



## FORMULATION AND EVALUATION OF POLYHERBAL ANTIFUNGAL CREAM

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### Introduction to Polyherbal Antifungal Cream

Fungal infections are a common health concern that affect millions of people worldwide. These infections, caused by various fungi such as dermatophytes, yeasts, and molds, can cause symptoms such as itching, redness, rashes, and skin peeling. They are particularly prevalent in warm, moist environments, which allow fungi to thrive. Conventional antifungal treatments, including topical antifungal creams and oral medications, are widely used but can sometimes lead to side effects, skin irritation, or the development of resistance. As a result, **polyherbal antifungal creams** have become an attractive alternative for individuals seeking a more natural and safer approach to treat fungal infections.

Polyherbal antifungal creams combine the medicinal properties of multiple herbs known for their antifungal, antimicrobial, anti-inflammatory, and soothing effects. These creams not only help to fight fungal infections but also assist in skin healing, reducing inflammation, and preventing further irritation. The natural compounds in the herbs used in these creams have proven antifungal activity, which targets the fungi's cell walls, metabolic pathways, or the ability to reproduce. The synergistic effect of combining different herbal ingredients often leads to a broader spectrum of activity and increased efficacy.

### General Information on Polyherbal Antifungal Creams

#### *What are Polyherbal Antifungal Creams?*

Polyherbal antifungal creams are topical formulations that contain a combination of plant-based extracts, oils, and compounds that are selected for their antifungal properties. These creams aim to treat common fungal infections such as **athlete's foot, ringworm, jock itch, and vaginal yeast infections**. They are designed to offer a holistic approach to managing these infections by not only addressing the fungal infection itself but also promoting the overall health of the skin.

These creams are typically used for **external application** on affected areas. The combination of multiple herbs provides a synergistic effect, meaning that the active ingredients work together to enhance the therapeutic outcomes. The herbal extracts are chosen for their ability to kill fungi, inhibit their growth, reduce inflammation, and help restore the skin's health.

#### *How Do Polyherbal Antifungal Creams Work?*

Polyherbal antifungal creams function by utilizing the active compounds in the herbs to target and eliminate the cause of fungal infections. Some of the key ways these creams work include:

##### 1. **Disruption of Fungal Cell Membranes:**

Many herbal ingredients, such as **tea tree oil** and **garlic**, contain compounds that penetrate the fungal cell membrane and disrupt its integrity, leading to the death of the fungus.

##### 2. **Inhibition of Fungal Growth and Reproduction:**

Certain herbs have compounds that inhibit the growth of fungi and prevent them from reproducing, thereby halting the spread of the infection. For example, **neem** and **turmeric** contain compounds that inhibit fungal enzyme activity.

##### 3. **Immune System Support:**

Many polyherbal creams contain herbs that help enhance the body's immune response, which can assist in fighting off infections. For instance, **echinacea** has immune-boosting properties that may help the body fight fungal infections more effectively.

##### 4. **Anti-inflammatory and Soothing Effects:**

Fungal infections often cause skin irritation, redness, and swelling. Polyherbal antifungal creams frequently contain **aloe vera**, **calendula**, or

**lavender**, which possess anti-inflammatory and soothing properties to reduce discomfort and accelerate healing.

5. **Moisturizing and Skin Healing:**

Fungal infections can leave the skin dry and damaged. Many polyherbal creams include natural moisturizers like **shea butter** or **cocoa butter**, which not only hydrate the skin but also provide regenerative effects, aiding in skin repair.

**Types of Polyherbal Antifungal Creams**

Polyherbal antifungal creams vary based on their formulation and intended application. Below are the different types of polyherbal antifungal creams, each tailored to specific fungal infections and user needs:

1. **Topical Creams for General Skin Fungal Infections:**

- These are the most common types of polyherbal antifungal creams, designed to treat skin infections such as athlete's foot, ringworm, jock itch, and skin rashes caused by fungi.
- They contain herbs known for their antifungal properties, along with soothing agents for skin comfort and healing.

2. **Nail Fungal Infection Creams:**

- Specialized for treating fungal infections of the nails (onychomycosis), these creams often have thicker, more penetrating formulations that help the active ingredients reach beneath the nail to combat the infection.
- They are designed to soften the nail plate and enhance the absorption of the antifungal agents.

3. **Mucosal Fungal Infection Creams:**

- These are formulated for use on mucosal membranes such as the vaginal area or inside the mouth. They are particularly helpful for conditions like **oral thrush** or **vaginal yeast infections**.
- These creams are typically gentler to avoid irritation on sensitive mucosal tissues while still delivering effective antifungal properties.

4. **Moisturizing Antifungal Creams:**

- These creams combine antifungal ingredients with additional moisturizers like **glycerin**, **shea butter**, or **coconut oil** to hydrate the skin while treating the fungal infection.
- They are ideal for individuals with dry or sensitive skin, as they provide relief from both the infection and the dryness caused by frequent use of antifungal products.

**Benefits of Polyherbal Antifungal Creams**

Polyherbal antifungal creams offer numerous advantages over conventional synthetic antifungal treatments. Some of the most notable benefits include:

**1. Broad-Spectrum Efficacy**

- By combining multiple herbal ingredients, polyherbal antifungal creams provide a **broad spectrum of antifungal activity**. They are effective against a variety of fungi, including dermatophytes, yeasts, and molds, which makes them versatile and useful for treating various types of fungal infections.

**2. Lower Risk of Side Effects**

- Herbal ingredients tend to have fewer side effects compared to synthetic chemicals, making polyherbal antifungal creams a **gentler alternative** for individuals with sensitive skin. They also typically contain natural moisturizing and soothing agents that help reduce irritation and inflammation associated with fungal infections.

**3. Natural and Sustainable Approach**

- Polyherbal creams use natural constituents that are frequently more sustainable and eco-friendly compared to chemical-grounded products. This appeals to individuals seeking holistic, eco-conscious products in their skincare routines.

**4. Reduced Risk of Resistance**

- Unlike synthetic antifungal medicines, which can lead to the development of fungal resistance, polyherbal creams are less likely to beget resistance due to the diversity of antifungal composites they contain. The combination of colorful active constituents makes it delicate for fungi to acclimatize to treatment.

**5. Skin Healing and Comfort**

- Numerous polyherbal antifungal creams contain constituents that not only treat the fungal infection but also support the mending of damaged skin. Herbs like aloe vera and calendula promote skin form, reduce inflammation, and keep the skin moisturized, enhancing the overall treatment experience.

**6. Holistic Healing Approach**

The multi-functional nature of polyherbal creams means that they do further than just fight fungi. They support overall skin health by promoting skin rejuvenescence, reducing scarring, and furnishing anti-inflammatory goods, which leads to faster recovery and bettered skin condition after the infection.

**HERBAL MEDICINE**

Herbal drug occasionally appertained to as botanical drug or herbalism it involves the use of shops or corridor of shops to treat injuries or ails. The corridor of shops like seeds, leaves, stems, dinghy, roots, flowers etc and their excerpts used in herbal drug as teas and tinctures, topical applicators,

capsules, capsules and other expression. Some of the medicinal specifics on the request are excerpts of some of these traditional sauces. The lower cost, and frequently safer use, has attracted numerous medical professionals.

### ***Cream***

Cream is defined as circumfluous mixes which are oil painting in- water (o/ w) or water in- oil painting (w/ o) type and these circumfluous mixes are intended for external operation.

Two phase of cream i.e. oil painting-in-water and water-in- oil painting.

Herbal cream which can produce multipurpose effect, like to reduce skin diseases e.g. hyperactive saturation, skin wrinkling, skin aging etc.

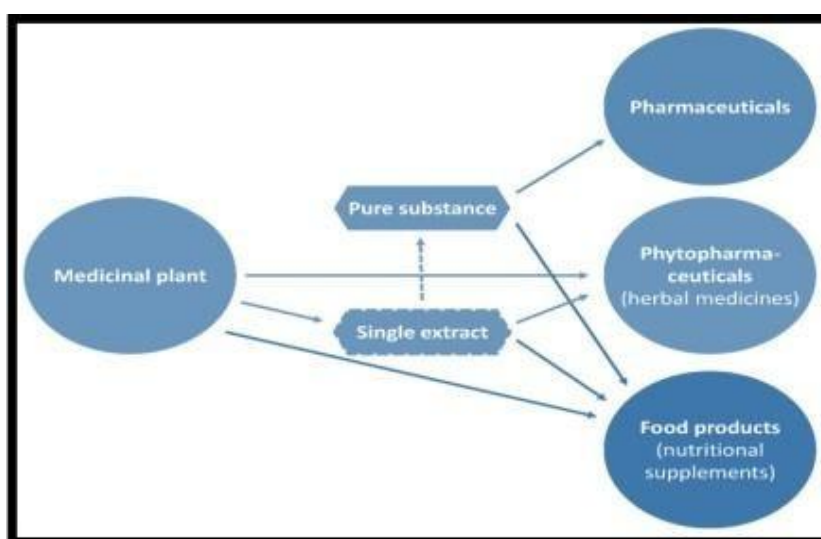
As the body's largest organ, the skin serves as the essential Défense against natural stressors like dust, UV radiation, pathogens, and chemicals, which can lead to diseases and maturing. It moreover reflects maturing and by and large inner wellbeing. It moreover reflects maturing and generally inside wellbeing. The hone of utilizing plants or plant parts to treat wounds or ailments is called home grown medication, botanical medication, or herbalism. This incorporates the utilize of seeds, clears out, stems, bark, roots, blossoms, and extricates to make medicines such as topical applications, pills, capsules, teas, and tinctures

The combination and synergistic impacts of commercial antifungal drugs with characteristic bioactive compounds from plants will be a complementary and elective approach to combat reoccurrence rates of contagious disease.

Medicinal plants are imperious sources of treasurable auxiliary metabolites and in this way, contribute to accessibility of common drugs in worldwide markets

### ***The role of medicinal plants in the pharmaceutical industry***

synthetic chemistry, combinatorial chemistry, atomic modeling, and division from plants and other characteristic sources of novel chemical substances have all been utilized to get particles for medicate advancement. Around a quarter of topselling medicines all inclusive in 2001 and 2002 were either characteristic fixings themselves or were inferred from them. For lead improvement, lead optimization, and clinical ponders, the amounts of separated common compounds are regularly inadequately. To survey if union or semi-synthesis would be attainable, participation with therapeutic and engineered chemists is required.



**Fig. Comprehensive presentation of medicinal plant discoveries**

World Health Organization (WHO) estimates that 80 of the world populations presently use herbal drug for primary health care.

Herbal drug is grounded upon the combination of traditional knowledge, clinical experience, understanding of medicinal wisdom and scientific substantiation of herbal drug. People are sluggishly and gradationally switching to indispensable forms of drug

### ***Problems with Synthetic Antifungal Creams***

Synthetic antifungal creams, though effective in treating fungal infections, come with several downsides that can impact their long- term use. Below are some of the common problems associated with these creams

#### **1. Risk of Side Effects**

- **Skin Irritation:** numerous synthetic antifungal creams contain chemicals like preservatives, alcohol, or artificial spices that can irritate the skin, causing burning sensations, greenishness, and blankness, especially for individuals with sensitive skin.

- **Allergic Reactions:** Some druggies may witness antipathetic responses to the chemical constituents, leading to swelling, rashes, or itching.
- 2. **Development of Resistance**
- **Fungal Resistance:** Fungal Resistance Overuse or unhappy use of synthetic antifungal treatments can contribute to the development of medicine-resistant fungi, making it harder to treat unborn infections effectively. This is especially concerning in intermittent infections or systemic fungal conditions.
- 3. **Limited Long-Term Efficacy**
- **Relapse of Infection:** While synthetic antifungal creams may give quick relief from the symptoms of fungal infections, they frequently do n't completely address the root cause. This can lead to a rush of the infection after discontinuing treatment.
- 4. **Potential for Systemic Absorption**
- **Skin Penetration:** Some synthetic antifungal creams can be absorbed into the bloodstream through the skin, leading to systemic side goods, particularly when used over large areas or for dragged ages. This is a concern for people with weakened vulnerable systems orpre-existing health conditions.
- **5. Presence of Harsh Chemicals**
- **Chemical Additives:** Many synthetic antifungal creams contain **preservatives**, **artificial colors**, and **fragrances** that may worsen skin irritation or damage the skin with prolonged use, especially for those with sensitive skin.
- 6. **Overuse in Sensitive Areas**
- **Sensitive Skin Areas:** Applying finagled antifungal creams to touchy regions of the body (like the defy or genital locale) can lead to bothering, vexation, or detriment, especially when the point is not defined for fragile skin.
- 7. **Not Suitable for Everyone**
- **Pregnancy and Children:** Numerous engineered antifungal creams are not suggested for utilizing amid pregnancy, breastfeeding, or for youthful children due to the potential dangers of chemical assimilation or unfavorable reactions.
- **Dependency on Chemicals:** Nonstop utilize of manufactured antifungal medicines may make a dependence on chemicals for overseeing contagious diseases. In differentiation, polyherbal antifungal creams offer a more characteristic and maintainable approach to mending without such concerns.

#### Approval of Natural Polyherbal Antifungal Creams

To replace synthetic antifungal creams with **polyherbal antifungal creams**, the following key steps are necessary:

1. **Regulatory Approval:** Polyherbal creams must experience security and adequacy testing and comply with administrative benchmarks set by wellbeing specialists (e.g., FDA, EMA). They must be delivered beneath Great Fabricating Hones (GMP).
2. **Safety and Efficacy:** Toxicological ponders are required to guarantee the item does not cause aggravation or unfavorably susceptible responses. Clinical trials must demonstrate the cream's adequacy against contagious infections.
3. **Standardization:** Active ingredients in herbal formulations must be consistent in each batch, and extraction methods must be reproducible for quality control.
4. **Market Demand:** Expanding shopper inclination for normal items boosts the request for polyherbal antifungal creams. Open mindfulness campaigns are key to teaching buyers on their benefits.
5. **Challenges:** The need of standardized rules in a few districts, the complexity of home grown combinations, and supportability of sourcing stay challenges. In any case, as intrigued in characteristic cures develops, polyherbal creams have solid potential to supplant engineered choices.

## Drug profile

### 1. Neem (Azadirachta indica) Extract



- **Family:** Meliaceae
- **Active Constituents:** Nimbin, nimbidin, azadirachtin, nimbolide, flavonoids, tannins
- **Pharmacological Actions:** Antibacterial, antifungal, antiviral, anti-inflammatory, antiparasitic, immunomodulatory
- **Uses:** Skin infections, acne, dandruff, oral care, wound healing, antifungal creams
- **Dosage Forms:** Creams, ointments, capsules, soaps, gels

## 2. Liquorice (Glycyrrhiza glabra) Extract



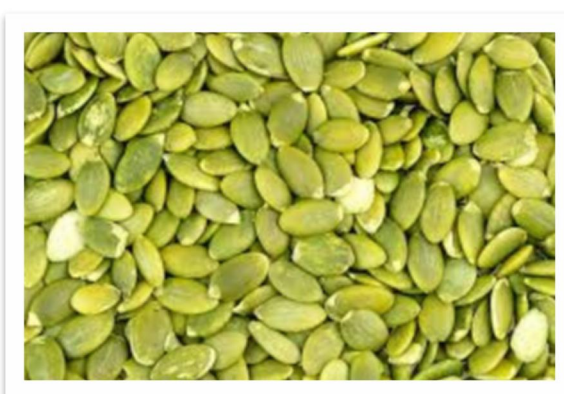
- **Family:** Fabaceae
- **Active Constituents:** Glycyrrhizin, liquiritin, glabridin, flavonoids, saponins
- **Pharmacological Actions:** Anti-inflammatory, demulcent, expectorant, antiviral, hepatoprotective
- **Uses:** Sore throat, cough, gastric ulcers, skin lightening, oral ulcers
- **Dosage Forms:** Lozenges, syrups, creams, powders, capsules

## 3. Guava (Psidium guajava) Leaf Extract



- **Family:** Myrtaceae
- **Active Constituents:** Quercetin, tannins, flavonoids, carotenoids, saponins
- **Pharmacological Actions:** Antimicrobial, antioxidant, anti-diarrheal, anti-inflammatory, antidiabetic
- **Uses:** Diarrhea, diabetes, oral infections, wound healing, acne
- **Dosage Forms:** Decoctions, capsules, mouthwash, gels

## 5. Pumpkin Seed (Cucurbita pepo) Extract



- **Family:** Cucurbitaceae
- **Active Constituents:** Phytosterols, cucurbitin, fatty acids (omega-3 & 6), tocopherols, zinc
- **Pharmacological Actions:** Antioxidant, anti-inflammatory, antiparasitic (vermifuge), prostate-protective
- **Uses:** Benign prostatic hyperplasia (BPH), intestinal parasites, urinary tract health
- **Dosage Forms:** Capsules, oils, powders, extracts

#### 6. Garlic Oil (*Allium sativum*)



- **Family:** Amaryllidaceae
- **Active Constituents:** Allicin, ajoene, diallyl sulfide, saponins, selenium
- **Pharmacological Actions:** Antibacterial, antifungal, antihypertensive, antiplatelet, cholesterol-lowering
- **Uses:** Cardiovascular health, infections, immunity booster, skin conditions
- **Dosage Forms:** Oil, capsules, tablets, ointments

#### 7. Clove Oil (*Syzygium aromaticum*)



- **Family:** Myrtaceae
- **Active Constituents:** Eugenol, caryophyllene, flavonoids, tannins
- **Pharmacological Actions:** Analgesic, antiseptic, antimicrobial, carminative, antifungal
- **Uses:** Toothache, oral care, acne, fungal infections, pain relief
- **Dosage Forms:** Oil, gels, creams, mouthwas

## LITURATURE REVIEW

### 1. Mudassar Mulla et al., 2024

The skin as a protective barrier and the growing use of **herbal medicine**. Herbal medicine, derived from plant parts such as seeds, leaves, stems, and roots, is gaining popularity due to its **cost-effectiveness** and **safety**. Bioactive compounds like **alkaloids**, **flavonoids**, and **phenolic compounds** found in herbs offer **antimicrobial** and **anti-inflammatory** properties.



2. **Ms. Jigyasa Patidar et al., 2024**  
Use of herbs in treating **skin diseases**, specifically fungal infections. **Psidium Guajava** and **Ocimum sanctum** leaves are recognized for their **antifungal activity**. Their incorporation in polyherbal antifungal creams is gaining attention due to their bioactive compounds like **flavonoids**, **camphor**, **eugenol**, and **eucalyptol**.
3. **Pranali Kunteshwar Rabade et al., 2024**  
Evaluation of herbal garlic extracts for **antibacterial** and **antifungal properties**. Herbal remedies, including garlic, are being explored for their **bioactive compounds** and **therapeutic properties**, offering potential treatments for both **human** and **veterinary medicine**.
4. **Pallab Das Gupta et al., 2023**  
Standardization of **polyherbal formulations**, specifically for arthritis. While herbal medicines are effective, they require **standardization** to ensure **quality**, **purity**, **safety**, and **efficacy**. This study focuses on applying **modern scientific quality control procedures** for the standardization of herbal products.
5. **Nilima A. Thombare et al., 2023**  
Fungal infections and the development of **guava leaf extract cream**. **Psidium guajava** Linn. leaf extract shows antifungal activity against a range of fungi. The study focused on developing a cream with guava leaf extract and evaluated its **flavonoid content**, **thin layer chromatography (TLC)**, and **antifungal activity** against **Candida albicans**. The optimized cream was characterized by appearance, pH, washability, spreadability, in-vitro drug diffusion, antifungal test, and skin irritation test on Wistar rats.
6. **Pratik Balasaheb Panhalkar et al., 2022**  
Development of a **polyherbal antifungal cream**. The study aimed to develop a long-lasting herbal antifungal cream using extracts from **Withania somnifera**, **Acorus calamus**, and **Piper nigrum**. The cream showed effective **physical** and **antifungal properties**, proving to be natural, stable, and safe. The investigation suggests the cream as a potential candidate for **clinical trials**.
7. **Kamlesh Kumar Yadav et al., 2022**  
The use of **Ayurvedic medicine** and **polyherbal formulations**. Ayurvedic medicine, which uses **polyherbal formulations** containing two or more herbs, has been practiced in India for centuries. Herbal therapy, rooted in medicinal plants, is making a strong comeback, and more people are turning to alternative medicine. The study highlights the growing interest in **herbal therapy** and **Ayurvedic medicine** for health management.
8. **Vibbavari Makarand Character et al., 2022**  
Cosmetics made from natural or synthetic components and the use of **Azadirachta indica** and **Nyctanthes arbor-tristis** in herbal systems. Both **Azadirachta indica** (Neem) and **Nyctanthes arbor-tristis** (Night Jasmine) are traditionally used in Ayurvedic, Homeopathic, and Siddha systems for their **antibacterial**, **anti-inflammatory**, and **analgesic** properties. These plants are widely used in cosmetics and herbal medicine.
9. **Kaushles Kumar Mishra et al., 2020**  
There has been an increase in **fungal infections** and resistance to common antifungal treatments like **amphotericin B**. Most antifungal therapies have **toxicity**, **efficacy**, and **cost** concerns, and frequent use has led to the emergence of resistant fungal strains. This underscores the need for new, safer antifungal treatments.
10. **Prashatchavhan et al., 2020**  
The formulation and evaluation of **polyherbal antifungal cream** using plants like **Eugenia caryophyllus**, **Zingiber officinale**, and **Nyctanthes arbor-tristis**. Clove (**Eugenia caryophyllus**), ginger (**Zingiber officinale**), and Night Jasmine (**Nyctanthes arbor-tristis**) have **anti-inflammatory**, **analgesic**, and **antifungal** properties. This study focused on formulating and evaluating a **polyherbal antifungal cream** using these plants, emphasizing its potential for therapeutic use.
11. **Harshita Patel et al., 2021**  
**Antifungal efficacy of natural plant extracts** and their incorporation into **topical formulations**. The study reviewed various **plant extracts** with known **antifungal activity**, including **Tea Tree oil**, **Lavender**, and **Neem**. These extracts were shown to inhibit the growth of common **dermatophytes** and yeasts like **Candida albicans**. The research highlights the potential of integrating these natural extracts into **polyherbal antifungal creams** for effective topical treatment of fungal skin infections.
12. **Shivani Gupta et al., 2020**  
The **role of polyherbal formulations** in managing **skin infections**. This study explored several **polyherbal formulations** containing combinations of **Neem**, **Aloe vera**, and **Turmeric**, which exhibited significant **antifungal** and **antibacterial** properties. These formulations demonstrated effective activity against a broad range of **pathogenic fungi** and were shown to improve skin health by promoting faster healing and reducing inflammation.
13. **Anju Sharma et al., 2021**  
**Phytochemical analysis** and **antifungal activity** of herbal extracts in topical formulations. The study focused on the **phytochemical constituents** such as **flavonoids**, **terpenoids**, and **alkaloids** in herbs like **Basil**, **Neem**, and **Tulsi**. These bioactive compounds were linked to their **antifungal** effects and were shown to effectively prevent the growth of **fungal pathogens** like **Trichophyton rubrum** and **Candida albicans**. The research suggested that these herbs could be utilized in **polyherbal antifungal creams** for enhanced **skin infection management**.

## Aim

Formulation and Evaluation of Polyherbal Antifungal Cream

**Objective**

- To prepare cream having antifungal properties.
- Antifungal cream having herbal active pharmaceutical ingredient.
- Selecting herbs having antifungal properties.
- To improve the efficacy of Antifungal cream on fungal infection.
- In order to reduce the side effect.

**PLAN OF WORK**

The present proposed research work has been planned as follows:

- Literature Survey**
  - Conduct an extensive **literature survey** to gather information on previously used **herbal antifungal ingredients**, their efficacy, and the best formulation techniques for antifungal creams.
- Collection of Excipients**
  - Select and gather **appropriate excipients** such as **emollients**, **stabilizers**, and **preservatives** that are compatible with the selected active herbal ingredients to ensure effective formulation and stability of the cream.
- Extraction of Active Ingredients**
  - Extract the **active pharmaceutical ingredients (APIs)** from the chosen herbs with antifungal properties, using suitable extraction methods (e.g., **maceration**, **percolation**, or **solvent extraction**).
- Formulation of Cream**
  - Develop a **polyherbal antifungal cream** by combining the extracted active ingredients with the selected excipients.
  - Standardize the **concentration** of active ingredients in the cream to ensure optimal antifungal activity and stability.
- Evaluation of Cream**

The formulated cream will be evaluated for the following parameters:

  - **Physical Appearance:** Assess the **texture**, **color**, and **consistency** of the cream.
  - **pH Range:** Measure and adjust the **pH** to ensure it is compatible with **skin** (typically between **4.5 - 6.5**).
  - **Skin Irritancy Test:** Conduct a **patch test** on a small area of skin to ensure the cream does not cause **irritation** or **allergic reactions**.
  - **Antimicrobial Test:** Perform **antifungal** testing to evaluate the cream's effectiveness against common **fungal pathogens** (e.g., **Candida albicans**, **Trichophyton rubrum**).

**MATERIAL AND EQUIPMENT**

<i>S. No.</i>	<i>Name of Ingredient</i>	<i>Botanical Name</i>	<i>Form</i>	<i>Function</i>
1	Neem	Azadirachta indica	Extract	Antifungal, antibacterial
2	Liquorice	Glycyrrhiza glabra	Extract	Anti-inflammatory, soothing
3	Guava Leaf	Psidium guajava	Extract	Antimicrobial, antioxidant
4	Pumpkin Seed	Cucurbita pepo	Extract	Skin conditioning, antifungal
5	Garlic Oil	Allium sativum	Essential Oil	Potent antifungal & antimicrobial
6	Clove Oil	Syzygium aromaticum	Essential Oil	Antifungal, preservative effect
7	Rose Water	Rosa damascena	Aqueous Solution	Cooling, aromatic base

**Table 1: Herbal Extracts**

<i>S. No.</i>	<i>Name of Ingredient</i>	<i>Function</i>
1	Borax (Sodium Borate)	Emulsifier
2	Methyl Paraben	Preservative
3	Bees Wax	Thickener, consistency agent
4	Liquid Paraffin	Emollient, skin softener
5	White Soft Paraffin	Moisturizer, base ingredient

**Table 2: Excipients**

<i>S. No.</i>	<i>Equipment</i>	<i>Purpose</i>
1	Hot Plate	Heating, melting wax/oil phase
2	Magnetic Stirrer	Uniform mixing of components



3	Beakers, Glass Rods	Mixing and transferring materials
4	Measuring Cylinders	Accurate measurement of liquids
5	pH Meter	Determination and adjustment of pH
6	Petri Dishes, Agar Medium	Culturing fungal strains for antifungal test
7	Fungal Cultures (e.g., <i>Candida albicans</i> , <i>Aspergillus niger</i> )	Antifungal efficacy testing
8	Incubator	Growth and incubation of fungal cultures

Table 3: Equipment Required

## EXPERIMENTAL WORK

### Procedure for Formulation of Polyherbal Antifungal Cream (50 g)

#### Step 1: Preparation of Materials

**Objective:** Ensure all materials are clean, weighed accurately, and ready for use.

- Clean all apparatus with distilled water and dry thoroughly.
- Weigh all ingredients accurately using a digital analytical balance as per the formulation table.

#### Step 2: Preparation of the Oil Phase

##### Ingredients:

- Beeswax – 3 g
- White soft paraffin – 7 g
- Liquid paraffin – 4 g

##### Procedure:

1. In a clean, dry beaker (Beaker A), add beeswax, white soft paraffin, and liquid paraffin.
2. Place Beaker A on a water bath set to **70–75°C**.
3. Stir continuously using a glass rod or magnetic stirrer until all the components melt completely.
4. Maintain the oil phase at 70°C.

#### Step 3: Preparation of the Aqueous Phase

##### Ingredients:

- Borax – 0.3 g
- Methylparaben – 0.1 g
- Propylparaben – 0.05 g
- Rose water – 3 g
- Distilled water – 20 g (initially; adjust q.s. to 50 g at the end)

##### Procedure:

1. In another clean beaker (Beaker B), add distilled water and heat to **70°C**.
2. Dissolve borax, methylparaben, and propylparaben in the warm distilled water with constant stirring.
3. Add rose water to the aqueous phase.
4. Maintain the aqueous phase at 70°C.

#### Step 4: Addition of Herbal Extracts

##### Ingredients:

- Neem extract – 2 g
- Guava leaf extract – 1.5 g
- Licorice extract – 1.5 g
- Pumpkin seed extract – 1 g

##### Procedure:

1. Once the aqueous phase is homogenous and fully dissolved, add the herbal extracts one by one.
2. Stir thoroughly to ensure uniform dispersion of all extracts.
3. Keep the mixture at 70°C to maintain fluidity for emulsification.

#### Step 5: Emulsification

**Objective:** Combine oil and aqueous phases to form a stable cream emulsion.

##### Procedure:

1. Slowly pour the hot aqueous phase (Beaker B) into the hot oil phase (Beaker A) **with continuous stirring**.
2. Stir with a magnetic stirrer or homogenizer at **moderate speed** for 10–15 minutes until a creamy emulsion forms.
3. Continue stirring and allow the mixture to cool to about **40°C**.

#### Step 6: Addition of Essential Oils

**Ingredients:**

- Clove oil – 0.5 g
- Garlic oil – 0.5 g

**Procedure:**

1. At 40°C (to preserve volatile oils), add clove oil and garlic oil.
2. Mix gently to avoid air entrapment.

**Step 7: Final Adjustment and Homogenization**

1. Add **distilled water q.s. to 50 g**.
2. Stir gently until a smooth, homogeneous cream is formed.
3. Ensure the consistency is uniform with no phase separation or clumping.

**Step 8: Packaging and Labelling****Procedure:**

1. Transfer the cream into a sterile, wide-mouth ointment jar or collapsible tube using a stainless steel spatula.
2. Label the container with:
  - Product name
  - Batch number
  - Date of manufacture
  - Expiry date (as per evaluation timeline)
  - "For External Use Only"

**Step 9: Storage**

- Store the cream in a **cool, dry place** away from sunlight.
- Ensure the lid is tightly closed to prevent contamination

**Formulation Table for 50 g Polyherbal Antifungal Cream**

Sr. No.	Ingredient	Botanical Name	Function	Quantity (g)
1	Neem extract	Azadirachta indica	Antifungal, antibacterial	2.0
2	Guava leaf extract	Psidium guajava	Antifungal, antioxidant	1.5
3	Liquorice extract	Glycyrrhiza glabra	Anti-inflammatory, antifungal	1.5
4	Pumpkin seed extract	Cucurbita pepo	Antifungal, skin nourishing	1.0

**Table 1: Active Herbal Extracts**

Sr. No.	Ingredient	Botanical Name	Function	Quantity (g)
1	Clove oil	Syzygium aromaticum	Antifungal, preservative	0.5
2	Garlic oil	Allium sativum	Broad-spectrum antifungal	0.5
3	Rose water	Rosa damascena	Fragrance, astringent	3.0
4	Methylparaben		Preservative	0.1
5	Propylparaben		Preservative	0.05

**Table 2: Essential Oils, Aromatics & Preservatives**

Sr. No.	Ingredient	Function	Quantity (g)
1	Beeswax	Emulsifier, thickener	3.0
2	Liquid paraffin	Emollient, skin softener	4.0
3	White soft paraffin	Base, occlusive agent	7.0

4	Borax (Sodium borate)	Emulsifier, stabilizer	0.3
5	Distilled water	Vehicle	q.s. to 50.0 g

Table 3: Cream Base Ingredients

## RESULT AND DISCUSSION

The two prepared batches of polyherbal antifungal cream, Batch A and Batch B, were evaluated for various physicochemical, biological, and safety parameters. The results obtained are as follows:

### 1. Physical Appearance

- **Method:** Visual inspection.
  - **Observation Parameters:** Color, texture, consistency, and presence of any lumps or grittiness.
- Both batches exhibited a smooth, uniform, semi-solid consistency with no signs of grittiness. Batch A had a pale green color due to a higher proportion of neem and guava extracts, while Batch B appeared light brown.

Batch	Consistency	Color	Observation
A	Smooth, semi-solid	Pale green (high neem & guava content)	Uniform, no grittiness
B	Smooth, semi-solid	Light brown	Uniform, no grittiness

### 2. pH Range

- **Method:** pH of 1% cream solution measured with a calibrated digital pH meter.
- **Acceptable Range:** 5.5 – 6.5

The pH of Batch A was found to be 5.8, and Batch B was 6.2, both within the acceptable range for topical skin products (5.5 to 6.5). This indicates compatibility with skin pH and reduces the risk of irritation or dryness, ensuring the formulations are suitable for regular use.

Batch	pH Value	Acceptable Range	Result
A	5.8	5.5 – 6.5	Within range – Skin-compatible
B	6.2	5.5 – 6.5	Within range – Skin-compatible

### 3. Skin Irritation Test and Safety

- **Method:** Patch test on shaved skin of albino Wistar rats or volunteers.
  - **Observation Period:** 24 to 48 hours.
- Skin irritation studies using the patch test method revealed no signs of erythema, redness, or allergic reaction on the test subjects for either batch. These findings confirm that both formulations are safe for topical application and are non-irritant in nature.

Batch	Test Method	Signs of Irritation	Result
A	Patch Test	None (no redness or erythema)	Non-irritant, safe
B	Patch Test	None (no redness or erythema)	Non-irritant, safe

### 4. Phase Separation

Neither batch exhibited any signs of phase separation during the stability observation period, indicating good emulsification and physical stability of the creams over time.

Batch	Observation Period	Phase Separation	Result
A	Stability period	None	Stable formulation
B	Stability period	None	Stable formulation

### 5. Washability

- **Method:** Cream applied on skin and washed with warm water.
- The creams were easily removed with warm water, leaving no greasy residue on the skin. This is an essential property for consumer acceptance and

daily usability.

Batch	Ease of Removal	Residue Left on Skin	Result
A	Easily removed with water	No greasy residue	Good consumer acceptability
B	Easily removed with water	No greasy residue	Good consumer acceptability

## 6. Homogeneity

- **Method:** Visual check and finger rub test.

Both formulations showed good homogeneity, as evidenced by uniform appearance and consistency. There were no lumps or separation observed, suggesting that the herbal actives and excipients were properly blended during the formulation process.

Batch	Uniformity of Appearance	Lumps or Separation	Result
A	Uniform	None	Proper blending and homogeneity
B	Uniform	None	Proper blending and homogeneity

## 7. Antifungal Activity

- **Method:** Agar well diffusion on *Candida albicans* using Sabouraud Dextrose Agar.
- **Zone of Inhibition Measured (mm):**

Antifungal testing by agar well diffusion method against *Candida albicans* revealed that both formulations possess effective antifungal properties. Batch A demonstrated a zone of inhibition of 22 mm, whereas Batch B exhibited a slightly higher zone of inhibition at 24 mm. The improved antifungal effect in Batch B may be attributed to the optimized concentration of herbal ingredients, particularly clove oil and garlic oil, which are known for their potent antifungal activity.

Batch	Test Organism	Zone of Inhibition (mm)	Result
A	<i>Candida albicans</i>	22 mm	Effective antifungal activity
B	<i>Candida albicans</i>	24 mm	Slightly higher activity due to clove & garlic oils

## Summary

This study focused on the formulation and evaluation of a polyherbal antifungal cream using active ingredients such as neem, guava, liquorice, pumpkin seed, garlic oil, clove oil, and rose water. The aim was to develop a natural, effective, and safe alternative to synthetic antifungal creams.

Two formulations, Batch A and Batch B, were prepared and subjected to various evaluation parameters, including physical appearance, pH range, skin irritation, washability, homogeneity, and antifungal efficacy. Both batches showed excellent stability and uniformity, with no signs of skin irritation or phase separation.

The antifungal activity of both batches was tested against *Candida albicans* using the agar well diffusion method. Batch B showed superior antifungal activity compared to Batch A, likely due to the enhanced concentration of antifungal essential oils. These results support the potential of the polyherbal antifungal cream as an effective natural remedy for fungal skin infections.

## Conclusion

The polyherbal antifungal creams, Batch A and Batch B, were successfully formulated and evaluated for their physicochemical properties, safety, and efficacy. Both formulations exhibited good physical stability, uniformity, and non-irritant characteristics, making them suitable for topical application. The pH values of both batches were within the ideal range for skin application, and no phase separation or washability issues were observed, further supporting their stability and ease of use.

Batch A and Batch B both demonstrated significant antifungal activity against *Candida albicans*, with Batch B showing slightly better antifungal efficacy. The improved performance of Batch B can be attributed to the optimal concentration of essential oils such as clove oil and garlic oil, which are known for their potent antifungal properties. The formulations were also safe for use, as indicated by the negative results of the skin irritation tests.

In conclusion, the polyherbal antifungal cream holds promise as an effective, safe, and stable alternative to synthetic antifungal treatments. Further clinical trials and in vivo studies are recommended to confirm the therapeutic benefits and to explore its potential in treating a wide range of fungal skin infections.

## REFERENCE

### 1. Introduction:

1. Mudassar Mulla et al., 2024

- The skin's role as a protective barrier and the growing use of herbal medicine for its safety and cost-effectiveness in treating diseases, particularly fungal infections.
- 2. **Jigyasa Patidar et al., 2024**
  - The use of *Psidium guajava* (guava) and *Ocimum sanctum* (Tulsi) for treating skin-related diseases and fungal infections due to their antifungal properties.
- 3. **Pranali KunteshwarRabade et al., 2024**
  - Importance of phytochemical composition in herbal extracts and their therapeutic benefits, including antifungal properties.
- 4. **Pallab Das Gupta et al., 2023**
  - Standardization of herbal formulations to ensure efficacy, safety, and quality, critical for the development of polyherbal antifungal creams.
- 5. **Nilima A. Thombare et al., 2023**
  - Focus on the antifungal activity of *Psidium guajava* leaf extract, demonstrating the potential of guava as a natural remedy in polyherbal creams.
- 6. **Pratik Balasaheb Panhalkar et al., 2022**
  - Antifungal properties of *Withania somnifera*, *Acorus calamus*, and *Piper nigrum*, highlighting their role in polyherbal formulations for skin diseases.
- 7. **Kamlesh Kumar Yadav et al., 2022**
  - The resurgence of Ayurvedic medicine and polyherbal formulations for treating a variety of ailments, including fungal infections.
- 8. **Vibbavari Makarand Character et al., 2022**
  - The use of *Azadirachta indica* (neem) and *Nyctanthes arbor-tristis* (night-flowering jasmine) in Ayurvedic treatments, supporting their use in polyherbal antifungal creams.
- 9. **Kaushles Kumar Mishra et al., 2020**
  - The increasing incidence of fungal infections and the need for safer, more effective alternatives to synthetic antifungal agents, promoting herbal remedies like polyherbal antifungal creams.
- 10. **Prashatchavhan et al., 2020**
  - The use of *Eugenia caryophyllus* (clove), *Zingiber officinale* (ginger), and *Nyctanthes arbor-tristis* in formulations for antifungal and anti-inflammatory benefits.

## 2. Literature Review:

- 1. **Mudassar Mulla et al., 2024**
  - Discusses the antimicrobial and anti-inflammatory properties of herbal ingredients, supporting the use of herbs in polyherbal antifungal creams.
- 2. **Jigyasa Patidar et al., 2024**
  - Supports the role of herbs like *Psidium guajava* and *Ocimum sanctum* in antifungal treatment, emphasizing their therapeutic potential.
- 3. **Pranali KunteshwarRabade et al., 2024**
  - Focuses on the evaluation of herbal extracts and their medicinal properties, supporting their use in polyherbal formulations.
- 4. **Nilima A. Thombare et al., 2023**
  - Investigates the effectiveness of guava leaf extracts in antifungal treatments, confirming its potential for use in creams.
- 5. **Pratik Balasaheb Panhalkar et al., 2022**
  - Provides insight into the efficacy of herbal ingredients like *Withania somnifera* and *Acorus calamus* in antifungal creams.
- 6. **Kamlesh Kumar Yadav et al., 2022**
  - Emphasizes the growing use of polyherbal treatments in alternative medicine for fungal infections, which aligns with the objectives of the research.
- 7. **Vibbavari Makarand Character et al., 2022**
  - Supports the inclusion of *Azadirachta indica* and *Nyctanthes arbor-tristis* for their antifungal properties, as reflected in the formulation.

## 3. Formulation and Evaluation (Methodology):

- 1. **Mudassar Mulla et al., 2024 [9]**
  - Discusses the role of bioactive compounds in herbs and their use in topical applications, supporting the formulation process.
- 2. **Pallab Das Gupta et al., 2023**
  - Highlights the need for proper standardization and quality control in herbal formulation, reinforcing the evaluation methods used in the study.
- 3. **Pratik Balasaheb Panhalkar et al., 2022**
  - Describes the preparation and evaluation of polyherbal antifungal creams, which are aligned with the experimental formulation and evaluation methods.
- 4. **Vibbavari Makarand Character et al., 2022**
  - Highlights the importance of evaluating the stability, homogeneity, and physical properties of the formulation, which was also evaluated in the experimental work.