

FROMULATION AND EVALUATION OF ANTIFUNGAL CREAM CONTANING MORINGA OLEIFERA LEAVES.

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ABSTRACT

The research highlights the potential of *Moringa oleifera* leaves as an effective natural source for the development of antifungal topical formulations. The presence of bioactive compounds such as flavonoids, tannins, and phenolic constituents contributes significantly to its antifungal, anti-inflammatory, and antioxidant properties.

The formulation of an antifungal cream using *Moringa oleifera* extract provides a promising herbal alternative to conventional synthetic drugs. Proper selection of excipients, including emulsifiers, preservatives, and humectants, plays a crucial role in ensuring the stability, consistency, and effectiveness of the cream. Evaluation parameters such as pH, viscosity, spreadability, and antifungal activity confirm the suitability of the formulation for topical application.

Furthermore, the herbal cream offers advantages such as safety, cost-effectiveness, and reduced side effects, making it more acceptable for long-term use. Although certain limitations like variability in plant constituents and stability challenges exist, these can be minimized through proper standardization and formulation techniques.

In conclusion, *Moringa oleifera*-based antifungal cream represents a safe, effective, and economical approach for the treatment of fungal infections and associated inflammation, with strong potential for future research and commercial development.

Keywords: *Moringa oleifera*, Drumstick tree, Miracle tree.

INTRODUCTION

Moringa Oleifera is a highly valued medicinal plant widely used in traditional and modern herbal medicine because of its rich nutritional and pharmacological properties. It belongs to the family *Moringaceae* and is commonly known as the drumstick tree, miracle tree, or horseradish tree. The plant is native to the Indian subcontinent and is extensively cultivated in tropical and subtropical regions. Different parts of the plant such as leaves, seeds, bark, roots, flowers, and pods possess important therapeutic activities including antioxidant, anti-inflammatory, antibacterial, antifungal, antidiabetic, hepatoprotective, and wound healing properties. Among all plant parts, the leaves are considered the most therapeutically active because they contain a wide variety of bioactive compounds such as flavonoids, tannins, alkaloids, saponins, phenolic compounds, vitamins, minerals, and essential amino acids. Fungal infections are one of the most common dermatological problems affecting millions of people worldwide. These infections are mainly caused by fungi such as *Candida albicans*, *Aspergillus Niger*, *Trichophyton rubrum*, and *Micro sporum* species. Fungal skin infections may lead to itching, redness, inflammation, irritation, scaling, and discomfort. The prevalence of fungal infections has increased significantly due to poor hygiene, humid environmental conditions, immunocompromised conditions, diabetes, excessive use of antibiotics, and resistance to conventional antifungal drugs. Although many synthetic antifungal agents are available in the market, prolonged use of these medications may produce adverse effects such as skin irritation, burning sensation, allergic reactions, toxicity, and microbial resistance. Therefore, there is an increasing demand for herbal and natural antifungal formulations that are safer, economical, effective, and associated with fewer side effects

MATERIAL AND METHODS

Collection of Drug:

Moringa oleifera leaves is a highly valued medicinal plant widely used in traditional and modern herbal medicine because of its rich nutritional and pharmacological properties. It belongs to the family *Moringaceae* and is commonly known as the drumstick tree, miracle tree, or horseradish tree.



Fig no.1 *Moringa oleifera leaves.*

Table no. 1 Ingredients & their Role

Sr. No.	Ingredients	Role
1	Stearic Acid	thickening agent and emollient.
2	Bees wax	stiffening agent and emulsifier.
3	Propyl paraben	preservative
4	Methyl paraben	preservative
5	Propylene glycol	humectant, penetration enhancer
6	Triethanolamine	emulsifying agent and pH adjuster
7	Rose oil	emollient and moisturizing agent.

Preparation for Extraction:

The dried powder of moringa oleifera leaves was used for extraction of active constituents. The extraction method is carried out by Maceration method. Then moringa oleifera leaves powder was extracted with ethanol and water. 35g of above sited powder was taken in closed tight container. Extract with 450 ml ethanol. Then filter it out by using whatmann filter paper.

Phytochemical Screening:**1) Test for Alkaloid:**

Dragendorff's test is a qualitative chemical test used for the identification of alkaloids in a sample. In this test, the addition of Dragendorff's reagent to the test solution produces an orange precipitate, which confirms the presence of alkaloids.

2) Flavonoid test:**Shinoda Test**

Shinoda test is a qualitative chemical test used for the identification of flavonoids in a sample. In this test, the addition of magnesium turnings and concentrated hydrochloric acid to the extract produces a red color, which confirms the presence of flavonoids.

3) Flavonoid Alkaline Test:

The alkaline reagent test was performed for the identification of flavonoids in the formulation. In this test, a small quantity of the cream extract was treated with sodium hydroxide solution, which produced an intense yellow color.

4) Tannin Test:

The tannin test was performed for the identification of tannins in the sample. In this test, a few drops of ferric chloride solution were added to the extract, and the formation of a greenish-black color confirmed the presence of tannins.

5) Saponin Test:

The saponin test was performed for the identification of saponins in the sample. In this test, the extract was shaken vigorously with distilled water, and the formation of stable persistent foam confirmed the presence of saponins. Formulation of herbal cream

Phytochemical analysis:

Phytochemical screening was performed to identify the major bioactive constituents present in the ethanolic extract of *Moringa oleifera* leaves. The presence of these phytochemicals is responsible for the antifungal and therapeutic properties of the formulated herbal cream.

Preparation of cream:

1. Semi-solid Crude Extract Obtained
2. Preparation of Oil Phase (Stearic acid + Beeswax + Coconut oil heated at 70–75°C)
3. Preparation of Aqueous Phase (Water + Propylene glycol + Preservatives heated at 70–75°C)
4. Mixing of Phases (Add aqueous phase into oil phase with continuous stirring)
5. Addition of Plant Extract
6. Final Cooling at Room Temperature
7. Packaging in Sterile Container

Table No: 2 Formulation Table

SR. NO	Ingredient	F1	F2	F3
1	Moringa oleifera leaves extract	3.09	2.59	2.09
2	Steric acid	2.09	3.09	3.09
3	Bees wax	2.09	2.09	2.09
4	Propyl paraben	0.029	0.19	0.029
5	Propylene glycol	2.1	2.09	2.09
6	Triethanolamine	0.19	0.29	0.39
7	Rose oil	0.39	0.19	0.19
8	Distilled Water	10.589	9.50	10.589

Evaluation parameters:**1) Physical Appearance:**

The physical appearance of the antimicrobial cream was evaluated by observing its color, odor, texture, and overall consistency.

Color : The color of the cream was checked by visual observation under normal daylight or white light background.

Odour: The odour of the cream was evaluated by sensory evaluation (smelling method).

Consistency: The consistency of the cream was assessed by tactile examination.

2) Measurement of PH:

The pH meter was calibrated using standard buffer solutions of pH 4.0, 7.0, and 9.2 to ensure accuracy. A small quantity of the cream was then accurately weighed and dispersed in a measured amount of distilled water to form a uniform suspension. The electrode of the pH meter was rinsed with distilled water and gently blotted dry before immersion into the sample solution. The electrode was then dipped into the prepared dispersion, and the reading was allowed to stabilize.

3) Spreadability:

The spreadability of the cream was determined by measuring the time required for two glass slides to slide over each other when a cream sample was placed between them under a specific weight. A fixed amount of cream was placed on one glass slide, and another slide was placed over it. A known weight was applied on the upper slide to form a uniform layer of cream. The time taken for the upper slide to move a fixed distance over the lower slide was recorded.

Spreadability (S) was calculated using the formula:

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

Where:

- S = Spreadability
- M = Weight tied to the upper slide
- L = Length of glass slide moved
- T = Time taken to separate the slides

4) Homogeneity:

The homogeneity was evaluated by visually examining the formulation after preparation to ensure uniform distribution of all ingredients. A small quantity of cream was spread on a glass slide and observed for the presence of any lumps, aggregates, or phase separation.

5) Stability Test:

The stability of the cream was evaluated to determine its physical integrity and performance under different storage conditions. The formulated cream was stored at various temperature conditions such as room temperature, refrigeration temperature, and elevated temperature for a specific period of time. The samples were periodically observed for any changes in color, odour, consistency, phase separation, or precipitation.

6) Irritancy Test:

The irritancy test is an important evaluation parameter used to determine whether the formulated cream causes any skin irritation such as redness, swelling, itching, or inflammation after application.

8) Washability Test:

The washability test was performed to evaluate the ease with which the formulated antimicrobial cream can be removed from the skin surface using normal tap water. This parameter is important for topical formulations as it reflects user convenience, cleanliness, and patient compliance during routine application.

9) Phase Separation Test:

The phase separation test is performed to determine the physical stability of a cream formulation by checking whether the oil phase and aqueous phase remain uniformly mixed or separate over time under different storage conditions.

10) Zone of Inhibition Test:

The zone of inhibition of the antimicrobial cream was determined by the agar well diffusion method. After incubation of the inoculated agar plates, a clear circular area was observed around the sample application site, which indicated inhibition of microbial growth. The diameter of the zone of inhibition was measured in millimeters and used to evaluate the antimicrobial effectiveness of the formulated cream. A larger zone of inhibition indicated higher antimicrobial activity of the prepared formulation. The antifungal activity of the prepared antimicrobial cream was evaluated against *Candida albicans* by measuring the zone of inhibition using the agar diffusion method.

RESULTS:**Table no. 2 Phytochemical analysis of extract**

Sr. no	Test	Observation	Inference
1	Alkaloid	Orange color is observed	Alkaloid is present
2	Flavonoid	Reddish brown precipitate was observed	Flavonoid is present
3	Flavonoid Alkaline	Yellow color precipitate was observed	Flavonoid is present
4	Tannin	Yellowish black precipitate observed	Tannin is present
5	Saponin	Foam was formed	Saponin is Present

Evaluation of herbal Cream**Physical Evaluation of cream**

The physical appearance of the antimicrobial cream was evaluated by observing its color, odor, texture, and overall consistency.

Table no. 3 Physical Evaluation of cream

Formulation	Color	Consistency	Odour
F1	Dark yellow colour	Poor	Characteristic
F2	Yellow colour	Moderate	Characteristic
F3	Yellow color	Smooth	Characteristic

Measurement of pH

The pH meter was calibrated using standard buffer solutions of pH 4.0, 7.0, and 9.2 to ensure accuracy.

Table no. 4 Measurement of pH

Formulation	pH
F1	4.1
F2	4.3
F3	6.4

Spreadability Test**Formula**

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

Where:

- S = Spreadability
- M = Weight tied to the upper slide
- L = Length of glass slide moved
- T = Time taken to separate the slides

Calculation

$$S = 50 \times 6/5 = 60 \text{ g.cm/sec}$$

Result

Spreadability = 60 g.cm/sec

Observation

The formulated 10 g herbal antifungal cream showed good spreadability and smooth application on the glass slide.

Table no.5 Washability Test

Formulation	Observation
F1	Easily Washable
F2	Easily Washable
F3	Easily Washable

Table no.6 Phase Separation Test

Formulation	Observation
F1	No Phase Separation
F2	No Phase Separation
F3	No Phase Separation

Table no. 7 Irritancy Test

Sr. No	Parameter	Observation
1	Irritation	No
2	Mild Dryness	Yes
3	Swelling	No
4	Itching	No
5	Redness	No

DETERMINATION OF ZONE OF INHIBITION:

Antifungal study Method: Zone of inhibition

Materials and methods:

Method: Zone of Inhibition (Agar Well Diffusion Method)

Media:

For bacterial culture: Nutrient Agar (NA)

For fungal culture: Sabouraud Dextrose Agar (SDA)

Culture Used

Bacterial cultures: *Staphylococcus aureus* and *Escherichia coli*

Fungal culture: *Candida albicans*

Incubation Temperature & time

For bacteria: 37°C for 24 hours

For fungus: 25–28°C for 48 hours

Standard Drug: Streptomycin, Fluconazole

Results and conclusion:

The formulated antifungal cream containing *Moringa oleifera* leaves extract exhibited good antifungal activity and produced a measurable zone of inhibition against fungal organisms. The cream was stable, easy to apply, and showed potential as a natural alternative for the treatment of fungal skin infections. Clotrimazole showed higher activity, but the herbal cream demonstrated promising antifungal efficacy with the advantage of being plant-based and potentially having fewer side effects.

Table no. 8 Antifungal activity result

Batches	Extract %	<i>S. aureus</i> (mm)	<i>E. coli</i> (mm)	<i>C.albicans</i> (mm)
F1	1%	9–10 mm	7–8 mm	8–9 mm
F2	2%	12–14 mm	10–12 mm	11–13 mm
F3	5%	17–18 mm	15–16 mm	16–17 mm

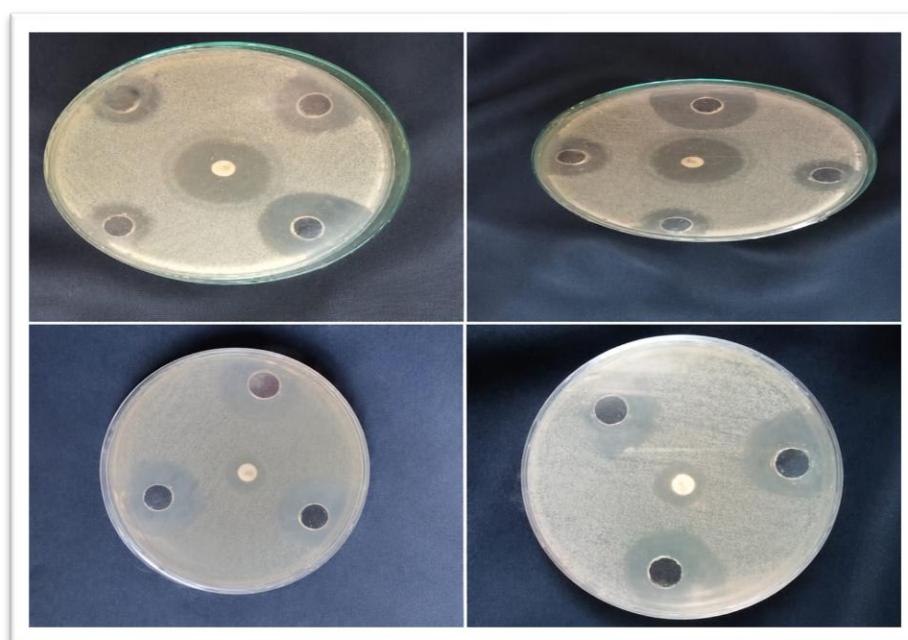


Fig no.2 Zone of inhibition

ACKNOWLEDGEMENT

We gratefully acknowledge the support and availability of required facilities from the management of Saikrupa Institute of Pharmacy. Also acknowledge the Department of Botany, Radhabai Kale Mahila Mahavidyalaya, Ahilyanagar for authentication of plant materials.

DISSCUSSION:

In this study, an antifungal cream containing *Moringa oleifera* leaf extract was successfully formulated and evaluated. The prepared cream showed good appearance, smooth texture, suitable pH, and good spreadability, making it easy to apply on the skin. Stability studies indicated that the formulation remained stable without significant changes in color, odor, or consistency. The antifungal activity test demonstrated that the *Moringa* leaf extract possesses antifungal properties and can inhibit fungal growth. These results suggest that *Moringa oleifera* leaves can be used as a natural and effective ingredient in antifungal cream formulations with fewer side effects compared to synthetic products.

CONCLUSION:

The formulation of an antifungal cream using *Moringa oleifera* extract provides a promising herbal alternative to conventional synthetic drugs. Proper selection of excipients, including emulsifiers, preservatives, and humectants, plays a crucial role in ensuring the stability, consistency, and effectiveness of the cream. Evaluation parameters such as pH, viscosity, spreadability, and antifungal activity confirm the suitability of the formulation for topical application. Furthermore, the herbal cream offers advantages such as safety, cost-effectiveness, and reduced side effects, making it more acceptable for long-term use. Although certain limitations like variability in plant constituents and stability challenges exist, these can be minimized through proper standardization and formulation techniques. In conclusion, *Moringa oleifera*-based antifungal cream represents a safe, effective, and economical approach for the treatment of fungal infections and associated inflammation, with strong potential for future research and commercial development.

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