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Formulation and Evaluation of herbal antifungal cream using Tea tree oil

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ABSTRACT:

Fungal infections pose a significant health challenge, necessitating the development of effective and safe treatment options. This study focuses on the formulation and evaluation of a herbal antifungal cream incorporating tea tree oil (*Melaleuca alternifolia*), renowned for its potent antifungal properties. The cream was developed using a combination of natural excipients to ensure skin compatibility and stability. The formulation underwent comprehensive evaluation, including assessment of its antifungal efficacy through in-vitro testing, skin irritation potential, stability under various storage conditions, and sensory attributes such as spreadability and consistency. The results demonstrated that the cream exhibited significant antifungal activity, minimal skin irritation, and maintained stability over the testing period. These findings suggest that the developed herbal antifungal cream with tea tree oil is a promising alternative for the treatment of fungal skin infections, offering a natural and effective solution with minimal side effects.

Keywords: Herbal antifungal cream, tea tree oil, formulation, evaluation, skin infections, natural remedy, in-vitro testing, skin compatibility, stability, sensory evaluation.

Introduction

Fungal infections are a common health concern, affecting the skin, nails, and mucous membranes. The increasing resistance to synthetic antifungal agents has sparked the search for alternative, natural remedies with effective antifungal properties. Herbal medicines have long been used for their therapeutic potential, and the growing interest in plant-based treatments has led to the development of herbal formulations for treating various diseases, including fungal infections.

Among the many natural ingredients known for their antifungal properties, Tea Tree Oil (TTO), derived from the leaves of Melaleuca alternifolia, stands out due to its broad-spectrum antimicrobial activity. TTO has demonstrated significant efficacy against a variety of fungal pathogens, including Candida species, Dermatophytes, and other common skin fungi. The bioactive compounds in tea tree oil, such as terpinen-4-ol, contribute to its antifungal, antiseptic, and anti-inflammatory effects, making it an ideal candidate for inclusion in topical formulations.

The formulation of a herbal antifungal cream with tea tree oil provides a promising alternative to conventional synthetic treatments, offering a natural solution with minimal side effects. The cream format, being easy to apply, allows for targeted delivery of the active ingredients to the affected areas of the skin. In addition, the incorporation of natural excipients ensures that the formulation is safe and well-tolerated by most skin types1.

The evaluation of such herbal antifungal creams involves several critical tests to ensure efficacy, safety, and stability. This includes determining the cream's antifungal activity through in-vitro testing (such as agar diffusion tests), assessing skin compatibility, evaluating the stability of the cream under various storage conditions, and performing sensory evaluations to confirm its cosmetic acceptability. Additionally, the formulation’s spreadability, consistency, and overall user-friendliness are important parameters that influence its success.

In this study, we aim to formulate and evaluate a herbal antifungal cream containing tea tree oil, with the goal of providing a natural, effective, and safe alternative for the treatment of fungal infections. By harnessing the therapeutic potential of tea tree oil, this formulation may offer an efficient solution for individuals seeking non-synthetic treatments for their skin conditions. The following sections will delve into the formulation process, the materials used, and the evaluation tests conducted to assess the cream's quality and performance2.

Objectives

Formulation of Herbal Antifungal Cream: To develop a topical cream incorporating tea tree oil (Melaleuca alternifolia) as the active ingredient, utilizing natural excipients to ensure skin compatibility and stability.
Evaluation of Antifungal Efficacy: To assess the cream's effectiveness against common fungal pathogens through in-vitro testing methods, such as agar diffusion assays.
Assessment of Skin Compatibility: To determine the cream's potential for skin irritation or sensitization through dermatological testing, ensuring its safety for topical application.
Stability Analysis: To evaluate the cream's physical and chemical stability under various storage conditions, including temperature and humidity variations, to ensure its shelf-life and efficacy over time.
Sensory Evaluation: To assess the cream's sensory attributes, including spreadability, consistency, and overall user acceptability, to ensure a pleasant user experience.

By achieving these objectives, the study aims to provide a natural, effective, and safe alternative for the treatment of fungal skin infections3.

3) Role of Ingredients:

***Neem*:**

Neem is helpful against a wide range of skin, disease including eczema, psoriasis, and dry skin.

Benefits of neem leaf powder:

- Acts as a shield against dandruff
- It can be used for both face and hair
- Treat dry scalp making it smooth and shiny
- Increase radiance and produce ageing effect
- Increase blood circulation
- Neem lightens and blurs the scars left behind by acne
- Neem is anti-inflammatory in nature with fatty acids and glycosides
- Neem is rich in anti-oxidant and vitamin E that reduce wrinkles
- Fatty acids and vitamin E in neem nourish the skin
- Help soothe eczema
- Treat acne
- Prevent skin infection
- Gives even skin tone
- Offers anti-ageing benefits4

Aloevera:

Benefits of aloe-vera for face:

- Its anti-inflammatory properties can reduce pain, swelling, and soreness of wounds or injuries
- It has a cooling effect on rashes or sunburns
- It supports the production and release of collagen
- Help in keeping your face health and gives you a natural shine
- Aloe-vera is rich in moisturizing properties it helps in removing dead cells
- Prevent or reduce wrinkles and dark spots of your face
- Moisturizes dry skin
- Soothes irritated skin
- Remove sign of ageing
- Fights acne and blemishes
- Remove dark circles and puffiness
- Relieves eczema and psoriasis
- Eliminates dead skin cells
- Treat sunburn
- Bring a natural glow to the skin
- Hydrated the skin with essential[5]

IV. Tea Tree Oil

Powerful Antifungal Action

Fights Fungal Infections: Tea tree oil has been widely studied and shown to have potent antifungal properties. It inhibits the growth of various fungi, including *Candida albicans*, *Trichophyton*, *Dermatophytes*, and *Aspergillus* species. This makes it effective in treating conditions like athlete's foot, ringworm, nail fungus, and other fungal skin infections.
Disruption of Cell Membranes: Tea tree oil contains terpinen-4-ol, which disrupts the cell membranes of fungi, leading to their breakdown. This action reduces the ability of the fungi to multiply and spread, helping the infection to subside.

Natural Alternative to Chemical Antifungals

Tea tree oil is a natural alternative to synthetic antifungal agents, which can sometimes cause side effects like skin irritation or allergic reactions. For individuals seeking a gentler, plant- based solution, tea tree oil can be an effective and safer option.

Anti-inflammatory Effects

Reduces Inflammation: In addition to its antifungal properties, tea tree oil also has anti- inflammatory effects, which help calm the skin and reduce redness, swelling, and irritation associated with fungal infections. This makes it useful in preventing the itching and discomfort that often accompany conditions like athlete's foot or fungal rashes.
Promotes Healing: The anti-inflammatory nature of tea tree oil promotes faster healing of damaged skin caused by fungal infections. It can help prevent further irritation while the skin heals.

Soothing and Calming

Tea tree oil can be soothing to inflamed or irritated skin. This is especially beneficial for people with fungal infections in sensitive areas, such as the groin or underarms, where skin can be more prone to irritation and discomfort.
It helps reduce itching, burning sensations, and redness that are commonly associated with fungal infections.

Prevention of Secondary Infections

Fungal infections often lead to secondary bacterial infections due to the breakage of the skin barrier. Tea tree oil has mild antibacterial properties that can help prevent bacterial overgrowth, reducing the risk of further complications like cellulitis or abscesses.

Antioxidant Properties

Tea tree oil is rich in antioxidants, which help protect the skin from oxidative stress and damage caused by free radicals. This can support the skin's natural healing process and reduce the appearance of scarring or hyperpigmentation, which may occur after a fungal infection.

Odor Control

Tea tree oil has a fresh, medicinal scent that helps to neutralize odors associated with fungal infections. This is particularly beneficial for infections in areas such as feet, armpits, and groin, which may develop unpleasant odors.

Supports Healthy Skin Microflora

Unlike some antifungal treatments that may disrupt the balance of beneficial bacteria on the skin, tea tree oil has been shown to support a healthy skin microbiome. This balance helps maintain healthy skin and prevents the overgrowth of harmful microorganisms[6].

V. Coconut Oil

Fig. coconut oil

Coconut oil is another highly beneficial ingredient in the formulation of antifungal creams due to its unique composition of fatty acids and other bioactive compounds. Here are the detailed benefits of using coconut oil in antifungal creams:

Powerful Antifungal Properties

Caprylic Acid: Coconut oil contains a high concentration of caprylic acid, a medium-chain fatty acid known for its potent antifungal activity. Caprylic acid helps to break down the cell membrane of fungi, which can disrupt their growth and ability to reproduce. This makes it effective against a wide range of fungal infections, including those caused by *Candida*, *Dermatophytes*, and *Aspergillus*.
Lauric Acid: Another fatty acid in coconut oil, lauric acid, also has antifungal properties. It can destroy the lipid membranes of fungal cells, weakening them and leading to their destruction. This is particularly effective in managing infections like athlete's foot, nail fungus, and ringworm.

Antibacterial and Antiviral Effects

Dual Action: In addition to its antifungal properties, coconut oil exhibits antibacterial and antiviral activities due to its lauric acid content. This is beneficial in preventing secondary bacterial or viral infections, which are common when the skin is compromised by a fungal infection.
Supports Skin Healing: The antibacterial properties of coconut oil help prevent the growth of harmful bacteria, reducing the risk of complications like cellulitis, which can occur when a fungal infection breaks down the skin's protective barrier.

Moisturizing and Skin-Repairing Benefits

Deep Moisturization: Coconut oil is a natural emollient, meaning it can penetrate the skin deeply to provide intense hydration. It helps restore moisture to dry or cracked skin, which can be common in fungal infections like athlete's foot. This is essential in promoting healthy skin and reducing discomfort.
Healing Properties: Coconut oil has been shown to accelerate the healing of damaged skin. The oil nourishes the skin and supports the regeneration of new, healthy skin cells. This can reduce scarring and prevent further damage caused by the fungal infection.

Anti-inflammatory Effects

Reduces Redness and Swelling: Coconut oil has anti-inflammatory effects that can calm the skin and reduce the redness, swelling, and irritation that accompany fungal infections. It helps to soothe itchy, inflamed areas, providing relief from the discomfort often associated with conditions like athlete's foot or fungal rashes.
Prevents Overreaction of the Immune System: By reducing inflammation, coconut oil also helps prevent the immune system from overreacting to the fungal infection, which can sometimes lead to skin flare-ups or worsening irritation.

Prevention of Secondary Skin Infections

Fungal infections can damage the skin's protective barrier, making it more vulnerable to bacterial or viral invaders. Coconut oil's antimicrobial properties help prevent the overgrowth of harmful bacteria, reducing the risk of developing secondary skin infections like impetigo or cellulitis.
This protective barrier is also helpful in preventing fungal infections from spreading to healthy skin areas.

Rich in Antioxidants

Coconut oil contains antioxidants like vitamin E and polyphenols, which help protect the skin from oxidative damage. These antioxidants can prevent further degradation of skin tissue, reduce inflammation, and protect skin cells from harmful free radicals that are often produced during infection. Antioxidants also help to combat any oxidative stress caused by the presence of the fungus, promoting a healthier skin appearance and aiding in the repair process.

Non-Irritating and Gentle on Skin

Gentle Formula: Coconut oil is generally well-tolerated by most skin types, including sensitive skin. It has a mild, soothing texture that is less likely to cause irritation compared to some stronger chemical antifungal agents. This makes it an excellent choice for individuals with sensitive skin or those prone to allergic reactions.
Suitable for Long-Term Use: Because of its gentle nature, coconut oil can be safely used over a longer period of time, which is helpful in preventing recurring fungal infections or for managing chronic conditions like eczema that may predispose someone to fungal growth.

Helps Maintain the Skin's pH Balance

Coconut oil helps maintain the skin's natural pH, which is important for overall skin health. Fungal infections often thrive in areas where the skin's pH is disrupted, so maintaining a healthy pH balance can help prevent future infections. By stabilizing the pH, coconut oil helps the skin stay resilient against various microorganisms.

Enhances the Effectiveness of Other Antifungal Agents

When combined with other antifungal ingredients like tea tree oil, coconut oil can enhance their effectiveness. The oil acts as a carrier, helping other active ingredients penetrate the skin more effectively, thus improving the overall action of the antifungal cream.
Coconut oil can also help to dilute stronger antifungal agents, reducing the potential for irritation while still maintaining their effectiveness.

Natural, Non-Toxic Option

One of the key benefits of using coconut oil in antifungal creams is its natural, non-toxic nature. Unlike many synthetic antifungal agents, coconut oil is free from harsh chemicals, making it a preferred choice for individuals who seek natural, safe alternatives for treating fungal infections[7].

VI. BEES WAX

Beeswax is a natural ingredient often used in skincare products, including antifungal creams, due to its multiple beneficial properties. When included in antifungal cream formulations, beeswax provides various advantages that enhance the overall effectiveness of the product. Here's a detailed breakdown of the benefits of beeswax in antifungal creams:

Creates a Protective Barrier

- Forms a Physical Shield: Beeswax acts as an occlusive agent, forming a thin, protective layer over the skin. This helps to lock in moisture and protect the skin from external environmental factors like dirt, pollution, and irritants. In the case of fungal infections, it also helps prevent the entry of further microorganisms, promoting faster healing.
- Reduces Water Loss: By preventing moisture from escaping the skin, beeswax helps maintain skin hydration, which is crucial when healing fungal infections. Hydrated skin is less prone to cracking and irritation, which can be aggravated by dryness in fungal conditions.

Natural Antibacterial and Antifungal Properties

- Supports Infection Control: Beeswax contains small amounts of antimicrobial compounds, including bee propolis (a resin-like substance collected by bees). Propolis has been shown to have natural antibacterial and antifungal properties. While beeswax itself isn't as potent as other antifungal ingredients, it helps to support the overall antimicrobial action of the cream.
- Combats Skin Infections: The mild antifungal activity of beeswax can work synergistically with other active ingredients (like tea tree oil or coconut oil) to provide additional support in controlling fungal infections. This helps to inhibit the growth and spread of fungi, especially in areas where the skin is compromised.

Soothes and Calms the Skin

- Anti-inflammatory Benefits: Beeswax has anti-inflammatory properties that help reduce redness, swelling, and irritation associated with fungal infections. This is especially beneficial in treating sensitive or inflamed areas of the skin, such as the feet or groin, which are common places for fungal infections like athlete's foot or jock itch.
- Relieves Itching and Discomfort: Fungal infections often lead to itching and discomfort. Beeswax helps to alleviate these symptoms by acting as a calming agent that can soothe irritated skin. This is crucial for improving overall comfort and preventing scratching, which could worsen the infection.

Supports Skin Healing and Regeneration

- Promotes Skin Repair: Beeswax is known to support the skin's natural healing process. It contains vitamin A, a nutrient that plays a key role in skin cell regeneration. This aids in the repair of damaged skin cells and accelerates the healing of areas affected by fungal infections. The healing action is particularly helpful for preventing scarring and promoting smooth, healthy skin after the infection subsides.
- Encourages Tissue Regeneration: The fatty acids in beeswax also nourish the skin, helping to stimulate new tissue growth and healing. This can be especially beneficial in treating cracked or damaged skin caused by persistent fungal infections, such as athlete's foot or fungal nail infections.

Enhances the Texture and Consistency of Creams

- Improves Cream Stability: Beeswax serves as a natural emulsifier, helping to bind together oils and water in the formulation of the cream. It provides structure and thickens the consistency of the cream, making it easier to apply and ensuring that it stays on the skin without running off.
- Long-Lasting Effect: Due to its waxy consistency, beeswax allows the antifungal cream to stay on the skin for a longer time, creating a longer-lasting protective layer that enhances the overall efficacy of the treatment.

Moisturizing and Hydrating Effects

- Hydrates the Skin: Beeswax has humectant properties, meaning it draws moisture into the skin and helps keep it hydrated. In fungal infections, the skin can become dry, cracked, and flaky, especially when exposed to harsh treatments. Beeswax helps to restore moisture and maintain skin elasticity, preventing further skin damage.
- Prevents Dryness and Cracking: The moisturizing properties of beeswax help to prevent the skin from becoming too dry or cracked, which can create an environment where fungi can thrive. By keeping the skin soft and hydrated, beeswax aids in the prevention of additional fungal infections and skin irritation.

Natural and Gentle on the Skin

- Non-Irritating: Beeswax is generally well-tolerated by most skin types, including sensitive skin. It's a natural ingredient that is less likely to cause irritation or allergic reactions compared to synthetic chemicals or preservatives commonly found in other topical treatments. This makes it a great addition to antifungal creams, particularly for those with sensitive or reactive skin.
- Safe for Long-Term Use: Because it's natural and gentle, beeswax can be used continuously without the risk of adverse side effects, which is especially beneficial for individuals with chronic or recurring fungal infections.

Supports the Effectiveness of Other Active Ingredients

- Enhances Delivery of Active Ingredients: Beeswax helps to bind and stabilize the other active ingredients in the antifungal cream, ensuring that they remain evenly distributed and effective. It also helps other ingredients penetrate the skin more effectively, allowing them to reach the deeper layers where the infection is located.
- Provides a Base for Essential Oils: Beeswax works well as a carrier for essential oils like tea tree oil, lavender oil, or eucalyptus oil, which are commonly used in antifungal creams. It helps to spread these oils evenly on the skin, making the overall formulation more efficient8.

VII. VITAMIN E

Vitamin E is a potent antioxidant and nourishing ingredient commonly used in antifungal cream formulations due to its numerous skincare benefits. When incorporated into antifungal creams, Vitamin E can enhance the overall effectiveness of the treatment while promoting healthy, hydrated, and healed skin. Below are the detailed benefits of Vitamin E in antifungal cream formulations:

Powerful Antioxidant Properties

- **Neutralizes Free Radicals**: Vitamin E is a powerful antioxidant that helps protect the skin from oxidative stress caused by free radicals. Fungal infections, along with environmental factors like UV rays and pollution, can lead to oxidative damage, which accelerates skin aging and promotes inflammation. Vitamin E neutralizes free radicals, reducing oxidative damage and supporting skin health.
- **Prevents Skin Damage**: The antioxidant action of Vitamin E prevents premature skin aging, wrinkles, and fine lines, which can result from ongoing inflammation or infection. It helps to repair and protect skin cells from external stressors.

Promotes Skin Healing and Repair

- **Supports Skin Regeneration**: Vitamin E is known for its ability to enhance the skin's healing process. It accelerates the repair of damaged skin, including those areas affected by fungal infections. By promoting the regeneration of skin cells, Vitamin E helps in faster recovery from fungal infections like athlete's foot, ringworm, or fungal nail infections.
- **Helps with Scarring**: Vitamin E is often used to minimize the appearance of scars or hyperpigmentation caused by fungal infections or previous skin damage. It supports the regeneration of new, healthy skin cells, reducing the likelihood of long-term scarring or discoloration.

Anti-inflammatory Effects

- **Reduces Redness and Swelling**: Fungal infections often cause inflammation, resulting in redness, swelling, and irritation. Vitamin E helps calm the skin by reducing inflammation and soothing affected areas. This makes it particularly beneficial for relieving discomfort and minimizing the visible symptoms of fungal infections.
- **Relieves Itchiness**: Vitamin E helps to alleviate itching caused by fungal conditions like athlete's foot. It moisturizes and protects the skin, reducing the urge to scratch, which can further irritate the skin and worsen the infection.

Moisturizing and Hydrating Benefits

- **Deeply Moisturizes the Skin**: Vitamin E is a potent emollient that helps to lock in moisture, keeping the skin hydrated. Fungal infections often lead to dry, cracked, and flaky skin, especially in areas like the feet or groin. Vitamin E helps to prevent this by restoring moisture and keeping the skin soft and pliable.
- **Prevents Dryness and Flaking**: In addition to moisturizing, Vitamin E helps to prevent the skin from becoming too dry or peeling, which can further compromise the skin barrier. Maintaining a healthy, hydrated skin barrier is crucial in preventing the spread of fungal infections and promoting quicker healing.

Strengthens the Skin's Natural Barrier

- **Improves Skin Elasticity**: Vitamin E improves the overall health of the skin barrier, enhancing its ability to retain moisture and defend against external threats like fungi, bacteria, or pollutants. A strong skin barrier is essential in preventing reinfection and maintaining healthy, resilient skin.
- **Protects Against External Irritants**: In addition to moisturizing, Vitamin E helps protect the skin from harmful environmental irritants. This is especially useful in treating fungal infections, where the skin may be compromised and more vulnerable to external harm.

Supports Collagen Production

- **Boosts Collagen Synthesis**: Vitamin E promotes collagen production, a key protein responsible for skin structure and elasticity. Collagen is crucial for the skin's repair process, especially after fungal
- infections that cause skin breakdown. By encouraging collagen synthesis, Vitamin E helps the skin regain its firmness and integrity.
- **Aids in Skin Rejuvenation**: The ability of Vitamin E to stimulate collagen production accelerates the skin's healing process and helps rejuvenate areas that may have been scarred or damaged by fungal infections.

Improves Skin Tone and Texture

- **Reduces Discoloration**: Vitamin E is known for its ability to improve skin tone and reduce hyperpigmentation or dark spots. After fungal infections, areas of the skin can become darker due to inflammation or irritation. Vitamin E helps even out skin tone and fade dark spots, leaving the skin looking healthier and more radiant.
- **Smooths and Softens Skin**: By promoting skin hydration and regeneration, Vitamin E helps to smooth rough patches, making the skin feel soft and supple. This is particularly useful for healing dry, cracked skin affected by fungal infections.

Antimicrobial Properties

- **Supports the Antifungal Action**: While Vitamin E itself is not a strong antifungal agent, its antimicrobial properties can work in synergy with other antifungal ingredients like tea tree oil, coconut oil, or beeswax. By preventing the overgrowth of bacteria and supporting the healing of the skin, Vitamin E enhances the overall effectiveness of the antifungal cream[9].

VIII. ROSE OIL

Rose oil, especially rose essential oil (often derived from Rosa damascena or Rosa centifolia), is an increasingly popular ingredient in skincare, including antifungal creams. It has numerous benefits due to its antimicrobial, soothing, and regenerative properties. Here's a detailed overview of how rose oil can enhance an antifungal cream formulation:

Antifungal Properties

- Fights Fungal Infections: Rose oil has been shown to have antifungal activity, making it an excellent addition to antifungal creams. It can help combat various types of fungal infections, including skin conditions such as athlete's foot, ringworm, and candidiasis. The active compounds in rose oil disrupt the cell membranes of fungi, inhibiting their growth and spread.
- Broad-Spectrum Activity: Rose oil's antifungal effects extend to a wide range of fungi, including Candida albicans and Trichophyton rubrum, two common causes of fungal skin infections. This makes rose oil an effective ingredient for treating fungal skin infections in a variety of areas, such
- as the feet, groin, and scalp.

Anti-Inflammatory Benefits

- Reduces Redness and Swelling: Rose oil contains compounds like citronellol and geraniol that help reduce inflammation in the skin. Inflammation is a common symptom of fungal infections, and rose oil's anti-inflammatory effects can help calm irritated skin, reduce swelling, and minimize the redness associated with fungal outbreaks.
- Soothes Itchy Skin: Fungal infections often cause intense itching, which can lead to scratching and further irritation. Rose oil has a soothing effect on the skin, alleviating itching and discomfort, allowing for a more comfortable healing process.
- Antibacterial Properties

- Prevents Secondary Infections: While primarily known for its antifungal properties, rose oil also possesses antibacterial effects. This makes it effective in preventing secondary bacterial infections, which can occur when fungal infections compromise the skin's integrity. By preventing bacterial growth, rose oil helps ensure that the infection does not worsen or spread.
- Supports Overall Skin Health: Rose oil's antibacterial properties work synergistically with other active ingredients in the antifungal cream, helping to maintain a clean and healthy skin environment for faster healing.

Skin Regeneration and Healing

- Promotes Skin Cell Regeneration: Rose oil is rich in vitamins (such as Vitamin C and Vitamin A) and essential fatty acids, which help support skin cell regeneration. This is crucial for healing skin that has been damaged by fungal infections. It accelerates the skin's ability to repair itself, leading to quicker recovery and less scarring.
- Fades Scars and Hyperpigmentation: For skin affected by fungal infections, rose oil can help reduce scarring and prevent hyperpigmentation (dark spots). Its regenerative properties promote the healing of damaged skin and help restore even skin tone, making it particularly beneficial after a fungal infection has cleared.

Moisturizing and Hydrating Effects

- Hydrates Dry, Cracked Skin: Fungal infections often lead to dry, flaky, and cracked skin. Rose oil is a natural emollient that helps lock in moisture, keeping the skin soft and hydrated. By preventing the skin from becoming excessively dry, rose oil helps reduce the discomfort associated with cracked or peeling skin, which is common in fungal infections like athlete's foot.
- Restores Skin Elasticity: Rose oil helps to keep the skin supple and soft, promoting its elasticity. This is particularly important for areas that are prone to fungal infections, as skin elasticity can help prevent further irritation or cracking.

Antioxidant Properties

- Protects the Skin from Damage: Rose oil contains a variety of antioxidants, such as flavonoids and polyphenols, that protect the skin from free radical damage. Free radicals can be produced as a result of inflammation and infection. By neutralizing these free radicals, rose oil helps protect the skin from premature aging and maintains the integrity of the skin barrier.
- Reduces Inflammation-Induced Skin Damage: The antioxidant compounds in rose oil help to minimize damage caused by inflammation and oxidative stress10.

Formulation Table

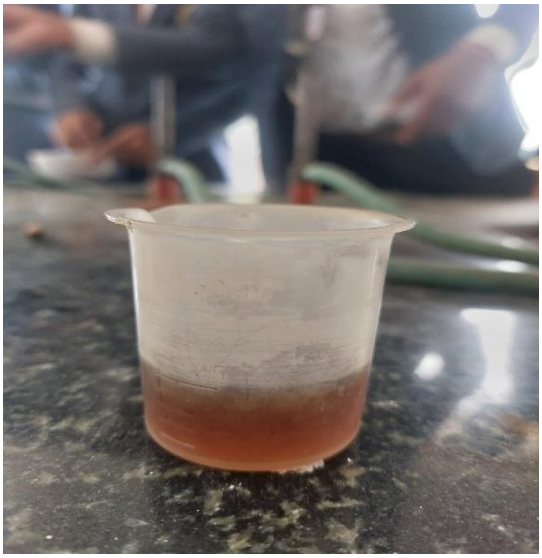
Ingredient	**Function**	**Quantity (per 50 g)**
Tea Tree Oil	**Active antifungal agent**	**2.0 g**
Neem extract	**Anti bacterial agent**	**3.0 g**
Aloe vera	**Anti inflammatry**	**5.0 g**
Beeswax	**Thickning agent**	**4.0 g**
Coconut Oil	**Emollient and carrier oil**	**5.0 g**
Coca Butter	**Anti inflammatry**	**5.0 g**
Glycerin	**Humectant**	**2.0 g**

Vitamin E Oil	**Antioxidant**	**1.0 g**
Rose oil	**Essantial oil**	**0.5 g**
Distilled Water	**Base**	**q.s.**

Material And Method:
Extraction Process:

Preparation of Tea Tree Plant:

The method includes: washing tea leaves, crushing them to 20 meshes to 80 meshes in particle size, adding organic solvent, performing percolation extracting, and filtering extract[11].



Preparation of neem extract:

Collect fresh neem leaves and wash it with distilled water. Dried it in hot air oven and then powdered take 5 gm neem powder in 20 ml of ethanol at 100°C for 5 to 10 minutes. Then filter it by filter paper and clear solution is obtained[12].

Procedure:

Preparation of Oils and Butters:

- Measure and combine coconut oil, shea butter, and almond oil in a heat-resistant container.
- Heat gently in a water bath until melted and well combined.

Incorporate Beeswax:

- Add beeswax to the melted oils and stir continuously until completely dissolved.

Cooling Phase:

- Remove the mixture from heat and allow it to cool slightly (around 40-45°C).

Adding Tea Tree Oil:

- Once the mixture cools to a safe temperature, add the tea tree oil. Mix thoroughly to ensure even distribution.

Incorporate Glycerin and Vitamin E:

- Add glycerin and vitamin E oil to the mixture. Stir well to combine.

Adjusting Consistency:

- If the mixture is too thick, you can add a small amount of distilled water to achieve the desired consistency. Make sure to mix thoroughly.

Preservation:

- If using a preservative, follow the manufacturer's instructions for incorporation.

Cooling and Packaging:

- Allow the cream to cool completely at room temperature.
- Once cooled, transfer the cream into clean, sterilized containers.

Labeling:

- Label the containers with the product name, ingredients, and date of preparation[13].

Evaluation of cream:

Physical Evaluation

Formulated herbal creams was further Evaluated by using the following physical parameter physical parameter colour, odour, consistency and state of the formulation.

Colour:

The colour of the cream was observed by visual examination.

Odour:

The odour of cream was found to be Pleasant.

Consistency:

The formulation was examined by rubbing cream on hand manually. The cream having smooth consistency.

PH:

pH of prepared herbal cream was measured by using digital pH meter. The solution of cream was prepared by using 100 ml of Distilled water and set aside 2h. pH was determined in three times for solution and the average value was calculated.

Spredability:

Spread ability of formulated cream was measured by placing sample in between two slides then compressed to uniform thickness by placing a definite weight for defined time. The specified time required to separate the two slides was measured as Spredability. Lesser the time taken
for separation of two slides results showed better Spredability.

Washability:

formulation was applied on the skin and then ease extends of washing with water was checked14.

Result and Discussion

Result: In the in vitro laboratory testing, the herbal antifungal cream with tea tree oil was evaluated for its antifungal activity against common pathogens like *Candida albicans*, *Trichophyton rubrum*, and *Aspergillus niger*.

Discussion:

The in vitro results support the antifungal potential of tea tree oil in the herbal cream. Terpinen-4-ol, the active compound in tea tree oil, is known for its fungistatic and fungicidal effects. The cream's ability to inhibit fungal growth in a controlled laboratory setting suggests its promise in treating fungal infections when used topically.

Sr. No.	Evaluation Test	Observation
1	Colour	A very light, almost white color with a hint of green.
2	Odour	Rose – A sweet, floral, and slightly exotic fragrance.
3	Consistency	The cream having smooth consistency.
4	pH	Ranging Between 5.5 to 7
5	Spreadability	Better Spreadability – Evenly Spread On Glass Slide

Conclusion:

- The herbal antifungal cream formulated with tea tree oil has shown significant promise as an effective natural alternative to conventional antifungal treatments.

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