* A Review on *Butea Monosperma*: A Pharmacologically Potent Plant

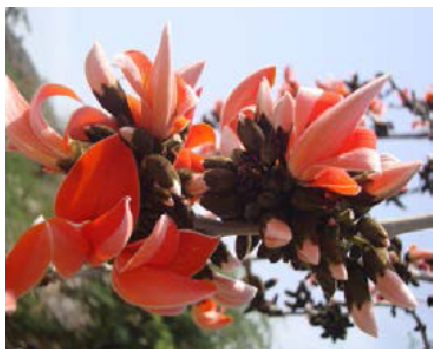
anthelmintic, appetizer, carminative, astringent and aphrodisiac.⁶ These are also used to treat stomach disorders, diabetic sore throat, irregular bleeding during menstruation, flatulent colic, cough and cold. Stem bark is traditionally used as aphrodisiac, anti dysentery, antiulcer, antitumor, antimicrobial, antifungal, antipyretic, blood purifier and anti-asthmatic. It is also used in bleeding hemorrhoid disorder, dysmenorrheal, hydrocele, liver disorders, gonorrhoea, wound, worm infections, scorpion sting, cough and cold.^{7,8}

Root is used in night blindness, elephantiasis, and impotency and in snake bite. It also causes temporary sterility in women and is applied in sprue, piles, ulcers, tumors and dropsy. Seed of *B. monosperma* is used in inflammation, skin and eye diseases, bleeding piles, urinary stones, abdominal troubles, intestinal worms and tumour. When seeds are pounded with lemon juice and applied to the skin, they act as a rubefacient. Gum is used in stomatitis, corneal apacititis, ring worm, leucorrhoea, septic sore throat, excessive perspiration and diarrhea.

MEDICINAL USES

✓ Flowers

Gawale *et al.*, reported effect of flowers in memory and behavior mediated via monoamine neurotransmitters. The acetone soluble part of petroleum ether and ethanolic extract exhibited nootropic activity in the elevated plus maze paradigm and active avoidance learning.⁹ Shah *et al.*,¹⁰ reported that flowers have phytochemical studies and antiestrogenic activity. Alcoholic extract exhibited significant antiestrogenic activity, while ethyl acetate extract containing butrin and isobutrin exhibited poor activity. Significant inhibition of uterus weight gain, vaginal epithelium cornification and characteristic histological changes have been observed.



Flowers of *Butea monosperma*

Jain *et al.* A Review on Butea Monosperma: A Pharmacologically Potent Plant

✓ Seed

Bavarva *et al.*, evaluated the antihyperglycemic and antihyperlipidemic effects of *B. monosperma* in NIDDM rats.¹¹



Seed of Butea monosperma

✓ Leaves

Mengi *et al.*, reported the anti-inflammatory activity of *B. frondosa* leaves.



Leaves of Butea monosperma

✓ Roots

Bodakhe *et al.*, reported in vitro lens protective and antimicrobial activity of roots.



Roots of *Butea monosperma*

✓ Stems

Suguna *et al.*, investigated the effect of alcoholic bark extract on cutaneous wound healing in rats.¹⁴ Agarwal *et al.*,¹⁵ reported use of “Ayurvedic Rasayana” (herbal medicine) containing *B. monosperma* in the management of giardiasis perhaps by immunomodulation as the “Rasayana” did not exhibit killing effect on the parasite *in vitro*.¹⁵

Pharmacological Activities of *Butea monosperma*

➤ Antifungal activity, Antimicrobial activity and Antibacterial activity

The stem bark of *Butea monosperma* displays antifungal activity which is due to the presence of an active constituent (-)-medicarpin (Bandara *et al.*). The seed oil of *Butea monosperma* shows significant bactericidal and fungicidal effect in in-vitro testing.¹⁶

➤ Anti-inflammatory activity

The leaves of *Butea monosperma* exhibit optical anti-inflammatory activity in rabbits.¹²

➤ Anticonvulsive activity

It shows anticonvulsive activity due to the presence of a triterpene.¹⁷ The ethanolic extracts of leaves of *Albizia lebbek* and flowers of *Hibiscus rosa sinensis* and the petroleum ether extract of flowers of *Butea monosperma* exhibited anticonvulsant activity. The acetone soluble part of petroleum ether extract of *Butea monosperma* flowers showed anticonvulsant activity.

➤ Anti-estrogenic and anti-fertility activity

Antifertility effect of seed extract of *Butea frondosa* has also been reported in mice.¹⁸

The stem bark of *Butea monosperma* led to the isolation and identification of three new compounds named buteaspermin A, buteaspermin B and Butea spermanol along with 19 known compounds.¹⁹

➤ Anti-diabetic activity

The single dose treatment of ethanolic extract of *Butea monosperma* flowers at the dose of 200mg/kg P.O significantly improved glucose tolerance and cause reduction in blood glucose level in alloxan induced diabetic rats.²⁰ Oral administration of the ethanolic extract of the *Butea monosperma* seeds at the dose of 300mg/kg b.w., exhibited significant antidiabetic, hypolipemic and antiperoxidative effects in non-insulin dependent diabetes mellitus rats.

➤ **Anti-diarrhoeal activity**

Butea monosperma gum has also been found useful in cases of chronic diarrhoea. It is a powerful astringent and also decrease bilirubin level.²¹ The ethanolic extract of stem bark of *Butea monosperma* at 400 mg/kg and 800 mg/kg inhibited castor oil induced diarrhoea due to inhibiting gastro-intestinal motility and PGE₂ induced enteropooling. It is used as nonspecific anti diarrhoeal agent in folk medicine.²²

Chemical Constituents

Flower – Triterpene²³ several flavonoids butein, butin, isobutrin, coreopsin, isocoreopsin (butin 7-glucoside), sulphurein, monospermoside (butein 3-e-D-glucoside) and isomonospermoside, chalcones, aurones, isobutyne, , palasitrin, 3',4',7-trihydroxyflavone.²⁴

Gum - Tannins, mucilaginous material, pyrocatechin.²⁵

Seed - Oil (yellow, tasteless), proteolytic and lipolytic enzymes, plant proteinase and polypeptidase. (Similar to yeast tripsin). A nitrogenous acidic compound, along with palasonin is present in seeds. It also contains monospermoside (butein 3-e-D-glucoside) and somonospermoside.²⁵

Root- The root of *Butea monosperma* contains glucose, glycine, a glycoside (aglycon) and an aromatic hydroxy compound.²⁶

Stem- 3-Z-hydroxyeuph-25-ene and 2, 14-dihydroxy-11,12-dimethyl-8-oxo-octadec-11-enylcyclohexane²⁷ Stigmasterol-e-D-glucopyranoside and nonacosanoic acid (35) Flavonoid 8-C-prenylquercetin 7,4'-di- O-methyl-3-O- α -L-rhamnopyranosyl(1-4)- α -L-rhamnopyranoside.²⁸

Bark - Kino-tannic acid, Gallic acid, pyrocatechin.²⁹ Two compounds, 3, 9-dimethoxypterocarpan, and triterpenoid ester, 3 α - hydroxyeuph-25-enyl heptacosanoate.³⁰

Leaves - Glycoside, Kino-oil containing oleic, linoleic acid, palmitic and lignoceric acid.³¹

Resin - Jalaric esters I, II and laccijalaric esters III, IV. Z-amyrin, e-sitosterone and its glucoside, sucrose, lactone-nheneicosanoic acid-lactone.³²

Sap - Chalcones, butein, butin, colourless isomeric flavanone and its glucosides, butrin.²⁵

Reported activity of *Butea monosperma* (L.) Bark

S. No.	Topic	Author	Year	Work done
1	Anti-inflammatory and Analgesic Activity Of <i>Butea Monosperma</i> (Lam) Stem Bark In Experimental Animals.	Carey M. William, Krishna Mohan. G ³³	2007	observed that methanolic extract of <i>B. monosperma</i> was obtained from Dry stem bark of <i>B. monosperma</i> . Its anti-inflammatory and analgesic activity is investigated using Carrageenon - induced paw edema, Hot plate test and Acetic acid induced writhing model. Methanolic extract of <i>B. monosperma</i> showed both anti-inflammatory and analgesic activity in dose dependant (200 and 400mg/kg,p.o.) manner which are comparable to the standard drug (Diclofenac sodium for Carrageenon induced paw edema and Acetic acid induced writhing and Pentozocine for hot plate test model). Phytochemical studies of this plant reveal the presence of flavonoids, steroids, tannins, alkaloids, glycosides and these might be responsible for the anti-inflammatory and analgesic activity of this plant.
2	Anti ulcer and Anti-Secretary Properties of the <i>Butea monosperma</i> (Lam) Bark Extract with Relation to antioxidant Studies	Prakash patil, T. prakash H. shivakumar and siddhartha pal ³⁴	2008	Worked on mechanisms of pharmacological actions of the extract, <i>in vitro</i> anti-oxidant activity of methanolic extract of the bark <i>B. monosperma</i> was investigated for scavenging lipid

peroxidation and reducing superoxide anion radicals and hydroxyl radical. A significant relation existed between concentration of the extract and percentage of free radicals scavenging effects. The extract inhibited 72.47, 75.86, 68.11 and 77.46% lipid peroxidation and reduced power, superoxide anion and hydroxyl radical scavenging activity at a 50 µg/ml concentration respectively. The anti-oxidant property may be related to the Flavonoids and polyphenol present in the extract.

- 3 Anti inflammatory activity of flavonoid fraction isolated from the stem bark of *butea monosperma* (*lam*): a mechanism based study A.Muralidhar, 2010 K.Sudhakar Babu, T.Ravi sankar, P.Reddanna, G.V.Reddy, J.Latha³⁵ worked on acute inflammatory models like- carrageenan induced paw oedema and chronic model like- cotton- pellet induced granuloma. The flavonoids fraction significantly reduced the inflammation in the carrageenan induced rat paw oedema and cotton- pellet induced granuloma in rats the flavonoids fraction did not inhibit the gastric acid secretion suggesting that its anti ulcerogenic effect can be attributed to its action on the mucosa defense factors. The phytochemical investigations revealed that the flavonoids

- fraction contains two isoflavones genistein and prunetine. Hence the anti inflammatory activity of the flavonoids fraction may be due to these isoflavones.
- 4 Hepatoprotective potentials of *Butea monosperma* stem bark extract against carbon tetrachloride induced hepatotoxicity in albino rats Prashant Tiwari, 2011 Kuldeep Kumar, Rajnikant Panik, Alok Pandey, Ashish Pandey and Pratap Kumar Sahu.³⁶ The studies indicated that stem bark extract of *B. monosperma* is a potential source of natural hepatoprotective. The hepatoprotective property may be attributed to the antioxidant potential and the phytochemical constituents of the plant. The present study justifies the claim of the native practitioner that the decoction of the plant is useful in treating jaundice and find out the clinical efficacy of the *B. monosperma*.
- 5 Phytopharmacological and Phytochemical Review of *Butea monosperma* and P. Pal and S. Bose³⁷ 2011 worked on phytochemical and Pharmacological behavior of plant (*Butea monosperma*). As per phytochemical investigation, the ethanolic extract was fractionated by various organic solvents. Repeated column chromatography of Chloroform fraction afforded nine compounds and the active *n*-butanol fraction afforded fourteen compounds and aqueous fraction afforded a single compound, which have been characterized by spectral study. As per pharmacological
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			investigation, antistress & anthelmintic activity, anti-diarrhoeal activity, anti hyperglycemic antihyperlipaemic Activity, wound healing and cytotoxic property were reported from different crude extracts and various isolated compounds from <i>Butea monosperma</i> .
6	Photochemical screening and in vitro anti helminthic activity of <i>Butea Monosperma</i> (L) bark ethanolic activity and aqueous extract	K Ramanujan 2011 eyulu, V preetam kumar, M ranganath K Nataraj ³⁸	worked on ethanolic and aqueous extract from the stem bark <i>Butea monosperma</i> was investigated for anti helminthic activity against <i>pheretima posthuma</i> . Various concentrations (20-60 mg/kg) of each extract were used in the bioassay which involved the parameter such as time of paralysis and time of death of worms.
7	Hepatoprotective and anti pyretic activities of methanolic extract of <i>Butea monosperma</i> lam stem bark in wister rats	R. Sathish, P. 2011 Sravan Kumar, K. Natarajan, N. Sridhar ³⁹	examined stem bark of <i>B. monosperma</i> lam exhibits the hepatoprotective and antipyretic property. The presence of flavonoids, glycoside, sterols, fixed oils, tannins were detected on Preliminary phytochemical screening of MEBM.
8	Evaluation of wound healing properties of bioactive fractions from the extract of <i>Butea monosperma</i> (lam) stems bark.	Avula 2011 Muralidhar, K. Sudhakar Babu, T. Ravi sankar, P. Reddanna, J. Latha ⁴⁰	Evaluated the wound healing activity of the ethanolic extract and the fractions isolated from the stem bark of <i>Butea monosperma</i> were evaluated in excision, incision and dead space wound healing models

- using Albino wistar rats. The wound healing activity was assessed by the breaking strength in case of incision wounds, epithelialization and wound contraction in case of excision wound and granulation tissue dry weight, breaking strength and hydroxyproline content in case of dead space wound
- 9 Antihyperglacemic and Nidhi Sharma 2012 worked on different parameters
antioxidant effect of and Veena Garg such as total cholesterol,
hydroethanolic extract of ⁴¹ triglyceride, low density
Butea Monosprema bark in lipoprotein and very low density
diabetic mice lipoprotein cholesterol were also
found to be important , whereas the
level of high density lipoprotein
cholesterol was markedly reduced
in diabetic animal oxidative
damage in the tissue of diabetic
mice was evidenced by a marked
increase in the level of
thiobarbituric acid reactive
substance , distinct decrease in
reduce glutathione contents and
declined activity of antioxidant
enzyme such
as superoxide dismutase, catalyses,
and glutathione peroxides.
- 10 Antibacterial activity of crude Mian Shahzada 2012 worked on antimicrobial activity of
extracts of different parts of Zia Ahmad & crude extracts of different parts of
Butea monosperma (Lamk.) Zaheer-Ud-Din *Butea monosperama*. and the test
Taub. Khan⁴² microorganisms used included five
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- bacterial species, two Gram-positive (*Staphylococcus aureus* and *Bacillus subtilis*) and three Gram-negative (*Pseudomonas aeruginosa*, *Bacillus subtilis* and *Escherichia coli*). The bacteria were cultured on the nutrient agar medium. The well plate method was used for the determination of zone of inhibition.
- 11 Anti diabetic effect of aqueous extract of *Butea monosperma* (LAM) Taub bark Sachdev Yadav, 2012 examined preliminary phytochemical analysis depicts that *B. monosperma* bark has the presence of steroids and tannins and absence of terpenoids, glycosides, alkaloids and flavonoids. The moisture content and total ash values of bark was 3.0% and 9.7% respectively. The treatment with bark aqueous extract of *B. monosperma* substantially declined the plasma glucose level in both IDDM and NIDDM animal subjects by 7.2% and 26.6% respectively. This treatment also appreciably (P=0.05 and P=0.01) lowered the serum lipid profile.
- 12 Wound healing activity of flavonoid fraction isolated from the stem bark of *Butea monosperma* (Lam) in albino Wister rats Avula Muralidhar, K. 2013 worked on wound healing activity was assessed by the breaking strength in case of incision wounds, epithelialization and wound contraction in case of
- Neelam Chaturvedi, Sheel Sharma, Rama Murthy and Kamal Nayan Dwivedi
28
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excision wound and granulation tissue dry weight, breaking strength and hydroxyproline content in case of dead space wound. The flavonoid fraction showed the Significant wound healing activity on all three wound models. The phytochemical investigations revealed that the flavonoids fraction contains two isoflavones genistein and prunetin. The increased rate of wound contraction and hydroxyproline content in the flavonoid fraction treated animals provides a scientific base to the ethno medicinal use of *Butea monosperma*, which is largely attributable to the additive or synergistic effect of isoflavones present in the flavonoid fraction.

- 13 Study on assesment of purity standards of *butea monosperma* (lamk.) taub. bark Kare M. A., 2013 Londhe D. K. and Bhuktar A. S ⁴³ worked on different parameter such as morphology, anatomy and phytochemical of palash bark for its identification
- 14 Evaluation of Chemical Constituents of *Butea Monosperma* (Bark) Mustazi Jafri 2014 and B.K. Mehta ⁴⁴ prepared TLC for examination of fractions of benzene and benzene: ether (5:5) extract of the stem bark of *B. monosperma* revealed the separable mixture. These fractions were subjected to chromatography. Isolated compounds were purified and crystallized by chloroform:

- methanol. After isolation and purification afforded white crystalline substance which was subjected to physical, chemical and spectral analysis and identified as Tetratriacont-15-ene(1), Heptacos-11-ene(2), 15-hydroxyethylheptadec-12-enoate(3), 10-hydroxy dodecyltridec-5-enoate(4), on the basis of spectral evidences.
- 15 Anticonvulsant Effect of Leaf and Bark of *Erythrina Variegata* Linn and *Butea monosperma* (LAM) Taub in different Experimental Convulsion Model in Rats Prakash, T.Sangale, Dhananjay B. Deshmukh, Rajesh Bhambere⁴⁵ 2015 This study indicated the anticonvulsant activity by erythrian variegata & *Butea monosperma* of bark & leaf PTZ and MES induced convulsions in Wister rats using erythrian variegata & *Butea monosperma* of bark & leaf ethanolic extracts. The anticonvulsant activity of this plant has not been studied in depth. In pentylene tetrazole an maximal electro shock seizure model test parameter like latency, onset of tonic convulsions, convulsion and percent protection were observed in the different test groups.
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Conclusion

The present review reveals that the plant *B. monosperma* is used in treating various diseases. The plant is used highly by the rural and tribal people in curing various disorders *Butea monosperma* has an effective natural origin that has a tremendous future for research. The present review also describe the use of the plant and an attempt was made to gather information about the qualitative analysis of phyto chemical and pharmacological activity of the plant and its constituents.

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Jain et al. A Review on Butea Monosperma: A Pharmacologically Potent Plant

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Jain et al. A Review on Butea Monosperma: A Pharmacologically Potent Plant

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Jain et al. A Review on Butea Monosperma: A Pharmacologically Potent Plant

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