

FORMULATION AND EVALUATION OF HERBAL ANTI-ACNE GEL USING GARCINIA INDICA EXTRACT

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Abstract— Acne vulgaris is a common skin condition for which topical therapies may be associated with unwanted effects. This study aimed to formulate and evaluate a herbal anti-acne gel containing ethanolic fruit-rind extract of *Garcinia indica*. The fruit rinds were washed, shade-dried, powdered and extracted with ethanol using ultrasonication-assisted maceration. Preliminary phytochemical screening was performed, and the extract was incorporated into a Carbopol 934 gel base. The formulation was evaluated for organoleptic properties, pH, spreadability, washability, visible skin irritation and in-vitro antibacterial activity. The extract showed positive screening results for alkaloids, flavonoids, saponins, tannins, phenolic compounds and glycosides. The optimized formulation (F1) was red, smooth and uniform, with a measured pH of 6.01 and spreadability reported as 4.2 cm. It was reported as easily washable and showed no visible irritation in the described assessment. In the antibacterial test, F1 produced a 20 mm zone of inhibition against *Cutibacterium acnes*, compared with 23 mm for streptomycin and 0 mm for the control. These preliminary findings support further investigation of *Garcinia indica*-based gel; additional standardized testing, safety evaluation and stability studies are required before drawing clinical conclusions.

Index Terms— *Garcinia indica*, herbal anti-acne gel, Carbopol 934, phytochemical screening, spreadability, antibacterial activity.

I. INTRODUCTION

Acne vulgaris is an inflammatory disorder of the pilosebaceous unit and commonly affects the face, chest and back. Its development is associated with multiple factors, including altered sebum production, follicular obstruction, inflammation and microbial involvement. Conventional topical treatments can be effective, but tolerability concerns have encouraged interest in plant-derived ingredients for topical formulations. *Garcinia indica*, commonly known as kokum, is a plant whose fruit rind contains phytoconstituents that have been investigated for potential biological activities. A topical gel can provide a convenient dosage form for application to affected skin. The present work describes the formulation of an anti-acne gel using ethanolic *Garcinia indica* fruit-rind extract and its preliminary physicochemical and antibacterial evaluation.

II. AIM

To formulate and evaluate a herbal anti-acne gel containing *Garcinia indica* fruit-rind extract.

III. MATERIALS AND METHODS

A. Materials

Garcinia indica fruit rinds, Carbopol 934, propylene glycol, sodium benzoate, triethanolamine, ethanol and distilled water were used. The project report lists an ultrasonic bath, hot-air oven, digital weighing balance, pH meter, water bath and Petri plates among the equipment.

B. Collection and preparation of plant material

Fresh fruit rinds were collected from local sources in Maharashtra, washed with distilled water and shade-dried at room temperature. The dried material was ground to a coarse powder, sieved for more uniform particle size and stored in an airtight container until extraction.

C. Extraction of *Garcinia indica*

The powdered fruit rind was extracted with ethanol (95%) using ultrasonication-assisted maceration. The mixture was sonicated and then left to stand for extraction. The liquid was separated from the plant residue by filtration. The filtrate was concentrated on a water bath at approximately 60–70 °C until a thick, semi-solid extract was obtained and stored in an airtight container.

D. Formulation of herbal anti-acne gel

Carbopol 934 was dispersed in distilled water with continuous stirring and allowed to hydrate. Propylene glycol was added and mixed. The *Garcinia indica* extract was incorporated gradually with stirring, and sodium benzoate was added as preservative. Triethanolamine was added dropwise to neutralize the polymer and adjust the pH, producing a uniform gel. The report selected the Carbopol 934 base (F1) over an Aloe vera gel base because F1 was observed to have better consistency, homogeneity, spreadability and stability.

Table 1. Composition of optimized formulation (F1)

Ingredient	Quantity reported
<i>Garcinia indica</i> extract	2 mL
Carbopol 934	1 g
Propylene glycol	1 mL
Sodium benzoate	0.15 g
Triethanolamine	q.s.

E. Preliminary phytochemical screening

The extract was screened using qualitative tests described in the project report: foam test for saponins, ferric chloride test for tannins and phenolic compounds, Mayer's test for alkaloids, sodium hydroxide test for flavonoids, and a colour-reaction test for glycosides.

F. Evaluation of gel

The prepared gel was visually assessed for colour, odour, texture, appearance and homogeneity. pH was measured using a calibrated digital pH meter after dispersing approximately 1 g of gel in 10 mL of distilled water. Spreadability was assessed using the glass-slide method; the report gives an average spreadability result of 4.2 cm. Washability and visible skin irritation were also assessed as described in the project report. Antibacterial activity was evaluated by the agar well diffusion method. Test samples were placed in wells in inoculated agar plates, with streptomycin as the positive control and a solvent control. The plates were incubated for 24 h at 37 °C, and the zones of inhibition were measured. The source report does not provide replicate counts or variability for the reported zone measurements.

IV. RESULTS AND DISCUSSION

A. Phytochemical screening

Qualitative screening of the ethanolic extract gave positive results for alkaloids, flavonoids, saponins, tannins, phenolic compounds and glycosides. These tests indicate the presence of several classes of secondary metabolites, although qualitative screening alone does not identify individual compounds or establish their concentration.

Table 2. Preliminary phytochemical screening of the extract

Constituent	Reported result
Alkaloids	+
Flavonoids	+
Saponins	+
Tannins	+
Phenolic compounds	+
Glycosides	+

+ Flavonoids + Saponins + Tannins + Phenolic compounds + Glycosides +

B. Organoleptic and physicochemical evaluation

The optimized F1 gel was reported as red in colour, with a characteristic odour, smooth texture, uniform appearance and good homogeneity. Its measured pH was 6.01. The report describes the formulation as easily washable, with no residue remaining after washing for one minute, and records no visible irritation in the described skin assessment. The average spreadability was reported as 4.2 cm. Viscosity, drug content, batch-to-batch variability and formal stability results were not sufficiently reported in the source material to include as quantitative findings.

Table 3. Summary of reported evaluation results for F1

Parameter	Observation/result
Colour	Red
Odour	Characteristic
Texture / appearance	Smooth / uniform
Homogeneity	Good
pH	6.01
Spreadability	4.2 cm (reported average)
Washability	Easy to wash; no residue after 1 min
Visible irritation	No visible irritation reported

Red Odour Characteristic Texture / appearance Smooth / uniform Homogeneity Good pH 6.01 Spreadability 4.2 cm (reported average)

C. In-vitro antibacterial activity

The reported agar well diffusion results showed a 20 mm zone of inhibition for F1 against *Cutibacterium acnes*. Streptomycin produced a 23 mm zone, while the control produced no inhibition (0 mm). The result suggests antibacterial activity under the test conditions. However, the report does not describe replicate data, statistical analysis or full assay validation, so the result should be interpreted as preliminary and should not be taken as evidence of clinical efficacy.

Table 4. Reported antibacterial activity

Sample	Zone of inhibition (mm)
Control	0
Streptomycin (standard)	23
Herbal anti-acne gel (F1)	20

0 Streptomycin (standard) 23 Herbal anti-acne gel (F1) 20

V. CONCLUSION

A herbal anti-acne gel containing ethanolic *Garcinia indica* fruit-rind extract was formulated using Carbopol 934 as the gelling agent. The optimized formulation showed acceptable reported organoleptic properties, pH (6.01), spreadability (4.2 cm) and washability. Qualitative phytochemical tests were positive for alkaloids, flavonoids, saponins, tannins, phenolic compounds and glycosides. The gel produced a reported 20 mm zone of inhibition against *C. acnes* compared with 23 mm for streptomycin. These findings are preliminary; future work should include validated microbiological testing with replicates and statistical analysis, quantitative characterization, stability testing, and appropriately reviewed safety studies before any therapeutic or clinical claims are made.

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