

**A COMPREHENSIVE REVIEW OF PHYTOCHEMISTRY &  
MEDICINAL USE OF BUTEA MONOSPERMA****Devlekar Shital\*<sup>1</sup>, Raval Jignyasha<sup>2</sup> and Khale Anubha<sup>3</sup>**

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**ABSTARCT**

Butea monosperma (Lam.) is necessary tree in forest. It's blooms & young fruits are used by tribals. plant is used to treat variety of diseases in Ayurvedic, Unani, & Siddha medicine. Almost every part of plant, including root, leaves, fruit, stem bark, blossoms, gum, & young branches, are used for medicinal, food, fibre, & other purposes including fish poison, dye, fodder, & cutlery. Its anti-diabetic, anti-cancer, anti-inflammatory, anti-asthmatic, anti-oxidant, anti-convulsant, anti-microbial, anti-viral, & hepatoprotective activities have been demonstrated in recent in vivo & in vitro research. Flavonoids, lactones, diterpenoids, diterpene glycosides, &

phytosterols are among phytochemicals found in plant's aerial section. Coreopsin, sulphurein, butein, butin, isobutrin, monospermoside & isomonospermoside, auronos, chalcones, flavonoids, & steroids are among active components found in B.monosperma from Leguminosae family. Alkaloids, flavonoids, phenolic compounds, amino acids, glycosides, steroids, & other phytoconstituents are found in B.monosperma. Butea monosperma has undergone considerable chemical investigation to determine its bioactive principles due to its widespread use in traditional medical systems. Butea monosperma's botany, chemistry, & pharmacology are briefly reviewed in this article.

**KEYWORDS:-** Buta Monosperma, Phytochemistry, Medicinal use, Anti- Diabetic, Anti-Inflammatory.

## INTRODUCTION

*Butea monosperma* (BM), often known as flame tree, is member of Caesalpinioideae subfamily of Fabaceae (previously Leguminosae) family. In India, plant is known as Palash tree. It may be found all throughout India & South Asian peninsula. It's deciduous tree with modest size. It reaches height of 10-15 metres. Because of greater branching, it seems to be little bush when it reaches height of 1-2 metres.<sup>[1]</sup> It has odourless flower that becomes crimson in spring as it blooms, & trifoliate leaves. Plant has variety of medical characteristics, including appetiser, laxative, anthelmintic, & aphrodisiac, to name few. Flower, gum, seed, leaf, & bark are examples of plant components that can be employed. It is one of most gorgeous trees that has been put to good use. *Butea monosperma* is widely utilised in Ayurveda, Unani, & Homeopathy, & has become contemporary medicine cynosure. This genus' plants are well-known for their pigmentation.<sup>[2]</sup> *Butea monosperma* is most commonly used as tonic, astringent, aphrodisiac, & diuretic. Filariasis, night blindness, helminthiasis, piles, ulcers, & tumours are all treated with roots. It has antifertility, aphrodisiac, & analgesic properties, according to reports. Flowers are astringent, diuretic, depurative, & tonic, & can help with diarrhoea. In indigenous medicine, stem bark is used to cure dyspepsia, diarrhoea, dysentery, ulcers, & sore throats. Aside from therapeutic purposes, leaves are used to make platters, cups, bowls, & beedi wraps, among other things. Cordage is made up of bark fibres. Well curbing & water scoops are made of wood. It's low-cost plank of wood. Wood pulp is excellent for production of newspaper. Lac bug, which creates natural lacquer, is also found in *Butea*. *Butea monosperma*, *Butea frondosa*, *Butea parviflora*, & *Butea superba* are members of *Butea* genus & are found across India. Current review's goal is to analyse *Butea monosperma*'s taxonomy, phytochemistry, & pharmacology.<sup>[3]</sup>

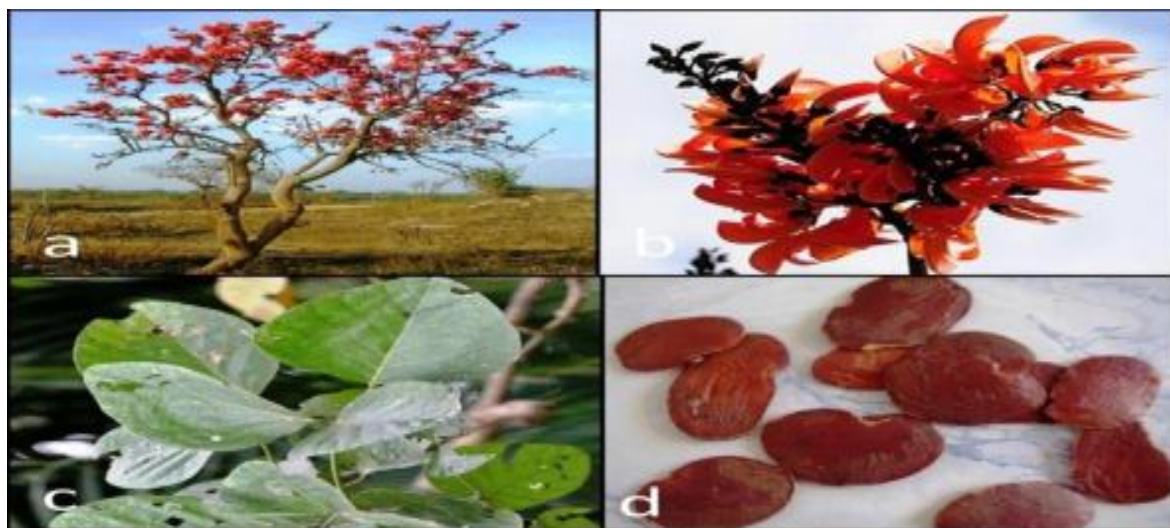
## Chemical constituents

Triterpenes, flavonoids such as butein, butin, isobutrin, coreopsin, isocoreopsin (butin 7-glucoside), sulphurein, monospermoside (butein 3-e-D-glucoside) & isomonospermoside, chalcones, aurones, isobutyne, palasitrin, 3',4',7-trihydroxyflavone, glucose, fructose, histidine, aspartic acid, alanine, & phenylalanine myricyl alcohol, stearic, palmitic, arachidic, & lignoceric acids glucose, fructose, histidine, aspartic acid, alanine, & phenylalanine Tannins, mucilaginous substance, & pyrocatechin are all found in gum. Proteolytic & lypolytic enzymes, plant proteinase & polypeptidase, seed oil (yellow, tasteless). (It works in similar way as yeast tripsin.) In addition to palasonin, seeds contain nitrogenous acidic chemical. Monospermoside (butein3-e-D-glucoside) & somonospermoside are also found in

this compound. Flavonoids (5, 6, 7, 4'-tetrahydroxy-8-methoxyisoflavone 6-O-rhamnopyranoside) & allophanic acid, D-glucoside, sucrose, butin (37)-Amyrin Fatty acids like myristic, palmitic, stearic, arachidic, behenic, lignoceric, oleic, linoleic, & linolenic acid, as well as myristic, palmitic, stearic, stearic, arachidic, behenic, lignoceric, lignoceric, oleic, linoleic, & Monospermine is kind of monospermine. & there's acid imide in there as well.<sup>[4]</sup>



**Figure 1: *B. monosperma*.**



**Figure 2: *Butea monosperma* (a) tree (b) flowers (c) leaves (d) seeds.**

### Phytochemistry

Alkaloids, flavonoids, phenolic chemicals, amino acids, glycosides, resin, saponin, & steroids are among phytoconstituents found in BM. We've spoken about many ingredients found in

different sections of plant, such as flower, gum, seed, leaves, bark, & stem. Following are components:

- **Flower:** Butrin, isobutrin, coreopsin, sulphurein, isocoreopsin, monospermoside & chalcones, isomonospermoside, aurones, steroids, & flavonoids are all found in flower. BM glycoside includes flavone 5, 7-dihydroxy-3, 6, 4-trimethoxy flavone 5, 7-dihydroxy-3, 6, 4-trimethoxy flavone 5, 7-dihydroxy-3, 6,4-trimethoxy flavon -7-O—L xylopyranosyl (13)-O—L-arabinopyranosyl-(14)-O—D galactopyranosyl-(14)-O—D galactopyranoside.<sup>[5]</sup>
- **Gum:** Mucilaginous substance, pyrocatechin, & tannins are all found in gum.
- **Seed:** Polypeptidase, lypolytic enzymes, & proteolytic enzymes are all found in seed oil. Seeds include palasonin & nitrogenous acidic chemicals. Isomonospermoside, monospermoside, & allophanic acid are also found in seed. Flavone glycosides found in BM seeds have been shown to have antiviral properties. Fixed oil, mixed fatty acids, & unsaponifiable materials are all found in BM seeds.
- **Resin:** Resin includes amyirin, -sitosterone, its glucoside, & sucrose; lactone-nheneicosanoic acid-lactone; jalaric esters I, II, & laccijalaric esters III, IV; lactone-nheneicosanoic acid-lactone; lactone-nheneicosanoic acid-lactone; lactone-nheneicosanoic acid-lac. Butein, butin, butrin, colourless isomeric flavanone, & chalcones are all found in saponin.
- **Leaves:** Kino-oil including oleic, linoleic, lignoceric, & palmitic acids may be found in leaves.
- **Stem:** 12 dimethyl-8-oxo-octadec-11-enylcyclohexane, Stigmasterol—D-glucopyranoside, & nonacosanoic acid are all found in stems.
- **Bark**

Gallic acid, kino-tannic acid, & pyrocatechin are all found in bark. Allophanic acid, butolic acid, shellolic acid, butrin, alanind, palasitrin, cyanidin, histidine, palasimide, & miroestrol are also found in bark. Cajanin & isoformononetin are two structurally similar methoxyisoflavones isolated from BM stem bark methanolic extract. Buteaspermin A, buteaspermin B, & buteasperminol, medicarpin, cajanin, formonentin, isoformonentin, & cladrin were found in phytochemical research & isolation of BM stem bark. Medicarpin was active component isolated from ethyl acetate & petroleum preparations of BM stem bark.<sup>[6]</sup>



**Table 1: Butea monosperma active components are listed.**

Plant Parts	Type of active principles	Example
Flowers	Triterpene	butrin, isobutrin, coreopsin, sulphurein, isocoreopsin, monospermoside, chal- cones, isomonospermoside, steroids.
	Glycoside	5,7-dihydroxy -3,6,4-trimethoxy flavone-7-O- $\alpha$ -L xylopyranosyl (1 $\rightarrow$ 3)-O- $\alpha$ -L- arabinopyranosyl-(1 $\rightarrow$ 4)-O- $\beta$ -D galactopyranoside.
Gum	Tannins	Mucilaginous material, pyrocatechin
Seed	enzymes	Polypeptidase, lipolytic enzymes, proteinase & proteolytic enzymes
Resin	esters	Jalaric esters I, II & laccijalaric esters III, IV $\alpha$ amyrin.
Saponin	polyphenols	Chalcones, butein, butin
Leaves	Fatty acid	Kino-oil containing oleic, linoleic acid, lignoceric acid.
Bark	Amino acids	Allophanic acid, butolic acid, shellolic acid, butrin, alanind, palasitrin, cyanidin, histidine
Stem	steroids	Stigmasterol- $\beta$ -D-glucopyranoside & nonacosanoic acid

**Table 2: Shows pharmacological effects of several components of B. monosperma.**

Plants part	Extract	Pharmacological action
Leaves	Aqueous	Anti-filarial
	Ethanollic	Antidiabetic, antioxidant
	Petroleum ether, chloroform	Anti-inflammatory, anti-oxidant
Flowers	Aqueous	Anticancer, Hepatoprotective effect
	Petroleum	Anticonvulsant
	Ethanollic	Antihyperglycemic, antioxidant potential
	Methanollic	Anti-inflammatory, antioxidant effects, Anti- dopaminergic activity, Free radical scavenging effect
Seed	Alcoholic	Hormone balancing effect
	Methanollic	Antifertility effect, Anthelmintic effect
	Ethanollic	Anti-hyperglycemic & Anti-hyperlipidemic
Barks	Ethanollic	Anti-diarrhoeal, Wound healing activity, Anti- stress
	Methanollic	Osteogenic & Osteoprotective activity, Anti-inflammatory, Effects on hormone level, Anti-ulcer
Fruits	Methanollic	Hypoglycemic effect
	Pippali rasayana	Antihelminthic effect

## Medicinal uses

### Anti-Diabetic

Butea monosperma flower ethanollic extract dramatically lowered blood glucose, serum cholesterol, enhanced HDL-cholesterol, & boosted antioxidant enzyme activity. Similarly, methanollic extract of Butea monosperma flowers demonstrated lipid-lowering & anti-diabetic action in rats fed high-fat diet & given streptozotocin. Dexamethasone-induced

hyperglycemia & hyperlipidemia in mice were significantly reduced by n-butanolic fraction of *Butea monosperma* flowers. In Type 2 diabetic rats, ethanolic extract of *Butea monosperma* leaves increased blood insulin levels, promoted insulin production in isolated rat islets, & increased hepatic glycogen production. Using several in vitro methods such as glucose adsorption, diffusion, amylolysis kinetics, enteric enzymes, & glucose transport through yeast cells, leaves & stem bark of *Butea monosperma* demonstrated considerable anti-diabetic action. In rats, aqueous extract of *Butea monosperma* bark, as well as ethanolic extract of bark & seeds, had anti-diabetic & lipid-lowering effects. Furthermore, stigmasterol extracted from *B. monosperma* bark dramatically decreased blood triiodothyronine, thyroxine, glucose, & liver glucose-6-phosphatase levels while simultaneously increasing insulin levels.<sup>[7]</sup>

### Anti-inflammatory properties

The anti-inflammatory efficacy of methanolic extract of *Butea monosperma* was assessed using carrageenin-induced paw edoema & cotton pellet granuloma in rabbits. Carrageenin generated paw edoema at 600 & 800 mg/kg inhibited paw edoema by 26 & 35 percent, respectively, while cotton pellet granuloma tissue development was inhibited by 22 & 28 percent.<sup>[8]</sup>

### Disorders of liver

In India, extract from flowers of *Butea monosperma* is used to treat liver diseases, & isobutrin & butrin, two antihepatotoxic flavonoids, have been extracted from extract. results imply that pretreatment of methanolic *Butea monosperma* extract prior to TAA treatment at two dosages may contribute to chemopreventive effect. *Butea monosperma* demonstrated considerable recovery in glutathione & its metabolising enzyme in liver, which triggered detoxifying enzyme system, as seen by raised levels of other phase II enzymes such as QR, SOD, GPx, & xanthine oxidase.<sup>[9]</sup>

### Antihelmintic Effectiveness

*Butea monosperma* seeds were given as crude powder (CP) at dosages of 1, 2, & 3 g/kg to sheep spontaneously infected with mixed species of gastrointestinal nematodes, & antihelmintic activity was dosage & time dependent. On day 10, after treatment with 3 g/kg, highest decrease in eggs per gramme of faeces (EPG) was documented at 78.4 percent. typical antihelmintic drug, levamisole (7.5 mg/kg), reduced EPG by 99.1 percent. In vitro

testing of methanol extract of *Butea monosperma* seeds revealed strong antihelmintic action.<sup>[10]</sup>

### **Antidiarrheal activities**

Several experimental models in Wister albino rats were used to assess anti-diarrheal potential of ethanolic extract of *Butea monosperma* (Lam) Kuntz's stem bark. In rats, extract decreased gastrointestinal motility following charcoal meal delivery & prevented castor oil-induced diarrhoea & PGE<sub>2</sub>-induced enter pooling. findings support efficacy of this herbal therapy as non-specific diarrhoea therapy in traditional medicine.<sup>[11]</sup>

### **Anti-Fungal activity**

*Butea monosperma* stem bark extracts in petroleum & ethyl acetate had antifungal efficacy against *Cladosporium cladosporioides*. Bioassay monitored chromatographic fractionation was used to extract active ingredient of low polarity, which was identified as (-)-medicarpin by physical data comparison. antifungal activity of (-)-medicarpin was found to be larger than that of Benlate, common fungicide, & (-)-medicarpin acetate had substantial action against *C. cladosporioides* (The Ayurvedic Pharmacopoeia of India).<sup>[12]</sup>

### **Anti-Stress activity**

The water soluble component of ethanolic extract of *Butea monosperma* flowers reduced increase in brain serotonin & plasma corticosteron levels caused by water immersion stress. reference standard, diazepam (0.2 mg/kg i.p. ), and elicited identical results.<sup>[13]</sup>

### **Scavenging of free radicals**

The reducing power assay, scavenging of 2,2 diphenyl-1-picrylhydrazyl (DPPH) radical, nitric oxide radical, superoxide anion radical, hydroxyl radical, & inhibition of erythrocyte hemolysis using 2,2' azo-bis (amidinopropane) dihydrochloride were used to evaluate free radical scavenging activity of various flower extracts (AAPH). methanolic extract, as well as its ethyl acetate & butanol fractions, have strong free radical scavenging properties. greater phenolic content in extracts might explain observed action.<sup>[14]</sup>

### **Anti-Cancer activity**

The aqueous extract of *Butea monosperma* flowers suppressed hepatoma cell growth & accumulation in G1 phase, with significant activation of apoptotic cell death, implying chemopreventive & anti-cancer properties. Pre-treatment of *Butea monosperma* methanolic

extract has chemopreventive effects on 2-acetylaminofluorene promote hepatic carcinogenesis. n-butanol component of *Butea monosperma* flower extracts has potential anticancer activity, according to in vitro & in silico docking studies.<sup>[15]</sup>

### **Anti-Dopaminergic**

Antidopaminergic action has been discovered in isoflavone isolated from methanolic extract of *Butea monosperma* flowers. They discovered that ethyl acetate fraction obtained from methanolic extract of *Butea monosperma* flowers had antidopaminergic effect.<sup>[16]</sup>

### **Activity that promotes bone formation**

*Butea monosperma* stem bark extracts medicarpin, cajanin, formonentin, isoformonentin, & cladrin showed promising osteogenic activity. When compared to control, Cajanin from *Butea monosperma* bark enhanced bone mineral density, bone biomechanical strength, mineral apposition rate (MAR), & bone formation rate (BFR) at all skeletal locations tested.<sup>[17]</sup>

### **Activity of protease inhibitors**

The protease inhibitor derived from *Butea monosperma* seeds (BmPI) has measurable inhibitory effect on *Helicoverpa armigera* total gut proteolytic enzymes & bovine trypsin. These negative effects on *Helicoverpa armigera* imply that BmPI might be effective in control of insect pests in food crops.<sup>[18]</sup>

### **Wound healing activity**

In rats, ethanolic extract of BM bark has wound healing properties. When applied topically to complete excision wounds on backs of rats, it sped up wound healing process. At wound infected region, ethanolic extract of BM stimulated collagen production as well as cellular proliferation. In excision wound model, extract boosted wound contraction & lowered epithelialization time, as well as hydroxyproline content, granulation tissue weight, & tensile strength of incision wound region.<sup>[19]</sup>

### **Hypoglycemic, Antiperoxidative, & Thyroid inhibitory effects**

In mice, thyroid hormone & glucose regulation effectiveness of stigmasterol, which was extracted from bark of *Butea monosperma*, was tested. With increase in insulin, 2.6 mg/kg/d for 20 days lowered serum triiodothyronine (T3), thyroxine (T4), & glucose concentrations, as well as activity of hepatic glucose-6-phosphatase (G-6-Pase). Thyroid inhibitory &



hypoglycemic characteristics were demonstrated. Antioxidant potential due to reduced hepatic lipid peroxidation & increased catalase, superoxide dismutase, & glutathione activities. Pro-oxidative activity was elicited at highest dosage tested (5.2 mg/kg).<sup>[20]</sup>

### **Anti-Ulcerative**

The methanolic extract demonstrated considerable recovery from aspirin & ethanol-induced stomach ulcers, indicating that it has anti-ulcer & anti-secretory properties. *Butea monosperma* stem bark significantly reduced acid output, number of lesions, & volume of gastric juice, indicating beneficial impact of *Butea monosperma* on indomethacin-induced gastric ulcers.<sup>[21]</sup>

### **Protective for kidneys**

In gentamicin-induced nephrotoxicity, ethanolic extract of *Butea monosperma* dramatically reduced serum creatinine, serum urea, & blood urea nitrogen levels. In doxorubicin-induced nephrotic syndrome, n-butanolic fraction of *Butea monosperma* flowers dramatically decreased proteinuria, hypoalbuminemia, dyslipidemia, & restored renal antioxidant enzyme activities.<sup>[22]</sup>

### **Giardiasis**

Giardiasis is gastrointestinal ailment caused by *Giardia lamblia*, protozoal parasite. *Piper longum* with *Butea monosperma* (Palash) ayurvedic herbal medication with ash of *Butea monosperma* stem, root, flower, & leaves shows substantial action against Giardiasis. It resulted in 98 percent recovery rate from infection. In vitro, rasayana had no impact on parasite. It activated macrophages significantly, as shown by enhanced macrophage movement index & phagocytic activity. PR recovery rose to 98 percent at 900 mg/kg with increasing dosages (63) This plant's flowers can also help with leprosy, leucorrhoea, & gout.<sup>[23]</sup>

### **Anticontraceptive activity in Estrogenic & Postcoital women**

Butin, which was extracted from *Butea monosperma* seeds & given orally to adult female rats at dosages of 5, 10, & 20 mg/rat from day one to day five of pregnancy, was shown to have anti-implantation action in 40%, 70%, & 90% of treated animals, respectively. There was dose-dependent termination of pregnancy & decrease in number of implantation sites at lower dosages. butin had estrogenic effect in ovariectomized young female rats at comparable anti-

conceptive dosages, but no anti-estrogenic action. Butin is weak oestrogen since it has strong uterotrophic effect even at 1/20th of anti-conception dosage.<sup>[24]</sup>

## CONCLUSION

The pharmacological & phytochemical actions of *Butea monosperma* are all discussed in this article. *Butea monosperma* has been used experimentally & therapeutically in both animals & humans to treat variety of maladies. More research is needed to figure out how *Butea monosperma* has medicinal potential, & these benefits must be verified in research work before it can be used as therapeutic agent.

## REFERENCES

1. Bhatwadekar A, Chintawar S, Logade N, Somani R, Veena KS, Kasture S. Antistress activity of *Butea monosperma* flowers. Indian J Pharmacol, 1999; 2: 153.
2. Borkar V, Gangurde H, Gulecha V, Bhoyar P, Mundada A. Evaluation of in vitro antihelmintic activity of leaves of *Butea monosperma*. Int J Phytomed, 2011; 1: 31-35.
3. Burlia D, Khadeb A. comprehensive review on *Butea monosperma* (Lam.) Kuntze. Pharmacog Rev, 2007; 2: 333-37.
4. Choedon T, Shukla SK, Kumar V. Chemopreventive & anti-cancer properties of aqueous extract of flowers of *Butea monosperma*. J Ethnopharmacol, 2010; 2: 208-13.
5. Chokchaisiri R, Suaism C, Sriphota S, Chindaduang A, Chuprajob T, Suksamrarn A. Bioactive flavonoids of flowers of *Butea monosperma*. Chem Pharm Bull, 2009; 4: 428-32.
6. Deshmukh M, Sahare KN, Patidar K, Mahajan B, Singh V. Antifilarial activity of *Butea monosperma* L. leaves extracts against *Setaria cervi*. Trends in Vector Research & Parasitology, 2014; 1: 1-5.
7. Divya B, Mini S. Ethanol extract of *Butea monosperma* bark modulates dyslipidemia in streptozotocin-induced diabetic rats. Pharm Biol, 2014; 8: 1021-1027.
8. Ekor M. growing use of herbal medicines: issues relating to adverse reactions & challenges in monitoring safety. Front in Pharmacol, 2013; 4: 1-10.
9. Ganeshan M, Polachi N, Nagaraja P, Subramaniyan B. Antiproliferative Activity of n-butanol floral extract from *Butea monosperma* against HCT 116 Colon Cancer Cells; Drug Likeness Properties & In silico evaluation of their active compounds toward glycogen Synthase Kinase-3 $\beta$ /Axin & B-Catenin/T-Cell Facto. Asian J Pharm Clin Res, 2015; 1: 134-141.

10. Lavhale MS, Mishra S. Evaluation of free radical scavenging activity of *Butea monosperma* Lam. Indian J Exp Biol, 2007; 4: 376.
11. Lohitha P, Kiran VR, Babu KM, Nataraj K, Rani PA, Madhavi N. Phytochemical screening & in vitro antimicrobial activity of *Butea monosperma* bark ethanolic & aqueous extract. Int J Pharm Sci Res, 2010; 1: 150-155.
12. Maurya R, Yadav DK, Singh G, Bhargavan B, Murthy PN, Sahai M. Osteogenic activity of constituents from *Butea monosperma*. Bioorg. Med Chem Lett, 2009; 3: 610-613.
13. Mishra M, Shukla YN, Kumar S. Euphane triterpenoid & lipid constituents from *Butea monosperma*. Phytochem, 2000; 8: 835-838.
14. More B, Sakharwade S, Tembhurne S, Sakarkar D. Evaluation of Sunscreen activity of Cream containing Leaves Extract of *Butea monosperma* for Topical application. Int J Cosmetic Sci, 2013; 3: 1-6.
15. Nadkarni KM. Indian materia medica with ayurvedic, unani-tibbi, siddha, allopathic, homeopathic, naturopathic & home remedies, appendices & indexes. Bombay, Popular Prakashan, 1976.
16. Panda S, Jafri M, Kar A, Meheta B. Thyroid inhibitory, antiperoxidative & hypoglycemic effects of stigmasterol isolated from *Butea monosperma*. Fitoterapia, 2009; 2: 123-126.
17. Pandey PK, Singh D, Singh S, Khan M, Jamal F. nonhost peptidase inhibitor of~ 14 kDa from *Butea monosperma* (Lam.) Taub. seeds affects negatively growth & developmental physiology of *Helicoverpa armigera*. Biochem Res Int, 2014; 2: 1-11.
18. Rasheed Z, Akhtar N, Khan A, Khan KA, Haqqi TM. Butrin, isobutrin, & butein from medicinal plant *Butea monosperma* selectively inhibit nuclear factor- $\kappa$ B in activated human mast cells: Suppression of tumor necrosis factor- $\alpha$ , interleukin (IL)-6, & IL-8. J Pharmacol Exp Ther, 2010; 2: 354-363.
19. Sahare K, Anandhraman V, Meshram V, Meshram S, Singh V, Reddy M. Antifilarial Potential of *Butea monosperma* against microfilaria in vitro. Int. J Pharm Tech Res, 2012; 3: 1181-1184. Sahu MC, Padhy RN. In vitro antibacterial potency of *Butea monosperma* Lam. against 12 clinically isolated multidrug resistant bacteria. Asian Pac J Trop Dis, 2013; 3: 217-226.
20. Tambekar D, Khante B. Antibacterial properties of traditionally used medicinal plants for enteric infections by adivasi's (bhumka) in melghat forest (amravati district). Int J Pharm Sci Res, 2010; 1: 120-8.
21. Tiwari P, Kumar K, Panik R, Pandey A, Pandey A, Sahu PK. Hepatoprotective potentials of *Butea monosperma* stem bark extract against carbon tetrachloride induced

- hepatotoxicity in albino rats. Res J Pharmacol Pharmacodyn, 2011; 5: 281-284.
- Ayurvedic Pharmacopoeia of India Part- I Volume – II. p.78.
22. Velis H, Kasture A, Maxia A, Sanna C, Mohan M, Kasture S, editors. Antidopaminergic activity of isoflavone isolated from *Butea monosperma* flowers. Planta Medica, 2008; 1: 159-168.
23. William CM, Krishna Mohan G. Antiinflammatory & analgesic activity of *Butea monosperma* (Lam) stem bark in experimental animals. Pharmacologyonline, 2007; 2: 88-94.
24. Yadav S, Chaturvedi N, Sharma S, Murthy R, Dwivedi KN. Antidiabetic effect of aqueous extract of *butea monosperma* (LAM) Taub bark. Food Sci, 2012; 42A: 6562-6567.