



Formulation and evaluation of polyherbal lotion showing antifungal activity

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Abstract

This study focuses on the formulation and evaluation of a herbal antifungal lotion utilizing the plant extracts of *Tridax procumbens* and *Ipomoea quamoclit*, both of which are traditionally recognized for their medicinal properties. The plants were collected from different regions of Pune, India, and their leaves were processed using Soxhlet extraction (for *Tridax procumbens*) and cold maceration (for *Ipomoea quamoclit*) methods with hydroalcoholic solvents. The extracts were incorporated into an oil-in-water emulsion-based lotion and evaluated for organoleptic properties, spreadability, viscosity, pH, washability, stability, skin irritation, and antifungal activity.

The antifungal effectiveness was tested using the well diffusion method against *Candida albicans*, where the formulation exhibited a clear zone of inhibition, confirming its antifungal potential. The lotion showed no signs of phase separation, had pleasant organoleptic characteristics, and remained stable under various temperature conditions. No skin irritation was observed during testing, indicating high skin compatibility.

Keywords: Herbal lotion, *tridax procumbens*, *ipomoea quamoclit*, antifungal, *candida albicans*, natural skincare

Introduction

The skin, being the body's largest organ, acts as the primary barrier against environmental stressors such as dust, UV radiation, pathogens, and chemicals. These stressors can lead to various conditions, including infections and premature aging. Maintaining skin health is thus essential for overall well-being.

Herbal Products

The use of plants or plant parts to treat infections and illnesses—known as herbal medicine, botanical medicine, or herbalism—has been a long-standing practice. This approach is gaining renewed interest due to its low cost, accessibility, and reduced side effects compared to synthetic drugs. The medicinal properties of herbs are attributed to their bioactive compounds and secondary metabolites, including alkaloids, glycosides, tannins, flavonoids, phenolic compounds, and carbohydrates.

As antibiotic resistance continues to rise, it becomes increasingly important to explore plant-based natural products for their potential antimicrobial properties and unique mechanisms of action. Plant extracts have been conventionally used to treat bacterial and fungal infections, offering effective, safer alternatives to chemical agents.

Polyherbal Lotions

Polyherbal formulations involve the combination of two or more medicinal plants. As described in Ayurveda—specifically in the *Sarangdhar Samhita*—polyherbalism relies on the principle of mutualism, where combining herbs enhances therapeutic effects through synergism. While single-plant formulations may contain active phytoconstituents, their concentration might be insufficient for significant therapeutic action. Polyherbal combinations often exhibit improved efficacy, attributed to pharmacokinetic and pharmacodynamic synergy.

Among various topical formulations, lotions are widely accepted in both cosmetic and pharmaceutical applications.

Skin lotions help protect the skin from environmental damage, provide soothing effects, and are usually applied without friction. Ideally, the insoluble matter in herbal lotions should be finely divided, approaching colloidal dimensions, as such preparations are more effective in calming inflamed areas and maintaining contact with infected surfaces.

Fungal Infections

Fungal infections (or mycoses) are caused by various fungi, including yeasts and molds. These infections are commonly observed on the skin, nails, mouth, throat, lungs, urinary Globally, fungal infections affect over one billion people annually. In 2017, approximately 1.6 million deaths were reported due to fungal infections, a figure that increased to 1.7 million by 2020.

Common skin fungal infections include

1. Athlete's foot
2. Jock itch
3. Candidiasis
4. Ringworm
5. Tinea capitis
6. Tinea corporis
7. Cutaneous candidiasis
8. Tinea unguium
9. Toenail fungus

This project focuses on developing a polyherbal antifungal lotion containing *Tridax procumbens* and *Ipomoea quamoclit*, specifically to treat Candidiasis infections of the skin. *Candida* is a type of fungus that typically resides harmlessly in the human body. However, overgrowth can lead to infection, especially in moist or compromised skin areas.

Diagnosis is typically based on clinical signs, microscopy, and cultures. Treatment involves the application of antifungal agents, and this study explores the potential of herbal formulations as a natural alternative.



Fig 1: Large rash caused by Candidiasis

Material

To develop the polyherbal lotion with antifungal activity, two medicinal plants were selected based on their ethnopharmacological properties and phytochemical constituents:

1. *Tridax procumbens*
2. *Ipomoea quamoclit*

1. *Tridax procumbens*

Common Names

- **English:** Coat Button, Tridax Daisy
- **Hindi:** Ghamara
- **Marathi:** Dagadi Pala
- **Sanskrit:** Jayanti Veda
- **Malayalam:** Chiravanak
- **Telugu:** Gaddi Chamanti
- **Tamil:** That Pudu
- **Chinese:** Kotobuki Goku
- **Spanish:** Cadillo Chisaca
- **French:** Herbe Caille

Synonyms

Coat-button, Coat Buttons, Mexican Daisy Taxonomy

Kingdom: Plantae

Subkingdom: Tracheobionta

Division: Spermatophyta

Subdivision: Magnoliophyta

Class: Magnoliopsida

Subclass: Asteridae

Order: Asterales

Family: Asteraceae

Genus: *Tridax*

Species: *T. procumbens*



Fig 1: Methods

Habit

A perennial, hispid, procumbent herb that spreads widely and typically flowers and fruits throughout the year.

Distribution

Native to tropical America, now widespread across India (up to 2400 m above sea level) and other tropical, subtropical, and temperate regions.

Description

Herb 12–24 cm tall, weak and straggling in habit.

- **Leaves:** Ovate or lanceolate, coarsely toothed, petiolate.
- **Flowers:** Yellow, solitary, long-stalked, with white ray florets.

Medicinal Importance

- Traditionally used for wound healing, anticoagulant, antifungal, and insect repellent purposes.
- Treats infectious skin diseases, blisters, cuts, gastritis, diarrhea, anemia, hypertension, and liver disorders.
- Also effective against bacterial, fungal, protozoal, and viral infections.

Important Phytochemicals

Flavonoids: Quercetin, Luteolin, Kaempferol, Apigenin

Alkaloids: Vasicine, Vasicinone

Triterpenoids: Lupeol, Oleanolic acid

Others: Carotenoids, β -sitosterol, tannins, linolenic acid, procumbenetin, various fatty acids (lauric, palmitic, linoleic)

Antifungal Phytochemicals

- Flavonoids (quercetin, kaempferol, luteolin, apigenin)
- Alkaloids (vasicine, vasicinone)
- Triterpenoids (lupeol, oleanolic acid)

2. *Ipomoea quamoclit*

Common Names

- Cypress Vine
- Cypress Vine Morning Glory
- Cardinal Creeper
- Star Glory
- Hummingbird Vine

Synonyms

- *Quamoclit pennata* Bojer
- *Quamoclit vulgaris* Choisy

Taxonomy

Kingdom: Plantae

Phylum: Tracheophyta

Class: Magnoliopsida

Order: Solanales

Family: Convolvulaceae

Genus: *Ipomoea*

Species: *I. quamoclit*



Fig 3: Ipomoea Quamoclit P lant

Habit

A fast-growing, twining herbaceous vine, either annual or perennial.

Distribution

Widely naturalized in northern and eastern Australia, including:

- Northern Territory
- Queensland
- Kimberley Region (Western Australia)
- New South Wales
- Also found on Christmas Island

Description

- Twining vine, grows 3–10 feet tall
- **Leaves:** Deeply lobed (pinnate-like), 1–4 inches long
- **Flowers:** Trumpet-shaped, 1–2 inches, red/pink/ white in color with five pointed petals

Medicinal Importance

Known for its antioxidant, antimicrobial, and purgative properties.

Traditionally used to treat

Hemorrhoids, ulcers, carbuncles, piles, Chest pain, snake bites, bleeding wounds, Body weakness, abnormal behavior, voice sinking

Important Phytochemicals

- **Fatty Acids:** Lauric acid, Palmitic acid, Stearic acid
- **Flavonoids:** Quercetin, Kaempferol
- **Glycosides:** Jalapin, Quamoclines I–IV
- **Others:** 7-O-β-D glycopyranosyl dihydroquercetin, Tannins

Methods

1. Collection of Plants

- **Tridax procumbens**
Collected from the local area (ground) of Kharadi, Pune.

- **Ipomoea quamoclit**

Collected from a plant nursery located in Manjari, Pune.

2. Drying of Plants

Tridax procumbens

Mature, healthy leaves were:

- Washed thoroughly using distilled water.
- Cut into small pieces.
- Shade dried until completely moisture-free.
- Ground into a fine powder using a grinder.

Ipomoea quamoclit the leaves were:

- a. Separated and cleaned using distilled water.
- b. Size reduced manually.
- c. Dried in an oven at approx. room temperature.
- d. Ground into a fine powder using a grinder.

3. Extraction Methods

Tridax procumbens – Soxhlet Extraction Method Solvent: Hydroalcoholic.

Extraction carried out at room temperature for 24 hours.

The extract was:

- Filtered.
- Concentrated using a Rotary Evaporator at 45°C
- Stored for further use.

Ipomoea quamoclit – Cold Maceration Process Powder macerated with hydroalcoholic solvent. Incubation period: 5 days at 40°C.

Sr. No	Ingredients	Quantities (gm)				Uses
		F1	F2	F3	F4	
1	Tridax procumbens	3ml	1.25 ml	1.75 ml	2.5 ml	Anti Fungal Activity
2	Ipomoea quamoclit	2ml	1.25 ml	1.75 ml	2.5 ml	Anti Fungal Activity
3	Stearic acid	1.5 gm	1.5 gm	2gm	2gm	Emulsifier
4	Cetyl alcohol	0.10 gm	0.10 gm	0.30 gm	0.30 gm	Moisturizer
5	Lanoline	0.5 gm	0.5 gm	0.6 gm	0.6 gm	Emollient
6	Methyl Paraben	0.05 gm	0.05 gm	0.05 gm	0.05 gm	Preservative
7	Propylene Glycol	4ml	4ml	3ml	3ml	Softening agent
8	Triethanolamine	0.35 ml	0.35 ml	0.4ml	0.4ml	Surface- active agent
9	Rose water	1.5 ml	1.5 ml	1.5 ml	1.5 ml	Skin- whitening agent
10	Aloe vera gel	1ml	1ml	1ml	1ml	Antioxidant
11	Rose oil	1ml	1ml	1ml	1ml	Fragrance
12	Water	q. s	q. s	q. s	q. s	Vehicle

The extract was:

- Filtered thrice.
- Concentrated using a Rotary Evaporator at 40°C.
- Stored until further use.

Result and Formulation

Result

The herbal antifungal lotion was successfully formulated using *Tridax procumbens* and *Ipomoea quamoclit* extracts. The formulation was subjected to various evaluation parameters including organoleptic properties, spreadability, pH, viscosity, washability, skin irritation, and antifungal activity. The results confirmed the consistency, effectiveness, and stability of the herbal lotion.

Formulation of herbal lotion

1. Oil Phase (Part A)

Stearic acid, cetyl alcohol, and lanolin were heated to 75°C until fully dissolved.

2. Aqueous Phase (Part B)

Methyl paraben, triethanolamine, glycerol, rose water, and aloe vera gel were heated to 75°C and dissolved completely.

3. Emulsification

The hot oil phase was slowly added to the aqueous phase with continuous stirring to form a uniform lotion base.

4. Addition of Extracts

Tridax procumbens and *Ipomoea quamoclit* extracts were levigated in geometric proportion and blended into the lotion to form a smooth, polyherbal antifungal lotion.

Formulation Table

The formulation table is an essential component in the development of any pharmaceutical or cosmetic product. It provides a quantitative and qualitative breakdown of all ingredients used in the formulation, ensuring consistency, efficacy, and safety of the final product.

Evaluation of Herbal Lotion

a. Organoleptic Evaluation

Organoleptic properties such as color, texture, and smell were assessed.

- Color was evaluated visually.
- Texture was evaluated by touch.
- Odor was evaluated by sensing the fragrance of the formulation.

b. Appearance and Homogeneity

The lotion was visually examined for uniformity, clarity, and phase separation to ensure consistent appearance and homogeneity throughout the formulation.

c. Spreadability Test

- **Procedure:** 0.1 g of the lotion was placed between two glass slides. A 100 g weight was placed on top for 5 minutes to spread the sample evenly.
- The diameter of the spread circle was measured to calculate spreadability using the formula based on radius.
- This test determines how easily the lotion can be applied on the skin surface.

d. Washability

- The lotion was applied on skin and then washed off using tap water.
- The ease of removal was observed to determine if the lotion leaves any residue or film behind.

e. Viscosity

- Viscosity of the herbal lotion was measured using an Ostwald Viscometer.
- This parameter reflects the flow characteristics and consistency of the lotion.

f. pH

- The pH of 1% aqueous solution of the herbal lotion was measured using a calibrated digital pH meter at room temperature.
- It ensures skin compatibility and formulation stability.

Conclusion

The study confirms the feasibility of preparing an effective antifungal lotion using botanical extracts. *Tridax procumbens*, known in traditional Indian medicine for its antifungal properties, and *Ipomoea quamoclit* were successfully utilized in the formulation.

The herbal lotion exhibited:

- Good spreadability
- No phase separation
- Stable physical properties across various temperatures
- Mild and skin-friendly nature without any irritation or adverse effects

The antifungal test using *Candida albicans* showed a positive zone of inhibition, validating the extract's antimicrobial action.

Hence, this formulation can be considered a promising natural alternative to synthetic antifungal agents, with potential applications in the treatment of skin infections caused by fungi and bacteria.

References

1. Available from: <https://www.plantsjournal.com/archives/2024/vol12issue4/PartB/12-3-40-647.pdf>
2. Available from: <https://ijcrt.org/papers/IJCRT2309326.pdf>
3. *Pharmaceutical Resonance*, 2022, 4(2).
4. Available from: <https://ssl.adam.com/graphics/images/en/1411.jpg>
5. Reference Sites: for aim and objectives.
6. *International Journal of Pharmaceutical Sciences and Research (IJSR): Formulation and Evaluation of Polyherbal Antifungal Cream*.
7. *International Journal of Novel Research in Dentistry (IJNRD): Formulation and Evaluation of Polyherbal Antifungal Cream Using Guava Leaves Extract and Ocimum Sanctum Oil*.
8. *International Journal of Scientific and Developmental Research (IJS DR): Formulation and Evaluation of Polyherbal Antifungal Cream*.
9. Image reference. Available from: <https://www.researchgate.net/publication/373549400/figure/fig1/AS:11431281185072022@1693513280956/Tridax-procumbens-plant-6.jpg>
10. Available from: <https://www.ijcrt.org/papers/IJCRT2310458.pdf>
11. *Bull Pharm Res*, 2011;1(2):25-32.
12. 418-Article Text-709-1-10-20230117.pdf
13. Available from: www.phytojournal.com
14. Available from: www.ijpsjournal.com
15. Available from: ijrti.org

16. Available from: ijrti.org
17. Ipomoea quamoclit.
18. Haque SM, Ghosh B. *In vitro* completion of sexual life cycle: production of R1 plants of Ipomoea quamoclit. Propag Ornamental Plants,2013;13:19–24.
19. Kumar AS, Reddy JR, Gupta VRM. *In vitro* antioxidant activity of Porana paniculata and Ipomoea quamoclit two ethnomedicinally important plants of Convolvulaceae family. Br J Pharm Res,2015;5:286–293.
20. British Journal of Pharmaceutical Research, 5, 286–293.
21. Srivastava D. Medicinal plant of genus Ipomoea found in Uttar Pradesh. Res J Recent Sci,2017;6(12):12-22.
22. Image address. Available from: https://m.mediaamazon.com/images/I/51uvlPd376L._A_C_.jpg
23. PAB-MS-190080287 (3).pdf
24. 05_workplan & methodology (5).pdf
25. IJRBAT, 2017, 5(S2).
26. Available from: <https://ijcrt.org/papers/IJCRT2204096.pdf>
27. Int J Pharm Res Appl,2024;9(3):1014-1022. Available from: www.ijprajournal.com
28. IJRBAT, Special Issue (2), Vol-V, July 2017. ISSN No. 2347-517X (Online). INTERNATIONAL JOURNAL OF RESEARCHES IN BIOSCIENCES, AGRICULTURE AND TECHNOLOGY. © VISHWASHANTI MULTIPURPOSE SOCIETY (Global Peace Multipurpose Society) R. No. MH-659/13(N), 2017, 5(S2). Available from: www.vmsindia.org