EJPMR, 2026, 13(6), 664-670 **Research Article** **Impact Factor: 8.158**

EUROPEAN JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.ejpmr.com

ISSN (O): 2394-3211
ISSN (P): 3051-2573
Coden USA: EJPMAG

FORMULATION AND EVALUATION OF ANTIFUNGAL CREAM WITH GUAVA LEAVES AND POMEGRANATE PEEL

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DOI: https://doi.org/10.5281/zenodo.20641324

How to cite this Article: Yogita Shivaji Warghade[1*], Ganesh Jayram Lamkhade[2], Vaishnavi Arun Narawade[3], Harshada Suresh Shinde[4]. (2026). Formulation and Evaluation of Antifungal Cream with Guava Leaves And Pomegranate Peel. European Journal of Pharmaceutical and Medical Research, 13(6), 664–670.

Article Received on 25/05/2026 **Article Revised on 05/06/2026** **Article Published on 10/06/2026**

ABSTRACT

Fungal infections are among the most common skin disorders affecting millions of people worldwide. The increasing resistance and side effects associated with synthetic antifungal drugs have led to the exploration of herbal alternatives. The present study focuses on the formulation and evaluation of a polyherbal antifungal cream containing guava leaves (*Psidium guajava*) and pomegranate peel (*Punica granatum*) extracts. Both plants possess significant antimicrobial, antioxidant, and antifungal properties due to the presence of flavonoids, tannins, and polyphenolic compounds. The extracts were prepared using hydroalcoholic solvent extraction and incorporated into an oil-in-water cream base. The formulated creams were evaluated for physical appearance, pH, spreadability, washability, viscosity, homogeneity, stability, skin irritation, and antifungal activity against fungal strains using the agar well diffusion method. The optimized formulation showed good consistency, acceptable pH, excellent spreadability, and significant antifungal activity. The study concludes that the polyherbal antifungal cream may serve as an effective and safer alternative to synthetic topical antifungal formulations.

KEYWORDS: Polyherbal cream, Antifungal activity, Guava leaves, Pomegranate peel, Herbal formulation, Topical cream, *Psidium guajava*, *Punica granatum*.

1. INTRODUCTION

Fungal infections are among the most common microbial diseases affecting humans worldwide. They are caused by various pathogenic fungi such as *Candida albicans*, *Aspergillus niger*, and dermatophytes, which infect the skin, nails, hair, and mucosal tissues. The prevalence of fungal infections has increased significantly due to factors such as poor hygiene, humid environmental conditions, weakened immune systems, diabetes, prolonged antibiotic therapy, and resistance to conventional antifungal drugs. Although synthetic antifungal agents are widely used for treatment, their long-term use may lead to adverse effects including skin irritation, allergic reactions, toxicity, and development of drug-resistant fungal strains. Therefore, there is an increasing demand for safer, more effective, and plant-based antifungal formulations.

Herbal medicines have gained considerable attention because of their therapeutic efficacy, low toxicity, easy availability, and cost-effectiveness. Medicinal plants contain various bioactive compounds such as flavonoids, tannins, alkaloids, phenolics, and terpenoids, which exhibit significant antimicrobial and antifungal activities. Among the various medicinal plants, guava leaves and pomegranate peel are widely recognized for their potent pharmacological properties.

Psidium guajava (Guava) leaves are rich in flavonoids, tannins, essential oils, and phenolic compounds that possess strong antimicrobial, antioxidant, anti-inflammatory, and antifungal properties. Traditionally, guava leaves have been used for the treatment of wounds, skin infections, diarrhea, and oral diseases. The presence of compounds such as quercetin and guaijaverin contributes significantly to their antifungal activity against pathogenic fungi.

Similarly, Punica granatum (Pomegranate) peel is an important source of polyphenols, ellagic acid,

punicalagins, and tannins, which exhibit remarkable antifungal, antibacterial, and antioxidant activities. Pomegranate peel has been traditionally utilized in Ayurvedic and herbal medicine for treating infections, inflammation, and skin disorders. Studies have shown that pomegranate peel extract effectively inhibits the growth of several fungal species responsible for skin infections.

Topical cream formulations are considered one of the most convenient and effective dosage forms for the treatment of fungal skin infections because they provide direct application to the affected area, prolonged contact time, better patient compliance, and reduced systemic side effects. Incorporation of herbal extracts into cream formulations offers an innovative approach for developing safer and more effective antifungal therapies.

The present study focuses on the formulation and evaluation of a polyherbal antifungal cream containing guava leaves and pomegranate peel extracts. The prepared cream is intended to provide effective antifungal activity along with good stability, spreadability, homogeneity, skin compatibility, and patient acceptability. Various evaluation parameters such as physical appearance, pH, viscosity, spreadability, washability, stability, and antifungal activity are assessed to determine the quality and effectiveness of the developed herbal cream. The study aims to develop a natural, economical, and efficient antifungal topical preparation that may serve as an alternative to synthetic antifungal formulations.

Importance of Herbal Antifungal Therapy

Herbal medicines are widely used due to:

- Fewer side effects
- Better patient compliance
- Cost-effectiveness
- Easy availability
- Reduced microbial resistance

Medicinal Uses of Guava Leaves and Pomegranate Peel

Guava Leaves (*Psidium guajava*)

Guava leaves contain:

- Quercetin
- Flavonoids
- Tannins
- Essential oils

Pharmacological Activities

- Antifungal
- Antibacterial
- Anti-inflammatory
- Antioxidant

Pomegranate Peel (*Punica granatum*)

Pomegranate peel contains:

- Ellagic acid
- Punicalagin
- Polyphenols
- Tannins

Pharmacological Activities

- Antifungal
- Antioxidant
- Antimicrobial
- Wound healing

Advantages of Polyherbal Cream Formulation

- Synergistic therapeutic effect
- Enhanced antifungal activity
- Improved skin compatibility
- Reduced toxicity
- Better stability and efficacy

2. MATERIALS AND METHODS

Collection and Authentication of Plant Materials

Fresh guava leaves and pomegranate peels were collected from local areas and authenticated by a botanist.

Fig. 1: Guava leaves.

Fig. 2: Pomegranate peel.

Preparation of Extracts

Maceration of Psidium guajava Leaves (20 g)

Fresh guava leaves were collected, washed, shade dried, powdered, and sieved. About 20 g of powder was macerated with 100 mL of 70% ethanol for 72 hours with occasional shaking. The mixture was filtered and concentrated on a water bath at 40–50°C to obtain semisolid extract, which was stored in an airtight container.

Maceration of Punica granatum Peel (20 g)

Fresh pomegranate peels were collected, washed, shade dried, powdered, and sieved. About 20 g of powder was macerated with 100 mL of 70% ethanol for 72 hours with occasional shaking. The mixture was filtered and concentrated on a water bath at 40–50°C to obtain semisolid extract, which was stored in an airtight container.

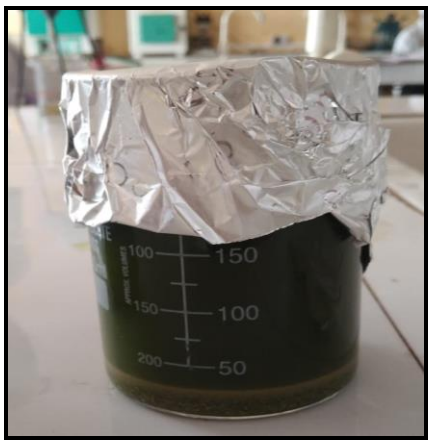

Fig. 3: Guava leaves extract.

Fig. 4: Pomegranate peel extract.

3. Phytochemical Screening of Guava Leaves and Pomegranate Peel

Phytochemical screening is a preliminary analytical method used to identify the presence of various bioactive chemical constituents in plant extracts. In the present study, phytochemical screening of Psidium guajava leaf extract and Punica granatum peel extract was carried out to detect the presence of compounds responsible for antifungal and therapeutic activity.

The phytoconstituents identified in both extracts include alkaloids, flavonoids, tannins, phenolic compounds, saponins, glycosides, terpenoids, carbohydrates, proteins, and steroids.

Sr. No.	Phytoconstituent	Test Performed	Observation	Psidium guajava Leaves	Punica granatum Peel
1	Alkaloids	Dragendorff's test	Orange/reddish-brown precipitate formed	Present (+)	Present (+)
2	Tannins	Ferric chloride test	Blue-black or green coloration formed	Moderately Present (++)	Highly Present (+++)
3	Glycosides	Keller-Killiani test	Brown ring formed at interface	Present (+)	Present (+)
4	Phenolic compounds	Ferric chloride test	Dark blue/black coloration appeared	Moderately Present (++)	Highly Present (+++)

Fig. 5: Phytochemical screening.

4. Methadology

Ingredients Used in Cream Formulation

Sr.No.	Ingredients	Batch F1 (20 g)	Batch F2 (20 g)	Batch F3 (20 g)	Role
1	Guava leaf extract (*Psidium guajava*)	1 g	2 g	3 g	Antifungal agent
2	Pomegranate peel extract (*Punica granatum*)	1 g	2 g	3 g	Antifungal and antioxidant agent
3	Aloe vera gel	2 g	3 g	4 g	Moisturizer and soothing agent
4	Stearic acid	2 g	2 g	2 g	Emulsifying agent
5	Cetyl alcohol	1 g	1 g	1 g	Thickening agent
6	Liquid paraffin	3 g	3 g	3 g	Emollient
7	Glycerin	2 g	2 g	2 g	Humectant
8	Triethanolamine	0.5 g	0.5 g	0.5 g	pH adjuster and emulsifier
9	Methyl paraben	0.1 g	0.1 g	0.1 g	Preservative
10	Propyl paraben	0.05 g	0.05 g	0.05 g	Preservative
11	Distilled water	q.s. to 20 g	q.s. to 20 g	q.s. to 20 g	Vehicle

Flowchart of Cream Preparation

Collection of Plant Materials
↓
Drying
↓
Extraction Process
↓
Preparation of Oil Phase
↓
Preparation of Aqueous Phase
↓
Mixing of Both Phases
↓
Addition of Herbal Extracts
↓
Homogenization
↓
Filling and Packaging

Preparation of Cream Base

Oil Phase

- Stearic acid
- Cetyl alcohol
- Liquid paraffin

Aqueous Phase

- Glycerin
- Triethanolamine
- Water

Fig. 6: Oil phase.

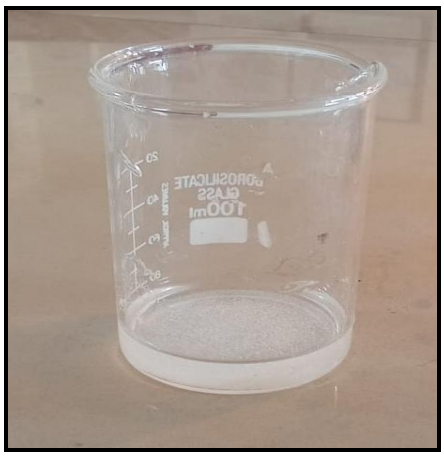

Fig. 7: Aqueous phase.

Both phases were heated separately to 70°C and mixed with continuous stirring.

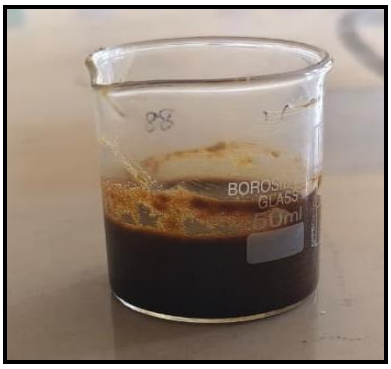

Fig 8 : mix both phase

Fig 9: formulated cream.

5. Evaluation Parameters

i) Physical Appearance

The cream should possess:
Smooth texture
Pleasant odor
Uniform color
No grittiness
No phase separation

ii) pH

Measured using digital pH meter.

Fig. 10: PH.

iii) Spreadability

Determined by slide method.

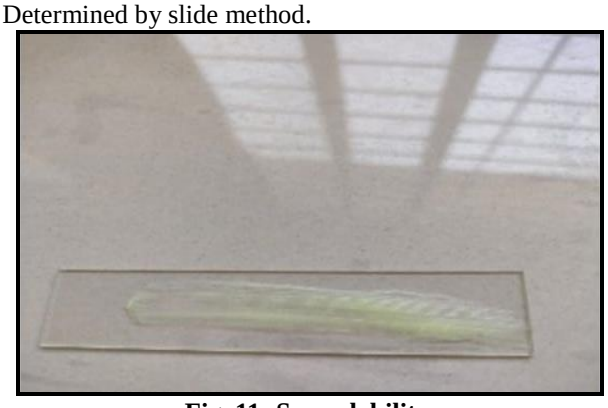

Fig. 11: Spreadability.

iv) Washability

Cream was applied on skin and washed with water.

v) Viscosity

Measured using Brookfield viscometer.

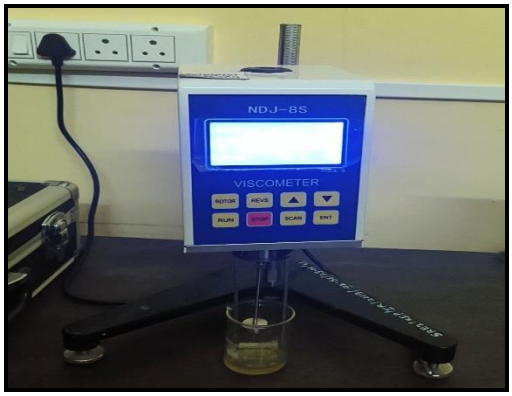

Fig 12: Viscosity.

vi) Homogeneity

Observed visually for uniformity and absence of lumps.

vii) Stability Studies

Formulations stored at:
Room temperature
Refrigerated conditions
Accelerated conditions
for 30 days.

viii) Skin Irritation Test

Applied on dorsal skin surface and observed for:

- Redness
- Irritation
- Swelling

6. RESULTS

The formulated polyherbal antifungal cream containing Psidium guajava leaf extract and Punica granatum peel extract was successfully prepared and evaluated for various physicochemical and biological parameters. The obtained results indicated that the formulation possessed satisfactory characteristics suitable for topical application.

Evaluation Results

Parameter	F1	F2	F3
Color	Light Brown	Brown	Dark Brown
pH	6.2	6.5	6.7
Spreadability	Good	Very Good	Excellent
Homogeneity	Good	Good	Excellent
Stability	Stable	Stable	Highly Stable

7. DISCUSSION

The present study successfully formulated and evaluated a polyherbal antifungal cream containing Psidium guajava leaf extract, Punica granatum peel extract, and Aloe vera gel. The prepared formulations showed good physical appearance, homogeneity, smooth texture, and stability without phase separation. The pH of the cream was found within the acceptable skin pH range, indicating suitability for topical application. The cream exhibited satisfactory spreadability, viscosity, washability, and extrudability, which ensure easy application and patient acceptability. Irritancy studies revealed that the formulation was safe and non-irritant to the skin. Stability studies confirmed that the cream remained stable under different storage conditions. The antifungal activity study demonstrated significant inhibition of fungal growth, especially in formulation F3, which showed the highest zone of inhibition. The antifungal effect may be attributed to the presence of bioactive phytoconstituents such as flavonoids, tannins, and phenolic compounds in guava leaves and pomegranate peel extracts. Overall, the developed polyherbal cream proved to be a safe, stable, and effective topical antifungal formulation.

7. CONCLUSION

The present study successfully formulated a polyherbal antifungal cream containing guava leaves and pomegranate peel extracts. The formulation exhibited good physical properties, stability, and significant antifungal activity against fungal pathogens. Among all formulations, F3 demonstrated the best results. The study supports the potential use of herbal antifungal creams as safe and effective alternatives to synthetic topical preparations.

8. Future Scope

- Advanced clinical studies can be conducted.
- Nano-herbal formulations may improve drug penetration.
- Large-scale industrial production can be explored.
- Further studies on shelf-life and toxicity may be performed.

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