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Original Article

Synergistic Combinations Of Natural Antifungals In The Management Of Dermatophytosis (Ringworm)

Nishika Tamrakar, Ramya Sri, Praveen Sahu*, Suchita Wamankar, Gyanesh Sahu, Chanchal Kaur

Rungta Institute of Pharmaceutical Science and Research, Bhilai, (C.G)

ABSTRACT

Fungal infections of the skin, hair, and nails represent a major global health concern, especially in tropical and subtropical regions. Increasing resistance to synthetic antifungal drugs, high cost of treatment, and side effects have encouraged exploration of plant-based alternatives. Herbal formulations containing Senna alata, neem (Azadirachta indica), and tulsi (Ocimum sanctum) have attracted attention because of their broad-spectrum antimicrobial and antifungal activities. Studies demonstrate that extracts of these plants possess bioactive compounds such as anthraquinones, terpenoids, flavonoids, tannins, and essential oils that inhibit dermatophytes, yeasts, and other sssszones ranging from approximately 12.85 mm to 20.85 mm against dermatophytes, confirming strong antifungal activity. Tulsi extracts and essential oils containing eugenol and linalool have shown effective anticandidal activity and potential for topical therapeutic use. Neem also exhibits antimicrobial and antifungal potential and is widely used in traditional medicine. A combination cream containing these botanicals may provide synergistic activity, improved efficacy, and reduced adverse effects. This review summarizes phytochemistry, antifungal mechanisms, pharmacological evidence, formulation approaches, and future prospects of herbal antifungal creams based on these three medicinal plants[1,2].

Keywords: Herbal antifungal cream, Senna alata, neem, tulsi, dermatophytes, phytochemicals, natural medicines[2].

INTRODUCTION

Fungal infections, particularly dermatophytosis, candidiasis, and pityriasis versicolor, affect millions worldwide. Warm climates, humidity, immunosuppression, and poor hygiene increase susceptibility. Conventional antifungal drugs such as azoles and allylamines are effective but may cause resistance, toxicity, or recurrence. Herbal medicine offers a promising alternative due to availability, safety, affordability, and historical therapeutic use[2,4].

Medicinal plants such as Senna alata, neem, and tulsi have long been used in Ayurveda and traditional medicine to treat skin infections, wounds, and inflammatory disorders. Scientific studies increasingly validate their antimicrobial properties. Herbal creams formulated with these plants combine traditional knowledge with modern pharmaceutical technology, providing a safe and effective treatment for fungal infection[3].

OVERVIEW OF FUNGAL SKIN INFECTIONS

Superficial fungal infections primarily affect keratinized tissues such as skin, nails, and hair. Common causative organisms include:

- Dermatophytes: Trichophyton, Micros Porum, Epidermophyton
- Yeasts: Candida albicans
- Lipophilic fungi: Malassezia furfur

Symptoms include itching, redness, scaling, and inflammation. These infections are highly contagious and often recurrent. Synthetic drugs are widely used but may lead to resistance or hypersensitivity reactions, highlighting the need for alternative therapies [3,4].

1. Ringworm

Ringworm (tinea) is a highly contagious fungal skin infection, not a worm, characterized by itchy, red,

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scaly, ring-shaped patches. Caused by mold-like parasites (dermatophytes), it spreads via direct skin-to-skin contact, pets, or contaminated items[4].

Symptoms of Ringworm :

- Skin: Red, itchy, scaly patches that may develop raised borders and a clear center (ring-like pattern).
- Scalp (Tinea Capitis): Scaly, bald patches, itching, and sometimes tender, swollen spots.
- Feet (Athlete's Foot): Cracked, flaking, and itchy skin between toes.
- Nails: Thickened, brittle, yellow, or discolored nails[17].

2. Types of Ringworm (Tinea):

- **Tinea Corporis (Body Ringworm):** Appears anywhere on the skin, often in skin folds, causing a classic ring-shaped rash with raised borders.
- **Tinea Pedis (Athlete's Foot):** Highly common, causing itching, burning, and cracked skin, particularly between the toes and on the soles.
- **Tinea Cruris (Jock Itch):** Causes a red, itchy rash in the groin area, inner thighs, and buttocks, more common in men.
- **Tinea Capitis (Scalp Ringworm):** Affects the scalp, often causing hair loss, scaly patches, and is more common in children.
- **Tinea Unguium (Nail Ringworm/Onychomycosis):** Affects fingernails and toenails, making them thick, discolored, and brittle.
- **Tinea Barbae (Beard Ringworm**): Affects the beard/mustache area in men, causing red, inflamed, or crusted patches.
- **Tinea Faciei (Face Ringworm):** Causes red, itchy, scaly patches on the face.
- **Tinea Manuum (Hand Ringworm):** Causes dry, scaly rashes or cracked skin on the palms[17,18] .

3. Factor Responsible for Ringworm

I. Causative Organisms (Primary Factors)

Ringworm is mainly caused by three genera of fungi:

- Trichophyton
  - Most common cause in humans
  - Infects skin, hair, and nails
- Microsporum
  - Commonly infects skin and hair
  - Often transmitted from animals
- Epidermophyton
  - Infects skin and nails only

These fungi feed on keratin, a protein found in skin, hair, and nails[45,26].

II. Environmental Factors

Certain environmental conditions promote fungal growth:

- Warm and humid climate
  - Common in tropical regions like India
- Excess sweating (moisture)
- Poor ventilation of skin (tight clothes, shoes)
- Wet skin for long duration [19,27].

III. Host (Human) Factors

Individual susceptibility plays a major role:

- Poor personal hygiene
- Weakened immune system
- Malnutrition
- Diabetes mellitus
- Skin injuries or cuts
- Excessive sweating (hyperhidrosis) [29,12].

IV. Source of Infection

Ringworm spreads through different sources:

a) Human-to-human (Anthropophilic)

- Direct skin contact with an infected person
- Sharing clothes, towels, combs

b) Animal-to-human (zoophilic)

- Pets like cats, dogs, cattle

c) Soil-to-human (Geophilic)

- Contact with contaminated soil [43,37].

V. Lifestyle and Behavioral Factors

- Wearing tight or synthetic clothes
- Walking barefoot in public places (gyms, bathrooms)
- Sharing personal items

- Poor drying of body after bathing [32].

VI. Other Contributing Factors

- Use of steroid creams (can worsen infection)
- Hot and sweaty occupations (laborers, athletes)
- Crowded living conditions[42].

MEDICINAL PLANTS USED IN HERBAL ANTIFUNGAL CREAM

1. Senna alata

Senna alata (syn. Cassia alata), commonly known as ringworm bush, is a tropical medicinal plant traditionally used to treat fungal skin diseases. Leaves contain anthraquinones, flavonoids, saponins, and tannins responsible for antimicrobial activity[31].

Taxonomical Identification :

Kingdom: Plantae (Plants)

Phylum/Division: Tracheophyta (vascular plants)

Class: Magnoliopsida (Dicotyledons)

Order: Fabales

Family: Fabaceae (Leguminosae)

Subfamily: Caesalpinioideae

Genus: Senna

Species: Senna alata (L.) Roxb[32].

Botanical identification :

Scientific name*: Cassia alata L.*

Family : Leguminosae

Common Names: Candle Bush, Candle Cassia, Ringworm Bush, Empress Candle Plant[26].

Appearance:

Colour: Senna alata : bright yellow vibrant green leaves

Taste : spicy, warm, and slightly bitter

Texture : thinly leathery texture[26].

Native Habitat: Originally from South America, now widely distributed throughout the tropics (pantropical) . Native to the Amazon Rainforest, it is now found in tropical regions worldwide, including Africa, Asia, Australia, and the Caribbean.

Growth Environment: It thrives in sunlit and humid environments and is often used as an ornamental plant[37,22].

Medicinal Uses: Known for antifungal properties, particularly in treating ringworm, eczema, and skin infections[37].

Safety and Toxicity :

1. **Acute Toxicity:** Studies in rats and mice show high safety levels, with lethality (LD50) often observed only at extremely high doses (e.g., >2000 mg/kg), classifying it as practically non-toxic at therapeutic levels.

2. **Sub-acute/Sub-chronic Toxicity**: Oral administration of leaf extract at doses (e.g., 250–1000 mg/kg) for 14-15 days did not show significant toxicity to liver or kidney functions, with no significant alterations in hematological parameters.

3. **Adverse Effects:** Known adverse effects in humans and animals, typically from excessive intake, include diarrhea. Some studies reported high-dose concerns such as elevated creatinine levels or mild behavioral changes in animals.

4. **Use Warnings:** S. alata acts as a potent laxative and, according to, can cause severe diarrhea. Some studies also suggest it may have abortifacient properties, making it unsuitable for use during pregnancy[37,38].

Fig.1: Senna alata.

2. Neem (Azadirachta indica)

Neem is widely used in traditional medicine for its antimicrobial, anti-inflammatory, and wound-healing properties. Leaves, bark, seeds, and oil contain bioactive compounds such as azadirachtin, nimbin, quercetin, and limonoids[24].

Taxonomic Identifucation :

Kingdom: Plantae

Order: Sapindales

Family: Meliaceae (Mahogany family)

Subfamily: Melioideae

Genus: Azadirachta

Species: A. indica

Botanical Identification:

Scientific name: *Azadirachta Indica A.Juss.*

Family : Meliaceae

Common name: Nimtree , Neem , Margose , Indian lilac [19].

Appearance:

Colour : dark green

Taste : extremely bitter

Texture: smooth & glossy [19].

Native Habitat and Characteristics :

Origin: Native to the Indian subcontinent, including India, Pakistan, Bangladesh, Sri Lanka, and Nepal.

Climate: Thrives in tropical and semi-tropical climates, known for being drought-resistant, long-lived (150–200 years), and able to grow in arid conditions with minimal water.

Habit: A fast-growing, large, evergreen tree with a thick, rounded canopy that provides significant shade[20,29].

Medicinal Uses : Every part of the neem tree—leaves, bark, flowers, fruits, seeds, and oil—is used for therapeutic purposes[15].

Safety and Toxicity :

1. **Topical Use (Skin/Hair):** Generally safe to use on skin or hair in creams or oils for up to 2 weeks.
2. **Short-term:** Low doses (e.g., 60 mg bark extract) for up to 10 weeks are likely safe for adults.
3. **Long-term/High doses:** Unsafe; can cause serious liver and kidney damage.
4. **Toxicity in Children:** Very high risk. Small amounts (5–30 mL) of neem oil have caused severe, sometimes fatal, poisoning in infants and children (vomiting, seizures, brain damage).
5. **Reproductive Safety**: Likely unsafe during pregnancy, as it can cause miscarriages. It may also decrease fertility in both men and women.
6. **Environmental Toxicity:** Neem oil is a broad-spectrum pesticide that can harm beneficial insects like butterflies and ladybugs, though it is often considered safe for bees if not sprayed directly on them.
7. **Contamination Risk**: Improperly stored neem seeds can produce highly toxic aflatoxins[1615].

Fig .2: Azadirachta indica.

3. Tulsi (Ocimum sanctum)

Tulsi is an aromatic medicinal herb belonging to the Lamiaceae family. It contains essential oils rich in eugenol, methyl chavicol, linalool, and other terpenoids[22,23].

Taxonomic Identification of Tulsi:

Kingdom: Plantae

Division: Angiosperms (Magnoliophyta)

Class: Magnoliopsida

Order: Lamiales

Genus: Ocimum

Species: O. tenuiflorum L. (commonly O. sanctum)[38].

Botanical Identification:

Scientific name*: Ocimum basilicum L.*

Family: Lamiaceae

Common name : Tulsi , Basil [4].

Appearance:

Colour: green, but some varieties are purple

Taste: a combination of sweet, peppery, and slightly minty

Texture: slightly glossy [3].

Native Habitat and Characteristics :

Region: Indigenous to India, Malaysia, Australia, West Africa, and some Arab countries.

Environment: Prefers warm, humid environments; commonly found in wastelands and as an undershrub in forests.

Adaptability: It is highly adaptable, often cultivated in home gardens and near temples.

Growing Conditions: Thrives in full sun within moist, well-drained soil, though it can tolerate varied soil types[26,45].

Medicinal Uses : anti-inflammatory , treat respitatory tract infection lower stress and antioxidant properties[33].

Safety and Toxicity :

Pregnancy & Fertility: Avoid high doses, as it may cause miscarriage or affect fertility.

Bleeding Disorders/ Surgery: Because it may slow blood clotting, avoid usage two weeks before surgery.

Diabetes: It can lower blood sugar; monitor glucose levels closely if taking medication.

Hypothyroidism: It may lower thyroid hormone levels, potentially worsening hypothyroidism.

"Pitta" Imbalance: Excessive consumption may cause a burning sensation, acidity, or skin irritation[33,16].

Fig. 4 : Ocimum sanctum.

4. Phytochemical Constituents Responsible for Antifungal Activity

The antifungal properties of herbal extracts are attributed to diverse phytochemicals:

Plant	Major Compounds	Antifungal Role
Senna alata	Anthraquinones, flavonoids, saponins	Membrane disruption, enzyme inhibition
Neem	Limonoids, azadirachtin, flavonoids	Cell wall damage, growth inhibition
Tulsi	Eugenol, linalool, terpenoids	Ergosterol disruption, oxidative stress

Terpenoids in plants are known to possess antimicrobial activity against pathogenic fungi, including Candida and dermatophytes[9,10].

5. Synergistic Combinations: Rationale and Mechanism

Synergy occurs when combined agents produce a greater therapeutic effect than either alone. Combining herbal extracts with conventional antifungals offers several advantages .

- Enhanced antifungal potency

- Reduced dosage requirements

- Lower toxicity and improved safety

- Slower development of drug resistance

- Faster symptom recovery and lower relapse rate [18] .

I. Mechanism of action Antifungal Agent:

A. Ergosterol Inhibition / Cell Membrane Disruption

Drug enters fungal cell

↓

Inhibits ergosterol synthesis (e.g., azoles block the 14-α demethylase enzyme).

↓

Decreased ergosterol content in the cell membrane

↓

Alteration of membrane structure and fluidity

↓

Increased membrane permeability

↓

Leakage of essential intracellular components (ions, proteins)

↓

Fungal cell death[33,2]

B. Cell Wall Synthesis Inhibition

Antifungal drugs target fungal cell walls.

↓

Inhibition of β-(1,3)-glucan synthesis (by echinocandins)

↓

Weakening of cell wall structure

↓

Loss of cell integrity

↓

Osmotic imbalance

↓

Cell lysis

↓

Fungal cell death[46,12].

C. Nucleic Acid Synthesis Inhibition (Optional third mechanism)

Drug enters fungal cell

↓

Converted into active metabolite (e.g., flucytosine → 5-FU)

↓

Inhibits DNA/RNA synthesis

↓

Blocks protein synthesis

↓

Cell death[39].

EXCIPIENT & METHODOLOGY:

1. Excipient :

- **Borax**

Borax acts as an essential emulsifier and stabilizer in vitiligo cream formulations, enabling the blending of oily herbal extracts with water-based components to create a smooth, consistent texture[38].

- **Stearic acid**

Stearic acid acts as a crucial emulsifier and thickener in vitiligo cream, creating a stable, smooth, and luxurious texture that ensures uniform application of active ingredients[41].

- **Liquid paraffin**

Liquid paraffin acts as an occlusive emollient in vitiligo creams, forming a protective, non-greasy

barrier that seals in moisture to alleviate dryness in depigmented patches[37,14].

- **Glycerin (Glycerol):**

Glycerin acts as a humectant, providing moisturizing properties to the skin by retaining water[39].

- **Xanthan gum** :

Xanthan gum is a common food additive made from sugar fermented by bacteria. It acts as a binder, thickener, and stabilizer to improve texture and keep ingredients from separating. As an emulsifier, it helps things such as oil and water mix[18].

- **Triethanolamine (TEA):**

Is often acts as a pH adjuster or neutralizer, commonly used to neutralize carbomer resin (a thickener) to create a clear, stable gel. It can also behave as an emulsifier[20].

- **Methylparaben:**

A popular preservative used to prevent the growth of bacteria and mold in personal care products, ensuring safety and extending shelf life[28,40].

- **Distilled water**

Distilled water acts as a high-purity, contaminant-free solvent that ensures stability and prevents unwanted chemical reactions in vitiligo cream formulations[33].

2. Methedology:

2.1. Drying and Powdering

Fresh leaves of Senna alata, Neem (Azadirachta indica), and Tulsi (Ocimum sanctum) are collected.

⇩

The leaves are thoroughly washed with distilled water to remove dust and impurities. They are then shade-dried at room temperature until completely moisture-free. The dried leaves are ground into coarse powder using a grinder and stored in airtight containers for further extraction[43].

2.2. Extraction of Plant Materials (Hot Water Extraction / Decoction)

The powdered plant materials are taken in a beaker and mixed with distilled water in a ratio of 1:10 (w/v).

⇩

The mixture is heated at 60–70°C for about 1 hour to extract the active phytochemicals[7,19].

Figure 5 : Decoction method

Decoction method : A decoction is a method of herbal extraction, and sometimes coffee brewing, that involves boiling tough plant materials—such as roots, bark, seeds, and twigs—in water for 15-45 minutes to extract active ingredients such as Senna alata , Ocimum basilicum , Azadirachta indica etc[7].

⇩

After heating, the extract is filtered through muslin cloth to remove plant residues.

⇩

The filtrate is then concentrated on until a semi-solid extract is obtained. This concentrated extract is used for the cream formulation[38].

Figure 6 : Filtration of extract

2.3. Formulation Procedure

A. Preparation of Oil Phase

Stearic acid, Xanthan gum, liquid paraffin, and Borax are taken in a beaker.

⬇

The mixture is heated in a water bath at 70–75°C until all components melt and form a homogeneous oil phase[39].

Figure 7: oil phase preparation

B. Preparation of Aqueous Phase

In another beaker, distilled water, glycerin, and preservative are taken.

⬇

The mixture is heated up to 70–75°C

⬇

Triethanolamine (TEA) is then added slowly with gentle stirring to maintain proper emulsification[27,36].

Figure 8: aqueous phase preparation

2.4. Incorporation of Herbal Extracts

The prepared Senna alata extract, neem extract/oil, and extract tract are added to the hot aqueous phase.

⬇

The mixture is stirred properly to ensure uniform dispersion of the herbal components[13].

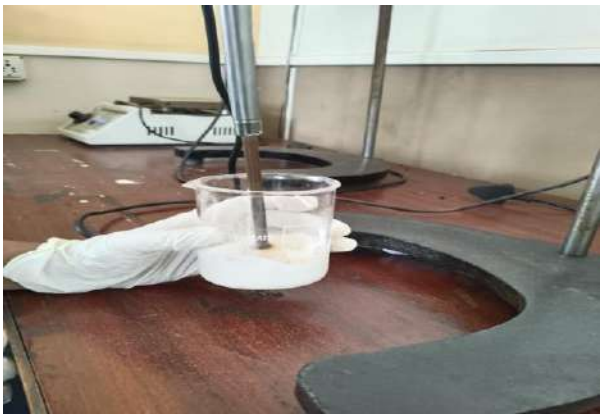


Figure 9 : Mixing of cream with Homogenizer

2.5. Emulsification

The aqueous phase is slowly added to the oil phase with continuous stirring[41].

⬇

The mixture is stirred using a magnetic stirrer or mechanical stirrer for about 20–30 minutes until a smooth cream emulsion is formed[33].

2.6. Cooling

The cream is allowed to cool gradually to room temperature while stirring continuously to prevent phase separation and ensure a stable formulation[31].

⬇

2.7. Addition of Fragrance

A few drops of essential oil (such as lavender or eucalyptus) are added to the cooled cream and mixed gently to provide a pleasant fragrance[12].

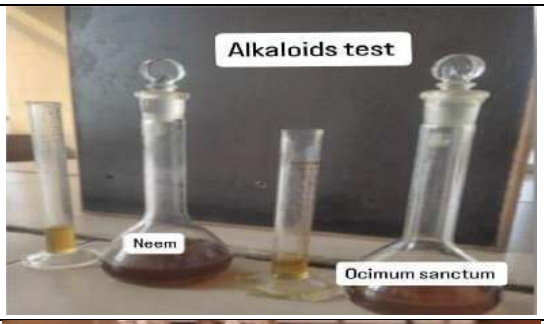
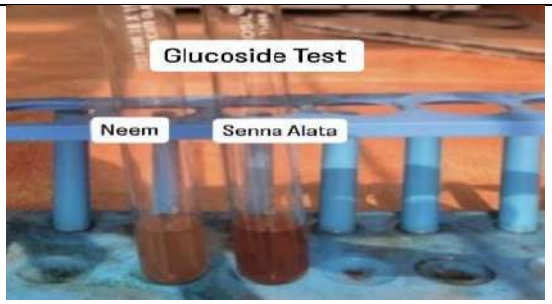
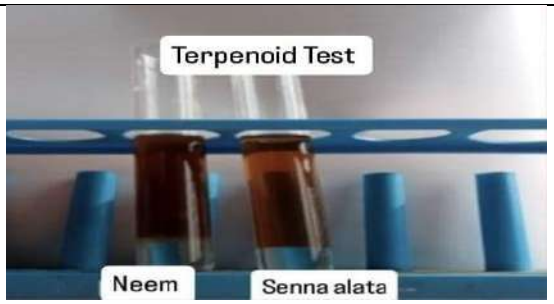
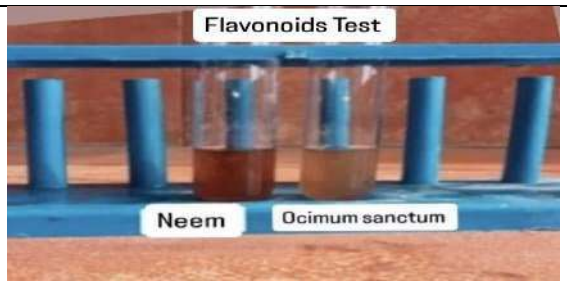
⬇

2.8. Packaging

The final herbal cream is transferred into sterilized airtight containers or collapsible tubes and stored for further evaluation and use[48].

EVALUATION:

1: Evaluation of Bioactive compounds :

TESTS	OBSERVATION		INFERENCE
1)ALKALOID a) Heger Test b) Take 2 ml of extract sample and add 2,3 drops of picric acid.	Yellow ppt and yellow stain.		Alkaloid is present and confirmed.
2)GLYCOSIDE a)Test for Cardiac b)Take 2ml of extract sample and add 2ml of glacial acetic acid and add 2,3 drops of FeCl2 and add 1 ml conc.H2So4.	Brown ring		Glycoside is present And confirmed.
3) TERPENIOD a)Salkowski test b)Take 5ml of extract &2ml of chloroform & add 3ml of conc. H2SO4	Separate into 2 layer		Terpenoid is present &confirmed
4)FLAVONOID a)Alkaline reagent test b)2ml extract & add few drops of NaOH solution.	Tulsi instantaneously converts into yellow but neem does not		Flavonoid present in Tulsi but not present in neem

2. Evaluation parameter of cream :

a) Organoleptic evaluation :

- Physical properties such as color, odour and texture was examined by visual inspection.
- Color: the color of cream should be off whiter.
- Odour : it should have mild fragrance.
- Texture :smooth texture without any lumps[49,45].

b) pH determination :

- 1 gm of cream is dissolved in 10 ml of distilled water; then ,using digital pH meter, the pH is checked .The pH should be around 5.5 --6.5, which is close to the normal pH of the skin[34].

c) Spreadability :

- About lg of each sample was weighed and placed at the centre of glass plate, another glass plate was placed over it carefully. Above the glass plates, 2 kg weight was placed at the centre of plate to avoid sliding of plate. the diameter of the paste in cm was measured after 30 minutes. The experiment was repeated 3 times & the averages was reported for all the samples[9,4].

d) Washability:

- After applying cream to the hand, it should be easily removed with a stream of water. resulting in less oily hands[4,9].

ADVANTAGES OF COMBINATION HERBAL CREAM:

Combination formulations offer several benefits:

Antifungal herbal creams offer a natural, effective, and safer alternative to synthetic treatments for skin infections like ringworm and athlete's foot, often causing fewer side effects and less skin irritation. They utilize natural, bioactive compounds (e.g., neem and tea tree oil) to disrupt fungal cell walls and provide additional benefits like anti-inflammatory, antioxidant, and soothing effects[24].

- Synergistic antifungal activity
- Broad-spectrum efficacy
- Reduced resistance risk
- Lower toxicity
- Cost-effectiveness
- Cultural acceptance

The presence of multiple active compounds ensures multitarget action against fungi[24,48].

FUTURE PERSPECTIVES:

Future research directions include:

• **Nanotechnology Integration**: Using nanocarriers like nanoemulsions, ethosomes, and liposomes to enhance the solubility and stability of herbal compounds.

• **Poly-herbal Formulations**: Combining multiple plant extracts (e.g., tea tree oil, neem, clove) for synergistic, stronger antifungal action against resistant strains.

• **Targeted Drug Delivery**: Utilizing nanohydrogels that deliver active compounds directly to the deep layers of the skin, maximizing impact on infections.

• **Improved Safety Profile**: Offering natural, eco-friendly, and less irritating alternatives to synthetic antifungals like azoles.

• **Scientific Validation**: Moving from anecdotal evidence to rigorous clinical trials to establish efficacy and standardize formulations.

The development of standardized herbal formulations may provide affordable antifungal therapies worldwide[16,19].

RESULT :

A comprehensive analysis of that herbal formulations containing Senna alata, Azadirachta indica (Neem), and Ocimum sanctum (Tulsi) exhibit significant antifungal potential and are widely investigated for topical applications[3,17].

Senna alata: Rich in anthraquinones (chrysophanol, rhein) known for strong antifungal action

Neem: Contains nimbidin and azadirachtin with broad-spectrum antimicrobial activity.

Tulsi: Contains eugenol andand ursolic acid, contributing to antifungal and anti-inflammatoeffects.ets[13,17].

The combination of these phytochemicals suggests a synergistic antifungal effect. The herbal antifungal cream showed good physical stability and acceptable pH[37,10].

It demonstrated effective antifungal activity, though slightly lower than the standard drug.

No irritation was observed, confirming safety for topical use. The formulated herbal antifungal cream is stable, safe, and effective against fungal infections like ringworm and can be considered a promising natural alternative to synthetic antifungal agents[11].

DISCUSSION :

Ringworm is a common fungal infection of the skin mainly caused by dermatophytes such as Trichophyton, Microsporum, and Epidermophyton

species. Conventional antifungal drugs are effective but may produce side effects, resistance, or recurrence after prolonged use. Therefore, herbal formulations have gained attention due to their safety, affordability, and therapeutic potential[14].

In the present study, an herbal antifungal cream was formulated using extracts of Senna alata, Tulsi, and Neem, which are well known for their antimicrobial and antifungal properties. The formulation aimed to combine the therapeutic benefits of these medicinal plants to enhance antifungal activity against ringworm infection[7].

Senna alata is traditionally used in many tropical countries for the treatment of fungal skin infections and is commonly known as the "ringworm plant." The leaves contain bioactive constituents such as anthraquinones, flavonoids, and phenolic compounds that exhibit significant antifungal activity against dermatophytes[16].

Neem (Azadirachta indica) possesses strong antifungal, antibacterial, and anti-inflammatory properties. Its active components, such as nimbidin, azadirachtin, and quercetin, help

inhibit fungal growth and reduce inflammation and itching associated with ringworm infections[13].

Tulsi (Ocimum sanctum) is widely used in traditional medicine due to its antimicrobial and antioxidant properties. It contains compounds such as eugenol and ursolic acid that contribute to its antifungal action and help in soothing irritated skin[24].

The formulated cream was evaluated for parameters such as appearance, pH, spreadability, viscosity, homogeneity, washability, and antifungal activity. The formulation showed acceptable physicochemical properties with good consistency and stability. The pH of the cream was found to be compatible with skin pH, indicating that it is safe for topical application[22].

The antifungal evaluation demonstrated that the herbal formulation exhibited inhibitory activity against fungal pathogens responsible for ringworm infection. The synergistic effect of Senna alata, neem, and tulsi may enhance the overall antifungal efficacy of the formulation[19].

Overall, the results suggest that the prepared herbal antifungal cream has potential as an effective and safe alternative for the treatment of ringworm infections. Further studies such as clinical trials, stability studies, and large-scale production are recommended to confirm its therapeutic effectiveness and commercial feasibility[16,18].

CONCLUSION

Herbal antifungal creams containing Senna alata, neem, and tulsi represent a promising alternative to conventional antifungal drugs. Scientific evidence confirms that these plants possess potent antifungal properties due to diverse phytochemicals. Experimental studies demonstrate significant inhibition of dermatophytes, yeasts, and other pathogenic fungi, supporting their traditional use. Combination formulations may enhance efficacy through synergistic action and reduce the risk of resistance. With further pharmacological and clinical validation, such herbal creams could become effective, safe, and economical treatments for fungal infections [12,14].

The present study concluded that the herbal antifungal cream formulated using Senna alata, Ocimum sanctum (Tulsi), and Azadirachta indica (Neem) demonstrated promising antifungal potential. These medicinal plants are well known for their natural antimicrobial, anti-inflammatory, and skin-protective properties, which contribute to their effectiveness in managing fungal skin infections such as ringworm[14].

The formulated cream showed satisfactory physicochemical characteristics, including good consistency, spreadability, homogeneity, and stability. The presence of bioactive compounds such as flavonoids, tannins, and phenolic compounds in these plant extracts may be responsible for the observed antifungal activity. The formulation also offers the advantage of being safer and having fewer side effects compared to synthetic antifungal agents[19].

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