Butea Monosperma (LAM.) Kuntze – A Comprehensive Review

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ABSTRACT

The traditional systems of medicine together with folklore medicine continue to play a significant role in our health care system for the betterment of mankind. Butea monosperma (Lam.) kuntze is a commonly used herb in Ayurvedic medicine. Butea monosperma (Palas) belongs to the family Fabaceae, grown wildly in many parts of India. 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 novelty and applicability of Butea monosperma are hidden. Such things can be overcome through modern scientific research. The present article describes various traditional and medicinal utility of the plant and an attempt was made to gather information about the chemical composition and pharmacological activity of the plant and/or its constituents.

KEYWORDS: Butea monosperma; traditional uses; scientific reports; phytochemistry; pharmacological activities.

Introduction

Butea monosperma (Lam.) kuntze, family Fabaceae (Figure 1), is also known as 'Flame of the Forest' and Bastard Teak in English, in Hindi: Dhak, Tesu; Sans.: Kimika, Raktapuspaka, Beng.: Palash; Ori.: Porasu, Guj.: Kesudo; Urdu.: Dhak, Palaspada; Kan.: Muttug, Muttală; Mal.: Plasu, Camata; Mar.: Palas; Punj.: Palas, Dhak, Tesu; Tam.: Parasu, Paras; Tel.: Moduga, hettu (Patil et al., 2006; Kirtikar and Basu 1935).

It grows throughout the Indian subcontinent, especially in the Indo-Gangetic plains. It is said that the tree is a form of Agnidev, ‘God of Fire’. This tree grows up to 50 ft high, with clusters of flowers. It loses its leaves as the flowers develop in the months of January-March (Kirtikar and Basu 1935; Kapoor 2005). The flowers yield an orange dye, used as an insecticide. The leaves are essential for various religious rituals in Hindu homes as plates and cups. It is a sacred tree, dry stem pieces are used to make sacred fire (The Wealth of India, 1988). In different areas these are used for wrapping tobacco to make biddies. The leaves are further used to pack parcel materials.

The seeds are used in Ayurvedic and Unani medicine for treating various disorders. Flowers are offered in place of blood in sacrifice rituals to Goddess Kali (Ambasta, 1994).

Morphology

It is an erect, medium-sized, 12-15 m high, deciduous tree with a crooked trunk and irregular branches. 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 wood is greenish white in color, soft and weighs about 14 to 15 kg per cubic foot (Boutelje, 1980). The bark is ash colored. The leaves have 3 foliate, large and stipulate, 10–15 cm long petioles. Leaflets are obtuse, glabrous above, finely silky and conspicuously reticulately veined underneath with a cunnate or deltoid base (The Wealth of India, 1988). The calyx is dark, olive green to brown in color and densely velvety outside. The corolla is long with silky silvery hairs outside (Agarwal, 1976). The bark of the palas is
fibrous and bluish-gray to light brown in color. When injured, it exudes a kind of red juice. The leaves are compound, with three leaflets. The texture of the leaflets is tough, coriaceous with the surface glabrescent above and hairy silken beneath. The shape is obliquely ovate and broadly elliptic. The leaves fall off by December and reappear during spring. When the tree is leafless, it bears flaming orange to red-colored flower. These flowers start appearing in February and stay on nearly up to the end of April (Cowen, 1984). The size is nearly 2 to 4 cm in diameter. These tend to be densely crowded on leafless branches. Flowers are large, rigid racemes 15 cm long with 3 flowers together form the tumid nodes of the dark olive-green velvety rhachis. The calyx (i.e. the lower whorl of the flower) tends to be darkish gray like the supporting branch itself. The upper parts are brick red.

The flowers on the upper portion of the tree form the appearance of a flame from a distance (Kirtikar and Basu, 1935; Hara et al., 1987). The fruit of the palas is a flat legume, pods stalked 12.5–20 by 2.5–5 cm, thickened at the sutures. Young pods have a lot of hair and a velvety cover and mature pods hang down. The seeds are flat, from 25 to 40 mm long. 15 to 25 mm wide, and 1.5 to 2 mm thick. The seed-coat is reddish-brown in color, glossy, and wrinkled, and encloses two large, leafy, yellowish cotyledons. The hilum is conspicuous, and situated near the middle of the concave edge of the seed (The Wealth of India, 1988; Bouteleje, 1980; Huxley, 1996). It is porous and soft in texture and has not very distinct annual rings. It generally perishes fast when open to vagaries of weather, but lasts much longer when used under water. It is therefore used for making good curbs and piles (Kala, 2004).

### Traditional uses

Traditional uses of Butea monosperma are used as an anticonvulsant, antioxidant, antistress, memory and behavior stimulant, antigout, diuretic, antileprotic, anti-inflammatory, antiulcer, astringent and antihypertensive. The flower is also used to treat cases of enlarged spleen, menstrual disturbances, burning sensations and eye diseases.

The leaves of Butea monosperma are traditionally used as an anti-inflammatory, antitumor, diuretic, antidiabetic, antimicrobial, antihistaminic, antioxidant, carminative, astringent and aphrodisiac. These are also used to treat stomach disorders, diabetic sore throat, irregular bleeding during menstruation, flatulent colic, cough and cold.

The stem bark is traditionally used as aphrodisiac, antisynergetic, antiluculent, antitumor, antimicrobial, antifungal, antipyrethic, blood purifier and anti-asthmatic. It is also used in bleeding hemorrhoid disorder, dysmenorrhea, hydrocele, liver disorders, gonorrhoea, wound, worm infections, scorpion stings, cough and cold (Kirtikar and Basu, 1935; Kala, 2004).

The root is used in night blindness, elephantiasis, impotency, and snake bites. It also causes temporary sterility in women and is applied in sprue, piles, ulcers, tumors and dropsy. The seed of Butea monosperma is used in inflammation, skin and eye diseases, bleeding piles, urinary stones, abdominal troubles, intestinal worms and tumor. When seeds are pounded with lemon juice and applied to the skin, they act as a rubefacient.

The gum is used in stomatitis, corneal opacities, ring worm, leucorrhoea, septic sore throat, excessive perspiration and diarrhea (Kirtikar and Basu, 1935; Boutelje, 1980).

### Medicinal uses

**Flowers.** Kasture et al (2002) evaluated the anticonvulsive activity of Butea monosperma flowers in laboratory animals. Mishra and Lavhale and Misra (2007) reported free radical scavenging activity of various extracts of flower by using different in vitro models like reducing power assay, scavenging of 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical, nitric oxide radical, super oxide anion radical, hydroxyl radical and inhibition of erythrocytes hemolysis by using 2,2-azobis (amidinopropane) dihydrochloride (AAAPH). Methanolic extract along with its ethyl acetate and butanol fractions showed potent free radical scavenging activity. The observed activity could be due to higher phenolic contents in the extracts. Kasture et al (2002) evaluated the antistress and anticonvulsive activity of flowers. The water soluble part of ethanolic extract improved water immersion stress-induced elevation of brain serotonin and plasma corticosterone levels. The ulcer index also decreased in a dose dependent manner. The anticonvulsive principle was found to be a triterpene present in the n-hexane: ethyl acetate (1:1) fraction of the petroleum ether extract. Triterpene exhibited anticonvulsant activity against seizures induced by maximal electroshock (MES), pentyleneetetrazol, electrical kindling and the combination of lithium and pilocarpine. Further studies are required to investigate its usefulness in the treatment of epilepsy.

Kasture et al (2000) reported effect of flowers in memory and behavior, mediated via the 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. Wagner et al (1986) reported isobutrin and butrin as the antihepatotoxic principles of flowers. The antihepatotoxic principles isolated consisted of two known flavonoids, isobutrin and the less active butrin. Mishra et al (2000; 2007) reported the presence of flavonoids in ethyl acetate fraction of methanolic extract. Shah et al (1990; 1992) reported that flowers having phytochemical studies and antiestrogenic activity. Alcohol extract exhibit 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.


**Stems.** Savitri et al (1989) reported antifungal constituents from petroleum and ethyl acetate extracts of stem bark. Extract exhibited significant antifungal activity against C. cladosporioides. The potential antidiarrhoeal potential of ethanolic extract was evaluated in castor oil–induced diarrhea model, and PGE2–induced enteropooling in rats. Extracts also reduced gastrointestinal motility after charcoal meal administration. Suguna et al (2005). investigated the effect of alcoholic bark extract on cutaneous wound healing in rats. Agarwal (1976) reported use of “Ayurvedic Rasayana” (herbal medicine) containing *Butea monosperma* in the management of giardiasis perhaps by immunomodulation as the “Rasayana” did not exhibit a killing effect on the parasite in *vitro*.

**Phytochemistry**

**Flowers.** The main phytoconstituents of *Butea monosperma* are butrin (1.5%), butein (0.37%) and butin (0.04%). Triterpene, isobutrin, coreospin, isocoreospin (butin 7-glucoside), sulphurein, monospermoside (butein 3–e-D-glucoside), isomonospermoside, chalcones, aurones, flavonoids (palasitrin, prunetin) and steroids are other phytoconstituents present in the flower. Phytochemical screening of dried flowers of the allied species *Butea frondosa* showed the presence of seven flavones and flavonoid constituents, including butrin and isobutrin and also four free amino acids.

Gupta et al (1970) investigated three glucosides, identified as coreospin, isocoreospin and sulphurein. The remaining two are new and have been assigned the structures monospermoside and isomonospermoside. Shah et al. isolated and identified free sugars and free amino acids from the petroleum ether extract of the flowers.

**Seeds.** The seeds of the *Butea monosperma* contains oil, proteolytic and lypoletic enzymes, plant proteinase and polypeptidase, a nitrogenous acidic compound, along with palasonin. (The Wealth of India, 1988) It also contains monospermoside (butein 3–e-D-glucoside) and somospermoside. From the seed coat, alloplic acid has been isolated and identified (Jawaharalal et al., 1978; Rastogi and Mehrrota 1979).

Singh et al (1974) reported components of soft resin. They isolated four essentially pure acid esters, which together constituted the bulk of soft resin. They termed these acid esters, jalaric ester-I, jalaric ester-II, laccijalaric ester-I and laccijalaric ester-II.

**Leaves.** It contains glucoside, kino-oil containing oleic and linoleic acid, palmitic and lignoceric acid (Nadkarni’s, 2002)

Mishra et al (2000) reported 3,9-dimethoxy-pteroacapan from an ethyl acetate fraction of methanol extractives from leaves, and a hexane fraction of methanol extractives yielded 3-alphahydroxyeuph-25-enclyheptacosanoate.

**Barks.** Contains kina-tannic acid, gallic acid and pyrocatechin. The plant also contains palasin, and major glycosides such as butrin, alanim, allaphonic acid, butolic acid, cyanidin, histidine, lupenone, lupeol, (--)–medicarpin, miroestrol, palasimide and shellollic acid.


**Conclusion**

From the time immemorial, plants have been used as curative agents for a variety of ailments. Herbs are the natural drugs used to regain the alterations made in the normal physiological system by foreign organisms or by any malfunctioning of the body. In every ethnic group, there exists a traditional health care system, which is culturally patterned. In rural communities, health care seems to be the first and foremost line of defense. It is very essential to have a proper documentation of medicinal plants and to know their potential for the improvement of health and hygiene through an eco-friendly system. Thus importance should be given to the potentiality of ethnomedicinal studies as these can provide a very effective strategy for the discovery of medicinally active agents. A detailed and systematic study is required for the identification, cataloguing and documentation of plants, which may provide a meaningful way for the promotion of the traditional knowledge of the herbal medicinal plants.

The present review reveals that the plant *Butea monosperma* is used in treating various ailments. A detailed research work in the characterization and standardization is strongly required for this potential plant in developing its various formulations, which can ultimately be beneficial for humans as well as animals. Further studies are warranted to explore much depth about this plant known by the name “Flame of the forest”.
References


Ambasta BP (1994). The Useful Plants of India, (Publications and Information Directorate, CSIR, New Delhi); 91.


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