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Research Article

Formulation and Evaluation of Cream of *Butea monosperma* (Palash) Leaves

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ABSTRACT

The medicinal plant *Butea monosperma* (Palash) has a variety of phytoconstituents that are associated to different pharmacological action, including as flavonoids, tannins, alkaloids, and glycosides. The goal of the current study was to develop and evaluate an antimicrobial cream with leaf extract from *Butea monosperma*. Thin-layer chromatography (TLC) and preliminary phytochemical screening were performed on the leaf extract, which was made by Soxhlet extraction. Organoleptic, physicochemical, and pharmacological qualities, such as appearance, pH, viscosity, homogeneity, washability, phase separation, skin irritation, and spreadability, were assessed when the extract was added to a cream base. TLC profiling with butanol: acetic acid: water (5: 3: 2) as the mobile phase revealed different spots for the extracts. Phase separation and skin irritation were not noted, and the formulated cream had a smooth texture, uniform consistency, easy washability, and acceptable physicochemical features. The cream exhibited initial antibacterial efficacy against *Escherichia coli* and *Staphylococcus aureus*, with zone of inhibition of 4 mm and 3.4 mm, respectively, as opposed to 6 mm of Soframycin. The created *Butea monosperma* leaf extract cream showed promising formulation qualities and initial antibacterial action, suggesting that it could be studied further as an herbal topical formulation.

INTRODUCTION

Microbes are becoming resistance to the medicine which is used to treat them, which makes infections harder to cure. This problem known as antimicrobial resistance is spreading worldwide and affect many types of microorganisms. As resistance grows, it poses serious risk to both

human and animal health. Infections caused by resistant microbes often last longer, can lead to more deaths, and require extended hospital stays. They also make surgeries and medical treatments less safe and increase healthcare costs. Because antimicrobial resistance impacts every area of health and society, it has become a global challenge that requires urgent attention.

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In May 2014, the World Health Assembly adopted resolution WHA87.25, calling for global plan to address antimicrobial is a serious threat to human health. It was developed through broad consultation across different sectors and input from Member State, reflecting a shared commitment to act together against this challenge.[1]

Scientist such as ethnopharmacologists, botanists, microbiologists, and natural-products chemists are searching for plants compounds that could help treat infection diseases. Although 25-52% of today's medicines come from plants, none are currently used as antimicrobials, Traditional healers have long relied on plants to fight infections, and modern medicine is trying to follow their success. Plants produce many secondary compounds – tannins, terpenoids, alkaloids, and flavonoids – which have shown antimicrobial activity in laboratory studies.[2]

Plant-based medicines are widely used and often chosen over synthetic drugs because they are considered safer and less harmful. For viral infections, herbal remedies are commonly applied. Ethnobotanical records from India describe hundreds of plants with therapeutics potential. Among them, *Butea monosperma* (family *Fabaceae*) is well known for its traditional use in treating inflammatory conditions. Research has shown that this plant possesses hepatoprotective, antidiabetic, and anti-helminthic properties. It also demonstrates antitumor and antiulcer activity. The leaves exhibit antimicrobial effects, while the roots are reported to have anti-spermatic activity.[3]

Crude extract from different part of *Butea monosperma* are traditionally used to treat wounds, skin diseases, cancer, ulcers, and piles. In Ayurveda and modern medicines, this plant is applied in managing condition such as *krimi roga*.

It is highly tolerant to harsh environmental conditions, in metabolic activity, enzyme function, antioxidant production, and responses to pollution-induced membrane damage. [4]

Plant-derived compounds such as *Butea monosperma*, a species well known for its medical value, contain diverse phytochemicals that aid in wound healing. These include flavonoids, tannins, and triterpenoids, which demonstrate anti-inflammatory, antimicrobial, and antioxidant properties. Together, these activities support tissue repair, lower the risk of infection, and improve the overall healing process.

Wound healing is a complex, step-by-step process that occurs in four main stages – hemostasis, inflammation, proliferation, and remodeling. Each stage plays a vital role in restoring the structure and function of the skin and damaged tissues.[5]

Shivkanta et al., (2026): Comparative review on pharmacological potential Reviewed the pharmacological potential of *Butea monosperma*, nothing its hepatoprotective, antidiabetic, and wound-healing activities. [6]Kajale et al., (2026): Polyherbal face cream enriched with *Butea monosperma* Formulated antibacterial cream with *Butea monosperma* Formulated antibacterial cream with *Butea monosperma*, neem, aloe vera, and turmeric; evaluate spreadability, pH and antimicrobial activity.[7]Kambale et al., (2025): Comprehensive Review of *Butea monosperma* Summarized ethnobotany, phytochemistry, and pharmacological potential including anticancer and antifertility effects. [8] Kumar et al., (2025): pharmacological Properties of *Butea monosperma* Highlighted flavonoids and tannins with antioxidant and antimicrobial potential.[9] Chaudhari et al., (2024): Antifungal Cream using *Butea monosperma* Developed antifungal cream enriched with medicarpin; showed fungicidal activity.[10] Patel et al., (2024) Herbal Tropical



formulations Demonstrated herbal creams improve spreadability and stability compared to synthetic base.[11] Dam et al., (2023): highlighted on nanoparticle-incorporated hydrogel wound patches as advanced wound healing strategies, showing improved penetration, antibacterial activity, and faster wound closure.[12] Panwar et al., (2018): Wound healing potential of *Butea monosperma* Demonstrated wound contraction and glucose reduction in diabetic rat models.[13]

Although there are several studies have highlighted the medicinal richness of *Butea monosperma*, the research remains fragmented. Shivkanta et al., 2026 reviewed its pharmacological potential, noting hepatoprotective, antidiabetic, and wound-healing activities. Kambale et al., 2025 and Kumar et al., 2024 attempted tropical formulations, Meanwhile, Kajale et al., 2026 and Chaudhari et al., 2024 attempted tropical formulations, but these were either polyherbal blends or antifungal creams enriched with specific compounds. Other work, such as Patel et al., 2024. Rossi et al., 2023 and Panwar et al., 2018, has been explored herbal bases, nano-formulations, or wound-healing models, but not a standardized cream derived solely from *Butea monosperma* leaves has not been discovered yet.

Taken together, these studies confirm the therapeutic promise of *Butea monosperma* but reveal a clear gap: Despite the reported therapeutic effect of *Butea monosperma*, limited research available on systematic formulation and evaluation of tropical cream contain herb extract alone. Hence, the present study aimed to formulate and evaluate antimicrobial cream from *Butea monosperma* leaves extract. And their objectives were to prepare *Butea monosperma* leaf extract, to perform phytochemical screening and TLC

profiling, to formulate the herbal cream, to determine antimicrobial activity.



Fig. No 1: Leaves of *Butea monosperma*

MATERIAL AND METHODS

A. Materials: Stearic acid, Glyceryl monostearate, Potassium hydroxide, *Butea monosperma* leaves extract were used in the formulation of herbal cream.

B. Instruments: The instrument used in the study include was a Soxhlet extractor, Incubator, Brookfield viscometer, weighing balance, water bath, pH meter, autoclave, measuring cylinder and other laboratory glassware.

C. Plant Profile: [14]

Plant profile of *Butea monosperma* (Palash)

Synonyms: *Butea frondose*, Dhak, Palas, Palasha, *Butea* gum tree, palash, Bastard teak, Bengal kino.

Biological source: It consist of dried leaves of *Butea monosperma*.

Family: *Fabaceae*.

Chemical constituents: Alkaloids, carbohydrates, Flavonoids, Saponins, Tannins, Glycosides.

Uses: Antifungal activity, Anti-microbial activity, Antibacterial activity, Anti-inflammatory activity,



Wound healing activity, Antidiabetic activity, Anti-cancer activity, Diarrhoea.

Taxonomical Classification:

Table. No 1: Taxonomical Classification of *Butea monosperma*

Sr. No	Kingdom	Plantae
1	Sub kingdom	Tracheobionta (Vascular plant)
2	Tribe	Phaseoleae
3	Division	Mangnoliophyta (Flowering plants)
4	Class	Magnoliopsida (Dicotyledonous)
5	Order	Fabales
6	Family	<i>Fabaceae</i>
7	Subfamily	Faboideae
8	Genus	<i>Butea</i>
9	Species	<i>Monosperma</i>

D. Collection and Authentication of plant – *Butea monosperma* (Lam.) leaves were collected in February and March from warthi region, Bhandara District for experimental reasons. *Butea monosperma* plant was authenticated by Dr. Mrs. Sayada P. Qureshi, a botanist, the authentication of the *Butea monosperma* plant from J. M. Patel College Botany Department Bhandara.

E. Preparation of leaf extract: The *Butea monosperma* were collected in the month of February and March. The collected leaves were thoroughly washed with distilled water to eliminate dirt and impurities, Afterward, they were dried under shade at room temperature and ground coarse particle using a mortar and pestle.

Butea monosperma leaf powder was extracted using a Soxhlet apparatus with aqueous solvent and hydroalcoholic solvent. About 50gm of precisely weighed powder were added to the Soxhlet extractor. For extractor, about 300ml of aqueous solvent were utilized. The extraction was

carried out for 14 cycles at the boiling temperature of the solvent. After being filtered and concentrated using a rotatory evaporator, the extracts were dried under extremely low pressure. For every extract, a phytochemical test was conducted. The filtrate was dried using a rotary evaporator at roughly 55°C after being evaporated under low pressure. The dried extract was kept at 20°C in sterile screw-capped bottles with labels.[15]

F. Preparation of Cream

The cream was prepared according to formula which is given in Table no.2

Weight accurately about 8.00g of aqueous extract and transferred into a beaker. An aqueous phase containing potassium hydroxide and purified water was prepared and mixed properly with the extract. An oily phase containing 15g of stearic acid and 6gm of glyceryl monostearate was weighed in a separate beaker and melted in a water-bath at (70°C). The two phases were mixed gentle stirring and allowed to cool. The formulated cream was then transferred into cream jar and labelled appropriately.[16]

Table. No 2: Formulation table of *Butea monosperma* cream

Sr. No	Ingredients	Quantity for 50 g
1	Stearic acid	15 g
2	Glyceryl monostearate	6 g
3	Potassium hydroxide	0.66 g
4	<i>Butea monosperma</i> leaf extract	8 g
5	Water	19 g
6	Perfume	2 mL

G. Preliminary Phytochemical Screening

1) Identification test for carbohydrate

Molish's test: About 2-3 mL of the aqueous extract was taken, and a few drops of alpha-naphthol solution in alcohol was added. Shake the mixture



carefully and add concentrated H^2SO^4 from the side of the test tube. A violet ring was formed at the junction of the two liquids.

2) Identification test for protein

Biuret test: About 3 mL of the test solution, 4 % sodium hydroxide solution was added, followed by a few drops of 1 % copper sulphate solution. After mixing, a violet or pink color will appear, which indicates a positive result for the presence of proteins.

3) Identification test for amino acid

Ninhydrin test: Approximately 3 mL of solution was heated for 10min in a boiling water bath with 3 drops of 5 % ninhydrin solution. The presence of amino acids was indicated by the appearance of a purple or bluish color after heating.

4) Identification test for alkaloids

Mayer's test: About 2-3 mL of the filtrate were mixed with a few drops of Mayer's reagent. A white or cream- colored precipitate has been formed, indicating the presence of alkaloids.

Wagner's test: About 2-3mL of the filtrate was treated with a few drops of Wagner's reagent, and a reddish-brown precipitate has formed.

Hager's test: About 2-3 mL of the filtrate was treated with Hager's reagent, resulting in the formulation of a yellow precipitates has formed.

5) Identification test for tannins

Lead acetate test: About 2-3 mL of the aqueous or alcoholic extract has treated with few drops of lead acetate, and a white precipitate has observed, indicating the presence of tannins.

6) Identification test for glycoside

Foam test: The extract has shaken vigorously with water, and persistent foam.[17]

H. Thin Layer Chromatography (Leaves)

Thin layer chromatography (TLC) was carried out to profile the phytochemical constituents of the leaves extracts of *Butea monosperma* Aluminum plates were pre-coated with silica.

Gel 60 F254 were used as the stationary phase. Leaf extract of alcoholic and hydroalcoholic (20uL) was spotted on the plate. The solvent system employed was butanol: acetic acid: water (5:3:2). After development, plates were air-dried and visualized under UV light at 366 nm. Rf values were recorded.[18]

I. Microbial Assay

The antibacterial activity of the leaf extract was examined using the agar disk diffusion method. In this technique, bacteria are first cultured on agar plates. Paper disc containing the extract are then placed on the agar surface, allowing the substance to spread into the medium. Where the extract prevents bacterial growth, a clear zone appears, known as the zone of inhibition, which is measured with a zone reader. *Staphylococcus aureus* and *Escherichia coli* were used as test organisms. Agar plates were prepared by mixing peptones, beef extract, sodium chloride, and agar in hot water, followed by sterilization in an autoclave. The medium was then poured into petri dishes and allowed to solidify before use.[19]

J. Evaluation of Antimicrobial Cream

Physical Evaluation

1. Color
2. Odour



3. Texture irritation, erythema and edema for up to 24hours, and any result are reported.
 4. Appearance
 5. pH
 6. Viscosity
 7. Washability
 8. Homogeneity
 9. Skin irritation
 10. Phase separation
 11. Spreadability
 12. Greasiness
- 1) pH: A digital pH meter was used to measure the pH after 0.5g of cream dissolved in 50mL of distilled water.
 - 2) Viscosity: Cream viscosity was measured by using a Brookfield viscometer at 25°C with spindle no 63 running at 2.5rpm.
 - 3) Washability: After applying a small amount of cream to the hand, tap water was used to wash it.
 - 4) Homogeneity: Homogeneity and texture were tested by pressing a small quantity of the formulated cream between the thumb and index finger. The consistency of formulation and presence of coarse particles were used to evaluate the texture and homogeneity of the formulation.
 - 5) Irritancy: Note the area (1cm) on the dorsal surface of the left hand. The time was then recorded after the cream was administered to that region. After that, it is examined for

6) Phase separation: The prepared cream was stored away from light in the covered container between 25 and 100°C. Phase separation was then examined for 24 hours throughout the course of 30 days. Phase separation changes were noted and verified.

7) Spreadability:

The spreadability was measured the number of second it took for two slides to separate from the cream that was positioned between them under a specific stress. Spreadability is improved when the two slides are separated in less time. Two sets of standard-sized glass were collected. The cream mixture was then put on a slide that was the right size. The formulation was then topped with another slide. The cream between the two slides was then uniformly compressed to create a thin layer by placing a weight or specific load on the upper slide. Following the removal of the weight and the scrapping off of any excess formulation that had adhered to the slides, the upper slide was free to slide off due to the force of the weight attached to it, and the time it took for it to do so recorded.

It was calculated using the formula

$$\text{Spreadability} = S = M \times L \div T$$

Where, S= Spreadability

M= Standard weight which is tied to place over the upper slide (30g)

T= time taken in seconds

L= length of glass slide(5cm)



- 8) Greasiness: Here the cream was applied on the skin surface in the form of smear and checked if the smear was oily or grease-like [20]

Preliminary phytochemical screening-

During preliminary phytochemical screening of palash leaves the constituents that are present are shown in table no.3

RESULTS AND DISCUSSION

I. Evaluation of Plant extract

Table. No 3: Preliminary phytochemical screening of *Butea monosperma*

Sr. No	Constituents	Test	Reported value	Observed Result	Inference (Aqueous extract)	Inference (Hydroalcoholic extract)
1	Carbohydrates	Molisch's test	Violet ring at the junction	Violet ring was observed at the junction	+++	++
2	Proteins & amino acids	Biuret test	Violet or pink color appear	Pink color observed	++	+
		Ninhydrin test	Purple color	Purple color appeared	++	+
3	Alkaloids	Mayer's test	Ppt appears	Ppt observed	+	+++
		Wagner's test	Reddish brown ppt	Reddish brown ppt appeared	+	++
		Hager's test	Yellow ppt	Yellow ppt observed	+	++
4	Flavonoids	Shinoda test	Color change	Color changed from orange to purple	++	+++
5	Tannins	Lead acetate test	White ppt	White ppt observed	+++	++
6	Glycoside	Foam test	Foam appears	Foam observed	++	+

Note: (+++) Highly presence/ intense result; (++) Moderately present; (+) Weakly present; (-) Absent. Values are based on visual intensity of

color change and precipitate density during preliminary screening.

II. Thin layer Chromatography (Leaves)

Table No. 4: Rf value of leaf extract of Alcoholic and Hydroalcoholic extract

Sr. No	Extract type	Solvent system	Major Bands (Rf values)	Interpretation
1	Leaf (Alcoholic)	Butanol: acetic acid: water (5: 3: 2)	0.25, 0.57, 0.82	Clear separation of flavonoids
2	Leaf (Hydroalcoholic)	Butanol: acetic acid: water (5: 3: 2)	0.21, 0.42, 0.78	Presence of phenolic group



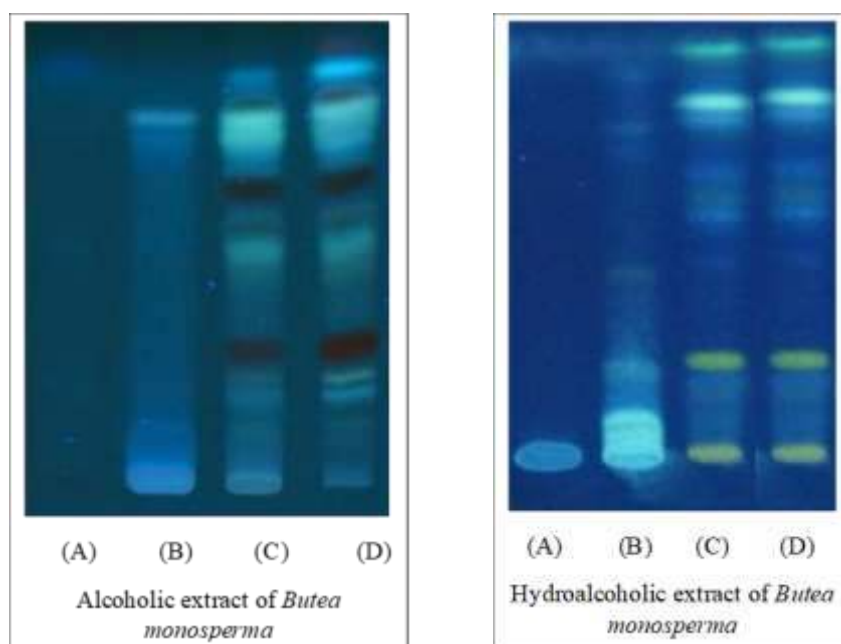


Fig. No 2: TLC Rf Band of Alcoholic extract and Hydroalcoholic extract. Where (A)Blank, (B)Standard, (C)/(D)Alcoholic extract/Hydroalcoholic extract

III. Physical Parameters

Table. No 5: Physical Parameter test for *Butea monosperma* Cream

Sr. no.	Parameter	Observation	IP Standard
1	Color	Light brown	Characteristics/uniform
2	Odour	Aromatic	Aromatic/characteristic
3	Appearance	Semisolid	Smooth semisolid
4	pH	4.5-5.5	4.5 - 6.5 (Skin compatible)
5	Viscosity	30,000 -50,000cP	Suitable range 30,000-60,000cP
6	Texture	Smooth	Smooth and non-gritty
7	Homogeneity	Homogeneous	Homogeneous
8	Washability	Easily washable	Easily washable
9	Phase Separation	No	No separation
10	Skin Irritation	no	No irritant

IV. Spreadability Test:

Table. No 6: Spreadability test of *Butea monosperma* Cream

Sr. No	Distance (cm)	Time (sec)	Spreadability (g.cm/s)
1	1	5	1.62
2	2	6	2.75
3	3	10	3.55

V. Microbial Assay:

The zone of inhibition observed is shown in Fig. 3 and the calculated inhibition range is mentioned in Table no.6

Table. No 7: Range of zone of inhibition

Microorganism	Formulation	Standard (Soframycin)
<i>Staphylococcus aureus</i>	6mm	6mm
<i>Escherichia coli</i>	7mm	6mm



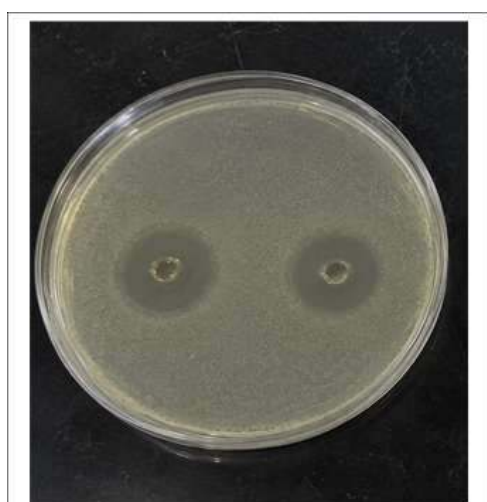


Fig. No. 3(a) Zone of Inhibition (mm) against *Staphylococcus Aureus* Standard (A), Formulation (B)



Fig. No. 3(b) Zone of Inhibition (mm) against *Escherichia coli* Standard (A), Formulation (B)

Fig. No 3: Antimicrobial activity of the formulation showing zone of inhibition against *Staphylococcus aureus*(a) and *Escherichia coli*(b).

DISCUSSION

The phytochemical screening verified that the *Butea monosperma* leaf extract included proteins, carbohydrates, amino acids, alkaloids, flavonoids, tannins, and glycosides. These substances' well-known antibacterial, antioxidant, and wound-healing qualities support their use in topical preparations. The phytochemical richness was further confirmed by TLC profiling, where hydroalcoholic extracts confirmed phenolic components and alcoholic extracts displayed unique flavonoid bands. Because of their safety, stability, and skin compatibility, aqueous extracts were chosen for cream formulation even if their separation was poorer. The cream's smooth texture, homogeneity, pH within the skin-friendly range (4.5–5.5), and lack of phase separation were all acceptable physical attributes. Microbial tests verified moderate inhibition against *Staphylococcus aureus* and *Escherichia coli*, whereas spreadability values showed ease of application. Although the herbal cream's inhibition zones were smaller than those of ordinary Soframycin, its antibacterial potential was

nonetheless confirmed. Overall, the study highlights *Butea monosperma* cream as a promising herbal substitute for skin care and wound healing by bridging traditional knowledge with methodical pharmaceutical evaluation.

CONCLUSION

Herbal Cream containing *Butea monosperma* leaf extract was successfully developed and evaluated in the present study. This formulation showed good physical properties, stability and antimicrobial activity and can be considered as a promising formulation for skin care and wound healing. The study bridges traditional knowledge with systematic pharmaceutical evaluation, pointing to the potential of *Butea monosperma* cream as a safe, effective and natural alternative to synthetic topical agents. Future work should include extensive pharmacological validation, clinical trials and optimization with preservatives or humectants to enhance shelf-life and patient compliance.



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