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RESEARCH ARTICLE

Development of Herbal Cream with Antifungal Properties for the Treatment of Fungal Infections

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ABSTRACT

Assessing skin and soft-tissue infections can be difficult. Turmeric, neem, and *Terminalia arjuna* bark possess significant antioxidant, anti-inflammatory, antibacterial, and antifungal activities, which substantially diminish fungal infections. The objective of the study was to develop an environmentally friendly antiseptic cream by utilizing turmeric, neem extract, *T. arjuna* bark, castor oil, coconut oil, and glycerine as a natural preservative, along with fish oils. The physicochemical qualities of the herbal antiseptic cream, a thick semisolid substance, were examined. These features included color, odor, pH level, ability to be squeezed out, thickness, capacity to spread, ability to dissolve, and ability to be washed off. The study conducted antimicrobial activity tests against Tinea species and fungus in microbiological culture and determined that eco-antifungal cream is compatible. The zone of inhibition was determined and administered to individuals with Tinea psoriasis. The product's quality assessment revealed no observable alterations, appropriate pH levels, commendable spreadability, uniformity, and efficacy in addressing skin infections in patients. The viscosity of creams is directly proportional to the shear rate, meaning that as the shear rate decreases, the cream viscosity increases. Stability analyses were performed on creams containing plant extracts, which exhibited antifungal characteristics and could function as a protective shield against fungal infections.

Keywords: Antifungal activity, fish oils, neem extracts, tinea species, turmeric powder

INTRODUCTION

Infections caused by fungi are prevalent in the natural world. Fungal infections in humans arise when a fungus colonizes a specific region of the body and becomes challenging for the immune system to combat. Various types of fungi exist, including both beneficial and detrimental ones. Harmful fungi can penetrate the body, making it challenging to eliminate them completely. Moreover, they can persist in the environment and potentially re-infect individuals who are recovering from an infection. Chlorphenesin (CHL) is a powerful antifungal substance found in many topical treatments used for dermatological therapy. It can fight against fungal infections and also has antibacterial capabilities. This chemical is topically applied to treat numerous skin disorders, including small and uncomplicated dermatophytic infections.[1]

Throughout history, humans have utilized plants for medical purposes, dating back to the time of the Vedic empire. These plants have been employed to either cure or efficiently treat a wide range of maladies. Infectious diseases can originate from a diverse range of causes, such as bacteria, viruses, parasites, fungi, prions, worms, and helminths. In the past, bacterial infections were the most perilous pathogens, but now fungi have become the most detrimental pathogens. This evolved as

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the methods for managing patients with bacterial infections progressed.[2] Various antifungal drugs are available in the form of topical therapies, such as creams, ointments, and powders, which can be bought for local dermatological treatment. CHL is an antifungal agent that also has antibacterial properties. Locally, it is utilized for treating different skin infections and mild cases of dermatophytes.[1] Mycoses, or fungal infections, occur when one or more types of fungi invade tissues. They can cause superficial, regional, or deeper tissue infections, as well as potentially life-threatening blood (septicemia), lung, or systemic illnesses. Several topical antifungal medicines have effectively cured numerous dermatological skin infections. Antifungal drugs can be obtained in different forms, including sprays, gels, lotions, and creams, as stated by Lee and Maibach.[3] Systemic and topical antifungal drugs are commonly used as alternatives to therapy. However, some patients may decide to discontinue treatment with oral antifungals due to their negative side effects, which may lead to the development of other medical disorders.[4] The initiative is to create and assess an herbal cream with antifungal properties for the treatment of superficial fungal infections, achieving optimal therapeutic levels upon topical application.

MATERIALS AND METHODS

Materials

Benzoic acid, vaseline, betamethasone, nicotinamide, castor oil, coconut oil, and glycerine were obtained from the Local Chemical Market in Lucknow, Uttar Pradesh. *Azadirachta indica* extract, *Vachellia nilotica* paste, *Terminalia arjuna* bark, fish oils, and *Curcuma longa* powder were collected from the local area of Jankipuram, Lucknow (Uttar Pradesh).

Extraction of *A. indica* Extract

The newly harvested foliage of the *A. indica* plant was gathered, meticulously cleansed, air-dried in the shade, and subsequently sliced into little fragments. Place 10 g of the leaves into a 250 mL volumetric flask. Add 150 mL of water and evaporate the mixture for 10 min at a temperature of 35–40°C. Finally, collect the resulting fraction.

Extraction of *V. nilotica* Paste *T. arjuna* Bark and *C. longa* Powder

The bark of *T. arjuna* and the plant *C. longa* were gathered, purified, and dehydrated to produce a paste and powder. The powder underwent maceration in boiling distilled water for 20 min, followed by centrifugation at a force of 3500 g for 15 min. The supernatant was evaporated, and the *Oxalis corniculata* was introduced into the cream base and stored in an appropriate container.

Preparation of Antifungal Herbal Cream

The antibacterial cream was prepared using benzoic acid as the basis material. The *A. indica* extract, *V. nilotica* paste, *T. arjuna* bark, *C. longa* powder, betamethasone, and nicotinamide were combined with benzoic acid and thoroughly mixed at room temperature for 20 min. The emulsion was prepared by adding glycerine, castor oil, coconut oil, and vaseline, and continuously stirring until it cooled [Table 1].

In Vitro Antimicrobial Studies

A study was carried out to examine the antibacterial efficacy of a fungal strain in a sample taken from a patient's illness. The fungal strains were propagated by inoculating a single colony onto nutritional broth and incubating it at 37°C for 1 day. The medium was sterilized using an autoclave and then poured onto Petri plates to produce 75 mL of solid media. The efficacy of antibacterial medicines was assessed using the antigen diffusion method. The respective wells were filled with herbal antifungal cream, while distilled water served as the negative control and cefixime as the positive control. The diameter of the area where the antifungal cream prevented the growth of microorganisms was measured and compared to cefixime.[5]

Table 1: Ingredients required for the formulation

Ingredients	Quantity (%)
Benzoic acid	10
Vaseline	5
Betamethasone	1
Nicotinamide	1
Castor oil	5
Coconut oil	20
Azadirachta indica extract	2
Vachellia nilotica paste	1
Glycerine	5
Terminalia arjuna bark	2
Curcuma longa powder	0.2
Fish oils	0.3

Physical Examination

The color, homogeneity, consistency, pH, and spreadability of the manufactured herbal antifungal lotions were studied.

pH of the Cream

The antifungal cream, formulated with various pH levels, was analyzed using a digital pH meter. The patient's skin was treated with antifungal cream and the progress of healing was monitored.[6]

Test for Thermal Stability

The developed cream was transferred into a glass bottle using a spatula and then gently tapped to ensure it settled at the bottom. Fill the bottle up to a capacity of two-thirds and then insert the plug and tighten the top. The filled bottle was placed upright in the incubator at a temperature of 4° ± 1°C for 48 h. If the sample, upon removal from the incubator, does not exhibit any oil separation or phase separation, it is considered to have passed the test.[7,8]

Spreadability

To assess the spreadability, varying amounts of coconut oil ranging from 0 g to 80 g were combined and then applied to the skin of the infected patient. The spreadability was quantified by measuring the time in seconds it took for two slides to slide off from the cream, which was sandwiched between the slides, under a specific force. The spreadability is improved when the time required for separating the two slides is reduced. Two sets of glass slides with standard dimensions were obtained. The herbal cream mixture was applied onto one of the slides. The second slide was positioned above the formulation, resulting in the cream being sandwiched between the two slides. A force was applied to the upper slides to evenly compress the cream between them and create a thin coating. The weight was removed and the excess formulation sticking to the slides was scraped off. The upper slide facilitated unhindered movement by the gravitational force exerted on it due to the attached weight. The duration of the upper slide was recorded, and the viscosity of the formed cream was measured using a book field viscometer at a speed of 50 rpm.[9]

$$\text{Spreadability} = M \times L/T$$

S = Spreadability
M = Weight tied to the upper slide (30 g)
L = Length of glass slide (5 cm)
T = Time taken in seconds

Effect of Herbal Antifungal Cream on Patient

An antifungal cream was administered to 15 patients for 35 days, starting from day 0. The daily outcomes were observed.

RESULTS AND DISCUSSION

The study assesses the efficacy of an antifungal herbal cream in combating various fungal strains, while also investigating potential adverse reactions, market demand, consumer preferences, sustainability, and environmental implications. Subsequent investigations will prioritize the study of herbal-based remedies, constituents, regulatory structures, patient contentment, and partnerships between conventional and contemporary health-care practitioners. In addition, it delves into the developing scientific evidence that supports the

effectiveness of certain herbs in the treatment of fungal diseases.

In Vitro Antimicrobial Studies

Testing for antifungal properties the findings of the antifungal activity study showed that the formulation, which consisted of *A. indica* extract, *V. nilotica* paste, *T. arjuna* bark, *C. longa* powder, betamethasone, nicotinamide, and fish oils combined in benzoic Acid, demonstrated notable antifungal activity. During the assessment of anti-microbial action, it was noted that the Petri dish with the antifungal cream showed no signs of fungal or bacterial development. In contrast, the Petri dish without the antifungal cream (control) exhibited the growth of both fungus and bacteria. The antigen diffusion method was employed to assess the antibacterial capabilities. The herbal antifungal cream had its highest antibacterial activity with a diameter of 19.33 mm for psoriasis, as reported by Moghimipour *et al.*[10] The developed cream exhibited significant antifungal action, as demonstrated in Figure 1.

Physical Examination

The herbal antifungal creams that were made underwent a visual inspection to assess their color, homogeneity, consistency, pH, and spreadability. The herbal antifungal cream was noted to have a yellow color and was thoroughly mixed to provide a consistent and uniform texture.[9]

pH of the Antibacterial Cream

While administering antifungal creams with varying pH values to the patient, [Figure 2] it was shown that the cream with a pH of 6.5 exhibited greater efficacy.[1]

Viscosity

The viscosity of the prepared antibacterial cream was measured using a Brookfield viscometer at a rotational speed of 50 revolutions per minute (rpm). The antibacterial cream had a viscosity ranging from 1000 to 3000 cp, indicating that it could be easily dispersed with minimal shear force.

Effect of Oil Concentration in Spreadability

When coconut oil was mixed in antifungal cream in different concentrations, it was found that 40 g of oil was 100% suitable for spreadability [Figure 3].

Effect of Herbal Antifungal Cream on Patient

When herbal antifungal cream was applied to 15 skin-infected patients, it was found that the skin

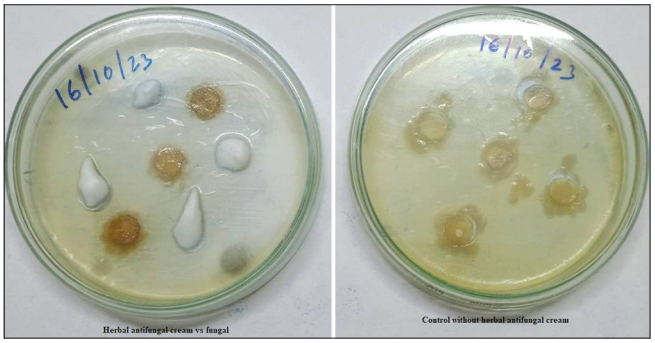

Figure 1: Compare of herbal antifungal cream versus fungal

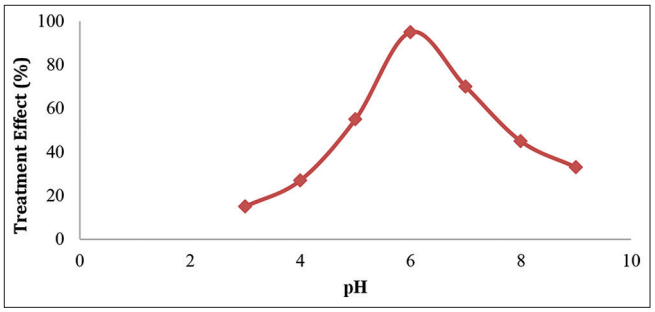

Figure 2: Effect of pH versus treatment

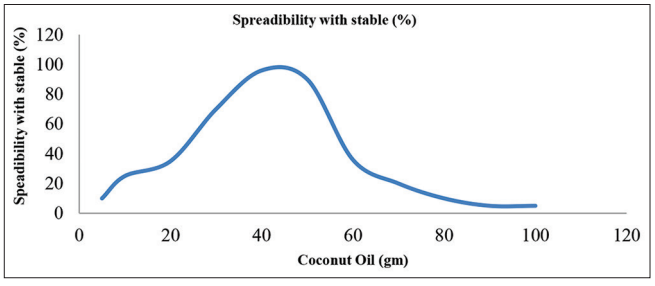

Figure 3: Effect of oil concentration on spreadability

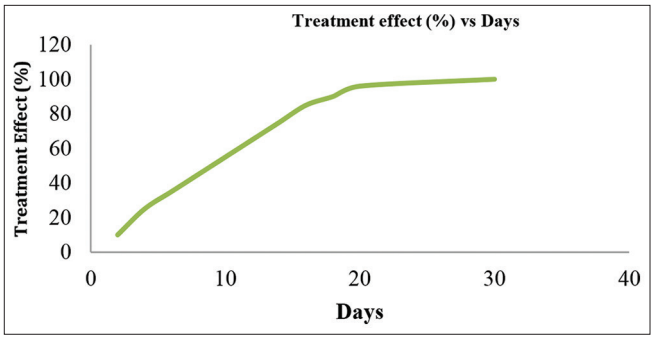

Figure 4: Compare treatment effect versus days

Figure 5: Effect of cream on patient leg

Figure 6: Effect of cream on patient hand

disease was completely cured within 30 days [Figure 4].

A topical antifungal cream formulated with extracts from *A. indica*, paste from *V. nilotica*, bark from *T. arjuna*, powder from *C. longa*, betamethasone, nicotinamide, and fish oils. The cream demonstrated efficacy in treating skin infections caused by *Staphylococcus aureus*, *Escherichia coli*, and fungi, thereby providing a foundation for further investigation [Figures 5 and 6].

CONCLUSION

This conclusion demonstrates the high efficacy of many herbal products combined with fish oils. The antifungal cream, which includes extracts from *A. indica*, *V. nilotica*, *T. arjuna*, and *C. longa*, as well as betamethasone, nicotinamide, and fish oils, had notable efficacy in treating psoriasis. An investigation carried out on a group of 15 individuals suffering from skin infections demonstrated that the application of a natural antifungal cream led to a total eradication of the condition within 30 days. An herbal antifungal cream, which includes *A. indica* extract, *V. nilotica* paste, *T. arjuna* bark, *C. longa* powder, betamethasone, nicotinamide, and fish oils, is highly efficient in treating skin infections.

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