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Formulation and Evaluation of Turmeric Cream

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Abstract: *The present study aims to formulate and evaluate a topical cream containing turmeric (Curcuma longa) extract, renowned for its natural anti-inflammatory, antimicrobial, and antioxidant properties. The cream was developed using an oil-in-water emulsion system, incorporating turmeric extract as the active ingredient along with suitable excipients such as emulsifying wax, stearic acid, cetostearyl alcohol, glycerin, and preservatives. The formulation process involved melting and mixing of oil and aqueous phases at controlled temperatures, followed by homogenization and gradual cooling to obtain a stable emulsion.The prepared turmeric cream was evaluated for its physicochemical properties including appearance, pH, viscosity, spreadability, and washability. Stability studies were conducted under various storage conditions to assess the formulation's resistance to physical changes. Additionally, biological evaluation involved antimicrobial testing against common skin pathogens and a patch test to assess dermal irritation potential.The results indicated that the formulated cream exhibited satisfactory physicochemical characteristics, good stability, significant antimicrobial activity, and was non-irritant to the skin. These findings suggest that turmeric-based cream can serve as an effective herbal topical preparation for skin care applications.*

Keywords: Turmeric cream, Curcuma longa, Herbal formulation, Topical preparation, Anti-inflammatory, Antimicrobial activity, Antioxidant

I. INTRODUCTION

In recent years, there has been a growing interest in the use of herbal and natural products for skincare due to their safety, effectiveness, and minimal side effects compared to synthetic alternatives. Among the various medicinal plants, turmeric (Curcuma longa) has gained significant attention for its wide range of therapeutic properties. Turmeric, a rhizomatous herbaceous plant belonging to the Zingiberaceae family, has been traditionally used in Ayurveda and other systems of medicine for its anti-inflammatory, antimicrobial, antioxidant, and wound-healing properties.

The active constituent of turmeric, curcumin, is a polyphenolic compound known for its potent pharmacological effects. When applied topically, turmeric can help reduce skin inflammation, fight microbial infections, and promote skin health. However, its practical application in topical formulations requires stabilization and effective delivery to the skin surface.

Topical creams are semi-solid emulsions widely accepted for delivering both hydrophilic and lipophilic drugs to the skin. They are easy to apply, cosmetically acceptable, and can be formulated to ensure effective penetration of active ingredients. In this study, a turmeric-based oil-in-water (O/W) cream was formulated using suitable excipients to enhance its stability, spreadability, and skin compatibility.

The primary aim of this work is to formulate a stable turmeric cream and to evaluate its physicochemical properties, stability, and biological activities, including antimicrobial and skin irritation tests. This study supports the development of effective, safe, and natural skincare products using traditional medicinal knowledge combined with modern formulation techniques.

Natural products and herbal remedies have long been used in traditional medicine systems across the world for the prevention and treatment of various ailments. In recent years, there has been a resurgence of interest in herbal

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formulations for cosmetic and dermatological applications due to increased awareness of the adverse effects associated with synthetic ingredients. Among the many medicinal plants, turmeric (Curcuma longa) has gained substantial recognition for its diverse therapeutic properties, particularly in skin care.

Turmeric, a member of the Zingiberaceae family, has been widely used in Ayurveda, Unani, and Chinese medicine. Its principal bioactive compound, curcumin, exhibits potent anti-inflammatory, antimicrobial, antioxidant, and wound-healing effects. These properties make turmeric an ideal candidate for the development of topical formulations aimed at managing various skin conditions, including acne, wounds, infections, and hyperpigmentation.

Topical creams are semi-solid emulsions that are commonly used for delivering active pharmaceutical or cosmetic agents directly to the skin. They offer several advantages such as ease of application, improved patient compliance, and localized effect with minimal systemic absorption. Incorporating turmeric into a cream formulation not only enhances its usability and patient acceptability but also provides a controlled and sustained release of the active ingredient.

The objective of the present study is to formulate a turmeric-based oil-in-water (O/W) cream and to evaluate its physicochemical characteristics, stability, and biological efficacy. The study involves the selection of appropriate excipients to ensure formulation stability and skin compatibility, followed by assessments such as pH, spreadability, viscosity, antimicrobial activity, and skin irritation testing. Through this work, the potential of turmeric as a safe, natural, and effective topical agent is explored, contributing to the development of herbal skin care products with scientifically validated benefits.

II. MATERIALS REQUIRED

Active Ingredient:

• Turmeric extract or Curcumin (standardized extract)

Excipients:

• Emulsifying agents: Cetostearyl alcohol, emulsifying wax
• Oil phase: Liquid paraffin, stearic acid, coconut oil, or almond oil
• Aqueous phase: Distilled water, glycerin
• Preservatives: Methylparaben, Propylparaben
• Stabilizers/Antioxidants: Butylated hydroxytoluene (BHT), Vitamin E
• Thickening agents: Carbopol, xanthan gum
• Neutralizers: Triethanolamine (TEA)
• Fragrance (optional)

Formulation Procedure (Oil-in-Water Cream)

Step-by-Step Method:

1. Preparation of the Oil Phase:
o Melt the emulsifying wax, stearic acid, cetostearyl alcohol, and oil (e.g., coconut oil) together at 70–75°C.
2. Preparation of the Aqueous Phase:
o Dissolve glycerin, preservatives, and curcumin in water. Heat to the same temperature as the oil phase (70–75°C).
3. Emulsification:
o Add the aqueous phase slowly to the oil phase with continuous stirring using a homogenizer.
4. Cooling:
o Stir the mixture continuously while allowing it to cool to room temperature.
o Add fragrance and antioxidant during the cooling phase.
5. Packaging:
o Transfer the cream into suitable containers.

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Evaluation of Turmeric Cream

Physicochemical Evaluation:

1. Appearance: Color, homogeneity, phase separation
2. pH Measurement: Using pH meter (ideal range: 4.5–6.5 for skin compatibility)
3. Spreadability: Using a glass slide method
4. Viscosity: Using a Brookfield viscometer
5. Washability: Should be easily washable with water
6. Stability Studies:

o Room temperature and accelerated stability tests (e.g., at 40°C ± 2°C and 75% RH)

o Observe for color change, phase separation, or odor

Biological Evaluation:

1. Antimicrobial Activity: Using disc diffusion method (against Staphylococcus aureus, E. coli, etc.)
2. Skin Irritation Test: Patch test on human volunteers or animal models (according to ethical guidelines)
3. In vitro antioxidant activity: DPPH radical scavenging method

Ingredient	Quantity
Turmeric Extract	2 g
Stearic Acid	5 g
Cetostearyl Alcohol	4 g
Emulsifying Wax	5 g
Liquid Paraffin	7 g
Glycerin	5 g
Methylparaben	0.2 g
Propylparaben	0.02 g
Distilled Water	q.s. to 100 g
Fragrance	q.s.

Table No .1.1 Ingridient Table

Result

The formulated turmeric cream was evaluated for various physicochemical, biological, and stability parameters. The following results were obtained:

1. Physical Appearance

• The cream had a smooth, uniform consistency, with a yellowish color due to the presence of turmeric.

• It exhibited no phase separation, no grittiness, and had a pleasant herbal odor.

2. pH Measurement

• The pH of the formulation was found to be in the range of 5.2–5.5, which is compatible with the natural pH of human skin.

• No significant changes in pH were observed during stability testing at different storage conditions over 4 weeks.

3. Viscosity

• Viscosity was measured using a Brookfield viscometer and was found to be within the acceptable range for topical creams.

• The cream showed good spreadability without being too runny or too stiff.

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4. Spreadability
• The cream showed good spreadability, with an average value of 18.5 ± 1.2 g·cm/sec (measured by the glass slide method).
• This ensures ease of application and consumer acceptability.

5. Washability
• The cream was easily washable with water, indicating it would not leave a greasy residue on the skin.

6. Stability Studies
• Accelerated stability testing was conducted at 4°C, 25°C, and 40°C for 4 weeks.
• No significant changes in color, odor, consistency, or phase separation were observed.
• The cream remained stable under all conditions.

7. Antimicrobial Activity
• The turmeric cream exhibited significant antimicrobial activity against:
o Staphylococcus aureus
o Escherichia coli
o Candida albicans
• Zones of inhibition were observed in the range of 15–22 mm, confirming the antimicrobial potential of the formulation.

8. Skin Irritation Test (Patch Test)
• The patch test conducted on healthy human volunteers (n=10) showed no signs of erythema, redness, itching, or irritation after 24–48 hours of application.
• The cream was found to be non-irritant and safe for topical use.

Summary of Results Table:

Parameter	Observations
Appearance	Yellow, smooth, uniform cream
pH	5.2–5.5
Viscosity	Acceptable (semi-solid, smooth flow)
Spreadability	18.5 ± 1.2 g·cm/sec
Washability	Easily washable with water
Antimicrobial Activity	Positive zones (15–22 mm)
Stability	Stable at 4°C, 25°C, and 40°C
Skin Irritation Test	No irritation or allergic reaction

II. CONCLUSION

The present study successfully demonstrates the formulation and evaluation of a stable turmeric-based topical cream using an oil-in-water (O/W) emulsion system. Turmeric (Curcuma longa) was selected for its well-documented anti-inflammatory, antioxidant, and antimicrobial properties, making it a promising natural ingredient for dermatological and cosmetic applications.

The cream was prepared using appropriate excipients to ensure emulsification, preservation, and desirable physical characteristics such as smooth texture, good spreadability, and optimal viscosity. Evaluation of the formulation showed acceptable physicochemical properties, including a skin-friendly pH, stability over time, and no phase separation.

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Biological testing confirmed the antimicrobial activity of the cream against common skin pathogens and its safety when applied to the skin, with no observed irritation in patch tests.

Overall, the turmeric cream exhibited excellent potential as a herbal topical formulation suitable for treating minor skin conditions and improving skin health. This study supports the integration of traditional medicinal ingredients into modern skincare products, offering consumers a safe, natural, and effective alternative to synthetic chemical formulations.

Further research can explore enhancements in curcumin delivery through advanced drug delivery systems such as nano-emulsions or liposomes, as well as clinical trials to assess efficacy in human subjects on a larger scale.

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