



Review Article

Volume 8 Issue 1

Jan - Mar 2019

PHARMACOLOGICAL PROFILE OF PALASH (BUTEA MONOSPERMA LAM.): A REVIEW

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ABSTARCT:

The awareness about the role of medicinal plants in health care in developing countries results in exploring the natural herbal medicine. Palash (*Buteamonosperma* Lam.) commonly known as 'flame of the forest' is a traditional medicinal plant which has been used for thousands of years in Ayurvedic system of medicine for the treatment of a various diseases like prameha, Atisara, Jwara, Kushta etc. Mainly bark and flowers are used in the treatment of diabetes at all the age group. It possesses various pharmacological activities like anti- oxidant, anti- inflammatory, anti-bacterial, anti-fungal, hypolipidemic etc. This paper aims to compile maximum information available, regarding its various traditional uses, pharmacognosy, phytochemical constituents and pharmacological activities to enrich our knowledge about this plant. We hope that it will surely give new directions for the researchers and pharmaceutical industries to develop a new drug.

KEYWORDS: *Buteamonosperma* Lam., Palash, Medicinal Plant.

INTRODUCTION:

Palash (*Buteamonosperma* Lam.) is medium- sized deciduous tree, 10-15 meters high belonging to the family *Fabaceae*^[1], is found throughout India. There are four types of *palash* i.e. *Rakta* (red), *Pita* (yellow), *Shweta* (white) and *Nila* (blue) as mentioned by Raj Nighantu^[2]. Out of above varieties, *Shweta* and *Nila* are rare. *Pita* variety becomes

endangered the abundantly available. *Rakta* variety is used commonly in medicines and it is called as flame of the forest^[3]. *Raktapalash* flower used for 'Holi' i.e. festival of colour in India. Colour prepared from flowers is natural, good for skin and has no any adverse effect. Though there is an evidence of the use of *palash* since ancient time its review was chosen for study.

Nirukti-

Palash- The tree having beautiful and useful leaves.^[4].

Vyutpatti-

Palash- The Sanskrit word '*Palash*' literally means looks like fleshy or blood.^[5].

Synonyms: ^[6]

Palash- leaves are beautiful

Kimshuk- flower looks like beak of parrot

Triparna- Three foliate leaves

Raktapushpa- flowers are of red colour

Yadnyik- used in *yadnya* since *vedic* period

Beejsneha- seeds are oily

Samidvara- describing its usefulness in rituals as *samidha*

Krumighna- pacifies *krimi*

Common Name of *Butea monosperma* Lam.in different Languages^[7]

Marathi- *Palas*

Sanskrit- *Palash*

Hindi- *Dhak*

English- The forest Flame

Bengali- *Palash*

Gujarati- *Khakhro*

Tamil – *Palashu*

Telugu – *Modugo*

Kannada –Mutag

Habitat:^[8]

Mountainous districts of India extending in the north west Himalayas as far as the Jhelum; and common all over Bengal and Southern India.

Taxonomical Classification:^[9]

Botanical name: *Butea Monosperma*

Kingdom: plantae

Sub-kingdom-: Tracheobionta

Division: Magnoliophyta

Order: *Fabaceae*

Genus: *Butea*

Species: *Monosperma*

Morphology:^[10]

Medium sized deciduous tree growing from 20-40 feet high, and trunk is usually crooked and twisted with irregular branches and rough, grey bark.

Leaves- 3-foliate leaflets, with 8-16 cm petiole, each leaflet 10-20 cm long, obtuse, glabrous above when old, finely silky and conspicuously reticulately veined beneath.

Flowers- long, bright orange-red, rigid.

Fruit- pods, thickened at the structures containing a single seed.

Seeds- Flat and uniform, 25-38 mm long, 16-25 mm wide, 1.5-2.1 mm thick.

Cultivation-^[11]After a good rain, find a spot that is the first to dry out. Water trapped beneath the scales may rot the bulb, so a well- drained site is essential.

Sunlight- full sun to part shade

Soil- well-drained soil

Water- medium

Temperature – 30 °C

Fertilizer- Apply any organic fertilizer

Caring for Palash- Apply a high- potassium liquid fertilizer every 2 weeks from early spring until 6 weeks after flowering. Keep moist in winter. Stake tall lilies. Lilies do not rebloom, but you can remove the faded flowers so that the plant seeds.

Chemical Composition- ^[12]

Seed- Fatty acid (linoleic acid), oleic acid, linolenic acid, palmitic acid, stearic acid, arachidic acid, behenic acid and linoceric acid, palasonin, monospermoside, glycoside.

Flower- Butrin, butein, flavonoids, steroids, coreopsin, isocoreopsin, sulphurein, monospermoside and chakones.

Root- Glycine, Glycoside and aromatic compound.

Gum- Mucilaginous material, pyrocatechin and tannin.

Bark- Kino-tannic acid, palasitrin, butolic acid, Gallic acid, pyrocatechin, lupeol, lupenone, cynidin, butrin. minerals,

Historical aspect

Palash tree are found in Vedic literature is a form of 'Agnidevta' i.e. the god of fire. The dry stem of *palash* was used to make scared fire^[13].

Classification of Palash in Vedas:

1.Charak samhita- *Palash* is not described in *mahakashaya*^[14]but it is mentioned in *Chikitsasthana* for treating the diseases like *Aarsha*, *Atisar* etc.

2.Sushrut samhita- in *Sushrut samhita* , *palash* is described in *Rodhradi*, *Mushkakadi*, *Ambasthadi* and *Nyagrodhadigana*^[15].

3.AshtangHridaya-in *AshtangHridayapalash* is described in *Rodhradi*, *Mushkakadi*, *Ambasthadi* and *Nyagrodhadigana*^[16].

4.Ashtangsangraha- *Palash* is described in *Rodhradi*, *Mushkakadi*, *Ambasthadi* and *Nyagrodhadigana*^[17].

NighantuEra- in *Nighantu*

- 1. Bhavprakash Nighntu-** *Palash* flower and *beeja* in "*VatadiVarga*" askrumighna and *Kushtaghna*.^[18]

2. Kaiyadev Nighantu- In this Nighantu it is included in “*Ayushaddivarga*” and twelve synonyms are given for it. [19].

3. Dhanwantari Nighantu- *Navpatra* in “*Amradivarga*” for *Pliha*, *Gulma*, *Grahni*, *Arsha* and *beeja* in *Amradivarga* as *krumighna*[20].

4. Raj Nighantu – *Palash* flower and *beeja* are mentioned in “*karviryadivarga*” for *Kushtha* and *prameha*. [21].

5. Priya Nighantu – He mentioned it in “*Haritkyadivarga*”. Its seeds have *Krimihar* property.[22].

6. Shodal Nighantu- *Palashkanda* in “*Aamradivarga*” as *Rasayan* and *beeja* in “*Amradivarga*” as *krumighna*[23].

7. MadanpalNighantu- *palash* flower in “*Vatadivarga*”as *krumighna*[24].

8. ShaligramNighantu- This Nighantu includes *Palash* in “*PhalaVarga*”. And gives 23 synonyms. Author stating that it is *Krimihar* and mainly seeds are used in skin disease.[25]

Many of the *Nighantu* have described the properties of *Palash* i.e. the *rasa* of *Palash* as ‘*tikta* and *kashya*’, *Viryaushna* but flower of *palash* is ‘*sheet*’ in nature. The fruit is *laghu*, *ushna* and used in *peameha*, *Arsha*, *krumi* and *vatakaphaj rogas*, according to Bhavprakash Nighantu[26].

According to Nighantu Adarsh, the *rasa* of *palash* is *katu*, *tikta*, *Kasaya*, *Virya- ushna*, *Vipaka – katu*, *Doshghnata-kaphavatanasaka*[27].

Raspanchka of Palash:[28]

Rasa(Taste)-*Kashaya*, *Katu*, *Tikt*

Virya (potency)-*Ushna*

Vipaka-*Katu*

Guna(Quality)-*Laghu*, *Ruksha*

Doshghnata - *Kapha*, *VatashamakandPittakar*

Roghagnata- *Prameha*, *Arsha*, *Krimihar*, *Kushta*, *Gulma*, *Udar roga*, *Kandu*, *Shoola*.

Traditional uses of *Palash*-

Roots are used in treatment of night blindness, other site defects and elephantiasis. The bark is acrid, bitter, oily appetizer, aphrodisiac, laxative, anthelmintic, useful in fracture of bones, diseases of anus, dysentery, piles, hydrocele, cures ulcer and tumours. The leaves are good for disease of eye, used as strong astringent, antibacterial, tonic, and cure for pimples. The gum is used in cures excessive perspiration and flower are sweet, bitter, acrid, astringent to bowels, increase "*Vata*" and decrease "*Kapha*", gout, skin diseases, thirst, burning sensation. A decoction of flowers is given in diarrhoea and haematuria. The juice is useful in eye diseases. The fruit and seeds are dry, aperients, and used in urinary discharges, piles, skin diseases, tumour's, abdominal troubles, given for scorpion sting. Stem bark has antifungal properties.^[29]

Prayoganga–Gum, Flowers , Bark, Seed, and Leaves.^[30]

Gum- Fresh juices is ruby red and transparent. Butea gum is form its dried part. In ulcers fresh juice is applied feeling become relaxed, congested and septic sore throat. The gum is powerful astringent; it is given internally for diarrhoea and dysentery, phthisis and haemorrhage from stomach and bladder; its local application in leucorrhoea. A solution of gum is applied to erysipelatous inflammations and ringworm.^[31]

Seeds – anthelmintic, seed powder with lemon juices is applied as cure for ringworm and herpes. The hot alcoholic extract of the seed showed significant anti-implantation and ovulatory activity in rats and rabbits.^[32]

Bark- The decoction is prescribed in cold, cough, fever, various forms of haemorrhages, in menstrual disorders. A fraction, containing the sodium salt of phenolic constituents, isolated from the bark, has shown potential as an anti- asthmatic agent in experimental animals^[33].

Leaves – The properties of leaves are astringent, diuretic and anti- ovulatory. They are used to cure boil, *pimples* and timorous haemorrhoids and piles. They are also used as bidi wrappers and as manure^[34].

Flowers- are tonic and nutritive, used to produce yellow and orange red dyes, The powder of the flower is used during Holi. They are used as poultice in orchitis and to reduce swelling, They are also effective in leprosy, leucorrhoea and gout. The petals are

given to sheep for haematuria. An alcoholic concentrate of the petals showed anti-estrogenic activity at a dose of 3.2mg/kg body wt. per day in mice.^[35]

Formulation-

Krimikuthar rasa, Mahanarayantaila, Janamghutti, Palashbijadi churna, palashksharaghrita^[36]

Matra-

Decoction (bark)- 50-100ml, Juice (leaf)- 10-20ml, Flower powder-3-6gm, Seed powder- 3-6gm.^[37]

Description:

Macroscopic:^[38]

Mature stem bark, 0.5-1cm thick, greyish to pale brown, curved, rough due to presence of rhytidome, and scattered dark brown spots of exudate; rhytidome 0.2 cm. thick usually peels off, exposing light brown surface, exfoliation of cork and presence of shallow longitudinal and transverse fissures; fracture, laminated in outer part and fibrous in inner part; internal surface rough, pale brown; taste, slightly astringent.

Microscopic:

Stem Bark- Mature bark shows rhytidome consisting of alternating layers of cork, secondary cortex and phloem tissue; cork cells, thin-walled, 5-10 or more layered, rectangular, dark-brown; secondary cortical cells round and irregular in outline, dark brown, sometimes containing mucilage and other materials found scattered in this zone; beneath this zone regular cork consisting of 4-12 rows of outwardly arranged, rectangular cells followed by a zone of 2-4 layers of sclereids; phloem consists of sieve tubes, companion cells, phloem parenchyma, phloem fibres, crystal fibres, crossed by phloem rays; in outer and middle phloem regions phloem tissues get crushed and form tangential bands of ceratenchyma; phloem fibres arranged in tangential bands alternating with sieve tubes and phloem parenchyma; most of fibre groups cover prismatic crystals of calcium oxalate making crystal sheath; Phloem fibres appear thick-walled lignified elongated with tapering or bifurcated ends; crystal fibre divided into a number of chambers containing a prismatic crystal of calcium oxalate in each chamber; phloem rays multiseriate 4-12 cells wide, 7-50 cells in height, straight; prismatic

crystals of calcium oxalate found scattered in the secondary phloem tissues and phloem rays; starch grains simple or compound having 2-3 components, measuring 2.75-13.75 μ in dia., found scattered in phloem parenchyma and phloem ray cells abundantly; tanniniferous cells and secretory cavities also occur in secondary phloem.

Powder- Reddish- brown; shows numerous prismatic crystals of calcium oxalate, starch grains simple and compound with 2-3 components measuring 3-14 μ in dia., dark brown coloured cells, sclereids mostly in groups, thin- walled cork cells, numerous crystal fibres in group or singles.

IDENTITY, PURITY AND STRENGTH- [39]

Foreign matter: Not more than 2 per cent, Appendix 2.2.2.

Total Ash: Not more than 12 per cent, Appendix 2.2.3.

Acid- insoluble Ash: Not more than 1.5 per cent, Appendix 2.2.4.

Alcohol- Soluble extractive Not less than 10 per cent, Appendix 2.2.6.

Water- soluble extractive Not less than 14 per cent, Appendix 2.2.7.

T.L.C. –

T.L.C. of alcoholic extract of the drug on silica gel 'G' plate using Toluene: Ethylacetate (90: 10) under U.V.(366nm) shows four fluorescent zones at Rf. 0.10, 0.18, 0.48, 0.65 (all blue). On exposure to iodine vapour; three spots appeared at Rf. 0.10, 0.48, and 0.67 (all yellow). On spraying with Vanillin- sulphuric acid reagent and heating the plate for about ten minutes at 105⁰ c three spots appeared at Rf. 0.10, 0.48, and 0.67 (all violet)[40]

Modern Era-

1. Indian Materia Medica-

The author of this book has mentioned vernacular names and chemical constitution of this drug. *Palash* flower are useful to treated many diseases.[41]

2. Data base on medicinal plants used in Ayurveda vol I-

Detail description regarding palash plant has been given such as family, classical text, vernacular names, morphology, useful parts, along with pharmacognosy, chemical

constituents, pharmacological activity, toxicology and therapeutic evaluation is described.^[42]

3. Medicinal plants quality standards of Indian medicinal plants-

Detail explanation regarding *palash* is given and also all types of phytochemical tests are described in details.^[43]

4. The Ayurvedic pharmacopeia of India-

It include pharmacopoeial standards of *palash*. Scientific data on *palash* is available in this text.^[44]

5. Indian medicinal plants-

In this book *palash* is mentioned including Sanskrit meaning, *paryay* name , property and uses of *palash*.^[45]

Therapeutic Uses-

1.Anti-diarrheal activity-

The ethanolic extract of the stem bark has been found to inhibit the castor oil induced diarrheabydecreasing the gastrointestinal motility. It reduces the Gastro- intestinal motility after charcoal meal administration in Wistar Albino rats. The gum of *Palash* has been found useful in the treatment of Chronic diarrhoea ^[46].

2.Anthelmintic activity-

The seeds of *palash* possess the anthelmintic activity. It eradicates the parasitic worms from the Gastro- intestinal tract. Seeds of *buteamonosperma* extract when tested in vitro, showed the anthelmintic activity. Crude powder of *palash* seeds given at the doses of 1, 2, 3 g/kg to sheep with mixed species of gastro-intestinal nematodes or round worms; it showed a dose and time dependent anthelmintic activity^[47].

3.Anti- convulsantactivity –

A triterpene whose name is TBM has been found in *palash*. It is responsible for the anticonvulsive activity but more research is required for the aspect yet. TBM shows the anticonvulsant activity against seizure induced by MES (Maximum Electro Shock), lithium sulphate, and pilocarpine nitrate, electrical killing, and pentylenetetrazol (PTZ). It also shows depressant effect on the CNS after repeated use for a total of 7 days. In the

same way, after repeatedly using the TBM, the duration of sleep induced by pentobarbital was not decreased^[48].

4. Anti-diabetic activity-

The ethanolic extract of *palash* causes the reduction in blood glucose level in the Alloxan induced diabetic rats. After repeated oral treatment of this herbal drug for 14 days, blood glucose get reduced, reduction in serum cholesterol and improved HDL(high density lipoprotein)- cholesterol were noted as compared to control diabetic group. Ethanolic extract of seed shows antidiabetic, hypolipidemic and antiperoxidative effect in type 2 diabetes mellitus rats. Aqueous extract of this drug reduces the blood glucose level in both the normal and Alloxan induced diabetic mice at 2 and 5 hours respectively. Nonetheless, the hypoglycaemic effect is peaked at 90 minutes and is not as sustained as which is seen with metformin drug therapy^[49].

5. Anti-stress activity-

The ethanolic extract of the part of *buteamonosperma* that is water soluble was found to be useful in reducing the water immersion stress induced high concentration of serotonin and plasma cortico-steroidal hormone^[50].

6. Anti-Implantation activity-

Butin isolated from the flower of *palash* shows both male and female contraceptive activity. Butin which had been isolated from the seed of *palash* (*buteamonosperma*), was given to female rats at the doses of 5, 10 and 20 mg/rat from day 1 to day 5 of pregnancy and it presented anti-implantation activity in 40%, 70% and 90% of the treated animals respectively. Alcoholic extract of *palash* has been found to show the anti-fertility activity. Butin is a weak estrogen as sufficient uterotrophic effect was recognised even at 1/20th the contraceptive dose^[51].

7. Anti-inflammatory activity-

Buteamonosperma methanolic extract was studied for the anti-inflammatory activity against carrageenan-induced rat paw inflammation and cotton pellet induced granuloma in albino rats. The agent MEBM was found that extract. MEBM at oral doses of 600mg/kg and 800mg/kg inhibited the carrageenan-induced paw edema. At the same doses, MEBM was also found effective in reducing the granuloma tissue formation

in the case of cotton pellet induced granuloma. It also reduced the serum lysosomal enzymes and lipid peroxides when compared to control groups^[52].

8. Antifungal activity-

The ethyl acetate and petroleum extracts of *palash* show the antifungal activity against *Cladosporium cladosporioides*. The chemical constituent that was responsible for this antifungal activity was medicarpin. Its activity against fungus was found to be greater than the standard fungicide that is Benlate^[53].

9. Anti- microbial activity-

Gum of *butea monosperma* is used to treat microbial infection. The in-vitro antimicrobial activity of alcoholic extract of *butea monosperma* gum was evaluated. It was done against various microbial strains such as *Staphylococcus aureus*, *Bacillus subtilis*, *Pseudomonas aeruginosa*, *Candida albicans* by using disc diffusion method^[54].

10. Hepatoprotective activity-

When the powdered flower of *butea monosperma* was given to rabbits, then the paracetamol induced serum marker enzymes got inhibited. In paracetamol treated group, there was the increase in the alanine phosphatase and alkaline transaminase. Butrin and the isobutrin acted as hepatoprotective agent^[55].

11. Antioxidant activity-

Antioxidant activity of *butea monosperma* flowers was studied. It was done through some in vitro models such as the radical scavenging activity using 2,2-diphenyl-1-picrylhydrazyl (DPPH) assay, reducing power assay, Nitric oxide scavenging activity and antioxidant capacity studied by phosphomolybdenum method. The n-butanol fraction showed the highest scavenging activity^[56].

12. Wound healing activity-

Experimental assessment of the wound healing activity of flavonoid fraction of *butea monosperma* stem bark showed increased rate of wound contraction and epithelization and increased granuloma tissue formation. Topical application of the flavonoid fraction on excision wounds accelerated wound contraction and reduced epithelization period in rats^[57].

13. Anti- cancer activity-

In the assessment of individual hepatic function in cancer patient, liver function test (LFT) represent a broad range of normal function performed by the liver. LFT are usually abnormal in HCC cases with elevated blood level of ALT due to excessive liver damage. Analysis of ALT levels in both treatment groups of mice showed a dramatic reduction in its levels ($p < 0.001$) indicating ameliorative effects of *buteamonosperma* against HCC and restoration of normal liver physiology^[58].

14. Antitumor activity-

The aqueous extract of flowers of *buteamonosperma* intraperitoneally administrated. It was performed in the x-15-myc onco mice showed antitumorigenic activity by maintain liver architecture and nuclear morphometry but also down regulated the serum VEGF levels. Immunohistochemical staining of liver section with anti- ribosomal protein S27a antibody showed post- treatment abolition of this proliferation marker from the tumour tissue^[59].

15. Radical scavenging activity-

Ethyl acetate, aqueous fraction and butanol were derived from total methanol extract of *buteamonosperma* flowers. They were evaluated for radical scavenging activities. It was done using different in vitro models like reducing power assay, scavenging of 2,2 diphenyl -1-picrylhydrazyl (DPPH) radical, nitric oxide radical, superoxide anion radical, hydroxyl radical and inhibition of erythrocyte haemolysis using 2,2 azo-bis (amidinopropane) dihydrochloride (AAPH)⁴. Methanol extract, its ethyl acetate and butanol fractions showed potent free radical scavenging activity. Whereas on other hand aqueous fraction was found to be devoid of any radical scavenging properties. The seen activity could be due to the higher phenolic content in the extracts and 17.74% w/w in methanol extract, ethyl acetate and butanol fractions respectively^[60].

Toxicity-

The extraction of dry flower powder with hot petroleum ether yielded about 2.2% of hot petroleum ether extract (BPPE) and about 9.2% of hot methanol extract (BME). This *buteamonosperma* flower extracts (BPPE and BME) were used for the pharmacological studies. Adult Wistar albino rats (100-130gm) and Swiss Albino mice (20-30gm) of either sex were used as experimental animals. Limit test revealed that the oral LD₅₀ of

BPEE and BME was above 2000mg/kg body weight and therefore could be used safely in the animals up to the oral dose of 2000mg/kg body weight.^[61]

CONCLUSION-

Buteamonosperma is a wonderful medicinal plant. All parts of *buteamonosperma* have different uses. It would be right to say that nature has blessed us with this herb. The tree has the very beautiful look due to its flower and is called as the 'Flame of the Forest'. Various chemical constituents like Flavonoid, Alkaloids, Butrin, Palasonic acid, Glycoside, Kino-tannin, Galic acid etc. which are responsible for many pharmacological activities like antioxidant, antibacterial, antifungal, anti-inflammatory, anticonvulsive, hepatoprotective, anti- fertility, wound healing etc. From ancient time *palash* has been used as curative agent in many diseases. Hence there is necessity to investigate the biological activity of its phyto-constituent at molecular level for development of an effective, safe and cheap herbal drug. More research has to be done to find out more pharmaceutical uses of *palash* or *Buteamonosperma*.

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