ISSN: 0975-8585

Research Journal of Pharmaceutical, Biological and Chemical Sciences

A Plant Review: *Butea Monosperma* (Lam.) Kuntze

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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. It finds use both medicinally and commercially with each part of the plant having utility. This plant species has been found to display a wide variety of biological activities. The plant is traditionally reported to possess astringent, bitter, alterative, aphrodiasiac, anthelmintic, antibacterial and anti-asthamatic properties. Bark yields red juice known as 'Butea gum'or'Bengalkino'. Previous phytochemical examination of this plant indicated the presence of various constituents some of these are Cajanin and isoformononetin; Stigmasterol; Butin; two known flavonoids, isobutrin (3, 4, 2', 4'-tetrahydroxychalcone-3, 4'- diglucoside), and the less active butrin (7, 3', 4'-trihydroxyflavanone-7, 3'-diglucoside); free sugars and free amino acids and (-)-3-hydroxy-9- methoxypterocarpan (medicarpin) which were isolated from stem-bark extract; bark; seeds; flower; the petroleum ether extract of flowers and petroleum and ethyl acetate extract of stem bark. Its reported pharmacological properties include anthelmintic, anticonceptive, anticonvulsive, antidiabetic, antidiarrhoeal, antiestrogenic and antifertility, antiinflammatory, antimicrobial, antifungal, antibacterial, antistress, chemopreventive, haemaggultinating, hepatoprotective, radical scavenging, Thyroid inhibitory, antiperoxidative and hypoglycemic effects and wound healing activities. It is powerful astringent and is given in many forms of chronic diarrhoea. Seeds have anthelmintic property especially for roundworms and tapeworms. Flowers yields a brilliant yellow coloring matter due to presence chalcones. Such herbal medicines may provide potential effect as of compared to the conventional available synthetic drugs, with less or no side effects.

Keywords: *Butea monosperma*, Stigmasterol, Butin, Palas, chalcones.

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ISSN: 0975-8585

INTRODUCTION

Butea monosperma (Lam.) is commonly known as Flame of forest, belongs to the family Fabaceae [1]. It is locally called as palas, palash, mutthuga, bijasneha, dhak, khakara, chichra, Bastard Teak, Bengal Kino, Nourouc and is common throughout India, Burma and Ceylon except in very acrid parts. The pods should be collected and shown before the commencement of rains, root suckers are freely produced and help in vegetative propagation [2]. 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 [3]. The flowers are also good source of flavonoids. The contents of flowers are Butein, Butrin, Isobutrin, Plastron, coreipsin, and Isocoreipsin [10]. Isolation of medicarpin with antifungal activity from this part of the plant has also been reported. From the flowers of this plant species the flavonoids Butin, Butein, Butrin, Isobutrin, Palasitrin, Coreopsin, Isocoreopsin, Sulphuresin, Monospermoside, Isomonospermoside and 7,3,4-trihydroxyflavone have been isolated. The Euphane triterpenoid 3a-hydroxyeuph-25-ene and the alcohol 2, 14-dihydroxy-11, 12-dimethyl-8-oxo-octadec-11-enylcyclohexane has been isolated from the stem. The Imide palasimide has been isolated from the pods of this plant species [12]. Studies on anti-oxidant status following ulceration indicate that free radicals seem to be associated with the pylorus ligation and ethanol induced ulceration in rats [12].

SCIENTIFIC CLASSIFICATION [21]

Kingdom- Plantae – Plants
Sub-kingdom- Tracheobionta – Vascular plants
Super-division- Spermatophyta – Seed plants
Division- Magnoliophyta – Flowering plants
Class- Magnoliopsida – Dicotyledons
Subclass- Rosidae
Order- Fabales
Family- Fabaceae – Pea family
Genus- Butea Roxb.ex Wild. – Butea
Species- Monosperma (Lam.) Taubert – Bengal kino

BUTEA SPECIES

Butea acuminate, Butea affinis, Butea Africana, Butea apoensis, Butea balansae, Butea braamiana, Butea bracteolate, Butea cuneiforms, Butea crassfolia, Butea dubia, Butea ferruginous, Butea gyrocarpa, Butea harmandii, Butea laotica, Butea listeri, Butea littoralis, Butea loureirii, Butea macroptera, Butea maingayi, Butea merguensis, Butea minor, Butea oblong folia, Butea parviflora, Butea pellita, Butea peltata, Butea philippinensis, Butea potting, Butea pulchara, Butea purpurea, Butea ridleyi, Butea riparia, Butea rosea, Butea sanguinea, Butea sericophylla, Butea spirei, Butea squirmier, Butea suberecta, Butea superba, Butea varians, Butea volubilis [13].

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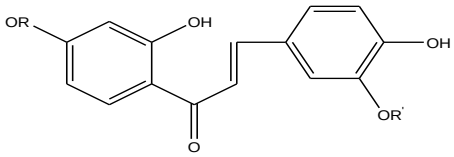
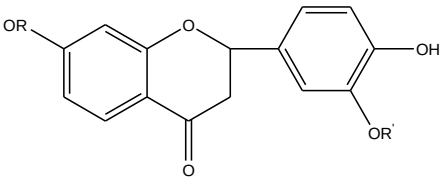
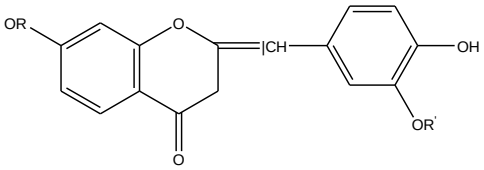
Butea superba is a native herb in the family of Papilionaceae. The preparation of Butea superba tubers has been used as an alternative herbal treatment for erectile dysfunction in males [5]. The tubers of Butea superba have been found to contain estrogenic substances similar to follicle hormones [6]. Roots of Butea superba show rejuvenating activity [7]. The root barks of Butea superba shows 65% inhibitory activity on acetylcholinesterase [8]. Butea parviflora also known as climbing Butea and palashabheda, is a large woody licine with large trifoliate leaves, white or cream coloured flowers and single seeded fruit found throughout in India. Roots contain rotenone .



R=H, R'=Glucosyl - Monospermoside, R=R'=H- Butein, R=R'=Glucosyl - Isobutarin [5]



R=R'=H-Butein, R=R'=Glucosyl–Butrin, R=H,R'=Glucosyl–Isomonospermoside[5]



R=R' = Glucosyl [5]

BOTANICAL DESCRIPTION

It is an erect tree 12-15 m high with crooked trunk and irregular branches bark rough, ash coloured, and young parts downy. Leaves are 3-foliate, petioles 10-15 cm long, stipules linear lanceolate. 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 the larger), all obtuse, glabrous above when old, finely silky and conspicuously reticulate veined beneath, petioles 6 mm long, stout-stipelssubulate, deciduous [2]. Calyx 13 mm long, dark rachis, pedicels about twice as long as the calyx, densely brown-velvety bracts and Flowers are large, in a rigid racemes 15 cm long, 3 flowers together form the tumid nodes of the dark olive-green velvety bracteoles small, deciduous, olive-green, densely velvety outside, clothed with silky hairs within teeth short, the 2 upper connate, the 3 lower

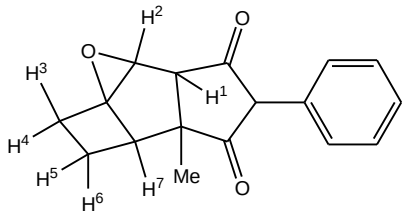
equal, deltoid. Corolla 3.8-5 cm long, clothed outside with silky, silvery hairs, orange or salmon colored, standard 2.5 cm broad, keel semi-circular, beaked, veined. Pods stalked 12.5-20 by 2.5-5 cm, thickened at the sutures, reticulate veined argenteocanesent stalked 2 cm long [9]. It is capable of growing in water logged situations, black cotton soils, saline, alkaline, swampy badly drained soils and on barren lands except in arid regions [13]. Leaflets are obtuse, glabrous above, finely silky and conspicuously reticulately veined beneath with cunnate or deltoid base. Calyx is dark, olive green to brown in colour and densely velvety outside. The corolla is long with silky silvery hairs outside and bright orange red. Stamens are diadelphes, anthers uniform. Ovary 2 ovule, style filiform, curved and stigma capitate. Pods argenteocanesent, narrowed, thickened at the sutures, splitting round the single apical seed, lowest part indehiscent. The seeds are flat, reniform, curved. The bark of pala is fibrous and bluish gray to light brown in color. It exudes a kind of red juice when injured[14].

PYTOCHEMISTRY

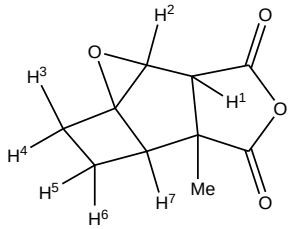
A number of constituents have been reported from various species of Butea and they belong to imides, lactone, flavonoids, sterols, and alkaloids [15].

IMIDE

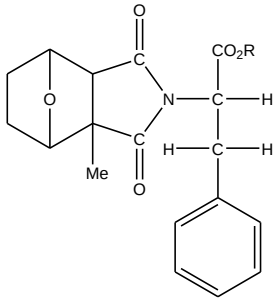
Palasimide has been isolated from the pods of Butea monosperma along with nitrogenous acidic compound and its methyl ester.



(1)PALASIMIDE [15]



(2) PALASONIN [15]



(3)R=H, NITROGENOUS COMPOUND [15]
(4)R=Me, METHYL ESTER OF NITROGENOUS COMPOUND [15]

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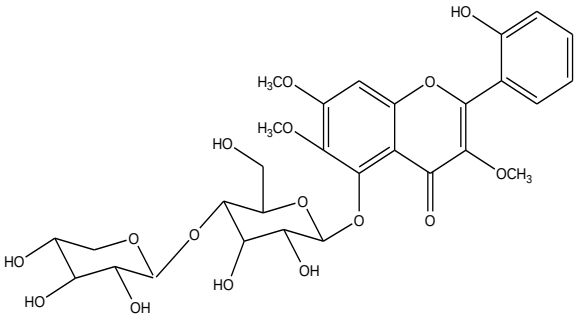
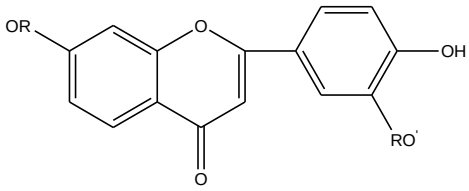
FLAVANOIDS

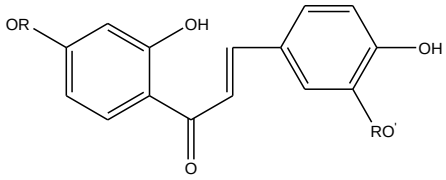
A potential flavone glycoside isolated from the seeds of *Butea monosperma* has been identified as 5, 2'- dihydroxy- 3, 6, 7-trimethoxy flavone -5-O-□-D-xylopransyl-(1-4)-O-□-D-glucopyranoside. It possesses the antiviral activity [21]. Two flavonoids are butrin and isobutrin. A flavone glycoside identified as 5,7- dihydroxy-3,6,4' flavone -7-O-□-L- xylopyranosyl-(1-3)-O-□□L- xylopyranosyl-(1-3)-O-□□L-arabinopyranos-yl-(1-4)-O-□□D-glactopyranoside have shown to possess the antifungal activity against Aspergillus niger, Fusarium oxysporum, Tricodermaviride, Penicillium digitatum . A number of flavonoids include Butin, Butein, palsitrin, coreopsin, isocoreopsin, and sulphuerin, monospermoside, and isomonospermoside. A flavone, quercetin has been isolated from stem bark of *Butea* frondosa. Two isoflavonoids isolated identified as 5-methoxygenistein and prunetin [15].



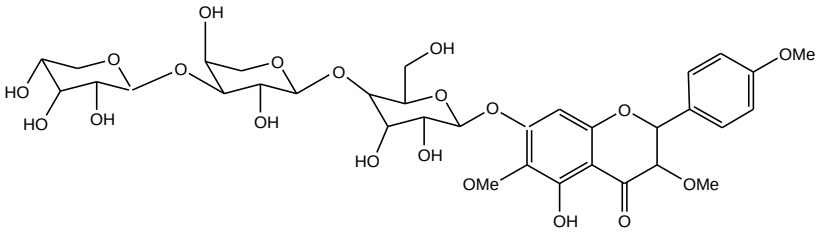
5'2-dihydroxy-3,6,7-trimethoxy flavone-5-O-□-D-Xylopyransyl-(1-4)-O- ω -D-glcopyranoside [15]



Butrin; R=R'Glucosyl [15]



Isobutrin;R=R'Gucosyl[15]



5, 7 Dihydroxy-3, 6, 4'trimethoxyflavone-7-O--L-xylopyranosyl-(1-3)-O- ω arabinopyranosyl-(1-4)-O- ω D-galactopyranoside [15]

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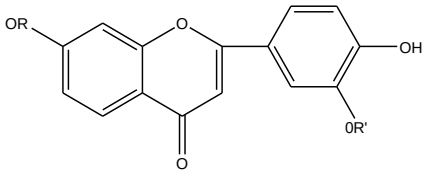
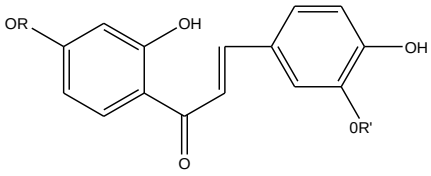
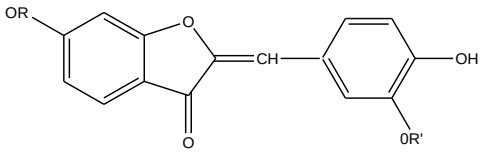


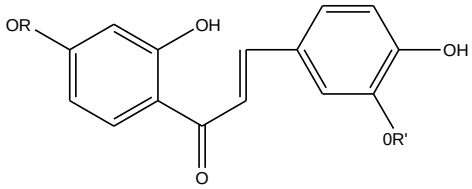
Butin; R=R'=H [15]



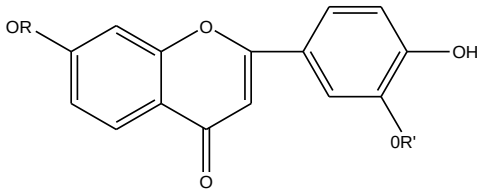
Butein; R=R'=H [15]



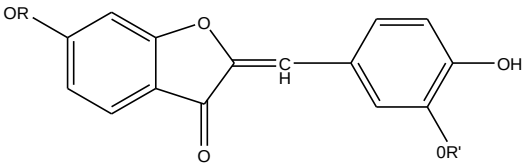
Palasitrin; R=R'= Glucosyl [15]



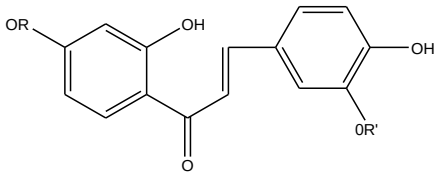
Coreopsin; R= Glucosyl, R'=H [15]



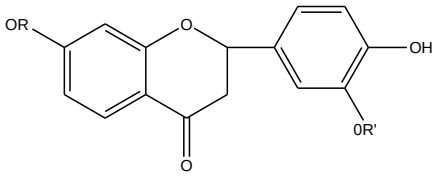
Isocoreopsin;R=Glucosyl, R'=H [15]



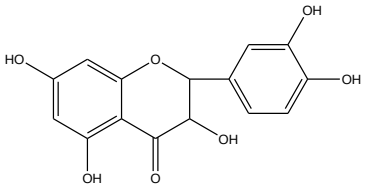
Sulphurein; R= Glucosyl, R= H [15]



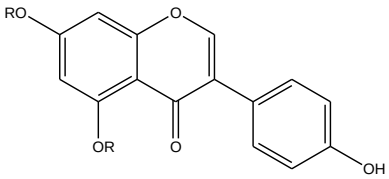
Monospermoside; R=H, R'= Glucosyl [15]



Isomonospermoside; R=H, R'= Glucosyl [15]



Quercetin [15]



5- methoxygenistein; R=H, R'=CH3 [15]

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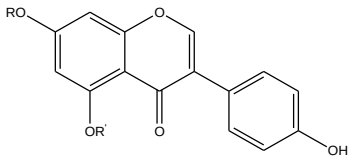
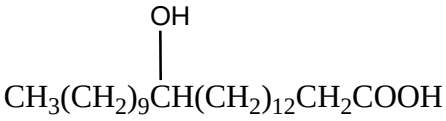


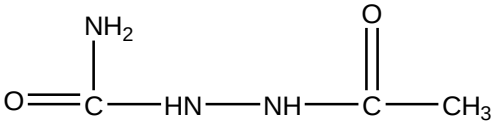
Prunetein; R= CH_3, R′=H [15]

ALIPHATIC COMPOUNDS

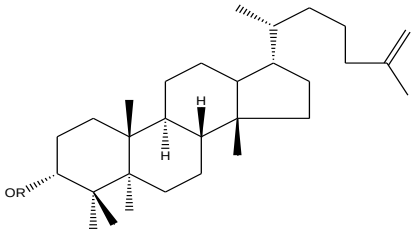
Two aliphatic long chain hydroxy acids and a derivative of hydrazine have been isolated from the Ethanolic extract of *Butea monosperma* seed coat and identified as 15-Hydroxy pentacosaonic acid and 1- carbomethoxy-2-carbomethydrazine. Two aliphatic compounds identified as 3-□□hydroxy-25-ene and 2, 14- Dihydroxy-11, 12- dimethyl-8-oxo-octadec-11-enylcyclohexane have been isolated from the stem of *Butea monosperma* . Aliphatic compounds identified as 2-hydroxy-□-methyl allophanic acids have been isolated from seeds of *Butea monosperma* (Lam) Kuntze. Nonacosonic acid has been isolated from the stem of *Butea monosperma* [15].



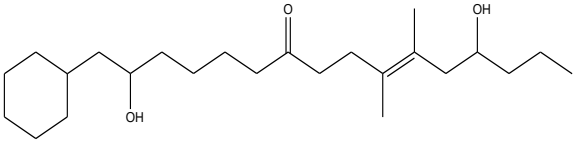
15-Hydroxy pentacosanoic acid [15]



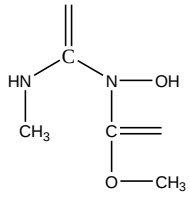
1-Carbomethoxy-2-carbomethydrazine [15]



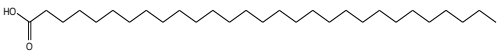
3- ω - hydroxy-euph-25-ene [15]



2, 14 – dihydroxy – 11, 12-dimethyl- 8 – oxooctadec –11- enylcyclohexane [15]



2, hydroxyl- ω -ω-methyl allophanic acids [15]



Nonacosanoic acid [15]

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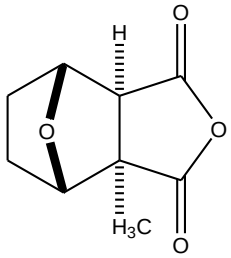
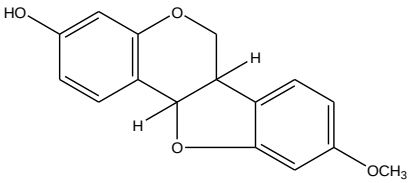
ALKALOIDS

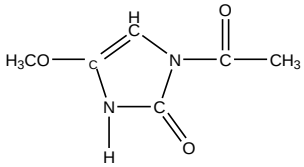
Palasonin isolated from the seeds of *Butea monosperma* have shown to possess antihelmintic activity. Monospermin has been isolated from *Butea monosperma* seeds. Medicarpin isolated from petroleum ether and ethyl acetate extract of stem bark of *Butea monosperma* has shown antifungal activity against *Cladosporium* cladosporioides [15].



Palasonin [15]



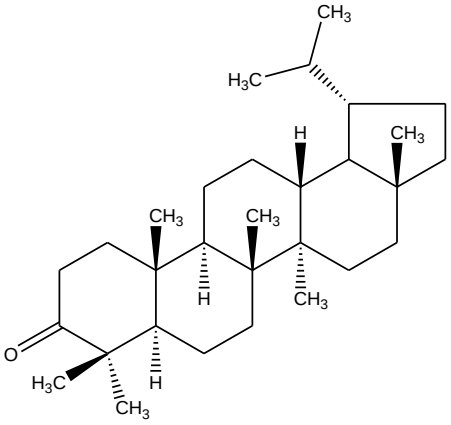
Medicarpin [15]



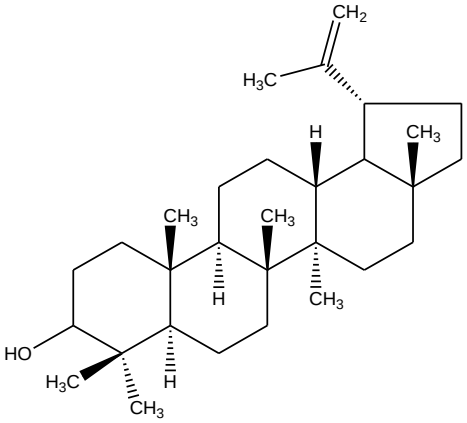
Monospermin [15]

STEROLS

The petroleum ether extract of *Butea monosperma* stem bark yielded Lupenone, lupeol and□ □□sitosterol. Three compounds identified as stigmasterol, stigmasterol-□-D-glucopyranoside has been isolated from the stem of *Butea* monosperma. □-sitosterol has been isolated from the flowers and seeds of *Butea monosperma* (Lamk.) Taub. Which possess estrogenic activity. □□□sitosterol-□□D-glucoside has been isolated from the seeds of *Butea* frondosa [15].



Lupenone [15]



Lupeol [15]

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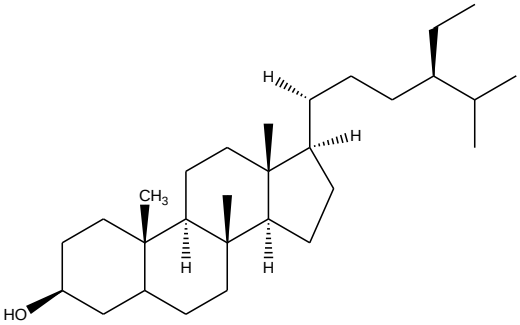
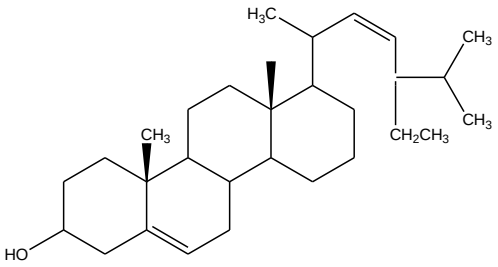
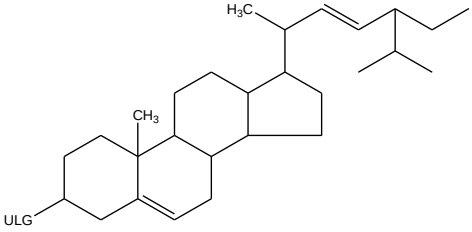


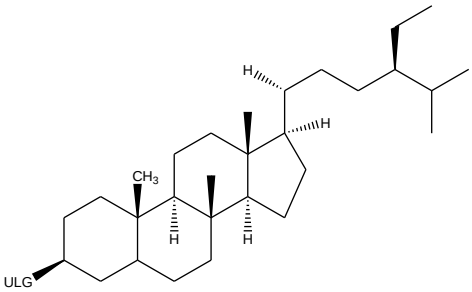
β-Sitsterol [15]



Stigmasterol [15]



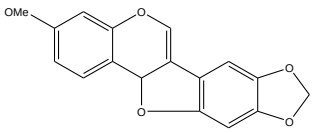
Stigmasterol-β-D–glucopyranoside [15]



βSitosterol-β-D-glucoside [15]

MISCELLANEOUS

Four compounds identified as 3-methoxy-8,9-methylene dioxypterocarp-6- ene , 21-methylene- 22- hydroxy -24-oxooctasanoic acid methyl ester, 4-pentacosanylphenol and pentacosanyl-□-glucopyranoside have been isolated from the stem of *Butea monosperma* □amyrin and sucrose have been isolated from the seeds of *Butea frondosa* . Proanthocyanidine has been isolated from the bark and gum of *Butea monosperma* [15].



3- Methoxy-8, 9- methylene dioxypterocarp-6- ene [15]

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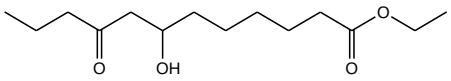
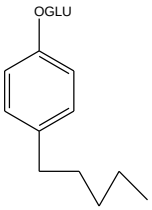
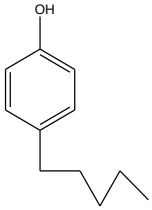


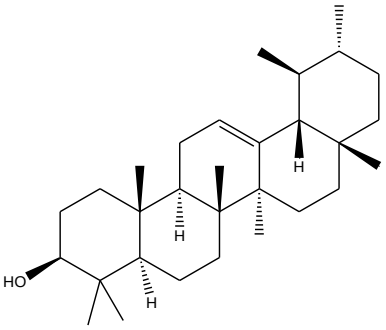
21-methylene - 22- hydroxy -24-oxooctasanoic acid methyl ester [15]



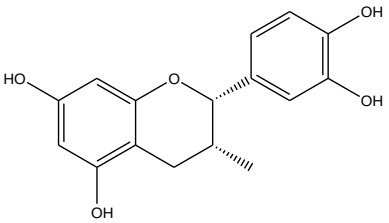
pentacosanyl-?-glucopyranoside [15]



4-pentacosanylphenol [15]



β- amyrin [15]



Proanthocyanidine [15]

Chemical Constituents [19]:

Flower: Triterpene, butein, butin, isobutrin, coreopsin, isocoreopsin (butin 7-glucoside), sulphurein, monospermoside (butein 3-e-D-glucoside) and isomonospermoside, chalkiness', aureoles, flavonoids (palasitrin, prunetin) and steroids.

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 (butein 3-e-D-glucoside) and so monospermoside.

Resin: Jalaric esters I, II and laccijalaric esters III, IV, From seed coat allophanic acid has been isolated and identified. Z- amyrin, e-sitosterone its glucoside and sucrose; lactone-nheneicosanoic acid-delta-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. The plant also contains 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-D-glucopyranoside and nonacosanoic acid.

PHARMACOLOGICAL ACTIVITY OF DIFFERENT PART

Different part of *Butea monosperma* possess various biological activities such as antimicrobial, antifertility, anticonvulsive, antihelmintic, antidiarrhoeal, antimicrobial, wound healing, antigiardiasis and hepatoprotective, antihypertenstive, antitumor, antidiabetic, anti-Inflammatory, free radical scavenging activity [18].

LEAVES

Antidiabetic activity

Single dose treatment Ethanolic extract of *Butea monosperma* of (200 mg/kg, p.o.) significantly improved glucose tolerance and caused reduction in blood glucose level in Alloxan-induced diabetic rats. Repeated oral treatment for 2 weeks significantly reduced blood glucose, serum cholesterol and improved HDL-cholesterol and albumin as compared to diabetic control group. Ethanolic extract of leaves also have antidiabetic and antioxidant potential in Alloxan-induced diabetic mice. Ethanolic extract of seeds (300mg/kg b.w.) exhibited significant antidiabetic, hypolipidemic and antiperoxidative effects in non-insulin dependent diabetes mellitus rats. Aqueous extract significantly decreases blood glucose level both in normal ($p<0.01$) and Alloxan induced diabetic ($p<0.001$) mice at 2 and 5 hr respectively. However, the hypoglycemic effect is peaked at 90min and is not sustained as observed for the standard drug Metformin. The effect of *Butea monosperma*(Lamk.) Taub on blood glucose and lipid profiles in normal and diabetic human volunteers was evaluated which indicated a significant decrease ($P < 0.05$) in 2 h post- prandial blood glucose (mg/dl) on 21st day in the diabetic subgroups treated with 2 g and 3 g of powdered *Butea monosperma* (Lamk.) Taub. A significant decrease in total cholesterol (mg/dl) was observed in normal and diabetic subgroups on day 21*st* post treatment. Both normal and diabetic groups exhibited a significant decrease in total lipids on day 21*st*. This study indicates that *B. monosperma* (Lamk.)Taub might possess important hypoglycemic and hypolipidemic properties [20].

Anti-inflammatory activity

The leaves of *Butea monosperma* exhibit ocular anti-inflammatory activity in rabbits. The anti-inflammatory activity of Methanolic extract of *Butea monosperma* evaluated by carrageenin induced paw edema and cotten pellet granuloma. In carrageenin induced paw

edema at 600 and 800 mg/kg inhibition of paw edema, by 26 and 35% and in cotten pellet granuloma inhibition of granuloma tissue formation, by 22 and 28% [20].

SEEDS

Antihelmintic activity

Palasonin a compound obtained from seeds of *Butea monosperma* has antihelmintic activity [15]. Seeds administered as crude powder at doses of 1, 2 and 3 g/kg to sheep naturally infected with mixed species of gastrointestinal nematodes exhibited a dose and a time dependent anthelmintic effect. The maximum reduction of 78.4% in eggs per gram of feces was recorded on day 10 after treatment with 3 g/kg. Levamisole (7.5 mg/kg), a standard anthelmintic agent, exhibited 99.1% reduction in eggs per gram. The anthelmintic activity of different species of Butea has been reported against *Ascaridia galli*, *ascaris lumbricoides*, *earthworms*, *toxocara canis*, *oxyurids*, *dipylidium caninum* and taenia, methanol extract of *Butea monosperma* seeds showed significant anthelmintic activity *in- vitro* [20].

Anticonceptive activity

Butin which is isolated from the seeds of *Butea monosperma* administered orally to adult female rats at the doses of 5, 10 and 20 mg/rat from day 1 to day 5 of pregnancy showed anti-implantation activity in 40%,70% and 90% of the treated animals, respectively. At lower doses, there was a dose-dependent termination of pregnancy and reduction in the number of implantation sites. In ovariectomized young female rats, the butin exhibited estrogenic activity at comparable anticonceptive doses, but was devoid of anti-estrogenic activity. Butin is a weak estrogen in that a significant uterotrophic effect was discerned evens at 1/20th the anticonceptive dose. It was reported that seed oil use as traditional sexual toner and contraceptive [20].

Hemagglutinating activity

Seeds of *Butea monosperma* showing specificity towards human erythrocytes . The lectins such as *Butea monosperma* agglutinin (BMA) isolated from the seeds of Butea monosperma are responsible for agglutinating property; this property was only shown by seeds not by flowers, leaves, roots and stems. Human blood group-A-specific agglutinins have been demonstrated in some of the N-acetyl galactosamine/galactose–binding lectins, such as the lectins. Hemagglutination test showed that N-acetyl galactosamine is the strongest inhibitor of agglutination [20].

FLOWERS

Antiesterogenic and antifertility activity

Methanolic extracts of *Butea monosperma* exhibited effect on uterotropic and uterine peroxidase activities in ovariectomized rats & determine estrogenic/antiestrogenic potential of antifertility substances using rat uterine peroxidase assay. Alcoholic extract of flowers of the title plant has also been reported to exhibit antiestrogenic and antifertility activities. Butin isolated from its flowers show both male and female contraceptive properties [20].

Hepatoprotective activity

Isobutrin and Butrin, the antihepatotoxic principles of flowers were reported and this activity was monitored by means of CCl4 and GaIN-induced liver lesion *in-vitro.* The methanolic extract of *B. monosperma* possesses hepatoprotective effects and also it might suppress the promotion stage via inhibition of oxidative stress and polyamine biosynthetic pathway by significant reduction in Thioacetamide-induced serum Aspartate transaminase (AST/SGOT), Alanine transaminase (ALT/SGPT), Lactate dehydrogenase (LDH) and gamma-Glutamyltranspeptidase (GGT) activities [20].

Radical scavenging activities

Ethyl acetate, Butanol and aqueous fractions derived from total methanol extract of *Butea monosperma* flowers were evaluated for radical scavenging activities 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 hemolysis using 2,2' azo-bis (amidinopropane) dihydrochloride (AAPH). Methanol extract along with its ethyl acetate and butanol fractions showed potent free radical scavenging activity, whereas aqueous fraction was found to be devoid of any radical scavenging properties. The observed activity could be due to the higher phenolic content in the extracts (16.1, 25.29, and 17.74% w/w in methanol extract, ethyl acetate and butanol fractions respectively) [20].

Antitumor activity

Intraperitonial administration of the aqueous extract of flowers of *Butea monosperma* in the X-15-myc onco mice showed antitumorgenic activity by maintaining liver architecture and nuclear morphometry but also down regulated the serum VGEF levels. Immuno-histochemical staining of liver sections with anti-ribosomal protein S27a antibody showed post-treatment abolition of this proliferation marker from the tumor tissue [20].

BARK

Thyroid inhibitory, antiperoxidative and Hypoglycemic effects

Stigmasterol, isolated from the bark of *Butea monosperma* was evaluated for its thyroid hormone and glucose regulatory efficacy in mice by administrating 2.6 mg/kg/d for 20 days which reduced serum tri iodothyronine (T3), thyroxin (T4) and glucose concentrations as well as the activity of hepatic glucose-6-phophatase (G-6-Pase) with a concomitant increase in insulin indicating its thyroid inhibiting and hypoglycemic properties. A decrease in the hepatic lipid peroxidation (LPO) and an increase in the activities of catalase (CAT), superoxide dismutase (SOD) and glutathione (GSH) suggested its antioxidative potential. The highest concentration tested (5.2 mg/kg) evoked pro-oxidative activity [20].

Wound healing

Topical administration of an alcoholic bark extract of *Butea monosperma* on cutaneous wound healing in rats increased cellular proliferation and collagen synthesis at the wound site, by increase in DNA, total protein and total collagen content of granulation tissues, the tensile strength also increased significantly & histopathological examinations also provide favourable result So, it possesses antioxidant properties, by its ability to reduce lipid peroxidation [20].

Anti-diarrhoeal activity

Ethanolic extract of stem bark of *Butea monosperma*(Lam) Kuntz at 400 mg/kg and 800mg/kg inhibited castor oil induced diarrhoea due to inhibiting gastrointestinal motility and PGE2 induced enteropooling and it also reduced gastrointestinal motility after charcoal meal administration in Wistar albino rats *Butea monosperma* gum has also been found useful in cases of chronic diarrhoea. It is a powerful astringent and also decreases bilirubin level [20].

MEDICINAL USES

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 [15].

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