Eurasian Journal of Analytical Chemistry
ISSN: 1306-3057 OPEN ACCESS 2024 19 (1): 515-520

A Complete Review On Phytochemical Constituents Obtained From *Butea Monosperma* For Skin Care

Suhas Bhikadiya[1*], Ms. Purvi Ramanuj[2], Dr. Pragnesh Patani[3]

[1*] Student, Khyati College of Pharmacy, Palodia, Ahmedabad.
[2]Associate Professor, Khyati College of Pharmacy, Palodia, Ahmedabad.
[3]Principal, Khyati College of Pharmacy, Palodia, Ahmedabad.

***Corresponding Author:** Suhas Bhikadiya
*Student, Khyati College of Pharmacy, Palodiya, Ahmedabad, Email: suhas8980@gmail.com

Abstract
Butea monosperma, commonly known as the *Flame of the Forest*, is a plant of significant ethnopharmacological importance, particularly in the realm of skin care. This review aims to consolidate and summarize the diverse phytochemical constituents of Butea monosperma and their applications in dermatological health. The plant is rich in a variety of bioactive compounds, including flavonoids (such as butein and isobutrin), saponins (including buteasaponins), tannins (notably gallic acid), and phenolic acids (such as protocatechuic and caffeic acid), all of which contribute to its therapeutic efficacy. This comprehensive review provides a valuable resource for researchers, clinicians, and formulators interested in harnessing the therapeutic potential of Butea monosperma in skin care. By synthesizing existing research and highlighting key phytochemical components, the review underscores the plant's promise as a natural, effective ingredient in dermatological applications.

Keywords: *Butea monosperma*, phytochemicals, skin care, flavonoids, saponins, tannins, phenolic acids, antioxidant, anti-inflammatory, antimicrobial

1. Introduction

1.1 General introduction of skin [1] :

The skin is the largestc organ in the body, covering its entire external surface. The skin has 3 layers the epidermis, dermis, and hypodermis, which have different anatomical structures and functions. The skin's structure comprises an intricate network that serves as the body's initial barrier against pathogens, ultraviolet (UV) light, chemicals, and mechanical injury. This organ also regulates temperature and the amount of water released into the environment. The epidermis, the skin's outermost layer, is composed of several strata and various cell types crucial for its function. The dermis is connected to the epidermis by the basement membrane.The rdermis consists of 2 connective tissue layers, papillary and reticular, which merge without clear demarcation. The hypodermis, also known as the subcutaneous fascia, is located beneath the dermis.

1.1.1 Epidermis:

The epidermis is the outermost stratified squamous keratinized layer of the skin composed of cells called keratinocytes, although it hosts other but less abundant cells such as melanocytes that produce the pigment melanin, Langerhans involved in an immune response, or Merkel cells entailed in tactile sensation.It is an important barrier between the organism and its environment, protecting it from physical, chemical, and microbial damage, and it also regulates the function and integrity of the underlying connective tissue.

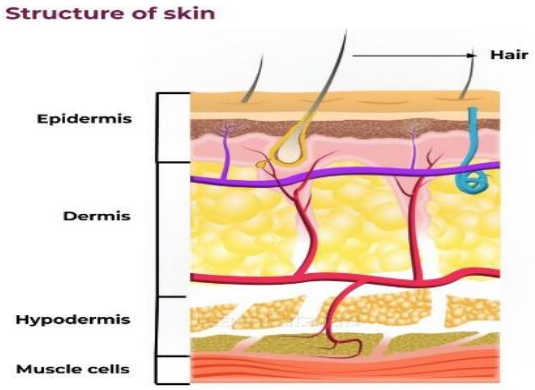

Figure 1: Structure Of Skin

1.1.2 Dermis:
The dermis is relatively acellular compared to the epidermis. It is a complex system of fibrous connective tissues, mainly composed of type I and II collagens and elastic fibers (elastin). Collagen fibers provide mainly tensile strength, and the elastin main function is resilience and elasticity of the skin.

1.1.3 Hypodermis:
Finally, the hypodermis consists of loose and well-vascularized connective tissues that join skin to subjacent organs and have larger nerves and blood vessels than those found in the dermis. It is mainly composed of adipocytes, fibroblasts, and macrophages.

1.2 COMMON SKIN PROBLEM:
Skin problems can significantly impact quality of life and self-esteem.[2]

1.2.1 Sunburn:
- An acute reaction to excessive UV radiation characterized by redness, pain, swelling, and sometimes blistering.

1.2.2 Suntan:
- Darkening of the skin due to increased melanin production as a response to UV exposure. While it may seem like a natural defense, it indicates underlying skin damage.

1.2.3 Acne :
- A condition characterized by pimples, blackheads, and cysts,
- Skin Infections
- Bacterial, viral, or fungal infections can lead to skin inflammation.

1.2.4 Skin Infections :
- These can be bacterial (like impetigo), viral (like herpes), or fungal (like athlete's foot).

2. *BUTEA MONOSPERMA*:
2.1 **Pharmacognosy of *Butea Monosperma*: [3-5]**
2.1.1 **Synonyms :**
- Butea frondosa (L.), Butea superba (B.),Butea reticulata (G.)

2.1.2 Biological Source
- Plant Type: Tree
- Parts Used: Flowers, leaves, bark, and seeds
- Distribution: Native to tropical and subtropical regions of South and Southeast Asia, including India, Nepal, Bangladesh, and parts of Southeast Asia.

2.1.3 Family
- Family: Fabaceae (Leguminosae)

2.1.4 Chemical Constituents of *Butea monosperma :*
Flavonoids[6] :
- **Butein**: A flavonoid with potent antioxidant and anti-inflammatory properties. It has been shown to inhibit oxidative stress and inflammation, contributing to the plant's therapeutic effects.
- **Butin**: Another flavonoid that exhibits strong antioxidant activity. It also has potential anti-cancer and anti-inflammatory effects.
- **Isobutein**: This compound also shows antioxidant properties and may play a role in reducing oxidative damage.

Saponins[7] :
- **Butea saponins**: These are glycosidic compounds that can exhibit expectorant, anti-inflammatory, and immune-modulatory effects. Saponins from *Butea monosperma* have been noted for their role in enhancing the plant's therapeutic potential.

Tannins[8] :
- **Butea tannins**: These polyphenolic compounds are known for their astringent properties and can aid in wound healing. Tannins also exhibit antioxidant and antimicrobial activities, contributing to the plant's overall pharmacological profile.

Glycosides[9]

- **Cardiac Glycosides**: These compounds, although present in minor quantities, can influence heart function. They have been investigated for their potential benefits in cardiac health and their role in traditional medicine.

Essential Oils[10] :

- **Volatile Oils**: The essential oils from *Butea monosperma* contain various terpenes and sesquiterpenes, contributing to its aromatic properties and potential antimicrobial activities.

Alkaloids[10] :

- **Butea alkaloids**: These are less studied but may contribute to the plant's pharmacological effects. Some alkaloids in related species have been shown to possess biological activity.

Other Compounds:

- **Polysaccharides**: Present in the plant, polysaccharides may contribute to immunomodulatory effects.
- **Sterols**: Compounds like β-sitosterol may be present and contribute to various biological activities, including anti-inflammatory and hypocholesterolemic effects.

2.2 Phytochemistry:

Butea Monosperma contains various phytoconstituents like alkaloids, flavonoids, phenolic compounds, amino acids, glycosides, resin, saponin and steroids (Table 1). Here we have described various constituents present in different parts such as flower, gum, seed, leaves, bark and stem. The constituents are as follows:

Plant Parts	**Type of active principles**	**Example**
Flowers	Triterpene	butrin, isobutrin, coreopsin, sulphurein, isocoreopsin, monospermoside, chalcones, isomonospermoside, steroids.
Gum	Tannins	Mucilaginous material, pyrocatechin
Seed	Enzymes	Polypeptidase, lipolytic enzymes, proteinase and proteolytic enzymes
Resin	Esters	Jalaric esters I, II and laccijalaric esters III, IV α 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-β-D-glucopyranoside and nonacosanoic acid

Table 1 Various active constituents of Butea monosperma

- **Flower:** It contains triterpene butrin, isobutrin, coreopsin, sulphurein, isocoreopsin, monospermoside and chalcones, isomonospermoside, aurones, steroids and flavonoids. Glycoside of the BM contains 5,7-dihydroxy -3,6,4-trimethoxy flavone-7-O-α-L xylopyranosyl (1→3)-O-α-L-arabinopyranosyl-(1→4)-O-β-D galacto pyranoside. [11-12]
- **Gum:** Gum contains mucilaginous material, pyrocatechin and tannins .[13]
- **Seed:** Oil contains polypeptidase, lypolytic enzymes, proteinase and proteolytic[13]. Palasonin and nitrogenous acidic compounds is present in seeds. Seed also contains isomonospermoside, monospermoside and allophanic acid. Flavone glycoside present in the seeds of BM which possess potential antiviral activity.[14] BM seeds contain fixed oil, mixed fatty acids, and unsaponifiable matter.[15]
- **Resin:** Resin contains jalaric esters I, II and laccijalaric esters III, IV α amyrin, β-sitosterone its glucoside and sucrose; lactone-nheneicosanoic acid-δ-lactone.[16]
- **Saponin:** Saponin contains butein, butin, butrin, colourless isomeric flavanone and chalcones.[17]
- **Leaves:** Leaves contain kino-oil containing oleic, linoleic acid, lignoceric acid and palmitic.[18]
- **Stem:** Stems contain 12 dimethyl-8-oxo-octadec-11-enylcyclohexane, Stigmasterol-β-D-glucopyranoside and nonacosanoic acid .[19]
- **Bark:** Barks contain gallic acid, kino-tannic acid, pyrocatechin. Barks also contain allophanic acid, butolic acid, shellolic acid, butrin, alanind, palasitrin, cyanidin, histidine, palasimide and miroestrol.[18-19] Isolation from stem bark methanolic extract of *Butea Monosperma* gives two structurally related methoxyisoflavones; cajanin and isoformononetin.[20] The phytochemical investigation and isolation of the stem bark of *Butea Monosperma* contain following compounds such as buteaspermin A, buteaspermin B and buteasperminol, medicarpin, cajanin,

formonentin, isoformonentin and cladrin.[21] The active constituent obtained from ethyl acetate and petroleum extracts of the stem bark of *Butea Monosperma* was medicarpin.[22]

Figure2 *Butea Monosperma*

2.3 Pharmacological Properties:

Butea monosperma exhibits a range of pharmacological activities:

- **Antioxidant Activity:** Extracts from various parts of the plant demonstrate significant antioxidant properties, attributed to flavonoids and tannins.[23]
- **Anti-inflammatory Effects:** The plant's extracts have shown effectiveness in reducing inflammation, which is beneficial in treating inflammatory disorders.[24]
- **Antidiabetic Activity:** Studies indicate that *Butea monosperma* can lower blood glucose levels and improve insulin sensitivity, supporting its use in diabetes management.[25]
- **Antimicrobial Activity:** The plant extracts exhibit antimicrobial properties against various bacterial and fungal strains.[26]
- **Hepatoprotective Effects:** Some studies suggest that *Butea monosperma* has protective effects on the liver, aiding in the prevention of liver damage.[27]
- **Anti-cancer**: Preliminary studies have explored the potential anti-cancer effects of Butea monosperma, showing promise in inhibiting the growth of cancer cells in vitro.
- **Anti-arthritic**: The plant may have potential benefits in managing arthritis due to its anti-inflammatory properties.[27]

Figure : 3 Butea monosperma (flower)

3. *Butea monosperma for skin problem*[28-32] :

3.1 Traditional Uses: In traditional medicine systems, *Butea monosperma* has been used to treat a range of skin conditions, including:

- Wounds and Ulcers: The bark and leaves are applied topically to accelerate healing.
- Skin Infections: Extracts have been used to manage bacterial and fungal infections.
- Inflammatory Skin Disorders: The plant's anti-inflammatory properties help alleviate conditions like eczema and psoriasis.

- Wounds and ulcers: Topically applied bark extracts are used for wounds and ulcers.
- Gastrointestinal problems: The herb is used to treat gastrointestinal problems.
- Issues with the respiratory system: The leaves and flowers are used to cure bronchitis &coughing.

3.2 Scientific Research and Evidence:

Several studies have explored the effectiveness of *Butea monosperma* in treating skin problems:

- **Wound Healing**: Research has demonstrated that topical application of *Butea monosperma* extracts can speed up the healing process of wounds and ulcers. For instance, a study on rats showed accelerated wound healing when treated with *Butea monosperma* bark extract.
- **Anti-inflammatory and Antioxidant Effects**: Studies have confirmed that *Butea monosperma* extracts possess significant anti-inflammatory and antioxidant activities, supporting its use in managing inflammatory skin conditions.
- **Antimicrobial Activity**: Extracts of *Butea monosperma* have shown antimicrobial effects against common pathogens, making it a potential candidate for treating skin infections.

Conclusion

Butea monosperma (commonly known as the Flame of the Forest) has emerged as a valuable source of phytochemical constituents with significant potential for skin care applications. The extensive array of bioactive compounds identified in this plant, including flavonoids, alkaloids, saponins, and tannins, underscores its potential as a therapeutic agent in dermatological treatments. The integration of *Butea monosperma* extracts into skin care formulations offers promising prospects for developing natural and effective solutions for various skin concerns. However, while the phytochemical profile of *Butea monosperma* is impressive, further research is warranted to fully understand the mechanisms of action, optimize extraction methods, and establish safety and efficacy through clinical trials. Such advancements could pave the way for innovative, plant-based skin care products that leverage the unique properties of *Butea monosperma*. The rich phytochemical composition of *Butea monosperma* highlights its potential as a multifaceted ingredient in skin care. Embracing its natural benefits could lead to novel and effective skin care solutions, aligning with the growing trend towards the use of botanical extracts in cosmetic and therapeutic applications.

4. REFERENCES:

1. Risueño, Iván, L. Valencia, J. L. Jorcano, and D. Velasco. "Skin-on-a-chip models: General overview and future perspectives." *APL bioengineering* 5, no. 3 **2021**.
2. American Academy of Dermatology Association (AAD) on Suntans.
3. Kumar, R., & Singh, P. "Pharmacological activities of Butea monosperma: A review." *Journal of Pharmacognosy and Phytochemistry*, **2020** 9(3), 68-74.
4. Kumar, V., et al. "Butea monosperma (Lam.) Taub.: A review of its chemical and pharmacological properties." *Journal of Ethnopharmacology*, **2015** 164, 161-176
5. Gupta, R., et al."Pharmacognostic and phytochemical evaluation of Butea monosperma (Lam.) Taub." *International Journal of PharmTech Research*, 4(3), **2012** 1314-1320.
6. Shah, K.C., Baxi, A.J. and Dave, K.K. Indian Drugs 29, , 1**992**,422-423
7. Rana F and Avijit M. "Review on Butea monosperma". *International Journal of Research in Pharmacy and Chemistry* 2. **2012:** 1035-1039**.**
8. Sindhia VR and Bairwa R. "Plant review: Butea monosperma". *International Journal of Pharmaceutical and Clinical Research* 2.2,**2010**: 90-94.
9. Gunakunru A., *et al*. "Chemical investigations and anti-inflammatory activity of fixed oil of Butea monosperma seeds". *Natural Product Sciences* 10.2,**2004**: 55-58.
10. Burli DA and Khade AB. "A comprehensive review on Butea monosperma (Lam.) Kuntze". *Pharmacognosy Reviews* 1.2 **,2007**: 333-337.
11. Kasture VS., *et al*. "Anticonvulsive activity of Butea monosperma flowers in laboratory animals". *Pharmacology Biochemistry and Behavior* 72.4,**2002**: 965-972.
12. Surin WR and Ananthaswamy K. "Recent advances on the pharmacological profile of Butea monosperma". *GERF Bulletin of Biosciences* 2 ,**2011**: 33-40.
13. Shah KN., *et al*. "A phyto-pharmacological overview on Jewel Weed". *Journal of Applied Pharmaceutical Science* 7.8,**2017**: 246-252.
14. Yadava RN and Tiwari L. "Note: A potential antiviral flavone glycoside from the seeds of Butea monosperma O. Kuntze". *Journal of Asian Natural Products Research* 7.2,**2005**: 185188.
15. Gunakunru A., *et al*. "Chemical investigations and anti-inflammatory activity of fixed oil of Butea monosperma seeds". *Natural Product Sciences* 10.2,**2004**: 55-58.
16. Singh AN., *et al*. "Chemistry of lac resin—VI: Components of soft resin". *Tetrahedron* 30.7,**1974**: 867-874.

17. Lohitha P., *et al*. “Phytochemical screening and in vitro antimicrobial activity of butea monosperma (l) bark ethanolic and aqueous extract”. *International Journal of Pharmaceutical Sciences and Research* 1.10,**2010**: 150.
18. Indurwade NH., *et al*. “Herbal plants with aphrodisiac activity”. *Indian Drugs* 42.2,**2005**: 67-72
19. Burli DA., *et al*. “A comprehensive review on Butea monosperma (Lam.) Kuntze”. *Pharmacognosy Reviews* 1.2,**2007**: 333337.
20. Pandey R., *et al*. “Total extract and standardized fraction from the stem bark of Butea monosperma have osteoprotective action: evidence for the nonestrogenic osteogenic effect of the standardized fraction”. *Menopause* 17.3,**2010**: 602-610.
21. Tyagi AM., *et al*. “Medicarpin inhibits osteoclastogenesis and has nonestrogenic bone conserving effect in ovariectomized mice”. *Molecular and Cellular Endocrinology* 1.2,**2010**: 101109.
22. Gupta P., *et al*. “Phytochemical and pharmacological review on Butea monosperma (Palash)”. *International Journal of Agronomy and Plant Production* 3.7 ,**2012**: 255-258.
23. kumar, V., et al**.** "Butea monosperma (Lam.) Taub.: A review of its chemical and pharmacological properties." *Journal of Ethnopharmacology*, **2015** 164, 161-176.
24. Burli DA., *et al*. “A comprehensive review on Butea monosperma (Lam.) Kuntze”. *Pharmacognosy Reviews* 1.2,**2007**: 333337.
25. Gupta, R., et al. "Pharmacognostic and phytochemical evaluation of Butea monosperma (Lam.) Taub." *International Journal of PharmTech Research*, 4(3), **2012** 1314-1320.
26. Krishnamurthy, K."Butea monosperma (Lam.) Taub.: A review on its botany and pharmacology." *Pharmacognosy Reviews*, **2011** 5(9), 162-169.
27. Rajasekaran, S., et al."Hepatoprotective and anti-diabetic potential of Butea monosperma on streptozotocin-induced diabetic rats." *Journal of Applied Pharmaceutical Science*, **2014** 4(4), 15-20
28. Jafri, Mustazi, and B. K. Mehta. "Evaluation of chemical constituents of Butea monosperma (bark)." *International Journal of Pharmaceutical Sciences and Research* 5, no. 10 **2014**: 4548.
29. Kaplan, Lee A. "Suntan, sunburn, and sun protection." *Journal of Wilderness Medicine* 3, no. 2 **1992**: 173-196.
30. Rights are reserved by Mariyan, All, and R. Patel. "Pharmacognosy, Preliminary Phytochemical Screening and Chromatographic Study of Aerial Parts of Butea monosperma."**2015**
31. Sindhia, V. R., and R. Bairwa. "Plant review: Butea monosperma." *International journal of pharmaceutical and clinical research* 2, no. 2 **2010**: 90-94.
32. Surin, William Rasican, and Kavya Ananthaswamy. "Recent advances on the pharmacological profile of Butea monosperma." *GERF Bulletin of Biosciences* 2 **2011**: 33-40.