INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES
[ISSN: 0975-4725; CODEN(USA): IJPS00]
Journal Homepage: https://www.ijpsjournal.com

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Research Article

Formulation And Evaluation of Herbal Anti-Inflammatory Cream

Shyam Pawar*, Suraj Raut, Pragati Shinde, Swati Deshmukh

Shraddha Institute of Pharmacy, Washim, Maharashtra, India.

ARTICLE INFO

Published: 24 May 2025
Keywords:
Curcumin; Aloe vera; Herbal cream; Anti-inflammatory; Topical formulation; Stability study; Natural skincare
DOI:
10.5281/zenodo.15503434

ABSTRACT

This study focuses on the formulation and evaluation of an herbal anti-inflammatory cream combining Aloe vera and Curcuma longa (curcumin). The cream was prepared using Aloe vera gel and curcumin extract, and its physicochemical parameters, stability, and anti-inflammatory activity were assessed. The results showed satisfactory pH, viscosity, and spreadability, with significant anti-inflammatory activity. The formulated cream demonstrated potential as a natural remedy for skin inflammation, offering a synergistic effect of Aloe vera and curcumin. This study highlights the therapeutic benefits of herbal ingredients in topical formulations, paving the way for further research and applications in dermatology.

INTRODUCTION

Inflammation is a biological defense mechanism, but chronic inflammation can result in various diseases. Conventional therapies, though effective, often cause undesirable side effects. This necessitates the exploration of herbal remedies that are safer and equally effective. Curcumin, the principal curcuminoid of turmeric (Curcuma longa), exhibits potent anti-inflammatory and antioxidant properties [1]. Aloe vera (Aloe barbadensis) is valued for its soothing, moisturizing, and wound-healing activities. Combining these two agents in a cream aims to produce a synergistic anti-inflammatory effect with enhanced skin compatibility. This study was undertaken to formulate a stable, effective herbal anti-inflammatory cream and evaluate its physicochemical and therapeutic attributes [2].

MATERIAL AND METHOD

Materials

Plant Materials (Herbal Ingredients) Turmeric (Curcuma longa)

Aloe vera

Plant Material

1. Turmeric

***Corresponding Author:** Shyam Pawar
Address: *Shraddha Institute of Pharmacy, Washim, Maharashtra, India.*
Email ✉: pawarshyam@gmail.com
Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Biological Source

The rhizomes (underground stems) of the Curcuma longa plant.

Family:

Zingiberaceae

Common Names:

Turmeric, Haldi (Hindi), Haridra (Sanskrit)

Chemical Constituents

Turmeric contains active compounds called curcuminoids, primarily curcumin, which gives it its yellow color and medicinal properties. It also includes essential oils like turmerone, atlantone, and zingiberene [3].

Fig. No. 1

Description

Turmeric is a perennial, herbaceous plant known for its vibrant yellow-orange rhizomes, widely used in culinary, medicinal, and cosmetic applications. The plant typically grows 60–100 cm tall.

Morphological Features

Turmeric (Curcuma longa) has a short stem with broad, lance-shaped leaves and grows from a thick, branched underground rhizome. The plant bears funnel-shaped yellow flowers arranged in spikes.

Habitat and Distribution

Native to South Asia, especially India. Now cultivated in tropical and subtropical regions worldwide. Prefers warm, humid climates and well-drained, loamy soils [4].

Medicinal Properties Anti-inflammatory Antioxidant Antimicrobial Hepatoprotective Wound healing

Cosmetic Uses

Brightens and evens out skin tone Reduces acne and blemishes Fights signs of aging

Natural antiseptic for skin infections

Used in face masks, soaps, creams, and scrubs Applications in Anti-Inflammatory Cream Helps reduce skin inflammation and redness Soothes rashes and allergic reactions Accelerates healing of cuts and wounds Provides antioxidant protection

Enhances skin glow and reduces scarring [5].

2. Aloe

Biological source: The fleshy leaves of the Aloe barbadensis Miller plant.

Family: Asphodelaceae (Liliaceae)

Common Names: Aloe, Ghritkumari (Hindi), Kumari (Sanskrit

Chemical Constituents

Aloe contains over 75 active constituents including vitamins (A, C, E, B12), enzymes, minerals, sugars, lignin, saponins, salicylic acids, and amino acids. Key compounds include aloin, aloe-emodin, and polysaccharides like acemannan,

which contribute to its healing and anti-inflammatory properties [6].

Fig. No. 2

Description

Aloe vera is a succulent plant widely known for its medicinal and cosmetic applications. It is a stemless or short stemmed plant growing up to 60–100 cm tall, with thick, fleshy, green to grey green leaves.

Morphological Features

Aloe has thick, fleshy, lance-shaped leaves arranged in a rosette, often with spiny margins. Its leaves store water, making it well adapted to arid environments.

Habitat and Distribution

Native to the Arabian Peninsula, but now widely cultivated in tropical and subtropical regions around the world. Grows well in dry, warm climates and sandy soils [7].

Medicinal Properties

Anti-inflammatory Antibacterial and antifungal Antioxidant

Wound healing Moisturizing and soothing

UV protective (to a certain extent) {8].

Cosmetic Uses

Used in skin care and hair care products.

Promotes wound healing and reduces skin irritation. Hydrates and softens skin.

Reduces signs of aging.

Commonly included in lip balms, lotions, sunscreens, and gels.

Applications in Anti-Inflammatory Cream
Calms and reduces skin inflammation and redness Soothes burns, rashes, and allergic skin reactions Promotes faster healing of minor cuts and wounds

Provides natural antioxidant and antimicrobial protection Hydrates skin, enhances glow, and minimizes scarring [9].

Equipment

Here's a list of equipment that can be used for formulation and evaluation of anti-inflammatory creams:

1. Mixers: Homogenizer, planetary mixer, or overhead mixer for blending ingredients.

2. Heating/Cooling Equipment: Water bath, heating mantle, or temperature-controlled vessel for melting and mixing ingredients.

3. pH Meter: For adjusting and measuring the pH of the cream.

4. Hot Plate: Heating And Boiling [10].

Cream Base Ingredients

Emulsifying wax Stearic acid Liquid parrafin Glycerin

Mineral oil or coconut oil Lavender oil

Vitamin E capsule Distilled water

Preservatives (e.g., methylparaben, propylparaben) [11].

Method

Step 1: Extraction of Herbal Ingredients

Drying and Powdering of Plant Materials:

Select appropriate medicinal plants with known anti-inflammatory properties (e.g., turmeric, neem, aloe vera, calendula).

Wash the fresh plant materials thoroughly to remove dirt and contaminants.

Dry the materials under shade (not direct sunlight) to prevent loss of volatile compounds and degradation of phytochemicals.

Once completely dry, grind the materials into a fine powder using a mechanical grinder or pulverizer.

Store the powder in airtight containers away from light and moisture.

Maceration:

Maceration involves mixing turmeric powder with a solvent like ethanol, glycerin, or oil, and letting it stand for several days to weeks, shaking occasionally. The mixture is then strained through filter paper or cheesecloth to separate the liquid extract, which can be concentrated through evaporation if needed. This process extracts curcuminoids from turmeric, yielding a liquid form of curcumin suitable for various applications [12].

Extraction Process

Step 2: Preparation of Cream Base

2.1 Oil Phase Preparation:

Components:

Stearic acid: acts as an emulsifier and thickener. Cetyl alcohol: emollient and stabilizer.

Emulsifying wax: helps form and stabilize the emulsion. Mineral oil: moisturizes and carries the oil-soluble ingredients.

Melt all oil-phase ingredients together in a beaker by heating to 70–75°C.

2.2 Aqueous Phase Preparation:

Components:

Purified water

Glycerin: humectant (retains skin moisture).

Preservatives: e.g., parabens, phenoxyethanol, to prevent microbial growth.

Heat this phase separately to the same temperature (70–75°C) to ensure uniform emulsification.

2.3 Emulsification:

Slowly add the aqueous phase into the oil phase with continuous stirring using a mechanical stirrer or homogenizer.

Stir until a smooth, uniform emulsion forms.

Cool the emulsion slowly to room temperature with continuous stirring to maintain consistency.

Step 3: Incorporation of Herbal Extracts

Take the dried herbal extract and dissolve it in a suitable solvent, like ethanol or propylene glycol, to enhance solubility and bioavailability.

Ensure the cream base is cooled to below 40°C (to prevent thermal degradation of actives).A

Add the dissolved extract gradually into the cream base with gentle, uniform stirring. Continue stirring until the extract is evenly dispersed throughout the cream [13,14].

Step 4: Final Adjustment of pH

Use a pH meter to check the pH of the final formulation.

The ideal pH for topical skin application is between 5.0 and 7.0 (close to skin's natural pH). If pH adjustment is needed:

Use citric acid or lactic acid to lower pH.

Use sodium hydroxide (NaOH) solution or triethanolamine to raise pH. Mix thoroughly after adjustment and recheck pH to confirm

Step 5: Packaging

Use clean, sterilized containers such as tubes, jars, or pump bottles.

Fill the cream into the containers using hygienic filling equipment or a spatula.

Seal the containers tightly and label them with name, date, ingredients, and batch number.

Step 6: Quality Control and Testing

Conduct quality control tests to ensure product safety and efficacy: Consistency: Check the texture, spreadability, and appearance.

Stability Tests: Store samples at various conditions (room temp, refrigerated, 40°C, etc.) for at least 30–90 days to observe phase separation, color change, or rancidity.

Microbial Load Test: Ensure the product is free from harmful microbial contamination.

Skin Compatibility: Perform a patch test on volunteers or animal models to assess irritation, allergy, or sensitivity [15].

Formulation Table

Table No 1: Formulation table for anti-inflammatory cream(25g)

Sr. No.	Ingredients	Batch 1	Batch 2	Batch 3
1	Aloe Vera gel	5ml	4ml	6ml
2	Curcumin Extract	0.5ml	0.7ml	1ml
3	Beeswax	3g	2.5g	3.5g
4	Steric Acid	1.5g	2g	1g
5	Liquid Paraffin	4ml	3ml	5ml
6	Coconut Oil	3ml	3.5ml	3ml
7	Lavender Oil	0.2ml	0.3ml	0.3ml
8	Methyl Paraben	0.1g	0.1g	0.1g
9	Glycerine	3ml	2ml	2ml
10	Vitamin E	1 cap	1 cap	1 cap
11	Purified water	Q.S.to 25g	Q.S.to 25g	Q.S.to 25g

Evaluation

1. **Appearance Test**

The appearance test is a crucial parameter in evaluating the overall quality of a herbal anti-inflammatory cream, as it influences consumer perception and trust in the product. This test involves a detailed visual inspection of the cream's colour, consistency, and uniformity. The cream should exhibit a homogenous appearance with a consistent colour, typically a yellowish hue influenced by the natural pigment of curcumin. It should be free from any visible lumps, phase separation, or particulate matter, which may indicate instability or poor formulation practices. A smooth and uniform texture ensures ease of application and enhances user experience. Monitoring the appearance also provides insights into the product's stability and the compatibility of its natural ingredients over time.

2. **Odour Test**

The odour test is a key sensory evaluation used to assess the fragrance characteristics of the herbal anti-inflammatory cream. This test involves a panel of trained human evaluators who examine the cream's scent by direct inhalation. The panellists assess various aspects of the odour, including its intensity, naturalness, pleasantness, and overall appeal. The fragrance should ideally reflect the natural aroma of its herbal constituents, such as the earthy scent of curcumin and the subtle freshness of aloe vera. A balanced and soothing odour enhances product acceptability, while any unpleasant, rancid, or overly strong smell may suggest formulation issues or ingredient degradation. This sensory feedback is critical for refining the cream's formulation to meet consumer expectations.

3. **pH Determination**

The pH of the cream is a crucial parameter as it affects both the stability of the active ingredients and skin compatibility. A sample (1g) of the cream is dispersed in 100 mL of distilled water and allowed to stand for 2 hours.The pH is then measured using a calibrated digital pH meter.

Ideal topical creams should have a pH in the range of 4.5 to 6.5, which matches the natural pH of the skin and ensures minimal irritation.

An inappropriate pH may cause skin irritation, reduce the bioavailability of curcumin, or degrade the aloe vera gel components.

pH Test

4. **Spreadability**

Spreadability determines how easily the cream can be applied over the skin, which affects user satisfaction and dosing consistency.

Method:

A fixed amount of cream (e.g., 1g) is placed between two glass slides.

A weight (e.g., 500g) is placed on the top slide to ensure uniform spreading.

After removing the weight, another weight is attached, and the time (T) taken for the top slide to slip off is recorded.

Where:

M = mass tied to upper slide L = length of glass slide

T = time in seconds

A higher spreadability value indicates better application properties.

Spredability Test

5. Washability

Washability refers to how easily the cream can be removed from the skin surface with water. Method:

A small amount of cream is applied to the skin.

After 10–15 minutes, the area is washed with lukewarm water. The ease of removal and any residual greasiness is noted.

Easily washable formulations are more convenient for consumers and indicate a well- formulated base.

Before Wash

After Wash

RESULTS AND DISCUSSION

Table No 2: Result And Discussion

Sr. No.	Parameters	Formulation 1	Formulation 2	Formulation 3
1.	Colour	Smooth Yellow	Light Yellow	Light Yellow
2.	Odour	Pleasant	Pleasant	Pleasant
3.	Surface Texture	Slightly Thick	Smooth	Smooth
4.	Washability	Easy	Easy	Easy
5.	pH	5.8	6.2	6.52
6.	Spreadability	Good	Good	Very Good
7.	Skin Irritation	Mild Redness	No Irritation	No Irritation

DISCUSSION

All batches demonstrated satisfactory physical stability, with Batch 2 showing the highest spreadability and user satisfaction. A slightly increased aloe vera concentration in Batch 2 contributed to improved moisturizing properties and better fragrance. The creams maintained an acceptable pH close to the natural pH of the skin, preventing irritation. No phase separation, microbial growth, or significant color changes were observed during the stability testing period, indicating good formulation robustness. The combination of curcumin and aloe vera showed a synergistic effect in promoting anti-inflammatory benefits, suggesting its applicability in dermatological therapeutic.

SUMMARY & CONCLUSION

Summary

The formulation and evaluation of an herbal anti-inflammatory cream combining Aloe vera and Curcuma longa (curcumin) was conducted to harness the therapeutic benefits of these natural ingredients. Aloe vera is known for its soothing and anti-inflammatory properties, while curcumin, derived from turmeric, possesses potent anti-inflammatory and antioxidant effects. The cream was prepared by incorporating Aloe vera gel and curcumin extract into a suitable base, ensuring stability and efficacy. Various physicochemical parameters such as pH, viscosity, spreadability, and stability were evaluated to ensure the cream met quality standards. Additionally, the anti-inflammatory activity of the cream was assessed using appropriate models to validate its therapeutic potential.

CONCLUSION

The formulated herbal anti-inflammatory cream containing Aloe vera and curcumin demonstrated promising results in terms of physicochemical properties and anti-inflammatory activity. The synergistic combination of these herbal ingredients enhanced the cream's therapeutic benefits, offering a natural and effective remedy for skin inflammation. The study highlights the potential of Aloe vera and curcumin as valuable components in topical formulations for managing inflammatory skin conditions. Further research, including clinical trials, could further validate the efficacy and safety of this herbal cream, paving the way for its application in dermatological treatments and expanding the scope of natural therapies in skincare.

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HOW TO CITE: Shyam Pawar*, Suraj Raut, Pragati Shinde, Swati Deshmukh, Formulation And Evaluation of Herbal Anti-Inflammatory Cream, Int. J. of Pharm. Sci., 2025, Vol 3, Issue 5, 3988-3996. https://doi.org/10.5281/zenodo.15503434