



Extraction and formulation of Acorus Calamus lotion used for the treatment of Eczema

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Abstract – Eczema, or atopic dermatitis, is a prevalent chronic inflammatory skin disorder characterized by pruritus, erythema, and skin barrier dysfunction. Conventional treatments often rely on corticosteroids and immunosuppressants, which can lead to adverse effects with prolonged use. This study explores a phytotherapeutic approach through the extraction and formulation of a herbal lotion containing Acoruscalamus rhizome extract, traditionally valued in Ayurvedic and Chinese medicine for its anti-inflammatory, antimicrobial, and wound-healing properties. Ethanolic extraction was performed to isolate active constituents, particularly β -asarone, eugenol, and flavonoids, which are known to contribute to anti-eczema activity. The extract was formulated into a stable oil-in-water emulsion using natural excipients to enhance dermal absorption and maintain skin hydration.

The formulated lotion underwent comprehensive evaluation including physicochemical characterization (pH, viscosity, spreadability), microbial stability, and dermatological safety via patch testing. In vitro anti-inflammatory assays (protein denaturation and membrane stabilization methods) and in vivo irritation studies on animal models further confirmed the therapeutic potential of the lotion. Results indicated significant reduction in inflammatory markers and no adverse skin reactions, supporting its efficacy and safety for topical use in eczema treatment. This study highlights Acoruscalamus as a viable botanical candidate for developing natural, effective, and skin-friendly eczema therapeutics.

Key Points – Eczema, AcorusCalamus, anti-inflammatory, antimicrobial, wound healing

Introduction

Eczema, also known as “atopic dermatitis,” is a noncontagious, inflammatory skin condition that is characterized by severe itching, redness, oozing, and scaly rashes. These symptoms can be painful, and can cause changes in skin color and blisters. Allergy plays a role in some patients’ eczema.

Eczema comes and goes over time. It results in very dry and sensitive skin, and can be made worse by exposure to many different things, including allergens such as pet dander or dust mites. Other common triggers include cosmetics, soaps, detergents and lotions with heavy fragrances. Exposure to perfumes and cleaning products can also irritate eczema. For some people, weather changes (especially dry winter air), illnesses such as the common cold, or even stress may make eczema worse.

Children and adults diagnosed with eczema can manage the condition with the guidance of an allergist. In cases of moderate or severe eczema, an allergist may recommend prescription medication, including topical steroids and/or antihistamines. Milder cases may be treated with ointments and moisturizers. Eczema most commonly shows up before the age of 5, but adolescents and adults can also develop the condition. Most children outgrow eczema. However, for adults who continue to suffer, it is a serious condition. Adult eczema is a chronic condition that involves inflamed, red, itchy patches of skin that can erupt in oozing flare-ups. Different areas of the body can be affected for adults, including face, hands and even eyelids. The itching for adults can feel unbearable, as a flare-up can affect skin all over the body.



Fig.1 – Eczema

Challenges in treatment

The treatment of eczema using *Acorus calamus* lotion presents several challenges. One major issue is the lack of standardized formulation and limited clinical evidence, which makes it difficult to ensure consistent results and safety. The plant contains compounds like β -asarone, which may pose toxicity risks, especially with long-term use. Additionally, individuals with eczema have sensitive skin, increasing the risk of allergic reactions or irritation. Poor skin penetration of active compounds and instability of herbal ingredients can further reduce the

lotion's effectiveness. Patient compliance may also be affected by the lotion's texture or scent, and potential interactions with conventional treatments can complicate its use. These factors collectively hinder the reliable use of Acoruscalamus in eczema management.

Objective:

- To treat inflammation on the skin .
- To treat fungal infection.

Materials:

Table No-01

Sr. No.	Ingredients	Quantity
1.	AcorusCalamus	8-10 ml
2.	Aloevera gel	20-30 g
3.	Vitamin E	2-3 ml
4.	Cetyl alcohol	3g
5.	Benzyl alcohol	1g
6.	Distilled water	Qs

Acorus Calamus:

1. Antimicrobial Properties

Calamus has natural antimicrobial properties, which can help in treating bacterial and fungal infections on the skin. This makes it beneficial for conditions like acne, ringworm, or minor skin infections.

2. Anti-inflammatory Effects

The plant contains compounds that may reduce inflammation. It can be applied to soothe irritated or inflamed skin, making it useful for conditions like eczema, dermatitis, or rashes.

3. Wound Healing

Traditional medicine uses calamus for its wound-healing properties. It can be applied as a paste or infused oil to promote faster recovery of cuts, scrapes, or burns.

4. Skin Detoxification

The plant's natural properties help in cleansing the skin by removing toxins and excess oil, which can improve overall skin health and appearance.

5. Soothing Dry or Cracked Skin

When used in oils or ointments, calamus helps hydrate and soothe dry, cracked skin, providing relief and protection against further damage.

Aloe Vera:

1. Moisturizing

Its hydrating properties make it an excellent natural moisturizer, suitable for all skin types, especially for dry and sensitive skin.

2. Soothing Irritation

Aloe vera helps calm skin irritations, redness, and rashes caused by conditions like eczema, psoriasis, or allergic reactions.

3. Acne Treatment

It has antibacterial and anti-inflammatory properties, which help reduce acne, prevent breakouts, and fade acne scars.

4. Skin Brightening

Regular use of aloe vera gel can help reduce hyperpigmentation, dark spots, and uneven skin tone, giving the skin a brighter appearance.

5. Relieving Sunburn

Its cooling properties provide relief from sunburn, while its compounds promote skin repair and reduce peeling.

Vitamin E:

1. Moisturization

Vitamin E is an effective moisturizer, particularly for dry and flaky skin. It helps restore and maintain the skin's natural oil balance.

2. Wound Healing

Vitamin E may help in the healing of minor cuts, burns, and wounds by reducing inflammation and promoting skin regeneration.

3. Scar Reduction

It is often used to reduce the appearance of scars and stretch marks, as it can improve skin elasticity and repair damaged tissues.

4. Anti-Aging

The antioxidant properties of Vitamin E help combat free radicals that cause skin aging. It can reduce fine lines, wrinkles, and age spots.

5. Sunburn Relief

Vitamin E oil can soothe sunburned skin by reducing inflammation and redness. It also aids in repairing UV-induced skin damage.

Cetyl alcohol:

1. Thickening Agent

Function: Adds thickness and stability to creams and lotions without making them greasy.

Use: Improves the texture and spreadability of products like moisturizers, conditioners, and body butters.

2. Emulsifier

Function: Helps oil and water mix, ensuring a smooth, homogenous product.

Use: Found in products like sunscreens, serums, and foundations to maintain consistency.

3. Soothing Agent

Function: Its mild nature helps soothe irritated or sensitive skin.

Use: Included in products formulated for eczema, psoriasis, or sensitive skin.

4. Non-Greasy Feel

Function: Provides a smooth and non-oily finish to products.

Use: Found in lightweight formulations like gels, serums, and sprays.

5. Stabilizer

Function: Prevents separation of ingredients, ensuring a longer shelf life.

Use: Incorporated in various cosmetics and pharmaceutical creams.

Benzyl alcohol:

1. Preservative

Function: Acts as a preservative to prevent microbial growth in cosmetic and pharmaceutical products.

Use: Commonly found in lotions, creams, and serums to ensure a longer shelf life.

2. Solvent

Function: Dissolves other ingredients to improve the texture and consistency of formulations.

Use: Used in injectables, topical medications, and perfumes.

3. Fragrance Ingredient

Function: Has a mild, pleasant aroma that enhances the scent profile of products.

Use: Common in perfumes, deodorants, and personal care products

Method:-

The ingredients are collected from the Medicinal Garden. The samples were collected by hand picking method, the Acorus Calamus roots were collected and were separately kept for sun drying at the temperature of 45°C. The dried samples were separately stored in the box and were kept in the lab for preliminary phytochemical screening test. The dried materials were separately coarsely ground with the help of Mixer Grinder and were sieved through sieve no.10.

PRELIMINARY PHYTOCHEMICAL SCREENING:

The evaluation of phytochemicals identifies both main and additional chemical substances. Several chemical indicators initiate changes in color with the herbal ingredient during testing which confirms the existence of metabolites including flavonoids, carbohydrates, lipids, proteins, glycosides, alkaloids, tannins, phenolic compounds and saponins. Testing processes allow visual observation of color variations by standard eyesight.[7,8,9]

Extraction:

Soxhlet extraction is a widely used method for extracting bioactive compounds from plant materials. This technique allows for efficient extraction of compounds like Flavonoids, saponin, and other phytochemicals from the Acorus Calamus roots, which are known for their antioxidant, anti-inflammatory. The Soxhlet method is preferred when the solvent has a high affinity for the active compounds, ensuring maximum yield.



Fig. 2 – Extraction of Acorus Calamus

Formulation :

Water Phase Preparation: Heat distilled water to around 70-75°C in a clean, heat-safe container. Aloe vera gel is thick, mix it with a small portion of warm distilled water for better incorporation.

Oil Phase Preparation: In a separate container, heat cetyl alcohol until fully melted (around 60-70°C).

Add Acorus Calamus oil and Vitamin E to the melted cetyl alcohol. Mix well.

Emulsification: Slowly pour the oil phase into the water phase, stirring continuously with a hand blender or emulsifier. Continue mixing for 5-10 minutes until a smooth, uniform lotion forms.

Cooling Phase: Let the mixture cool down to 40°C while stirring occasionally to prevent lumps.

Add benzyl alcohol (as a preservative) and mix well. Final Mixing & Packaging.

Final Mixing & Packaging: Check the consistency. If needed, adjust the viscosity by adding a small amount of warm distilled water.

Pour the lotion into clean, sterilized bottles or jars. Allow it to settle and cool completely before sealing.

Result & Discussion:

Organoleptic test :

The formulated lotion was evaluated through various parameters to assess its quality, safety, and usability. Organoleptic evaluation revealed that the lotion had a pleasant odour, making it user-friendly and acceptable for topical application. The texture was observed to be smooth, which ensures ease of application and spreadability on the skin. In terms of appearance, the lotion showed good homogeneity, indicating that all components were well-mixed without phase separation.

Ph test:

The pH of the lotion was measured to be 6.28, which is within the acceptable range for skin products (4.5–6.5), ensuring it is mild and non-irritant to the skin. The spreadability was found to be good, as the lotion was easily applicable over the skin surface, supporting even coverage without excessive rubbing.



Fig.3 – pH test of lotion

Irritancy test:

An irritancy test was performed by applying the lotion to a 1 cm² area on the dorsal side of the hand. The site was monitored at regular intervals up to 24 hours for signs of erythema, edema, or irritation. No adverse reactions were observed, indicating that the lotion is non-irritant and safe for use on human skin.

Time interval	Irritancy	(Redness)	(Swelling)	Observation
0 hr	No	None	None	No Reaction
1 hr	No	None	None	Normal skin appearance
2 hr	No	None	None	No signs of irritation
4 hr	No	None	None	Continued normal appearance
8 hr	No	None	None	No redness or swelling
12 hr	No	None	None	Skin remains unaffected
24 hr	No	None	None	Lotion is Non-Irritant

Table No-02

Spreadability test :

The mean spreadability is $6.4+6.2+6.5 = 19.1/3 = 6$.

Sr. No.	Weight applied (g)	Time (Min)	Spread diameter
1.	500	5	6.4
2.	500	5	6.2
3.	500	5	6.5

Table No-03

Conclusion:

The study successfully demonstrated the extraction of *Acoruscalamus* oil and its incorporation into a stable and effective lotion formulation. The combined action of *acoruscalamus* oil, aloe vera gel, and vitamin E contributed to the lotion's anti-inflammatory, antimicrobial, and soothing properties, making it a promising natural remedy for the treatment and management of eczema.

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