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Ethanomedicinal Properties of Butea Monosperma (Palas)

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Abstract

Butea monosperma (Lam.) Taub., commonly known as Palas or "Flame of the Forest," is a widely distributed medicinal plant in India and other parts of South Asia, deeply rooted in traditional healthcare systems such as Ayurveda, Siddha, Unani, and various folk practices. Ethnomedicinally, different parts of the plant—including flowers, leaves, bark, seeds, and gum—are extensively used by indigenous communities for the treatment of numerous ailments. The flowers are traditionally employed as anti-inflammatory, antipyretic, and hepatoprotective agents, while the bark is used for its astringent and antimicrobial properties. Seeds of B. monosperma are well known for their anthelmintic and anti-parasitic activities, particularly in treating intestinal worm infections. Leaf extracts are used in wound healing, ulcers, and skin disorders, whereas the gum (Bengal kino) is utilized in diarrhea and dysentery. Phytochemical investigations reveal the presence of bioactive compounds such as flavonoids, chalcones, steroids, tannins, and glycosides, which may be responsible for its therapeutic efficacy. The rich ethnomedicinal knowledge associated with Butea monosperma highlights its significant potential as a source of natural therapeutic agents and supports the need for further pharmacological and clinical studies to validate its traditional uses.

Keywords: Butea monosperm, Ethanomedicinal properties, medicinal compounds.

Introduction:

Butea monosperma (Lam) Kuntze commonly known as Flame of the Forest belongs to family leguminoaceae. It is locally called as Palas, Dhak and Khakhra. It is medium size tree commonly found throughtout India[1], except in the arid region. Bark, flowers, seeds, gum and leaves of B. monosperma are used in indigenous system of medicine for the treatment of various diseases. B. monsperma is one of the most showy flowering tree. The flowers in the dried condition are known as Tesu , Kesu and Palas ke phool, have a bright orange colour but B. monosperma tree with pale yellow colour flowers has been reported for the first time from Bhalua forest in Gaya forest division[2], although they are much layer, closely resemble in appearance to the common gorse (Wex european) with, they are botanicaliy allied. B. monosperma is also called as medicinal dye bearing tree[3].

Ethanomedicinal properties

Leaves

Leaves of B. monosperma are astringent, anti-inflammatory, diuretic, tonic and aphrodisiac. The leaves induced fall of blood sugar level and given in the treatment of glycosuriya. An infusion or decoction of

the leaves is given in diarrhoea, dysentery, as a vaginal douche in lucorrhoea and as a gargle for mouthwash and in septic and congested throat[4-5]. The fresh juice of leaves is taken internally in phthisis, haemorrheagic affection, diarrhea, dysentery, fever and leaf juice is dropped into eyes to treat conjunctivitis[6]. Extract of fresh leaves is employed to kill intestinal worms and petiole is chewed and the juice is sucked to cure cough, cold and stomach disorder[7].

Green leaves of this plant are good fodder for domestic animals and are used for making dinning plates and bowls. The complete mature leaves are also used for making Ghongda to protect from rains. Fresh twings are tied on horns of bullocks on occasion of 'Pola' festival[4].

Leaf powder, about two spoonfuls mixed with a cup of water per day for a month is drunk mixed with a cup of water to cure diabetes[6].A hot poultice of the leaves is effectively used as antiphlogistic or dispersing boils, pimples, tumours haemorrhoids, ulcer, swelling etc. in case of retention of urine the region of the bladder is fermented with hot leaves. The leaves are also used in inflammation in eye diseases[8-9]. A euphane triterpenoid ester and a pterocapan were reported from the leaves of this plant[10].

Flower

Its dried flowers of this plant are called as tisso, tesoo, keeso, kesaree flower and Tesu ke Phool in Hindi and are used in making colour. In India, where they are used in the production of beautiful yellow and orange, red dyes, but the tints are not permanent[11]. Flowers and young fruits are used as vagetables by tribals and flower are boiled in water and cooked to obtain a dye[4].

Flowers are astringent, sweet, laxative, anthelmintic and tonic, aphrodisiac and diuretic[12]. The flowers are used for the treatment of liver disorder and to cure Kapha and Vata, skin diseases, swelling, bone facture, as antifertility and abortifacient[13]. The flowers boiled in water are applied as a poultice over the abdomen pubes to promote diuresis in different painful discharges of urine and to promote menstrual flow as an antiphogistic.

The antihyperglycemic activity of the ethanolic extract of B. monosperma was studied in glucose-loaded and alloxan-induced diabetic rats. Single dose treatment of the extract (200 mg/kg, p.o.) significantly improved glucose tolerance and caused reduction in blood glucose level in alloxan-induced rats. Repeated oral treatment with this extract (200 mg/kg day) for 2 weeks significantly reduced blood glucose, serum cholesterol and improved HDL-cholesterol and albumin as compared to diabetic control group[14].

The flowers yielded several new anthocyanin, flavones and flavonoids glycoside[15] viz cyanin chloride, cyanidin, butein, butin, palasonin, isobutein[16], coreopsin, isocoreopsin[17], allophanic acid (Methyl ester), gallic acid,[18] sulphurien, monospermoside and isomonospermoside[19-21]. The chalcone and aurones are responsible for the bright colour of the flowers. From the flowers terpenes, waxes, gums containing leucoanthocyanidin were also reported[22]. Four compounds isolated from the flowers of B. monosperma have been characterized as butrin, butein, 3', 4', 7'-trihydroxyflavone and stigmasterol-3-β-D-glucopyranoside[23].

Bark

The bark of this plant is astringent, pungent, alternative, aphrodisiac, anthelmintic and used in ulcer and tumours. It is also used against house flies[25]. Decoction of bark is given in cold, cough, fever, haemorrhage, menstrual disorder, piles to cure "Vata and Kapha". Alcoholic extract of bark is given in bloody diarrhoea. Bark fibers are obtained from stem for making cordage and stem powder is used to st-

upefy fishes.

The antidiarrhoeal potential of the ethanolic extract of stem bark of B. monosperma has been evaluated using several experimental models in white albino rats. The extract inhibited castor oil induced diarrhea and PGE2 induced enteropooling in rats, it also reduces gastrointestinal motility after charcoal meal administration. The result obtained established the efficacy and substantiate the use of this herbal remedy as a non-specific treatment for folk medicine[25].

The antifungal compound isolated from the petroleum and ethylacetate extracts of the stem bark from was identified as (-)-3-hydroxy-9-methoxypterocarpan, (-)-medicarpin. Both the compounds and its acetate were active against Cladosporioides. The peteroleum ether and ethylacetate extract of bark of this plant yielded lupeol, lupenone, two isoflavones (5-methoxy genistein and prunelin) and an agent having antifungal activity[26].

Seeds:

Seed contain oil called as moodooga oil. The fresh seeds are mainly used as a powerful anthelmintic for roundworms[27], 10 to 20 grains of the seeds made into a paste with honey are given thrice a day for three days, followed by a dose of castor oil on the fourth day. However, a considerable difference of opinion present regarding their efficacy as an anthelmintic. A decoction of the seeds is given with nitre in gravel complaints. Externally the seeds are used as a paste for ringworm. Seeds are crushed in milk and this mixture about two spoons is taken orally to treat urinal complaints and also against urinary stone[28]. A paste made with lime juice is useful for the cure of dhobic itch. Two to three seeds are powdered and consumed by children as a remedy against intestinal worms[30].The powdered seeds are used for the killing maggots from infected sores and wounds. The pulverized seeds also act as a rubefacient.

The methanolic extract of seed coat and seed preparation prevented pregnancy in adult female albino rats at daily level of 120, 440 and 500 mg/kg body weight, when administered for 10 days dose post coitum[24]. The seed preparation of B. monosperma as such also showed estrogenic activity at dose level of 500 mg/kg body weight on female white albino rats[30]. Significant antifertility activity i.e. 75% and 67.25% have been observed from the alcoholic extract of outer seed coat and seed powder of B. monosperma respectively at the dose level of 200 mg/kg body weight in female rats[31].

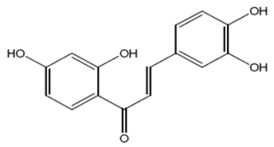
The invitro antimicrobial efficacy of B. monosperma outer seed coat extracts was studied by filter paper disk method against several human pathogenic gram positive and gram negative bacteria and phytopathogenic fungi. The hexane extract of seed showed excellent antibacterial effect, while the ethanol extract of seeds showed significant fungicidal effects[32]. Siddiqui and coworkers screened the seed and its peteroleum ether extract for their biological activity and found low hypertensive activity[33-36].

A new imide palasoimide has been isolated from the pods of B. monosperma and identified as palasonin-N-phenylimide[37]. Kurup and co-workers have isolated three alkaloids from the seeds of B. monosperma[38-39]. Savita Sharma, and coworkers from this laboratory have been investigated seed and seed coat of B. monosperma and have isolated following compounds-

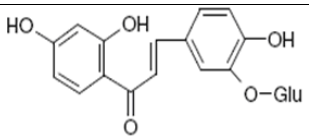
1. 1-Carbomethoxy-2-carbomyl hydrazine[40]
2. 15-hydroxy pentacosanoic acid[40]
3. 1-acetyl-4-methoxy-4-imidazolin-2-one[41]
4. 1-N-acetyl-2-oxo-4-methoxy-3H,5H-imidazole[42]
5. 4-carbomethoxy-3,6-dioxo-5-hydro-1,2,4-triazine[43]

6. 2-hydroxy-ω-methyl allophanic acid[41]
7. Phosphonic acid bis (methyl)[44]
8. Patchulia alcohol[45-46]
9. Methyl aristollene[47-48]

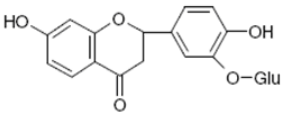
Phenolic compounds are the main class of natural antioxidants. One of these compounds is a chalcone compound known as butein (20,40,3,4–tetrahydroxy chalcone) (1). Butein is one of the major active components of B. monosperma[49] (Wang, Weng, & Cheng, 2000). It is also found in Acacia heartwood, and has been reported to be an inhibitor of xanthine oxidase, and has inhibitory effects on lipid peroxidation in rat liver microsomes[50]. In addition, it has been shown to be a specific protein tyrosine kinase inhibitor and also to induce apoptosis in human leukaemic HL-60 cells. Butein also shows antioxidant activity[51-52].



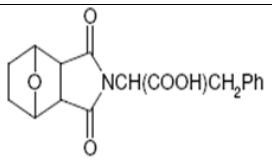
Butein



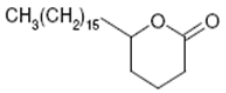
Monospermoside



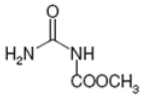
Isomonospermoside



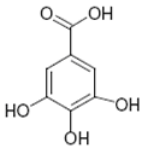
Palasonin



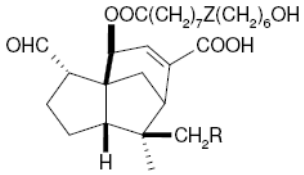
L
actone-n-heneicosanoic acid-δ-lactone



Allophanic acid



Gallic acid



Ref No. (11)

Jalaric ester I
R = OH, Z = CH = CH

Jalaric ester II
R = OH, Z = (CHOH)$_2$

Laccijalaric ester III
R = H, Z = CH = CH

Laccijalaric ester IV
R = H, Z = (CHOH)$_2$

Flower

Triterpene, butein, butin, isobutrin, coreopsin, isocoreopsin (butin glucoside), sulphurein, monospermoside (butein 3-α-D-glucoside) and somonospermoside, chalcones, aurones, flavonoids (palasitrin, prunetin) and steroids were reported from the flower.

Gum: The gum contains 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 (butein 3-α-D-glucoside). The seeds were rich in fatty oil and several fatty acids were reported[52].

Resin

Beside it also contains jalaric esters I, II and laccijalaric esters III, IV; Z- amyrin, β-sitosterol its glucoside and sucrose; lactone-n-heneicosanoic acid-{-lactone).

Sap

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

Leaves

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

Bark

Kino-tannic acid, gallic acid, pyrocatechin, palasitrin, and major glycosides as butrin, alanind, allophanic acid, butolic acid, cyanidin, histidine, lupenone, lupeol, (-)-medicarpin, miroestrol, palasimide and shellolic acid. Stem: 3-Z-hydroxyeuph-25-ene and 2, 14-dihydroxy-11, 12- dimethyl-8-oxo-octadec-11-enylcyclohexane. Stigmasterol-α-D-glucopyranoside and nonacosanoic acid[50-51].

Botanical description

An erect tree 12-15 m high with crooked trunk and irregular branches, bark rough, ash coloured, young parts downy. Leaves 3-foliate, petioles 10-15 cm long, stipules linearlanceolate. Leaflets coriaceous (the terminal 10-20 cm long, broadly ovate from a cuneate base, the lateral smaller, 10-15 by 7.5 – 10 cm, obliquely rounded at the base, equilateral, the lower side is larger), all obtuse, glabrous above when old, finely silky and conspicuously reticulately veined beneath; petioles 6 mm long, stout-stipels subulate, deciduous. Flowers large, in a rigid racemes 15 cm long, 3 flowers together form the tumid nodes of the dark olive-green velvety rhachis: pedicels about twice as long as the calyx, densely brown-velvety: bracts and bracteoles small, deciduous. Calyx 13 mm long, dark olive-green, densely velvety outside, clothed with silky hairs within: teeth short, the 2 upper connate, the 3 lower equal, deltoid. Corolla 3.8-5 cm long, clothed outside with silky, silvery hairs, orange or salmon coloured, standard 2.5 cm broad, veined. Pods stalked 12.5-20 by 2.5-5 cm, thickened at the sutures, reticulately veined argente cane ascent stalked 2 cm long[53-54].

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