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A Review on Herbal Antifungal Creams: Efficacy, Mechanisms, and Future Prospects in Dermatological Therapy

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ABSTRACT
Fungal infections, ranging from superficial skin conditions to life-threatening systemic diseases, present a growing global health challenge. The rise in fungal resistance to conventional antifungal agents, coupled with an increasing number of immunocompromised individuals, underscores the urgent need for novel antifungal therapies. This review explores the current landscape of antifungal treatments, including traditional agents such as azoles, polyenes, and echinocandins, as well as emerging alternatives like novel small molecules, biologics, and immunotherapies. It discusses the mechanisms of action, resistance patterns, and clinical effectiveness of these therapies, as well as recent advancements in antifungal drug discovery. The review also highlights the ongoing efforts to improve drug delivery systems, minimize side effects, and overcome resistance through combination therapy strategies. Finally, it emphasizes the need for continued research to better understand fungal pathogenesis, resistance mechanisms, and host-pathogen interactions in order to design more effective and targeted antifungal treatments for diverse patient populations.

Keywords: Superficial skin, Conventional, Therapies.

1. INTRODUCTION

One of the main causes of skin diseases in the globe is fungus infection. In emerging and undeveloped nations, an estimated 40 million individuals are infected with fungi. During the first stage, fungi often target the skin's surface before desquamating their way into the deeper layer. One of the fungi that cause the most superficial skin infections is Candida species.
The idea of cosmetics and beauty is as old as civilization and humanity. Indian herbs and their importance are well-known around the world. Herbal cosmetics are becoming more and more popular worldwide and are a priceless gift

from nature. Because of their potent activity and very low or non-existent side effects, herbal formulations have always garnered a lot of attention consequences of synthetic medications. Herbal cosmetics are characterized as cosmetics that contain herbal ingredients that have desired physiological activity, such as rehabilitation, smoothing appearance, boosting, and conditioning qualities. The use of herbs in the manufacturing of cosmeceuticals has grown significantly in the personal care sector in recent years, and demand for herbal cosmetics is high. Cosmetics are materials designed to be applied to the human body in order to change look, promote attractiveness, cleanse, and beautify it without compromising the structure or functions of the body. However, the use of synthetic materials has long been detrimental to both our environment and young people. Numerous chemicals, dyes, and synthetic substances have been linked to a number of skin conditions with a wide range of adverse consequences. As a result, we are making every effort to use herbal cosmetics. The foundational principles of skin care cosmetics are found in the homeopathic, Yajurveda, Ayurvedic, Unani, and Rig Vedic medical systems. These are goods that include crude or extracted forms of plants. These herbs ought to possess a range of qualities, including antibacterial, anti-inflammatory, antiseptic, emollient, anti-seborrheic, and antixerotic action. Cosmetics are designed to combat acne, minimize wrinkles, and regulate oil production. Formulations such as skin protection, sunscreen, antiacne, antiwrinkle, and antiaging are made with a variety of natural and synthetic components to treat different kinds of skin conditions. Tulsi oil is a polyherbal ingredient in the cream. These herbs were chosen using a scientific rationale and a traditional method with contemporary applications. When used consistently, a herbal cream that effectively protects skin and is devoid of toxicity, toxic residue, and inflammation should also be aesthetically pleasing.

1.1 Fungi

"Fungi are a kingdom of heterotrophic, typically multicellular eukaryotic organisms that play a significant role in the cycling of nutrients within an ecosystem."

Types of Fungi

- Chytridiomycota
- Zygomycota
- Glomeromycotan
- Ascomycota

➢ **Chytridiomycota:**

Chytrids, which belong to the Chytridiomycota, are mostly asexual creatures that use flagella, which are tiny appendages that resemble tails, to create spores. Because it burrows beneath the frogs' skin, it can infect them with fungi.

➢ **Zygomycota:**

The majority of these are terrestrial. They grow on human feces, which causes problems.

➢ **Glomeromycotan:**

Soil contains them. In exchange for the sugar that the plant provides, the fungus breakdown nutrients in the soil to offer the plant nutrition. Additionally, this fungus reproduces asexually.

➢ **Ascomycota:**

These are plant and animal pathogens that can infect people as well. They cause diseases including ringworm, athlete's foot, and ergotism, which can induce vomiting, convulsions, and hallucinations. And occasionally even demise.

Fungal Infection

A fungal-induced inflammatory disease. mycosis. In medicine, zymosis refers to the emergence and dissemination of an infectious illness, particularly one brought on by a fungus. Blastomycosis is one of numerous skin or mucus membrane disorders brought on by Blastomycosis.

(Fig 1 Fungal Infection)

Type of fungal infection

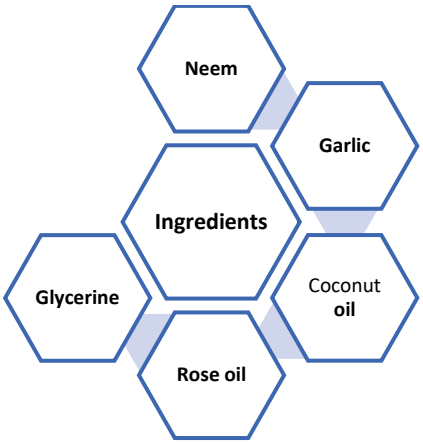
- **Superficial:**

Impact the mucous membranes of the skin. For instance, fungi that impact the keratin layer of skin, hair, and nails are known as tinea versicolor dermatophytes. For instance, ringworm infection and tinea pedis Candida infections include nail infections, vulvo-vaginitis, oral thrush, and yeast-like conditions.

- **Deep infections:**

Cause pneumonia, endocarditis, and meningitis by affecting internal organs such as the heart, brain, and lungs.

INGREDIENTS



- **Neem**

There are several ways to treat fungal diseases with neem (Azadirachta indica), which has antifungal qualities. Neem contains compounds called nimbidin and nimbolide, which have antifungal qualities. They function by lysing bacterial and fungal cell membranes.

(Fig 2 Neem)

- **Garlic**

Since 3,000 BC, people have been growing garlic (Allium sativum L.) as a spice and medicinal vegetable all across the world. Garlic's primary ingredient, allicin, is responsible for the majority of its biological properties, including its bactericidal, antifungal, and antiviral properties.

(Fig 3 Garlic)

- **Coconut oil**

Medium-chain fatty acids found in coconut oil, such as lauric, capric, and caprylic acids, have the ability to damage bacterial, viral, and fungal cell membranes.

(Fig 4 Coconut oil)

- **Rose oil**

Geraniol that, citronellol, and nerol are some of the chemical components in rose oil that give it its antifungal qualities. The combined actions of these elements may aid in the battle against fungus and bacteria.

(Fig 5 Rose Oil)

- **Glycerine**

Glycerine competes with bacteria and fungus for the available water. The glycerine prevents the growth of bacteria and fungus by drawing water out of them through a hygroscopic effect.

(Fig 6 Glycerine)

1.2 EVALAUATION OF CREAM

- **Physical Properties**:

The cream's colour, smell, and look were assessed.

- **Stability studies:**

Drug product stability testing starts during the drug development process and concludes when the chemical or commercial product fails. Stability studies were conducted in accordance with ICH recommendations to evaluate the stability of the medication and formulation. The ICH criteria were followed for conducting the stability investigations. The cream was placed in a bottle and stored in a humidity chamber for a month at 30 ± 2°C and 65 ± 5% relative humidity and 40 ± 2°C and 75 ± 5% relative humidity.

- **Determination of pH**:

A precise weight of 0.5 ± 0.01g of the cream was measured in a 10-milliliter test tube. 4.5 millilitres of water were added, and the cream was dissolved in it. Using a pH meter, the suspension's pH was measured at 270 C.

- **Patch Test:**

On a piece of cloth or funnel, 1-3 grams of the item to be tested were put to the skin's sensitive area, such as the region behind the ears. One square meter of skin was treated with the cosmetic under test. Additionally, control patches were used.

After a day, the patch location is examined.

- **Spread ability Test:**

Having strong spread ability is a crucial need for semisolids. "The word "spread ability" refers to the size of the region that the cream easily covers when applied to the skin. The spreading value of a formulation also affects its medicinal effectiveness. A specialized device has been created to investigate the formulations' spread ability. Spread ability is defined as the "time in seconds" it takes for two slides to separate from the formulation when a specific force is applied. The better the spread ability, the shorter the time it takes to separate the two different batches.

- **Test for microbial growth in formulated creams:**

Using the streak plate method, the produced creams were inoculated into the agar medium plates, and a control was made by leaving the cream out. The plates were put in the incubator and left there for twenty-four hours at 37.0°C. Plates were removed after the period of incubation, the and the microbial growth was examined by contrasting it with the control.

MARKET FORMAULATION

S,no	Marketed Product	Composition
01	Canesten Anti-fungal cream	Cotrimoxazole
02	Miconazole Nitrate IP 2.00%, Cream	Miconazole Nitrate
03	Dufine	Amorolfine Hydrochloride
04	Fungase	Cotrimoxazole
05	Tetmosol Plus Cream	Terbinafine Hydrochloride
06	Marhamdad Anti-Fungal Cream	Zincum Oxydatum, and Sulphanilamide
07	Ketineal	Ketoconazole

FUTURE PROSPECTS

With novel antifungal drugs and methods being created to treat fungal infections, the prospects for the development of antifungal creams is bright.

The most prevalent problem with skin health worldwide is fungal skin infections. Topical or systemic antifungal treatment is frequently used to treat fungal infections. Because topical fungal medication is more focused and has fewer adverse effects, it is typically recommended. Because of their unique structural and functional characteristics, advanced topical carriers are able to overcome biopharmaceutical issues including inadequate bioavailability and poor retention that are linked to traditional drug delivery methods. According to published research, topical nanocarriers containing antifungal drugs exhibit a better therapeutic response with less toxicity. Solid-lipid nanoparticles, microemulsions, liposomes, niosomes, micro sponge, nanogel, nano emulsion, micelles, and others are examples of nanocarriers that are often utilized for topical antifungal drugs. Recent developments in innovative techniques used in topical carriers to enhance the therapeutic efficacy of antifungal medications are included in this study. Toxicology, drug-drug interactions, and developing resistance are some of the drawbacks of the antifungal medications on the market today. These restrictions may cause patients to have unfavourable results.

CONCLUSION

The potential of plant extracts for cosmetic applications is the main focus of this work. The personal care system now employs cosmetics for many more purposes. The use of bioactive substances in cosmetics affects the biological processes of the skin and supplies the nutrients required for healthy skin. Throughout the research period, the produced formulations demonstrated high consistency, good spread ability, and no signs of phase separation. Stability measures such as the formulations' visual appeal, natural fluctuation during the research period, and scent demonstrated that there were no appreciable changes over that time. The effects of several fungal skin diseases on human skin were thoroughly examined. The numerous benefits and uses of antifungal nanocarriers mentioned above undoubtedly suggest that nanocarriers have the potential to completely transform the food and pharmaceutical industries. Nanohydrogels are the most versatile of all nanocarriers, and creating functional nanohydrogels for antifungal applications using natural polymers is generally seen as a safer and more sustainable method. A variety of essential oils and plant-based biopolymers may be added to nanohydrogels to create useful components for a range of fungal skin conditions.

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