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Research Article

Formulation and Evaluation of Antifungal Cream

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Abstract

The present study aims to investigate the antifungal potential of *Epipremnum aureum* and to formulate a topical antifungal preparation derived from its extract. This formulation falls under the category of medicinal creams containing herbal antifungal agents. For treating skin infections, topical applications are generally preferred as they deliver the active ingredient directly to the affected site. *Epipremnum aureum*, commonly known as the Money Plant or Golden Pothos, is a rapidly growing climber belonging to the family Araceae. Widely cultivated as an ornamental indoor plant, it is also known for its remarkable air-purifying ability, effectively removing pollutants such as formaldehyde, benzene, and xylene from the environment.

Phytochemical investigations have revealed that *E. aureum* contains several bioactive constituents, including flavonoids, alkaloids, tannins, saponins, and terpenoids, which contribute to its broad spectrum of biological activities. These compounds are believed to be primarily responsible for its antifungal efficacy. In addition to its antifungal effects, different parts of the plant exhibit antioxidant, antibacterial, antimalarial, anticancer, and wound-healing properties. However, many of the therapeutic potentials of *Epipremnum* species remain underexplored and warrant further scientific investigation for their benefits to human health and environmental applications.

In this study, a herbal antifungal cream was developed using *E. aureum* extract, and the formulation was evaluated for physicochemical parameters such as pH, appearance, viscosity, spreadability, and skin irritation potential to ensure its suitability for topical use.

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KEYWORDS: Epipremnum aureum extract, antifungal activity, fungal infection, topical herbal formulation, phytochemical analysis, viscosity, Golden Pothos, antifungal cream

1. INTRODUCTION

Polymers. Since the earliest stages of human civilisation, plants have been an essential and preferred source of medicine. They synthesise numerous bioactive compounds with strong antioxidant properties, making them valuable natural agents for maintaining health and preventing disease. *Epipremnum aureum*, a popular ornamental foliage plant, is easily propagated through stem cuttings and requires minimal maintenance when grown in suitable conditions. This plant is also known for its air-purifying abilities, effectively removing harmful indoor pollutants such as formaldehyde, benzene, and xylene.

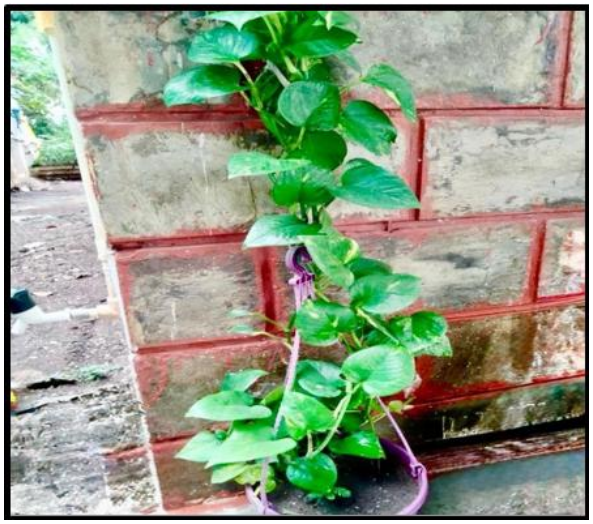
Both the aerial roots and leaves of *E. aureum* have demonstrated significant antibacterial and antimicrobial potential. Historically, plants rich in such bioactive constituents have been used in traditional medicinal systems like Ayurveda, Unani, and Siddha to treat a wide range of ailments. Although synthetic drugs have become dominant in modern medicine, their adverse effects have renewed global interest in natural remedies derived from medicinal plants. The family Araceae, to which *Epipremnum aureum* belongs, includes many species with notable therapeutic properties.

E. aureum produces small green flowers during the summer and is widely recognised in regions such as Malaysia and Singapore, where it has been traditionally used for treating cancer and various skin conditions. In local practices, decoctions made from its fresh leaves—often boiled with meat, eggs, or prepared as herbal tea—are commonly consumed for their perceived healing effects. The identification and characterisation of phytoconstituents in this plant are essential to understanding its pharmacological potential, as these compounds play a vital role in its therapeutic activity.

Botanically, *Epipremnum aureum* is an evergreen, herbaceous vine commonly referred to as the Money Plant, Golden Pothos, Devil's Ivy, or Silver Vine. Its attractive marbled leaves, air-purifying capacity, and ability to thrive indoors have made it one of the most popular houseplants worldwide. Uniquely, it can grow hydroponically in plain water for extended periods without soil or added nutrients, relying solely on naturally occurring minerals in the water. Optimal growth occurs in bright, filtered light; however, excessive or insufficient light may cause leaf discolouration.

Crude leaf extracts of *E. aureum* have shown broad-spectrum antimicrobial and antifungal effects, suggesting its possible application in the treatment of microbial infections. Phytochemical screening of the methanolic leaf extract has revealed the presence of secondary metabolites such as alkaloids, flavonoids, tannins, triterpenoids, and saponins. Among its active compounds, phytol is particularly noteworthy for exhibiting diverse biological activities, including antimalarial, antioxidant, anti-inflammatory, antitumor, antifungal, and antibacterial effects, notably against *Salmonella typhi*.

Fig. 1: Plant of *Epipremnum Aureum*



Classification of Genus *Epipremnum*
Kingdom: *Plantae*
Subkingdom: Viridaeplantae-Green Plants
Phylum: *Tracheophyta*-Vascular plants
Subphylum: *Euphyllophytina*
Infraphylum: *Radiatopses*
Class: *Liliopsida*-Monocotyledons
Subclass: *Aridae*
Superorder: *Aranae*
Order: *Arales Dumortier*
Family: *Araceae*
Subfamily: *Monsteroideae*
Tribe: *Monstereae*
Genus: Epipremnum Linnaeus

Anti-bacterial and Anti-fungal Activity

Different solvent extracts of *Epipremnum aureum* leaves and aerial roots have demonstrated notable antibacterial and antifungal properties. Studies have shown that aqueous extracts of the plant's aerial roots produced clear and well-defined zones of inhibition when tested against various microorganisms. The inhibitory effect was found to be comparable to that of standard antibiotic discs, following the decreasing order: *Escherichia coli* > *Micrococcus luteus* > *Bacillus cereus* > *Bacillus subtilis*.

The methanolic extract of *E. aureum* leaves exhibited significant antibacterial activity against *Escherichia coli* and *Staphylococcus aureus*, while its antifungal efficacy was confirmed against *Candida albicans*. Similarly, the ethyl extract derived from the aerial roots of *Raphidophora aurea*—a species closely related to *E. aureum* that typically grows on *Areca catechu*—also displayed strong antibacterial and antifungal effects.

Moreover, extracts prepared using petroleum ether, acetone, and ethanol from *E. aureum* leaves were found to possess considerable antibacterial potential, particularly against *E. coli* and *S. aureus*. These findings suggest that the bioactive

compounds present in *E. aureum*, such as alkaloids, flavonoids, and saponins, may play a vital role in inhibiting the growth of both bacterial and fungal pathogens.

Drug Profile

1. Stearic Acid

Chemical name: Octadecanoic acid
Molecular formula: $C_{18}H_{36}O_2$
Molecular Weight:284.48
Description: White or slightly yellow, crystal masses, or a white to slightly yellow powder.
Melting Point: 69-70º
Boiling Point: 383º
Solubility: Freely soluble in ether, chloroform, and acetone. Insoluble in water
Uses: 1. For suppositories, coating enteric pills, ointments, and coating bitter remedies.
2. Use in vanishing creams and other cosmetics.

2. Stearyl Alcohol

Chemical Name: 1-Octadecanol **Molecular Formula:** $C_{18}H_{38}O$ **Molecular Weight:** 270.50
Description: White flakes or granules
Melting Point: 59.4-59.8º
Boiling Point: 210º °
Solubility: Soluble in alcohol, ether and insoluble in water.
Uses: Substitute for cetyl alcohol in pharmaceutical dispensing, in cosmetic creams, for emulsion, textile oil and finishes, as an antifoaming agent, lubricant, and chemical raw material.

3. Triethanolamine

Chemical Name: trihydroxytriethylamine
Molecular Formula: $C_{16}H_{15}NO_3$
Molecular Weight: 149.19
Description: Very hygroscopic, viscous liquid. Slight ammonical odour. Turns brown on exposure to air and light.
Melting Point: 21.57º
Boiling point: 335.4º
Solubility: Miscible with water, methanol, and acetone.

Uses:
1. Use in making emulsions with mineral and vegetable oils, paraffin and waxes.
2. Pharmaceutical aid (alkalizer)

4. Liquid Paraffin

Synonym: Petroleum liquid, mineral oil, paraffin oil
Description: Colourless, oily liquid, practically tasteless and odourless even when warmed.
Solubility: Soluble in Benzene, chloroform, ether, carbon disulfide, and petroleum ether.

Uses:
1. Lubricant.
2. Pharmaceutical aid (Vehicle, Solvent)
3. As a formulation aid in foods.
4. In cosmetics as an emollient

5. Glycerol

Chemical Name:1,2,3-Propanetriol, trihydroxypropane
Molecular Formula: $C_3H_8O_3$
Molecular Weight: 92.09
Description: Syrupy liquid, sweet, warm taste.
Melting Point: 17.8º
Boiling Point: 290.0º
Solubility: Miscible with water, alcohol and insoluble in benzene, chloroform, carbon tetrachloride, carbon disulfide, petroleum ether and in fixed and volatile oils.
Uses: Use as a solvent, humectant, plasticiser, emollient, sweetener, pharmaceutical aid (humectant, solvent, vehicle)

6. Methyl Paraben

Chemical Name: 4-Hydroxybenzoic acid methyl ester
Molecular formula: $C_8H_8O_3$
Molecular weight: 152.15 **Melting point:**131º
Boiling point: 270-280º °C
Solubility: Freely soluble in alcohol, methanol, acetone, and ether.
Uses: As a preservative in foods, beverages and cosmetics.

Role of Ingredients

Ingredients	Role of Ingredients
Stearyl alcohol	Emulsifier
Steric acid	Emollient
Liquid paraffin	Lubricant
Triethanolamine	Surface active agent
Glycerol	Emollient
Methyl Paraben	Preservative
Water	Vehicle

Plan of Work

1. Literature Review

Study the antifungal properties of *Epipremnum aureum*. Review existing herbal cream formulations.
Study fungal pathogens commonly responsible for skin infections.

2. Collection and Authentication of Plant Material

Collect fresh Epipremnum aureum leaves.
Authenticate the plant from a recognised botanical institute/herbarium.

3. Preparation of Extract

Wash and dry leaves in shade. Powder the dried leaves.
Perform extraction by Soxhlet using methanol as a solvent.
Filter and concentrate the extract using a water bath.
Store in an airtight container.

4. Phytochemical Screening

Perform preliminary phytochemical tests to identify active constituents (e.g., flavonoids, alkaloids, tannins).

5. Formulation of Antifungal Cream

6. Evaluation of Cream

Perform evaluation based on:
Physical appearance: Colour, texture, consistency, pH: Using a pH meter.
Viscosity: Using the Brookfield viscometer
Stability study: At different temperature and humidity conditions for up to 30 days
Washability: Easy to wash or not.
Irritancy test: On human volunteers.

Report Writing and Presentation: Assemble findings into a report. Prepare charts and presentation slides.

2. REVIEWS OF LITERATURE

Rita Himanshu Mehta, Ashok Bhagwat, and Sharad Karmarkar (2013) described *Epipremnum aureum*, commonly known as the Money Plant, as a rapidly growing monocotyledonous climber capable of covering large areas or spreading along the ground. Their research and previous reports have shown that several foliage plants, including *E. aureum*, can purify indoor air by removing chemical pollutants such as formaldehyde. Supporting these findings, a NASA study on indoor air purification ranked Golden Pothos among the top three most effective houseplants—alongside Philodendron and Spider Plant—for eliminating formaldehyde from enclosed spaces.
Vishakha Panchal, Palak Sapra, and Archana Mankad (2022) investigated the antimicrobial potential of *E. aureum* leaf and root extracts prepared using different solvents. Their findings revealed that methanolic extracts of the leaves showed antifungal activity against *Candida albicans*, while extracts in ethanol, acetone, and petroleum ether demonstrated antibacterial properties against *Staphylococcus aureus* and *Escherichia coli*.
Anju Meshram and Nidhi Srivastava (2014) reported that *E. aureum* possesses broad-spectrum antimicrobial activity against a range of pathogenic microorganisms. Both the leaves and aerial roots of the plant exhibited significant antibacterial and antifungal potential. The study emphasised that certain plant-derived compounds in *E. aureum* could serve as promising natural alternatives for the development of antimicrobial agents.
A subsequent study by Meshram, Srivastava, and Bhagyawant (2016) confirmed that the leaf extract of *E. aureum* effectively inhibited bacterial and fungal growth. The methanolic extract showed the presence of several important secondary metabolites, including alkaloids, tannins, flavonoids, triterpenoids, and saponins—compounds known for their pharmacological and antimicrobial significance. These findings support the potential use of *E. aureum* in managing microbial infections.
Selma Tobudic, Christina Kratzer, Andrea Lassnigg, and Elizabeth Presterl (2011) highlighted that *Candida* species are among the most frequent human fungal pathogens encountered in clinical practice. Infections caused by *Candida* can range from mild mucosal conditions to severe systemic diseases, with mortality rates for invasive candidiasis reported between 40% and 60%. The virulence of *Candida* species is primarily attributed to their adaptability to diverse environments and their ability to form biofilms, which enhance resistance to antifungal treatments.
Lakshmi Reka, Chamari Maheshika Godage, Jayantha Wijayabandara, and Aravinda Siriwardhene (2023) defined "mycosis" as a fungal infection affecting humans, typically chronic in nature. They noted that superficial, cutaneous, and occasionally systemic mycoses are commonly observed, with *Candida albicans* being the predominant fungal pathogen responsible for such infections. Topical antifungal therapies are often employed to treat superficial infections affecting the skin, nails, and ears.
Sreemoy Kanti Das, Pinaki Sengupta, Mohd. Shahimi Mustapha, Md. Kifayatudullah, and Md. Gousuddin (2015) explored the pharmacological relevance of various phytoconstituents. Their study revealed that flavonoids exhibit antidiabetic and neuroprotective activities, alkaloids function as anaesthetic agents, and terpenoids possess diverse biological activities, including anti-inflammatory, anticancer, antihyperlipidemic, antiviral, and antibacterial properties. The authors emphasised that the identification and quantification of phytochemicals are crucial for understanding and harnessing their therapeutic potential.

3. MATERIAL AND METHODS

Collection and Authentication of Plant Material

The fresh whole plant of *Epipremnum aureum* was collected from the area of Nashik district, Maharashtra, India.

Preparation of crude drug for extraction

The authenticated leaves were washed with fresh water and dried in the shade of sunlight for 15-20 days. The dried plant leaves were coarsely powdered with the help of a mechanical grinder. The powder was stored in an airtight container for further use.

Fig 2: Dried Leaves of *E. Aureum*

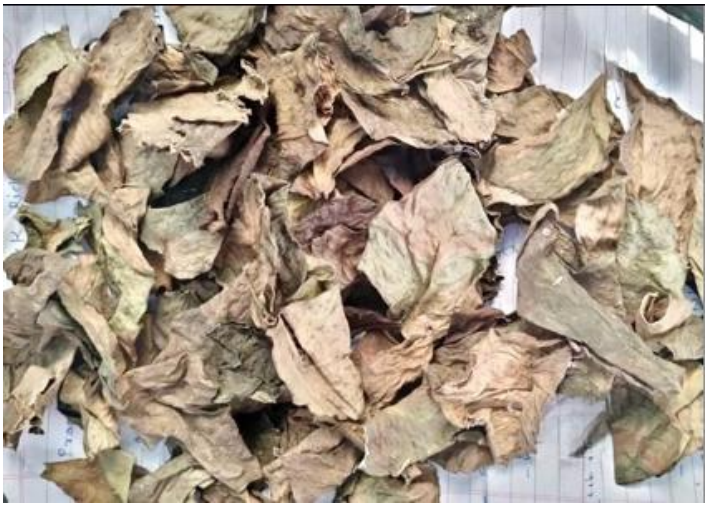
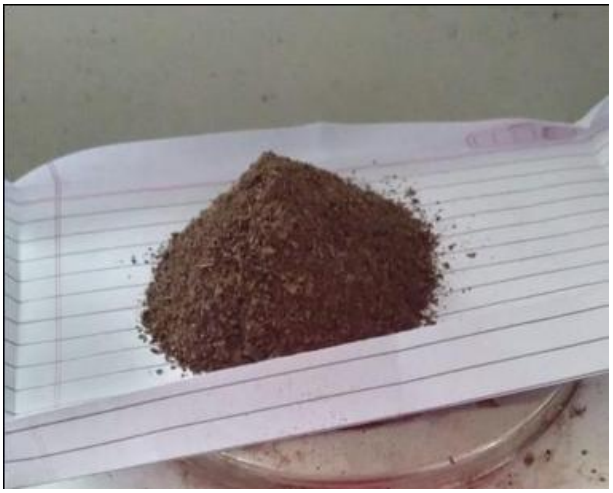


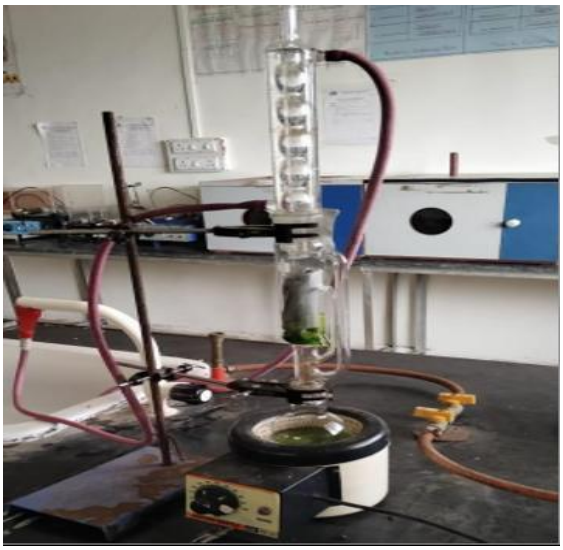
Fig. 3: Powder of *Epipremnum aureum* leaves (Dried leaves powder)



Extraction of Plant Material

Air-dried leaves were processed for methanolic extraction using a Soxhlet apparatus. After the extraction, the extracted material is kept in a water bath to get a pure extract of *Epipremnum aureum* leaves.

Fig 4: Soxhlet Extraction Process Preparation of Antifungal



Cream:

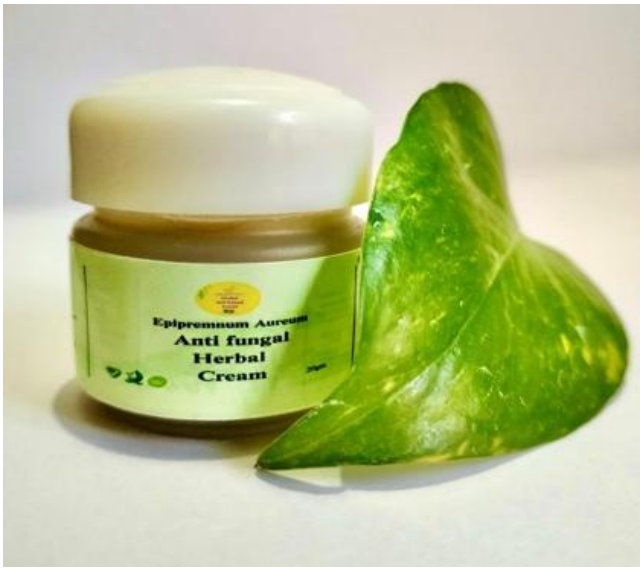
1. Weigh all the ingredients as per the quantity.
2. An oily phase (Stearyl alcohol, stearic acid, liquid paraffin) containing lipophilic substances.
3. An aqueous phase (Water and glycerine) containing a hydrophilic substance.
4. They were separately heated in a water bath at 60°c.
5. The aqueous phase was gradually added to the oily phase while constantly stirring until the mixture congealed at room temperature.
6. The resulting cream was treated with the extract.

And at the end, the perfuming agent will be added for a good fragrance.

Table 2: Formulation table

Sr. No.	Ingredients	F1	F2
1	Stearyl alcohol	2gm	1.2gm
2	Steric acid	8gm	7.7gm
3	Liquid paraffin	4 ml	4.5ml
4	Triethanolamine	1.3ml	1.3ml
5	Glycerol	2ml	1.9ml
6	Methyl Paraben	0.18gm	0.19gm
7	Water	q. s	q. s
8	Lavender oil	1-2dropes	1-2dropes
9	*Epipremnum Aureum* (Extract)	4%	6%

Fig. 5: Formulation of Antifungal cream

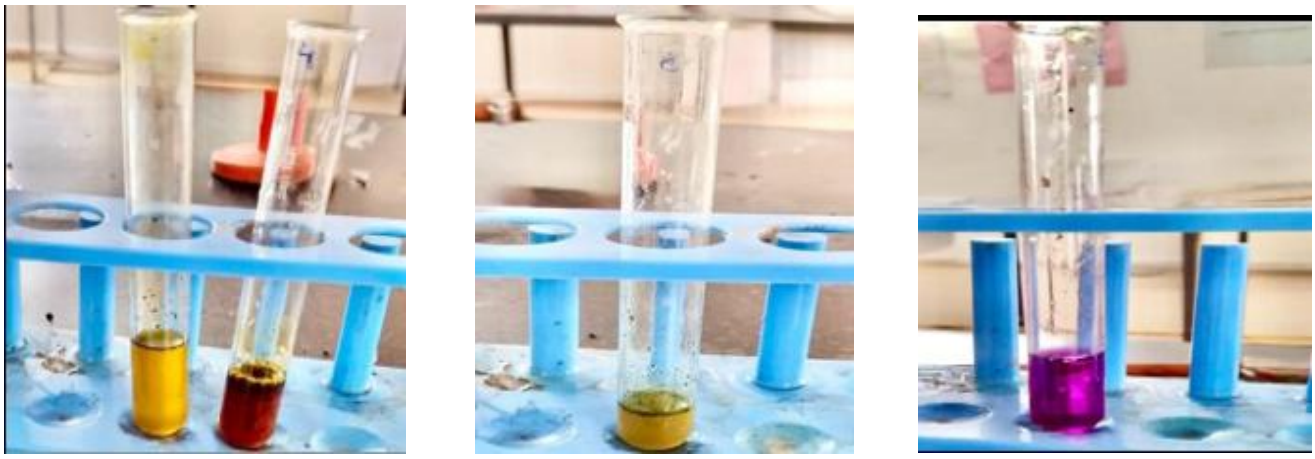


Evaluation test

Preliminary Phytochemical Analysis of *E.aureum*

Sr. No.	Test	Result	Inference
1	**Test for Alkaloid**		
	Dragandroff's Test: i) Test the solution few drops of Dragandroff's reagent (potassium iodide + bismuth nitrate)	Orange precipitate formed	Alkaloid present.
	Mayer's reagent ii) Test solution few drops of Mayer's reagent (potassium mercuric iodide solution)	Yellow precipitate formed.	Alkaloid present.
2.	**Test for Flavonoids**		
	i) Test with zinc dust. Test solution Zn dust + conc. HCL	Pink colour observed.	Flavonoids present
3.	**Test for tannins and phenolic compounds**		
	i) Ferric chloride test. Test solution small amount of freshly prepared 5% FeCl3 solution.	Deep blur black colour present.	Tannins and phenolic compounds are absent.

Fig. 6: Preliminary phytochemical test of **A)** Test for tannins and phenolic compounds, **B)** Test for alkaloids, **C)** Test for flavonoids



A **B** **C**

Appearance:
Colour, texture, and fragrance were used to evaluate the cream's appearance.

Spreadability: The spreadability of the prepared herbal cream was evaluated using two glass slides of standard dimensions. A fixed quantity of the formulation was carefully placed on one of the slides, and the second slide was positioned on top so that the cream formed a thin film covering a length of 6.5 cm between them. A weight of 200 g was then placed on the upper slide to ensure uniform compression of the cream into a consistent layer. After a few minutes, the weight was removed, and any excess formulation adhering to the slides was gently scraped off. The paired slides were then mounted on a stand in such a way that the upper slide could move freely under the influence of an applied load. A 20 g weight was attached to the upper slide, allowing it to slide down the lower one by the force of gravity.

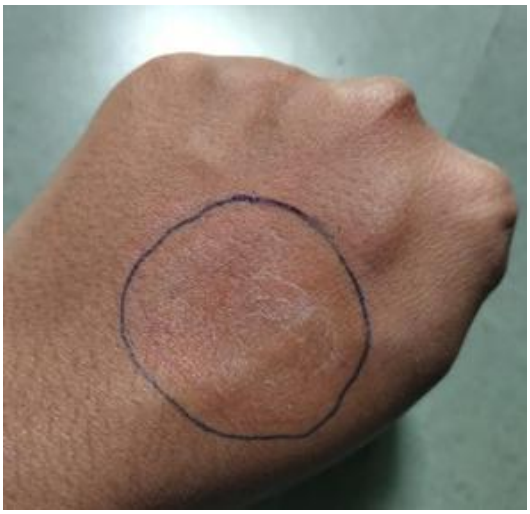
The time taken for the upper slide to completely separate and cover the 6.5 cm distance was recorded. The procedure was repeated three times, and the average value was used to determine the spreadability of the cream formulation.
Spreadability was calculated by using the following formula:

$$S = m. l/t$$

Were
S – Spreadability,
m - Weight tied to the upper slide (20 g),
l - Length of the glass (6.5 cm), t - Time taken in seconds

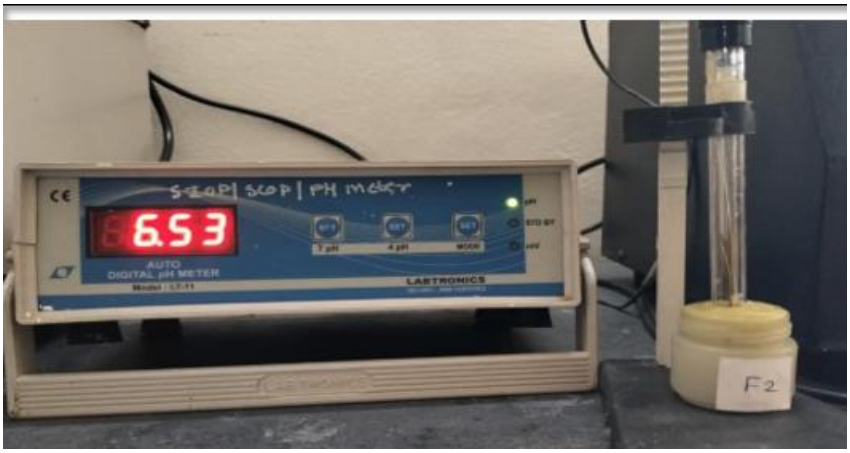
Irritancy test: On the left-hand dorsal surface, mark an area surface. The cream was applied to two volunteers in a specific area, and the duration of irritation was examined and reported at regular intervals up to 48 hours.

Fig 7: Irritancy test



pH: The pH of the cream was determined by a pH meter.

Fig 8: pH of the cream

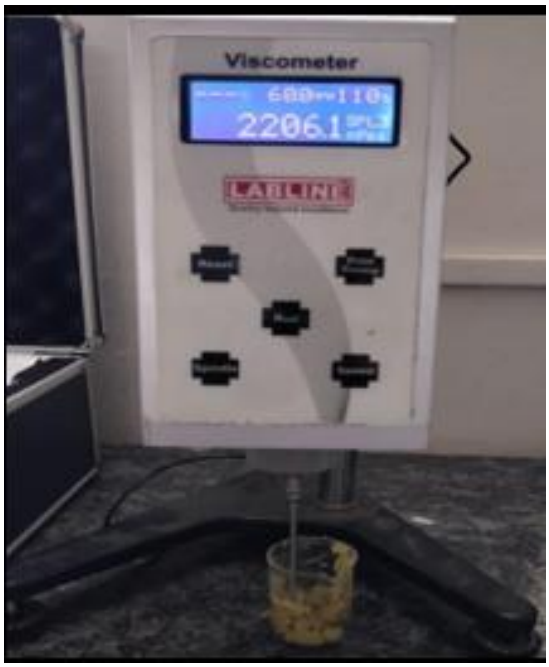


Viscosity

The viscosity of the formulated cream was measured using a Brookfield viscometer (LMDV-60 Labline) using a spindle L3 at 60.0 rpm. Viscosity measurements were performed at room temperature.

Washability:

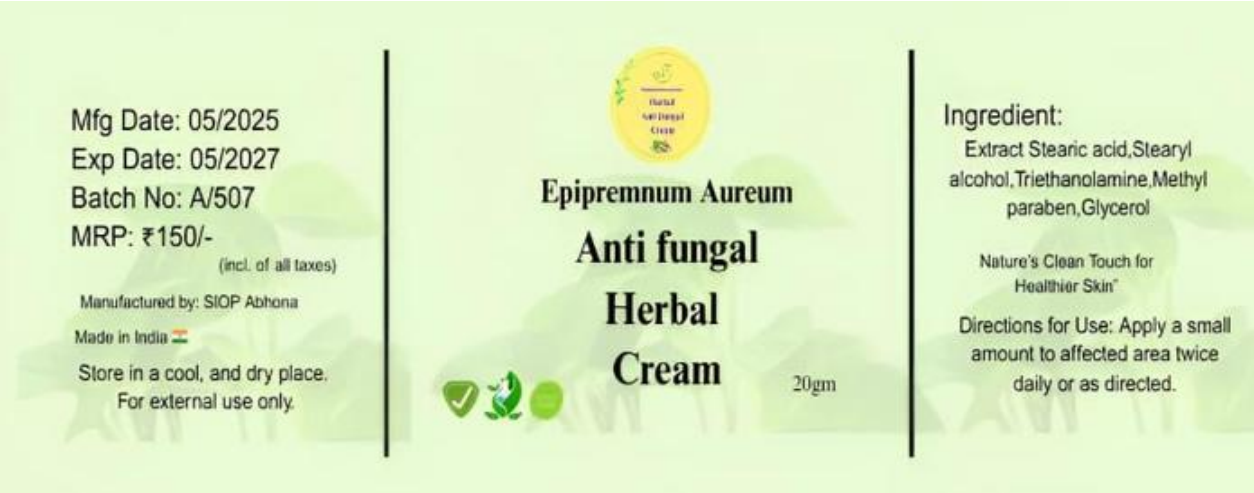
Fig 9: Viscosity of the cream

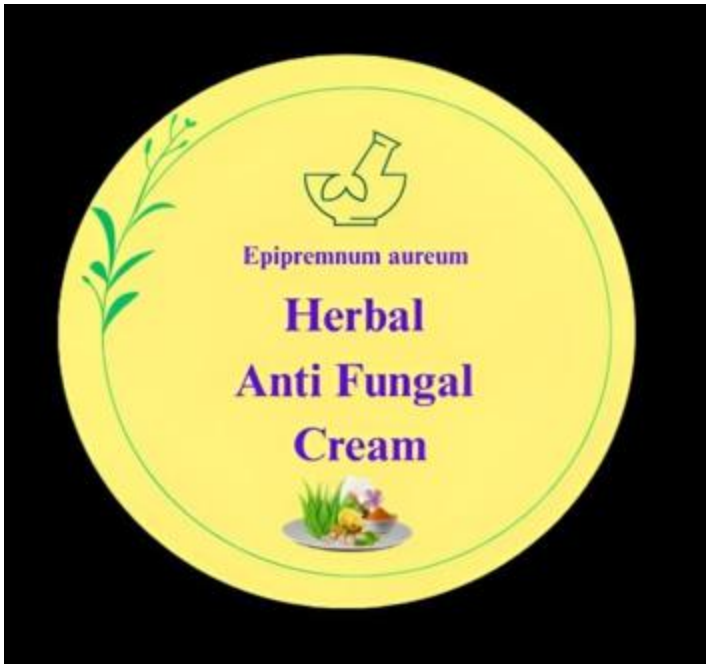


The washability of the formulation was tested by first applying the skin, then assessing the ease and extent of washing it with distilled water and manually examining the effect.

Stability: For 48 hours, the former cream was stored in a Petri plate at room temperature. The sample displays no oil separation or other phase separation after 48 hours; it passes the test.

Labelled Container





RESULTS

Sr. No	Parameter	F1	F2
1	Colour	Pale lime yellow	Pale lime yellow
2	Odour	Lavender like	Lavender like
3	Texture	Smooth	Smooth
4	pH	6.12	6.59
5	Appearance and Washability	Good	Good
6	Skin irritation test	No irritation	No irritation
7	Stability	Stable	Stable
8	Viscosity	2196.7mPas	2206.1mPas
9	Spreadability	Easily Spreadable	Easily Spreadable

CONCLUSION

Natural remedies are more acceptable in the belief that they are safer with fewer side effects than synthetic ones. Herbal formulations have a growing demand in the world market.is very good attempt has been made to establish the herbal cream containing *E. Aureum* leaves extract at various concentrations (3% and 6%). The purpose of this study was to develop an herbal cream. The methanolic extract of *E. Aureum* was identified as the best extract with stronger antifungal activity against C.albicans. During this study, the antifungal herbal cream of *Epipremnum aureum* showed that the product was very efficient and safe to use. No volunteer complained about allergic consequences. So, it is a safe product. The formulation was ecologically, economically and pocket-friendly. The result of different physicochemical tests showed a stable and good appearance of the cream.

Thus, in the current investigation, the cream containing 6% extract of *Epipremnum Aureum* (F2 formulation) has greater antifungal activity than the cream containing 3% extract of *E. Aureum* (F1 formulation). Based on this finding, the prepared cream was proven to be an Antifungal polyherbal cream.

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