



Formulation And Comparison Of Anti-Acne Gel From Curcuma Longa And Different Phytochemical Investigations

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Abstract : This study was undertaken to investigate the formulation and comparison of anti-acne gel from Curcuma longa and different phytochemical investigations. Conventionally, Curcuma longa (rhizome) is known for treating inflammation, cancer, wound healing, diabetes, asthma, and microbial infections. This study includes pharmacognostic and preliminary phytochemical evaluations of turmeric, covering organoleptic characteristics, microscopy, powder microscopy, and physicochemical parameters like total phenolic and flavonoid content.

Results showed significant pharmacognostical variations in different accessions of turmeric. The study also involved formulating topical anti-acne gels using extracts and evaluating them for clarity, viscosity, pH, drug content, and anti-acne efficacy. Among the formulations, F2 gel showed maximum effectiveness against Propionibacterium acnes and Staphylococcus epidermidis. The findings confirm Curcuma longa's potential as a therapeutic agent in topical acne treatment.

IndexTerms - Curcuma longa, anti-acne gel, phytochemical screening, turmeric extract, antimicrobial activity

INTRODUCTION

Curcuma longa L. is a member of the ginger family (Zingiberaceae) and is widely used by traditional medical practitioners for treating various ailments. Due to its high curcumin content, Indian turmeric is particularly valued. The rhizomes of Curcuma longa, commonly known as Haldi or turmeric, are horizontal underground stems that sprout shoots and roots.

Turmeric contains fat-soluble polyphenolic pigments called curcuminoids, including curcumin (diferuloylmethane), demethoxycurcumin, and bisdemethoxycurcumin, which are primarily responsible for turmeric's bright yellow color and therapeutic activity. It is also referred to as "Indian saffron" and serves as a natural antiseptic.

Turmeric is known for its nutritive and medicinal values. It contains various phytochemicals that have disease-preventive properties. Traditionally used as a spice and coloring agent, turmeric is also recognized for its broad medicinal applications. Studies have documented its morphological and phytochemical characteristics and reported diverse pharmacological activities.

This study attempts to review and investigate the botanical description, phytochemical constituents, and pharmacological potentials of turmeric. The bioactive compounds in turmeric can be extracted and formulated into capsules, tinctures, oils, or gels. Specifically, curcumin — the yellow pigment — has demonstrated anti-inflammatory and anticancer properties.

Turmeric continues to play a significant role in traditional Indian medicine, Hindu rituals, and as a coloring and flavoring agent in food. According to the World Health Organization (WHO), about 80% of people in developing countries rely on traditional plant-based medicine. Turmeric has also shown effectiveness in treating conditions like uveitis, gastrointestinal disorders, diabetic wounds, and rheumatism. Its wide range of pharmacological activities includes anticancer, anti-diabetic, antioxidant, hypolipidemic, anti-inflammatory, antimicrobial, antifertility, anti-venom, hepatoprotective, nephroprotective, anticoagulant, and anti-HIV effects.

NEED OF THE STUDY.

Acne is one of the most common dermatological problems affecting adolescents and adults, often leading to psychological stress and skin scarring. Marketed synthetic gels may cause side effects or limited long-term efficacy. There is a growing demand for natural alternatives with fewer side effects. *Curcuma longa* has shown potential in anti-inflammatory and antimicrobial applications but lacks standardized gel-based formulations that are both effective and stable. Hence, this study aims to fill that gap by formulating and evaluating anti-acne gels derived from turmeric extract.

RESEARCH METHODOLOGY

3.1 Study Design

This research is an experimental laboratory-based investigation focusing on the extraction of phytochemicals from *Curcuma longa* (turmeric) rhizomes, their pharmacognostical and phytochemical analysis, and the formulation of anti-acne gels. The gels were then evaluated for physicochemical parameters and antimicrobial (anti-acne) activity.

3.2 Materials

Plant material: Rhizomes of *Curcuma longa* collected from herbal gardens.

Chemicals and excipients: All chemicals used were of analytical grade including Carbopol 940, PEG 400, Triethanolamine, Aloe vera, and preservatives (Methyl and Propyl Paraben).

Market reference: Clindac Gel (standard synthetic anti-acne gel).

3.3 Preparation of Herbal Extract

The dried *Curcuma longa* rhizome was powdered and subjected to ethanolic Soxhlet extraction for 72 hours. The extract was concentrated below 60°C to obtain a semi-solid extract suitable for gel formulation.

3.4 Phytochemical Screening

The following qualitative tests were performed on the extract:

Alkaloids: Mayer's, Wagner's, Dragendorff's tests

Flavonoids: Shinoda, Alkaline reagent test

Glycosides: Legal's, Keller-Killani, Borntrager's tests

Tannins: Ferric chloride and Gelatin test

Saponins: Foam test

Phenols, Proteins, Carbohydrates, Fixed oils, and Triterpenoids were also screened.

3.5 Formulation of Anti-Acne Gel

Four gel formulations (F1–F4) were prepared using different concentrations of turmeric extract and excipients.

Table: Composition of Anti-Acne Gel Formulations

Ingredients	F1	F2	F3	F4
Turmeric Extract (g)	2.5	2.5	2.5	2.5
Carbopol 940	1.0	1.5	2.0	2.5
PEG 400	5.0	7.5	10	15
Aloe vera (g)	2.5	2.5	2.5	2.5
Calcium acetate	1	3	5	7
Triethanolamine	1.2	1.5	1.8	2.1
Methyl paraben	0.5	0.5	0.5	0.5
Propyl paraben	0.5	0.5	0.5	0.5
Purified water (ml)	q.s.	q.s.	q.s.	q.s.

3.6 Evaluation of Gel Formulations

Clarity: Visual inspection under black and white background.

pH: Measured after 2 hours using a digital pH meter (1g gel in 100 ml water).

Drug Content: Measured spectrophotometrically after dilution.

Viscosity: Measured using Brookfield Viscometer.

Spreadability: Calculated by

$$S = M \times L T$$

$$S = T M \times L$$

Extrudability: Measured by extruding 0.5 cm ribbon in 10 seconds.

Homogeneity: Visual check for uniformity and absence of aggregates.

Grittiness: Microscopic evaluation for particle presence.

3.7 In Vitro Anti-Acne Activity

The formulations were tested for antibacterial activity against:

Propionibacterium acnes

Staphylococcus epidermidis

Results Summary (Zone of Inhibition in mm ± SD):

Formulation	<i>P. acnes</i>	<i>S. epidermidis</i>
F1	19.2 ± 0.05	19.3 ± 0.05
F2	19.7 ± 0.05	19.8 ± 0.05
F3	19.5 ± 0.05	19.7 ± 0.05
F4	19.6 ± 0.05	19.5 ± 0.05
Marketed	20.0 ± 0.05	20.0 ± 0.05

Percentage Inhibition (compared to standard):

Formulation	P. acnes (%)	S. epidermidis (%)
F1	96	96.5
F2	98.5	99
F3	97	98.5
F4	98	97
Marketed	100	100

Observation: F2 showed maximum anti-acne activity, close to the marketed formulation.

IV. RESULTS AND DISCUSSION**Microscopic Observation**

Transverse section of *Curcuma longa* rhizome revealed thick-walled epidermis, rounded parenchyma cells, 4–6 layers of cork cells, starch-filled ground tissue, scattered vascular bundles, spiral vessels, and suberized oil cells.

Therapeutic Activities of Turmeric

Turmeric demonstrated:

Anti-inflammatory: Comparable to cortisone at 48 mg/kg.

Antimicrobial: Effective against bacteria, fungi, and dermatophytes.

Antidiabetic: Curcumin extracts enhanced glucose control.

Antioxidant & Hepatoprotective: Comparable to vitamins C/E; protected liver and heart.

Anticancer: Inhibited tumor promotion and cell proliferation.

Gastroprotective: Promoted enzyme secretion and protected GI tract.

Gel Evaluation Summary

Parameter	F2 Performance
Clarity	Very clear (+++)
pH	6.1 (Skin-compatible)
Viscosity	Moderate, good consistency
Spreadability	Highest among all formulations
Drug Content	Consistent and acceptable
Homogeneity	Smooth, non-gritty
Extrudability	Easily extruded, user-friendly

Anti-Acne Activity

Formulation	P. acnes (mm)	S. epidermidis (mm)
F2	19.7 ± 0.05	19.8 ± 0.05
Marketed	20.0 ± 0.05	20.0 ± 0.05

Percentage inhibition of F2:

P. acnes: 98.5%

S. epidermidis: 99.0%

Conclusion:

F2 gel exhibited superior physical and antimicrobial properties, close to the marketed Clindac gel. This confirms *Curcuma longa*'s potential in effective, natural anti-acne formulations.

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