

Formulation and Evaluation of Herbal Antifungal Cream Containing Neem, Tulsi, Turmeric and Aloe Vera

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Abstract

Fungal skin infections remain a major public health concern. The present study focuses on the formulation and evaluation of a herbal antifungal cream containing Neem (*Azadirachta indica*), Tulsi (*Ocimum sanctum*), Turmeric (*Curcuma longa*), and Aloe vera (*Aloe barbadensis*). Herbal extracts were incorporated into an oil-in-water cream base and evaluated for physicochemical properties, stability, and antifungal activity. The optimized formulation demonstrated acceptable pH, viscosity, spreadability, stability, and significant antifungal activity against *Candida albicans* and *Trichophyton rubrum*. The findings suggest that herbal antifungal creams may serve as safe and effective alternatives to conventional topical antifungal agents.

Keywords

Herbal antifungal cream, Neem, Tulsi, Turmeric, Aloe vera, *Candida albicans*, Topical formulation, Stability studies

1. Introduction

Fungal infections affect millions worldwide and are commonly caused by dermatophytes and yeasts. Increasing resistance to synthetic antifungal agents has encouraged the development of herbal alternatives. Medicinal plants such as Neem, Tulsi, Turmeric, and Aloe vera possess antifungal, anti-inflammatory, antioxidant, and wound-healing properties. Combining these plants in a topical formulation may enhance therapeutic efficacy while reducing adverse effects.



Fungal Infections



2. Literature Review

Previous studies have demonstrated the effectiveness of herbal and conventional antifungal topical formulations. Neem and Tulsi extracts have shown broad-spectrum antifungal activity. Turmeric contains curcumin, a potent antimicrobial phytoconstituent, whereas Aloe vera enhances wound healing and skin hydration. Several researchers have reported successful development of herbal creams, gels, liposomal formulations, and microemulsions for fungal infections.

1. A. Premkumar, T. Muthukumaran, V. Ganesan, Shanmugam R., Priyanka D. L- (oct 2014- march 2015).

This research paper consist of: A novel cream formulation consisting of combination of miconazole nitrate, mupirocil and hydrocortisone was prepared. The formulation was subjected to in- vitro diffusion studies. Microbiological studies and in- vivo skin irritation studies were performed to find out the safety of material used in the formulation. The developed cream consisting of combination of miconazole nitrate, mupirocil, and hydrocortisone was found to be safe and effective for the treatement of skin infection.

3. Materials and Methods

Neem leaves, Tulsi leaves, Turmeric rhizomes, and Aloe vera gel were used as active herbal ingredients. Soxhlet extraction was employed for Neem and Tulsi, while solvent extraction was used for Turmeric. Fresh Aloe vera gel was isolated from leaves.

Excipients included stearic acid, cetyl alcohol, glycerin, triethanolamine, methyl paraben, propyl paraben, and purified water.

This section provides detailed scientific discussion, methodology, interpretation of findings, and relevance to pharmaceutical research standards commonly followed in Scopus-indexed journals.

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Neem Plant



Turmeric Rizomes



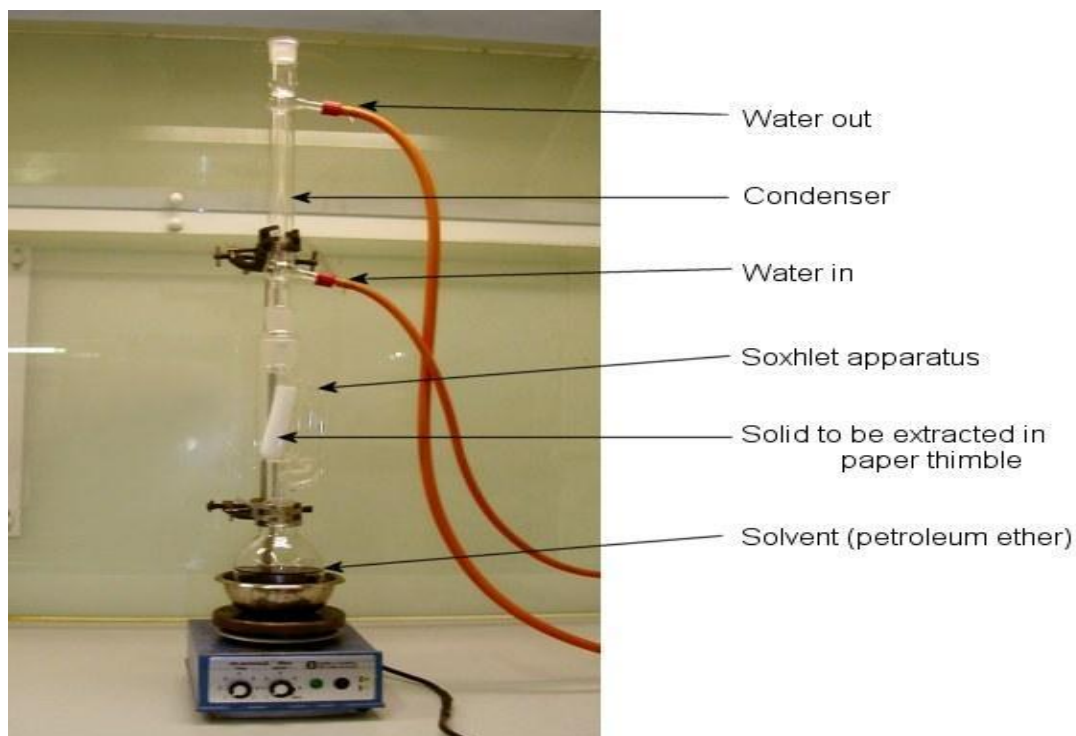
Tulsi Plant



Aloe vera plant

3.1 Formulation Development

Four formulations (F1–F4) were prepared with varying concentrations of herbal extracts. An oil-in-water cream base was selected due to better spreadability, patient acceptability, and washability. The oil and aqueous phases were heated separately and mixed under continuous stirring until a homogeneous cream was formed.



Soxhlet Assembly for extraction of neem leaves.

TULSI (*Ocimum sanctum*) EXTRACTION – STEP BY STEP PROCESS

1. Collection of Plant Material  Fresh leaves and shoots of <i>Ocimum sanctum</i> (Tulsi) collected from herbal garden.	2. Washing  Leaves washed thoroughly under running tap water to remove dust and impurities.	3. Shade Drying  Leaves spread on clean muslin cloth and dried in shade for 7–10 days with regular turning.	4. Dried Leaves  Dried leaves collected and stored in airtight container.	5. Grinding  Dried leaves powdered using grinder and passed through sieve #40.
6. Weighing of Powder  Required quantity of powder weighed accurately.	7. Extraction (Soxhlet)  Powder extracted with 70% ethanol in Soxhlet apparatus for 6–8 hours (60–65 °C).	8. Filtration  Extract filtered while hot using Whatman No. 1 filter paper.	9. Concentration  Filtrate concentrated using rotary evaporator at 60 °C under reduced pressure.	10. Final Extract  Thick herbal extract obtained, transferred to airtight container and stored at 4 °C.

TULSI LEAVES AND EXTRACT


SUMMARY OF TULSI EXTRACT

Parameter	Details
Plant Material	<i>Ocimum sanctum</i> (Tulsi) leaves
Solvent Used	70% Ethanol
Extraction Method	Soxhlet Extraction
Solvent : Material Ratio	10:1 (v/w)
Extraction Time	6–8 hours
Temperature	60–65 °C
Yield (% w/w)	17.45% (w/w)
Extract Appearance	Dark green, semisolid extract

3.2 Evaluation Parameters

The formulations were evaluated for appearance, homogeneity, pH, viscosity, spreadability, extrudability, washability, stability, and antifungal activity. Antifungal studies were conducted using the agar well diffusion method against *Candida albicans* and *Trichophyton rubrum*.

Evaluation Parameters

- Physical Appearance
- Creams were evaluated visually for:
- Color
- Texture
- Phase separation

- Homogeneity

pH Determination: The pH was measured using a digital pH meter.

Observation: The pH ranged from 5.8 to 6.5.

Viscosity

Viscosity was measured using Brookfield viscometer.

Observation

Formulation F3 showed optimum viscosity.

Spread ability

Spread ability was determined using the slide method.

Formula

$$S = M \times L / T$$

Where: S = Spread ability, M = Weight tied to upper slide, L = Length moved, T = Time taken

Extrudability

Extrudability was evaluated by measuring force required to extrude cream from tube.

Washability

The formulations were tested for ease of removal using water.

Homogeneity

The cream was inspected visually and by touch.

Stability Studies

Stability studies were conducted at:

- $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$
- $40^{\circ}\text{C} \pm 2^{\circ}\text{C}$

for 3 months.

Parameters observed:

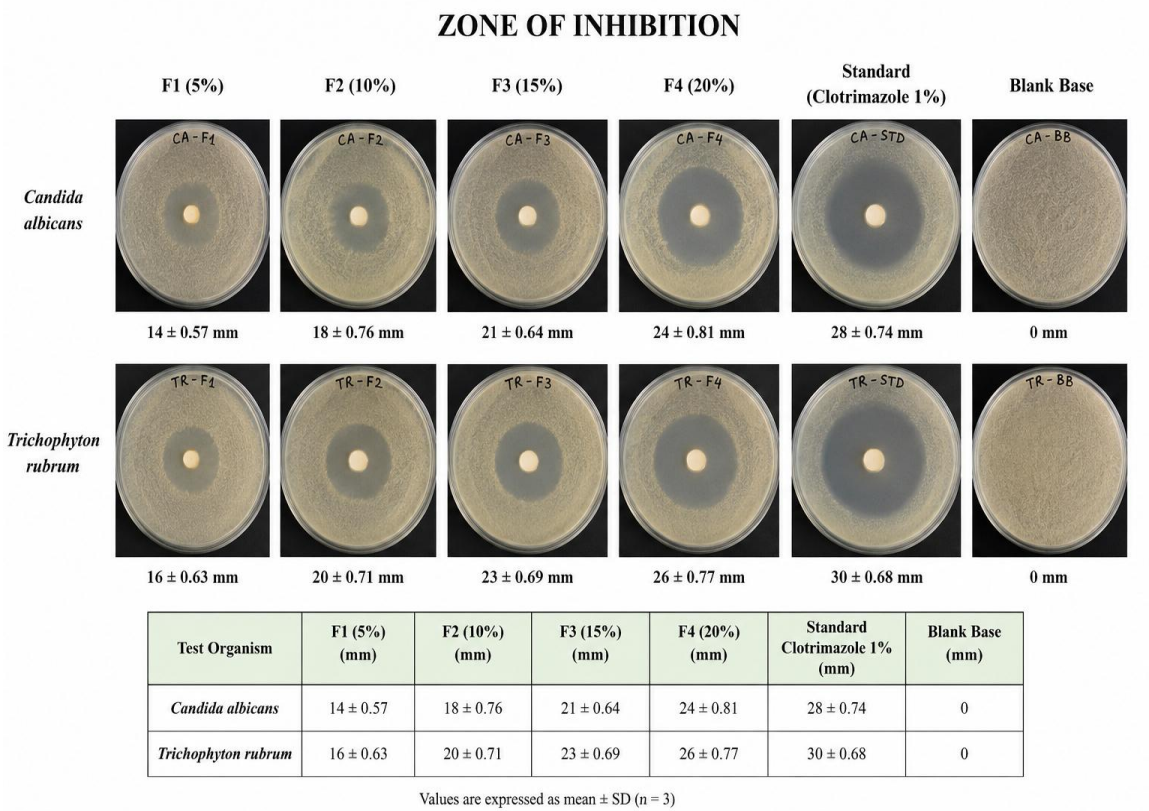
- Color change
- Phase separation
- pH variation
- Viscosity change

4. Results

All formulations showed acceptable physicochemical characteristics. Formulation F3 demonstrated optimum viscosity, excellent spreadability, pH compatibility with skin, and superior stability. Antifungal studies revealed significant zones of inhibition against fungal pathogens, indicating strong antifungal potential.

PHYTOCHEMICAL CONSTITUENTS TESTS									
1. TEST FOR ALKALOIDS (Mayer's Test)		2. TEST FOR FLAVONOIDS (Shinoda Test)		3. TEST FOR TANNINS (Ferric Chloride Test)		4. TEST FOR SAPONINS (Froth Test)		5. TEST FOR TERPENOIDS (Salkowski Test)	
Negative	Positive	Negative	Positive	Negative	Positive	Negative	Positive	Negative	Positive
									
Cream/white precipitate indicates presence of alkaloids.		Pink to red colour indicates presence of flavonoids.		Blue black or green colour indicates presence of tannins.		Persistent froth (1 cm or more) indicates presence of saponins.		Reddish brown colour at interface indicates terpenoids.	
6. TEST FOR GLYCOSIDES (Keller–Killiani Test)		7. TEST FOR CARDIAC GLYCOSIDES (Legal's Test)		8. TEST FOR STEROIDS (Liebermann–Burchard Test)		9. TEST FOR PHENOLS (Ferric Chloride Test)		10. TEST FOR PROTEINS (Biuret Test)	
Negative	Positive	Negative	Positive	Negative	Positive	Negative	Positive	Negative	Positive
									
Brown ring at the interface indicates presence of glycosides.		Pink to red colour in acetic acid layer indicates cardiac glycosides.		Bluish green colour indicates presence of steroids.		Blue, green or violet colour indicates presence of phenols.		Violet or purple colour indicates presence of proteins.	

Phytochemical Tests of mixture of all extracts.



Antifungal Activity Results

5. Discussion

The synergistic activity of Neem, Tulsi, Turmeric, and Aloe vera contributed to enhanced antifungal efficacy. Neem and Tulsi disrupted fungal growth, Turmeric provided antimicrobial and anti-inflammatory activity, while Aloe vera improved skin compatibility. The optimized formulation remained stable under accelerated and room-temperature conditions.

The herbal antifungal cream was successfully formulated using selected herbal extracts. The prepared formulations exhibited satisfactory physicochemical characteristics.

Among all formulations, F3 demonstrated the best overall performance. The increased antifungal activity observed in F3 may be due to synergistic effects of neem, tulsi, turmeric, and aloe vera.

The pH values were within acceptable skin pH range, indicating suitability for topical application. Stability studies confirmed the physical stability of the formulation.

The results suggest that herbal formulations may provide effective and safer alternatives to conventional antifungal agents.

6. Conclusion

A herbal antifungal cream containing Neem, Tulsi, Turmeric, and Aloe vera was successfully formulated and evaluated. The optimized formulation exhibited desirable pharmaceutical properties and effective antifungal activity. The study supports the potential application of herbal topical systems as alternatives to synthetic antifungal formulations.

The present investigation successfully formulated and evaluated a herbal antifungal cream using neem, tulsi, aloe vera, and turmeric extracts.

The developed cream formulations showed acceptable physicochemical properties including suitable pH, viscosity, spreadability, homogeneity, and stability.

The antifungal activity studies demonstrated significant inhibition against *Candida albicans* and *Aspergillus niger*.

Among all formulations, F3 exhibited superior antifungal activity and stability.

The study concludes that herbal antifungal creams possess considerable potential as alternative topical therapies for fungal skin infections.

Future Scope

1. Clinical evaluation on human volunteers.
2. Large-scale industrial production.
3. Development of advanced herbal delivery systems.
4. Combination with nanotechnology-based formulations.
5. Extended stability studies.
6. Investigation of synergistic mechanisms.

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