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Review Article

Recent Advances on The Pharmacological Activities of Butea Monosperma

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ABSTRACT

Butea monosperma (Lam.) Kuntze (Syn. Butea frondosa; Family Fabaceae), This is a moderate sized deciduous Tree which is widely distributed throughout India, Burma and Ceylon, popularly known as 'dhak' or 'palas', Commonly known as 'Flame of forest'. The family Fabaceae compromises of 630 genera and 18,000 species.The plant is used in Ayurvedic, Unani and Siddha medicine for various ailments. Almost all the parts of the plant namely root, leaves, fruit, stem bark, flowers, gum, young branches are used as medicine, food, fibre and for other miscellaneous purposes such as fish poison, dye, fodder, utensils, etc. About 45 medicinal uses are associated with the plant and out of these claims almost half the number of claims have been scientifically studied and reported. These observations are noteworthy for further studies on modern scientific lines. The crude extracts of various parts and pure isolates of Butea monosperma was reported to possess antibacterial, Antifungal, hypoglycemic, anti-inflammatory activities. Butea monosperma have been found to possess tonic, Astringent, aphrodisiac and diuretics properties. The widespread uses of Butea monosperma in traditional Systems of medicine have resulted in their extensive chemical analysis for their bio-active principles. This article Briefly reviews the botany, chemistry and pharmacology of Butea monosperma (Lam) Kuntze. It is evident that Without nature human being life is impossible. There are three basic necessity of humans is food, clothes and Shelter and now the fourth one is good health, which provided by plant kingdom. Nature stands a golden mark And provided the storehouse of remedies to cure all ailments of mankind. Plant kingdom represents a rich house of organic compounds, many of which have been used for medicinal purposes and could serve as lead for the Development of novel agents having good efficacy in various pathological disorders in the coming years. Herbs have always been the principal form of medicine in India and presently they are becoming popular throughout the world, as people strive to stay healthy in the face of chronic

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stress and pollution, and to treat illness with Medicines that work in count with the body's own defence.

INTRODUCTION

Butea monosperma, known as Palas, is a medium-sized deciduous tree that belongs to the Leguminosae-Papilioneae family. This tree is often known as the 'Flame of the Forest' and is also called Bastard Teak It can be found throughout the Indian subcontinent, particularly in the Indo-Gangetic plains. According to legend, the tree represents Agnidev, the God of Fire, who was punished by Goddess Parvati for interrupting her and Lord Shiva's privacy. This tree can grow up to 50 bases altitudinous and features striking clusters of flowers. It sheds its leaves as the flowers begin to bloom between January and March. When the flowers start to bloom in January through March, it sheds its leaves.The wind causes the trunk to grow gnarled and twisted, creating a talking point. You can use it as a specimen or as a backdrop element for the canopy.Local names for the plant include: Bastard Teak, Parrot Tree (Eng.), Chichratesu, desukajhad, dhak, palas, chalcha, kankrei (Hindi), Palashpapra (Urdu), Muthuga (Can.), Palas, Polashi (Beng.), Porasum, Parasu (Tam.), Muriku, Shamata (Mal.), Modugu (Tel.), Khakda (Guj.), and Kela (Sinh.). It is a useful plant in many ways. Its leaves are essential for various religious rituals in Hindu homes. These are also used as cheap leaf plates and cups for rural feasts. In some parts of the country these are used for wrapping tobacco to make biddies. These are further used as packing material for parcels. There are numerous benefits to this plant. Its leaves are used in many religious ceremonies in Hindu houses. These are also used as low-cost leaf plates and cups for village feasts. These are used to wrap tobacco in biddies in different parts of the country. Packages are also packed using them. The palas leaves are also eagerly eaten by the cattle. Rough cordage is made from the brown, coarse fiber that the bark produces. Tree stem cuttings are used to extract butea gum, a dried, astringent liquid. The bark secretes a fluid that hardens into ruby-colored, brittle gum beads. (1) B. monosperma is widely used in homeopathy, Ayurveda, Unani, and traditional medical systems. Anticonvulsant, antioxidant, antistress, antigout, diuretic, antileprotic, anti-inflammatory, antiulcer, astringent, antiestrogenic, antihepatotoxic, and eye-related medicinal properties are all found in B. monosperma flowers. Leprosy, skin disorders, diarrhea, tonics, depuratives, and thirst.Phytochemical investigations of floral extract have identified triterpene, flavonoids, and glycosides, including butein, butin, isobutrin, coreopsin, isocoreopsin, sulphurein, monospermoside, isomonospermoside, chalcones, aurones, and steroids.B. monosperma is widely used in homeopathy, Ayurveda, Unani, and traditional medical systems. Anticonvulsant, antioxidant, antistress, antigout, diuretic, antileprotic, anti-inflammatory, antiulcer, astringent, antiestrogenic, antihepatotoxic, and eye-related medicinal properties are all found in B. monosperma flowers. Leprosy, skin disorders, diarrhea, tonics, depuratives, and thirst.Phytochemical investigations of floral extract have identified triterpene, flavonoids, and glycosides, including butein, butin, isobutrin, coreopsin, isocoreopsin, sulphurein, monospermoside, isomonospermoside, chalcones, aurones, and steroids. Every plant medication has distinct qualities related to its chemistry, botany, and therapeutic efficacy. To distinguish the real plant sample, it is crucial to examine the pharmacognostic characteristics of each medicinal plant. All sections of B. monospema have been the subject of numerous isolation and pharmacological investigations, however pharmacognosy is a relatively unknown topic. The goal of the current effort is to establish standard pharmacognostic measures for Butea monosperma

flowers that will be helpful in drug authentication and standardization, ensuring the medicine's quality and purity. (2-8). The natural herb Butea superba belongs to the Popilionaceae family. Only in Thailand can one find the woody, long-lived herbal plant known as twinning. This species is found in the same mountainous habitat as Pueraria mirifica. Every year, the long tuberous grew larger and gathered at least fifteen chemicals. Among the direct chain organic acid group, flavonoids and flavonoid glycosides in particular have a strong c-AMP phosphodiesterase inhibitor that acts directly on the corpus cavernosum of the penis, increasing blood flow there. It also promotes erectile function, normal sexual function, increased sensitivity, and improved performance. Male erectile dysfunction has been treated using Butea superba tuber preparation as an alternative herbal remedy. It has been discovered that Butea Superba tubers contain estrogenic substances that resemble follicular hormones. Butea superba roots exhibit restorative properties. Butea superba root bark exhibits 65% acetylcholinesterase inhibiting activity. Butea parviflora, sometimes referred to as climbing Butea and Palashabheda, is a huge woody licine that grows all throughout India. It has enormous trifoliate leaves, white or cream-colored flowers, and single-seeded fruit. (9-12) Butea monosperma is frequently used as a diuretic, astringent, tonic, and aphrodisiac. Filariasis, night blindness, helminthiasis, piles, ulcers, and tumors can all be treated with roots. It is said to have analgesic, aphrodisiac, and antifertility properties.Flowers are astringent, diuretic, depurative, and tonic, and they can help with diarrhea. In Indigenous medicine, the stem bark is used to cure snake bites, ulcers, sore throats, diarrhea, dyspepsia, and dysentery. In addition to its therapeutic purposes, it has commercial use. For example, its leaves are used to make bowls, platters, cups, and beedi wraps. Cordage is made from bark fibers. (13-19)

Botanical Description:

This tree is upright, 12 to 15 meters tall, with a crooked trunk, uneven branches, rough, ash-colored bark, and downy young portions. Stipules are linear-lanceolate, petioles are 10–15 cm long, and leaves are 3-foliate. Coriaceous leaflets (the terminal 10–20 cm long, broad 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 noticeably reticulately veined below; strong-stipels subulate, 6 mm long, deciduous. Large flowers in stiff racemes The tumid nodes of the dark olive-green Velvety rhachis are formed by three flowers that are 15 cm long, with pedicels that are roughly twice as long as the calyx. Dense, brown-velvety, with tiny, deciduous bracts and bracteoles. The calyx is 13 mm long, dark olive-green, and covered in silky hairs on the inside. Its teeth are short, The three lower equal, deltoid, and two upper connate. Corolla 3.8 to 5 cm in length, covered with silky, silvery hair, and colored either salmon or orange: typical 2.5 cm wide: semicircular keel, veined and beaked. Thickened pod stalks measuring 12.5–20 by 2.5–5 cm Reticulately veined argenteo-canescent at the sutures: 2 cm long stalked.

Fig - 1 Butea Monosperma Flower

Phytoconstituents:

Flower - Triterpene , several flavonoids butein, butin, isobutrin, coreopsin, isocoreopsin (butin 7-glucoside), sulphurein, monospermoside(butein 3-e-D-glucoside) and isomonospermoside, chalcones,aurones, isobutyine, , palasitrin, 3',4',7-trihydroxyflavone . Myricyl alcohol, stearic, palmitic, arachidic and lignoceric acids , glucose, fructose, histidine, aspartic acid, alanine and phenylalanine

Gum -Tannins, mucilaginous material, pyrocatechin .

Seed - Oil (yellow, tasteless), proteolytic and lypolytic enzymes, plant proteinase and polypeptidase. (Similar to yeast tripsin) . A nitrogenous acidic compound, along with palasonin is present in seeds. It also contains monospermoside (butein3-e-D-glucoside) and somonospermoside. Allophanic acid, several flavonoids (5, 6, 7, 4'-tetrahydroxy-8-methoxyisoflavone 6-O-rhamnopyranoside. Butin α-Amyrin, βsitosterol, β-sitosterol-β-D-glucoside, sucrose .

Fatty acids such as myristic, palmitic, stearic, arachidic, behenic, lignoceric, oleic, linoleic and linolenic , Monospermin . and an acid imide. 15-Hydroxypentacosanoic acid nheneicosanoic acid δlactone. 10, 16-dihydroxyhexadecanoic acid Phosphatidylcholine, phosphatidylethanolamine and phosphatidylinositol .

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

Stem- 3-Z-hydroxyeuph-25-ene and 2,14-dihydroxy11,12-dimethyl-8-oxo-octadec-11-enylcyclohexane (58) Stigmasterol-e-D-glucopyranoside and nonacosanoic acid , Flavonoid 8-C-prenylquercetin 7,4'-di- Omethyl-3-O-α-L-rhamnopyranosyl(1-4)-α Lrhamnopyranoside. 3-hydroxy-9~ methoxypterocarpan [(-)-medicarpin]. Lupenone, lupeol and sitosterol. Two iso flavones 5-methoxygenistein and prunetin. In addition to stigmasterol-3-α-Larabinopyranoside, four compounds isolated from the stem of Butea monosperma have been characterized as 3-methoxy-8,9-methylenedioxypterocarp-6-ene, 21-methylene-22-hydroxy-24-oxooctacosanoic acid Me ester, 4-pentacosanylphenol and pentacosanyl-β-Dglucopyranoside .

Bark - Kino-tannic acid, Gallic acid, pyrocatechin . Also contains palasitrin, and major glycosides as butrin, alanind, allophanic acid, butolic acid, cyanidin, histidine, lupenone, lupeol, (-)-medicarpin, miroestrol, palasimide and shellolic acid. Two compounds, 3, 9-dimethoxypterocarpan, and triterpenoid ester, 3α-hydroxyeuph-25-enyl heptacosanoate.

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

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

Sap – Chalcones, butein , butin, colourless isomeric Flavanone and its glucosides, butrin (20-27)

Taxonomical Classification:

Kingdom: Plantae, Plants
Phylum: Magnoliophyta
Class: Magnoliophyta
Order: Fabales
Family: Fabaceae
Tribe: Phaseoleae
Genus: Butea
Synoynms: Butea braamania DC; Butea frondosa Roxb; Butea frondosa willd; Butea

frondosa willd. Var, lutea (witt.) Maheshw;Plaso monos (Lam.)

Geographical Distribution:

ASIA: Vietnam, Bangladesh, Bhutan, Cambodia, China, India, Indonesia, Java, Myanmar, Nepal, Laos,Pakistan,SriLanka,Thailand,and
India: Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Dadra-Nagar-Haveli, Delhi, Gujarat, Haryana, Jammu & Kashmir, Kerala, Karnataka, Madhya Pradesh, Maharashtra, Punjab, Rajasthan, Tripura, Tamilnadu, Uttar Pradesh, and West Bengal (28)

Literature Review:

1. **Sindhia V.R., Bairwa R.** reported that, Butea monosperma (Lam.) Kuntze (Syn. Butea frondosa; Family Fabaceae) , This is a moderate sized deciduous tree which is widely distributed throughout India , Burma and Ceylon, popularly known as 'dhak' or 'palas', commonly known as ‘Flame of forest’. The family Fabaceae compromises of 630 genera and 18,000 species. The crude extracts of various parts and pure isolates of Butea monosperma was reported to possess antibacterial, antifungal, hypoglycemic, anti-inflammatory activities. Butea monosperma have been found to possess tonic, astringent, aphrodisiac and diuretics properties. The widespread uses of Butea monosperma in traditional systems of medicine have resulted in their extensive chemical analysis for their bio-active principles. This article briefly reviews the botany, chemistry and pharmacology of Butea monosperma (Lam) Kuntze.

2. **Sourabh Jain, P. K. Dubey** concluded that, In the current review, we have made an endeavor to give the mophological, phytochemical, ethnopharmacological and pharmacological information on B. monosperma. The plant B. monosperma has an excellent potential against various ailments and have been experimentally and clinically utilized in both animals and man. A variety of extracts and chemical compounds of the plant have shown aphrodisiac, antioxidant, antibacterial, cytotoxic, anti-inflammatory and hypoglycaemic activities ect. A huge number of compounds have been remote from B. monosperma and shown to possess assorted biological properties. There is lack of management and conservation plan from the government side. Similarly, lack of awareness of importance regarding B. monosperma among rural villagers is leading towards the destruction of this valuable species. Due to the overexploitation of one of the critically endangered plants, there is a require to focus on conservation, upgradation and sustainable utilization of this wonder plant.

3. **Shruti V. Hegde, G. R. Hegde, Shruti Mannur, Shreedevi S. Poti** reported that , The parameters studied can be utilized in identification of Butea monosperma in crude drug form and can be used as a potential source for useful therapeutics. The resulted data will be beneficial for quantitative and qualitative standardization of genuine drug in herbal preparations. Positive result for alkaloids, saponins and phenols is indicative of scope for future analysis.

4. **Ashish Mishra, Saket Verma, , Abhinav Prasoon Mishra** stated that , Roots are used in treatment of night blindness, other site defects and elephanthiasis. The bark is acrid, bitter, oily appetizer, aphrodisiac, laxative, antihelmintic, useful in fracture of bones, diseases of anus, dysentery, piles, hydrocele,

cures ulcer and tumours.The leaves are good for diseases of the eye, used as strong astringent, antibacterial, tonic and cure for pimples. The gum is astringent to the bowels, used in treatment of dysentery, stomatitis, cough, pterygium, corneal opacities, cures excessive perspiration and flowers are sweet, bitter, acrid, astringent to bowls, increase "vata" and decrease "kapha", leprosy, strangury, gout, skin diseases, thirst, burning sensation. A decoction of flowers is given in diarrhea and haematuria. The juice is useful in eye diseases. The fruit and seeds are dry, digestible, antihelmintic, aperients, and used in urinary discharges, piles, skin diseases, tumors, abdominal troubles, given for scorpion string. Stem bark has antifungal properties .

5. **Ratchanaporn Chokchaisiri, a Channarong Suaisom, et al** Described that , One new dihydrochalcone, dihydromonospermoside , was isolated from the flowers of Butea monosperma together with three known chalcones, butein , monospermoside and isoliquiritigenin , one flavone, 7,3,4-trihydroxyflavone , four flavanones, ()-butin , ()-butrin isomonospermoside and ()-liquiritigenin , and three isoflavones, formononetin , afrormosin and formononetin-7-O-b-D-glucopyranoside . The structure of the new compound was elucidated by spectroscopic techniques whereas those of the known compounds were identified by comparisons of spectroscopic and some physical data with those of reported compounds. The absolute configurations at the 2-position of the flavanones 1a, 3a, 5b and 9a were established to be 2S, 2S, 2R and 2S, respectively, by circular dichroism spectral measurements and were confirmed by comparison of the optical rotations with those of reported values and by enzymic hydrolysis of the glucosides to the corresponding aglycones. The isolated flavonoids exhibited varying antimycobacterial activity with the chalcone 2 being the most active compound (MIC 12.5 mg/ml)

6. **William Rasican Surin and Kavya Ananthaswamy** concluded that, Various bioactivity studies of B. monosperma plant derivatives are at the preliminary level requiring further studies to delineate the mechanism of actions. Only few studies shed light in the mechanism of actions in details. This review provides an outlook on various aspects that need to be done to carry forward the available information in developing suitable clinical therapeutics out of B. monosperma plant.

7. **D. A. Burlia and A. B. Khadeb** stated that, In the present review we have congregated information pertaining botanical, phytochemical, nutritional, traditional claims and recent studies. The tree has immense potential and appears to have a broad spectrum of activity on several ailments. Various parts of the plant have been explored for antioxidant, antidiarrhoeal, dermal wound healing, antidiabetic, antistress, anticonvulsive, antihepatotoxic, nootropic, antiestrogenic and anthelmintic activities. In Addition root is lens protective and antimicrobial. Isolation, identification of the diverse chemical constituents are in progress. A clinical trial of the plant in worm infestation proved its effectiveness in cases of round worm and thread worm infestations and the drug was found to be ineffective in the only case of tapeworm infestation. An Ayurvedic formulation containing Butea monosperma as one of the constituents is used in the treatment of giardiasis. A number of reports are available

with respect to antihepatotoxic potential of flower and seed of Butea monosperma. Utility of flower, seed, fruit, leaves against various eye ailments are not extensively evaluated by scientific means. Plant has immense potential as antidote and in symptomatic treatment of either snake bite or scorpion sting. There are traditional claims for usefulness of young branches, stem bark and seed of Butea monosperma in snake bite and scorpion sting, if these claims are scientifically evaluated they may prove to be a good remedy against the same.

8. **Rakesh Maurya, Dinesh K. Yadav, Geetu Singh, Biju Bhargavan** descibed that, Phytochemical investigation from the stem bark of Butea monosperma, led to the isolation and identification of three new compounds named buteaspermin A, buteaspermin B and buteaspermanol , along with 19 known compounds. The structure of compounds 1–22 were established on the basis of their spectroscopic data. The isolated compounds 2–17 were evaluated using neonatal (1–3 days old) rat calvaria derived primary osteoblast cultures. Five of these compounds 7, 10–13 showed promising osteogenic activity, attributed to increased osteoblast proliferation, differentiation and mineralization as evidenced by marked increase in expression of alkaline phosphatase, an early phase differentiation marker, and alizarin Red S staining of osteoblasts cultured for 48 h and von Kossa silver staining of nodules formed 15 days after culture with these compounds. Quantification of mineralization by optical density measurement of Alizarin Red S extracted from stained osteoblasts cultured for 7 days in presence of these compounds showed significant ($P < 0.05$, vs corresponding vehicle control group) increase in mineralization. On the basis of biological results, structure–activity relationships are discussed.

9. **V.M. Shahavi , S.K. Desai** concluded that , Methanolic extract of Butea monosperma flowers (MEBM) was studied for anti-inflammatory activity against carrageenin induced paw edema and cotton pellet granuloma in albino rats. In carrageenin induced paw edema, MEBM at oral doses of 600 mg/ kg and 800 mg/kg, dose-dependently inhibited the paw edema. In cotton pellet induced granuloma, MEBM at the same doses was found to significantly inhibit granuloma tissue formation, including significant reduction in levels of serum lysosomal enzymes (SGOT, SGPT and ALP) and lipid peroxides as compared to control.

10. **Apurva Rai, Ashutosh Kumar Singh, Vimal Chandra Pandey stated that ,** Butea has a significant effect on rhizosphere soil's biological properties. Microbial biomass, as well as its activity in the rhizosphere has a great ecological significance due to the role played by microorganisms in nutrient cycling. In this study, the rhizosphericzone of Butea shows a significant change in soil pH, EC, microbial biomass carbon and enzyme (dehydrogenase, -glucosidase and alkaline phosphatase) activities which concludes that it can be used as a potential tree species for the restoration of the degraded lands including moisture stress lands. Additionally, it is considered as an important constituent of land use system as a source of fuel wood, lac rearing, making of traditional plates (dona). This study indicates the potential of Butea in agro forestry system and its role in other ecosystem services. However, further extensive research is required to develop sustainable land management strategies

including other tree species. Moreover, research should be focused on the study of microbial community through various biochemical and molecular tools to explore the potential for restoration and rehabilitation of other lands.

Table -1 Active Principles

S. No	Plant Parts	Type Of Active Principles	Examples	Plant Part and Preparation
1	Flowers	Triterpene	Butrin,Isobutrin,Coreopsin, Sulphurein,Isocoreopsin, Steroids,Chalcones, Monospermoside,	Aqueous extract, Methanolic extract,Ethanolic extract
2	Gum	Tannins	Mucilaginous material , pyrocatechin	
3	Seed	Enzymes	Polypeptidase , Lipolytic enzymes ,Proteinase and Proteolytic enzymes	Butin extract,Crude powder, Ethanolic extract
4	Resin	Esters	Jalaric esters 1,2 and Laccijalaric esters 3, 4 α amyrin	
5	Saponin	Polyphenols	Chalcones , Butein , Butin	
6	Leaves	Fatty acid	Kino-oil containing oleic , Linoleic acid , Lignoceric acid	Aqueous extract
7	Bark	Aminoacids	Allophanic acid , Butolic acid , Shellolic acid , Butrin , Alanind , Palasitrin Cyanidin , Histidine	Ethanolic extract Alcholic bark extract
8	Stem	Steroids	Stigmasterol-β- D-glucopyranoside and Nonacosanoic acid	Ethanolic extract

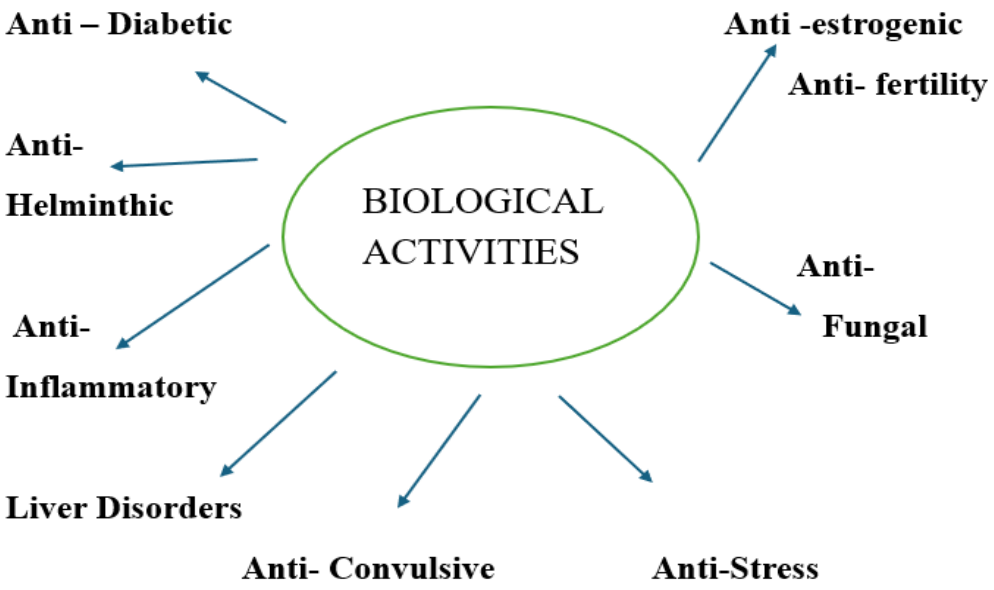

Fig -2 Pharmacological Activities

Anti-fungal activity

The stem bark of Butea monosperma includes the active component medicarpin, which gives it antifungal properties (-). In vitro tests have shown that Butea monosperma seed oil has strong bactericidal and fungicidal properties. The stem bark of Butea monosperma includes the active component medicarpin, which gives it antifungal properties (-). Butea monosperma seed oil exhibits potent bactericidal and fungicidal qualities, according to in vitro testing. When B. monosperma stem bark was extracted using petroleum and ethyl acetate, it demonstrated antifungal activity against Cladosporium cladosporioide. Significant fungicidal and bactericidal activities were found in an in vitro investigation of Butea monosperma seed oil.The inner bark segments of Butea monosperma, a medicinal tree of ethnopharmaceutical importance, were used to isolate fungal endophytes. Through bioassay-monitored chromatographic fractionation, the low-polarity active ingredient was separated, and physical data comparison revealed that it was (-)-medicarpin. Benlate, a common fungicide, was shown to have less antifungal action than (-)-medicarpin, whereas (-)-medicarpin acetate also demonstrated notable efficacy against C. Cladosporiodes.

Anti-inflammatory Activity

Butea monosperma leaves have anti-inflammatory properties for rabbits' eyes. Carrageenin-induced paw edema and cotton pellet granuloma are two ways that Butea monosperma methanolic extract reduces inflammation. Paw edema induced by carrageenin at 600 and 800 mg/kg was inhibited by 26 and 35%, while granuloma tissue development in cotton pellets was inhibited by 22 and 28%. In rabbits' eyes, B. monosperma leaves showed anti-inflammatory qualities.The methanolic extract of B. monosperma was tested for its anti-inflammatory properties using carrageenin-induced paw edema61 and cotton pellet granuloma. At 600 and 800 mg/kg, carrageenin-induced paw edoema was inhibited by 26 and 35%, whereas cotton pellet granuloma showed suppression of granuloma tissue growth by 22 and 28%. Furthermore, the molecular basis of mast cell anti-inflammatory function has been studied by Rasheed et al. (2010). Butrin, isobutrin, isocoreopsin, and butein are among the polyphenols that Rasheed et al. (2010) isolated from B. monosperma flowers. They discovered a considerable decrease in butrin, isobutrin, and butein. PMA and calcium ionophore A23187 induced the production of TNF-α, IL-6, and IL-8 as well as the expression of inflammatory genes in HMC-1 cells by blocking NF-kappa B activation (Rasheed et al., 2010).Additionally, butein significantlysuppresses PMA-induced COX-2 expression in MCF-10A and MCF-7 breast cancer cells by blocking ERK and MAPK kinase, followed by a decrease in PKC activity overall, indicating butein's anti-inflammatory and anti-cancer properties (Lau et al., 2010).

Anti-stress activity

It was discovered that the ethanolic extract of the water-soluble portion of B. monosperma was helpful in lowering the water High levels of serotonin and plasma cortico-steroidal hormone69 were brought on by immersion stress. The water-soluble portion of the ethanolic extract has an anti-stress effect. The extract reduced the rise in brain serotonin and plasma corticosterone levels brought on by water immersion stress, and its anti-stress effects were similar to those of diazepam. The activity of antidopamine: The antidopaminergic properties of the methanolic extract of B. monosperma flowers have been investigated by Velis et al. (2008). The isoflavone that was separated from the ethyl acetate soluble

fraction of the methanolic extract has antidopaminergic activity. It enhanced the effects of haloperidol-induced catalepsy in a dose-dependent manner and prevented rats from becoming aggressive when they were shocked by foot shock.

Anti -Diabetic Activity

Butea Monosperma flower ethanolic extract was administered as a single dosage at a dose of 200mg/kg P.O. markedly enhanced glucose tolerance and induce Blood glucose levels in rats with diabetes caused by alloxan are reduced. Rats with non-insulin-dependent diabetes mellitus showed notable antidiabetic, hypolipaemic, and antiperoxidative benefits when given the ethanolic extract of Butea monosperma seeds orally at a dose of 300 mg/kg b.w.
The anti-hyperglycemic properties of B. monosperma's ethanolic extract were investigated in rats with diabetes caused by alloxan and glucose loading.Alloxan-induced diabetic rats showed a significant improvement in glucose tolerance and a reduction in blood glucose levels after receiving a single dosage of extract (200 mg/kg, p.o.). Rats with diabetes caused by alloxan and glucose were used to test the ethanolic extract of B. monosperma's antihyperglycemic properties. An ethanolic extract of B. monosperma (200 mg/kg, p.o.) improved glucose tolerance and reduced blood glucose levels in rats with alloxan-induced diabetes. An ethanolic extract of B. monosperma (200 mg/kg/day) was administered orally twice for two weeks, resulting in a substantial decrease in blood glucose and serum cholesterol and an improvement in HDL-cholesterol and albumin when compared to the diabetic control group. The ethanolic extract from B. monosperma seeds appears to have strong anti-hyperlipaemic, anti-peroxidative, and antidiabetic properties. In non-insulin dependent diabetes mellitus (NIDDM) rats, Bavarva and Narasimhacharya (2008) discovered that a four-week therapy with ethanolic Soxhlet Extract significantly reduces hyperglycemia and improves glucose tolerance.

Anti-Convulsive Activity

Because it contains a triterpene, it exhibits anticonvulsive effects. The ethanolic extracts of Hibiscus rosa sinesis flowers and Albizzia lebbeck leaves, as well as the petroleum ether extract of Butea Monosperma flowers, have demonstrated anticonvulsant qualities. The fractions did not protect animals from convulsions caused by strychnine, but they did protect them against maximum electroshock, electrical kindling, pentylenetetrazole, and lithium-pilocarpine. The fractions increased serotonin and gamma aminobutyric acid (GABA) levels in the brain. The material possesses anticonvulsant effects because to the presence of a triterpene58. Petroleum ether extract from B. monosperma flowers exhibited anticonvulsant qualities. The acetone-soluble part of the petroleum ether extract of B. monosperma flowers exhibited anticonvulsant qualities. The percentages protected animals from pentylenetetrazol59-induced mouse convulsions, maximum electroshock, and electrical kindling. However, they did not stop animals from experiencing convulsions due to strychnine. The fractions mitigated amphetamine's behavioral effects and improved pentobarbitone-induced sleep. The brain's levels of serotonin and gamma-aminobutyric acid (GABA) rose. by the fractions

Liver disorders

Butea monosperma flowers are used in India to treat liver diseases. Two antihepatotoxic flavonoids, butrin and isobutrin, have been extracted from the extract. The results indicate that pretreatment with methanolic Butea monosperma extract before TAA treatment at two doses may

have a role in the chemopreventive effect. Butea monosperma recovered significantly. Glutathione and its metabolizing enzyme levels in the liver triggered the detoxifying enzyme system, as seen by increased levels of other crucial phase II enzymes, including xanthine oxidase, SOD, GPx, and QR. Thioacetamide (TAA) was used to Induce oxidative stress and the tumour promotion response, And it significantly depleted the detoxification and antioxidant Enzyme arsenal, increasing the production of ornithine Decarboxylase (ODC), malondialdehyde (MDA), hydrogen Peroxide (H2O2), and unscheduled DNA synthesis49. The study used an alcoholic B. monosperma extract that seems to protect the liver cells in a dose-dependent manner while maintaining their structural integrity. The considerable reduction in serum GOT, GPT, Lactate Dehydrogenase (LDH), and -Glutamyl transpeptidase activity (GGT) caused by TAA ($p<0.001$) served as evidence of this. By blocking oxidative stress and the pathway for polyamine production, the alcohol extract may also hinder the promotion stage in addition to its hepatoprotective qualities. Significant activity was demonstrated in various models of liver damage by an extract from the flowers of B. monosperma, a plant medication used in India to treat liver problems. The extract was separated using solvent partitioning and high-performance liquid chromatography. The antihepatotoxic principles isolated Consisted of two known flavonoids, isobutrin(3, 4, 2', 4'-tetrahydroxychalcone-3, 4'-Diglucoside), and the less active butrin (7, 3', 4'-trihydroxyflavanone-7, 3'-diglucoside). For Qualitative and quantitative analysis of Isobutrin and butrin in extracts of B. Monosperma flowers a HPLC system was Developed . According to Wagner et al. (1986), butrin and isobutrin derived from B. monosperma flowers appear to have antihepatotoxic qualities. Sharma and Shukla's (2010) research on rats with acute liver injury generated by CCl4 supports this theory. The changes caused by CCl4 in serum transaminases, protein, albumin, hepatic lipid peroxidation, reduced glutathione, and total protein levels were reversed by the aqueous extract and returned to the control group's levels.

Anti estrogenic and anti fertility activity

It has also been claimed that Butea monosperma floral alcoholic extract possesses antiestrogenic propertiesConsiderable anti-ovulatory and anti-implantation effects were observed in rats and rabbits given a hot alcoholic extract of Butea monosperma seeds. The active ingredient has been identified as butin.Additionally, butin has male contraceptive qualities. There have also been reports of Butea frondosa seed extract having an antifertility effect in mice. Three novel chemicals—buteaspermin A, buteaspermin B, and buteaspermanol—as well as 19 existing compounds were isolated and identified from the stem bark of Butea monosperma. It has also been stated that the title plant's methanolic floral extract possesses antiestrogenic and antifertility properties.Its blooms contain an active ingredient called butin, which has contraceptive effects on both men and women. According to reports, it can influence uterotropic and uterine peroxidase activity in rats with ovariectomies and use the rat uterine peroxidase assay to assess the estrogenic and antiestrogenic capabilities of antifertility drugs. When butin, which was extracted from B. monosperma seeds, was given orally to adult female rats at doses of 5, 10, and 20 mg/kg between day 1 and day 5 of pregnancy, 40%, 70%, and 90% of the treated animals exhibited anti-implantation activity. There was a dose-dependent reduction in the number of implantation sites and a termination of pregnancy at lower doses. The butin had no anti-estrogenic effect in ovariectomized young female rats, but it did exhibit estrogenic activity at similar

anticonceptive levels. Butin is a weak estrogen, and even at 1/20th the anticonceptive doses, a notable uterotrophic effect was observed. Butin showed anti-implantation activity When administrated orally to adult female rats at the doses Of 5, 10 and 20 mg/rat from day 1 to day 5 of pregnancy.

Anti-Helminthic Activity

The seeds of the plant are used as an anthelmintic drug in the Ayurvedic system. In sheep, the anthelmintic activity of Butea Monosperma seed (CP) crude powder was dose-dependent (1–3 g/kg) and time-dependent . Certain species of Butea have been found to exhibit anthelmintic activity against earthworms, Toxocara canis, Oxyurids, Dipylidium caninum, Taenia, Ascaridia galli, and Ascaris Lumbricoides. Anti helmintic qualities are present in the plant's seeds. The gastrointestinal tract's parasitic worms are eliminated. Upon in vitro examination, the seeds of the B. monosperma extract shown anthelmintic activity. The crude palash seed powder showed dose- and time-dependent anthelmintic action when given to sheep with mixed species of roundworms or gastrointestinal nematodes at doses of 1, 2, or 3 g/kg. Demonstrated an anthelmintic effect that was dependent on both dose and time. The highest decrease of 78.4% in eggs per gram of feces (EPG) was noted on day 10 following the 3 g/kg treatment. Levamisole (7.5 mg/kg), a common anthelmintic drug, decreased EPG by 99.1%. When tested in vitro, the B. monosperma seed methanol extract demonstrated strong anthelmintic action. (29 – 39)

CONCLUSION:

Butea monosperma, also known as the Flame of the Forest, has been extensively studied for its pharmacological activities. Recent research highlights its potential in various therapeutic areas Antimicrobial and Anti-Inflammatory Properties, Antidiabetic and Hypoglycemic Effects, Antioxidant and Anticancer Activities, Neuroprotective and Cardiovascular Benefits. Phytochemical analysis of Butea monosperma has revealed a range of bioactive compounds, including Flavanoids , Saponins, Tannins, Phenolic Acids . These findings suggest that Butea monosperma has significant potential as a natural remedy for various health conditions. However, further research is needed to fully explore its therapeutic applications and ensure safe use.

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