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Design Development and in Vitro Anti-Microbial Assessment of a 70 % Ethonolic Poly Herbal Extract based on Topical Cream Against Lacto Bacillus Microflora

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Abstract: ***The growing interest in safe and effective herbal formulations has encouraged the development of plant-based topical products for antimicrobial applications. This study focused on the formulation and evaluation of a polyherbal topical cream containing a 70% ethanolic extract of Hibiscus rosa-sinensis, Ocimum sanctum (Tulsi), and Citrus limon (lemon) leaves. The extracts were prepared from shade-dried plant materials using the maceration technique with 70% ethanol. Preliminary phytochemical analysis confirmed the presence of several bioactive constituents, including alkaloids, flavonoids, tannins, glycosides, phenolic compounds, and saponins. The combined extract was incorporated into an oil-in-water cream base using suitable pharmaceutical excipients. The formulated cream was assessed for various physicochemical properties, including appearance, pH, spreadability, viscosity, washability, irritancy, and stability. Results indicated that the formulation possessed a smooth texture, acceptable viscosity, skin-friendly pH, and showed no signs of irritation or phase separation. Antimicrobial activity was evaluated using the agar well diffusion method and demonstrated concentration-dependent inhibitory effects against Lactobacillus microflora. Stability studies further confirmed the physical and chemical integrity of the formulation under different storage conditions. These findings suggest that the developed polyherbal cream may serve as a safe and effective alternative for topical antimicrobial therapy.***

Keywords: Polyherbal cream, *Hibiscus rosa-sinensis*, *Ocimum sanctum*, *Citrus limon*, Ethanolic extract, Antimicrobial activity, Topical formulation, *Lactobacillus*, Phytochemical screening, Herbal medicine

1. Introduction

Natural products have gained considerable importance in modern healthcare and cosmetic industries because of their therapeutic potential and safety profile. Plant-based formulations are increasingly being explored as alternatives to synthetic products due to their effectiveness, accessibility, and reduced risk of adverse reactions. Recent scientific advancements have strengthened the evidence supporting the medicinal value of herbs and have encouraged the development of innovative dosage forms with improved stability, efficacy, and patient compliance. Among topical formulations, creams remain one of the most commonly used delivery systems because they are convenient to apply, aesthetically acceptable, and capable of providing localized drug action.

Microbial skin disorders continue to affect a large population worldwide and represent an important healthcare challenge. Although synthetic antimicrobial agents are effective in controlling such infections, their extensive use has been associated with several drawbacks, including the development of resistant microbial strains, allergic responses, skin irritation, and disturbances in the normal skin microbiota. Consequently, attention has shifted toward natural therapeutic alternatives that are both effective and environmentally friendly. Herbal preparations are particularly attractive because they contain multiple phytochemicals with antimicrobial, antioxidant, anti-inflammatory, and tissue-repairing properties

The concept of polyherbal therapy is based on combining different medicinal plants to achieve enhanced therapeutic outcomes through synergistic interactions among their bioactive constituents. Such combinations may improve overall efficacy while minimizing undesirable effects. In this study, Hibiscus rosa-sinensis, Ocimum sanctum, and Citrus limon were selected due to their well-established medicinal properties and traditional use in skin-related disorders. Hibiscus rosa-sinensis contains various phytochemicals, including flavonoids, anthocyanins, tannins, and phenolic compounds that exhibit antioxidant and antimicrobial activities. Ocimum sanctum is recognized for its rich content of eugenol, ursolic acid, and rosmarinic acid, which contribute to its antimicrobial, anti-inflammatory, and immunomodulatory effects. Likewise, Citrus limon leaves contain essential oils and phenolic constituents that help suppress microbial growth and protect tissues from oxidative stress. The combination of these extracts is expected to enhance antimicrobial performance through complementary biological mechanisms.

Efficient extraction is essential for obtaining biologically active constituents from medicinal plants. A hydroalcoholic solvent consisting of 70% ethanol was employed in the present study because of its ability to dissolve a broad spectrum of phytochemicals ranging from polar to moderately non-polar compounds. This solvent system facilitates the extraction of flavonoids, tannins, phenolic compounds, glycosides, and other active constituents responsible for antimicrobial activity.

The present work was undertaken to develop and evaluate a polyherbal topical cream formulated with 70% ethanolic extracts of Hibiscus rosa-sinensis, Ocimum sanctum, and Citrus limon. The antimicrobial potential of the formulation was investigated against Lactobacillus microflora using in vitro methods. In addition, the physicochemical properties,

safety, and stability of the developed cream were assessed to determine its suitability for topical application. The findings of this investigation may provide valuable information for the development of herbal antimicrobial products as natural substitutes for conventional topical preparations.

2. Materials

Materials Used

The present investigation utilized leaves of Hibiscus rosa-sinensis, Ocimum sanctum, and Citrus limon as the primary herbal ingredients for the preparation of a polyherbal topical cream Fresh and healthy leaves were collected from local gardens and authenticated using standard botanical identification procedures. These medicinal plants were selected due to their well-documented antimicrobial, antioxidant, and anti-inflammatory activities [11-14].

Seventy percent ethanol was employed as the extraction solvent because of its ability to efficiently extract a broad spectrum of phytoconstituents, including flavonoids, tannins, phenolics, and alkaloids [15]. Distilled water was used throughout the extraction and formulation processes as the aqueous medium.

The cream base was formulated using pharmaceutical-grade excipients [16-20]. Stearic acid was incorporated to provide emulsification and improve the consistency of the formulation [17-19]. Cetyl alcohol functioned as a thickening agent and emollient, contributing to the smooth texture of the cream [17,18]. Liquid paraffin served as the oil-phase component and enhanced the moisturizing effect of the formulation [18,19]. Glycerin was added as a humectant to maintain skin hydration and prevent excessive moisture loss [18,21]. Methyl paraben was included as a preservative to inhibit microbial growth and improve the storage stability of the final product [17,18,21].

Plant Details

Hibiscus rosa-sinensis (Hibiscus)

Hibiscus rosa-sinensis is a flowering plant belonging to the family Malvaceae and is widely distributed in tropical and subtropical regions. The plant is valued for its attractive flowers and green foliage. Its leaves contain several bioactive constituents, including flavonoids, tannins, saponins, anthocyanins, and phenolic compounds. These phytochemicals are associated with various biological activities such as antimicrobial, antioxidant, anti-inflammatory, and wound-healing effects, making the plant a promising ingredient for topical herbal formulations [22–24].

Ocimum sanctum (Tulasi):

Ocimum sanctum, commonly referred to as Tulasi or Holy Basil, is an important medicinal herb of the family Lamiaceae. The plant is known for its aromatic nature, which is primarily attributed to the presence of essential oils. It contains a variety of phytoconstituents, including eugenol, ursolic acid, flavonoids, tannins, and other volatile compounds. Numerous studies have reported its antibacterial, antifungal, antioxidant, anti-inflammatory, and immunomodulatory activities, supporting its use in herbal therapeutic preparations [25–27].

Citrus limon (Lemon):

Citrus limon, a member of the family Rutaceae, is extensively cultivated for its nutritional and medicinal significance. The leaves are rich in essential oils and several phytochemicals, including limonene, citral, flavonoids, alkaloids, and vitamin C. These constituents contribute to a range of biological activities such as antimicrobial, antioxidant, antiseptic, and skin-protective effects. Owing to these beneficial properties, lemon leaves are frequently incorporated into herbal skincare formulations intended to promote and maintain healthy skin [28,29].

3. Methodology

The present investigation was undertaken to formulate and assess a polyherbal topical cream containing ethanolic extracts of Hibiscus rosa-sinensis, Ocimum sanctum, and Citrus limon. The study involved the extraction of plant materials, phytochemical characterization, formulation development, antimicrobial evaluation, physicochemical testing, and stability assessment of the prepared cream.

Major steps involved in the study:

- Collection and botanical authentication of plant materials
- Preparation of ethanolic plant extracts
- Preliminary phytochemical analysis
- Development of the polyherbal cream formulation
- Evaluation of antimicrobial activity
- Assessment of physicochemical characteristics
- Stability studies under specified storage conditions

Extraction of Hibiscus rosa-sinensis Leaves

Fresh leaves of Hibiscus rosa-sinensis were collected and thoroughly washed to remove dust and other impurities. The cleaned leaves were shade-dried at room temperature and subsequently ground into a coarse powder using a mechanical grinder. The powdered material was immersed in 70% ethanol and kept for maceration for approximately 72 hours with intermittent stirring to enhance the extraction of phytoconstituents. After completion of the extraction process, the mixture was filtered and the solvent was evaporated using a water bath maintained at 40–50°C until a semi-solid extract was obtained. The concentrated extract was stored in airtight containers for further experimental use.

Extraction of *Ocimum sanctum* Leaves

Healthy leaves of Ocimum sanctum were harvested, cleaned with water, shade-dried, and pulverized into coarse powder. The powdered leaves were subjected to maceration using 70% ethanol for three days. Periodic shaking was performed during the extraction process to improve solvent penetration and maximize the recovery of bioactive constituents. The extract was then filtered and concentrated under controlled heating conditions to obtain a semi-solid mass, which was preserved for subsequent formulation studies.

Extraction of *Citrus limon* Leaves

Leaves of Citrus limon were washed thoroughly, shade-dried, and ground into a fine powder. The powdered material was extracted with 70% ethanol by the maceration technique for 48–72 hours. Following extraction, the solution was filtered and concentrated using a water bath maintained at a moderate temperature. The resulting semi-solid extract was collected

and stored in sealed containers until further formulation and evaluation studies were conducted.

Preliminary Phytochemical Screening

A qualitative phytochemical investigation was carried out to determine the presence of important secondary metabolites in the prepared plant extracts. Standard phytochemical procedures were employed to identify major groups of bioactive compounds, including alkaloids, flavonoids, tannins, glycosides, saponins, terpenoids, and phenolic constituents.

Phytochemical Tests Performed

1) Dragendorff's Test (Test for Alkaloids)

Approximately 2 mL of the ethanolic extract was transferred into a test tube and acidified with a few drops of dilute hydrochloric acid. Subsequently, 1–2 mL of Dragendorff's reagent was added carefully. The appearance of an orange to reddish-brown precipitate indicated the presence of alkaloids in the extract.

Observation: Orange-brown precipitate
Inference: Presence of alkaloids [3,34]

2) Shinoda Test (Test for Flavonoids)

About 2 mL of the extract was taken in a test tube and mixed with a small quantity of magnesium turnings. A few drops of concentrated hydrochloric acid were then added slowly. The development of a pink, crimson-red, or magenta coloration confirmed the presence of flavonoids.

Observation: Pink/red coloration
Inference: Presence of flavonoids

3) Ferric Chloride Test (Test for Phenolic Compounds)

Approximately 2 mL of the plant extract was transferred into a test tube, followed by the addition of a few drops of 5% ferric chloride solution. The appearance of a blue, green, violet, or black coloration indicated the presence of phenolic compounds in the extract.

Observation: Dark green or blue-black coloration
Inference: Presence of phenolic compounds

4) Keller–Killiani Test (Test for Cardiac Glycosides)

About 2 mL of the extract was mixed with 1 mL of glacial acetic acid containing a trace amount of ferric chloride solution. Concentrated sulfuric acid was then carefully introduced along the inner wall of the test tube to form two distinct layers. The formation of a brown-colored ring at the junction of the layers confirmed the presence of cardiac glycosides.

Observation: Brown ring at the junction of two layers
Inference: Presence of glycosides

5) Foam Test (Test for Saponins)

Approximately 1 mL of the extract was diluted with 10 mL of distilled water and shaken vigorously for 2–3 minutes. The formation of a stable and persistent froth that remained for at least 10–15 minutes was considered positive for saponins.

Observation: Persistent foam layer
Inference: Presence of saponins

6) Salkowski Test (Test for Terpenoids)

About 2 mL of the extract was combined with 2 mL of chloroform in a test tube. Concentrated sulfuric acid was then added carefully along the side of the tube to form a separate lower layer. The appearance of a reddish-brown coloration at the interface of the two layers indicated the presence of terpenoid compounds.

Observation: Reddish-brown interface
Inference: Presence of terpenoids

7) Ferric Chloride Test (Test for Tannins)

Approximately 2 mL of the extract was treated with a few drops of ferric chloride solution. The development of a blue-black or greenish-black coloration indicated the presence of tannins.

Observation: Greenish-black or blue-black coloration
Inference: Presence of tannins

Theory of Cream Formulation

Creams are semi-solid dosage forms intended for topical administration and are generally composed of oil and aqueous phases stabilized by emulsifying agents. In the present investigation, an oil-in-water emulsion system was selected due to its non-greasy nature, ease of application, good patient acceptability, and simple removal from the skin surface.

Incorporation of herbal extracts into the cream base provides localized therapeutic action and enhances antimicrobial and antioxidant effects due to the presence of naturally occurring phytochemicals. Appropriate excipients were selected to improve stability, spreadability, texture, and moisturizing properties.

Formulation of Polyherbal Cream

The cream formulation consisted of a combination of herbal extracts along with suitable pharmaceutical excipients.

Ingredient	Quantity (%)	Function
Polyherbal Extract	2–5	Active ingredient
Stearic Acid	10–15	Emulsifier and thickener
Cetyl Alcohol	2–5	Emollient and stabilizer
Beeswax	2–5	Consistency enhancer
Liquid Paraffin	5–10	Oil phase component
Glycerin	5–10	Humectant
Triethanolamine	1–2	Emulsifier and pH modifier
Methyl Paraben	0.1–0.2	Preservative
Propyl Paraben	0.01–0.05	Preservative
Distilled Water	q.s.	Vehicle

Method of Preparation

Polyherbal cream was formulated by employing the emulsification method. The The oil phase, consisting of stearic acid, cetyl alcohol, beeswax, and liquid paraffin, was heated to approximately 70–75°C until all ingredients were completely liquefied. At the same time, the aqueous phase containing distilled water, glycerin, methyl paraben, and propyl paraben was heated separately to the same temperature.

The heated aqueous phase was slowly added to the oil phase with continuous stirring to obtain a uniform and stable emulsion. Triethanolamine was then incorporated gradually to promote emulsification and to adjust the pH of the formulation. After emulsion formation, the herbal extracts were added and mixed thoroughly to ensure uniform distribution throughout the cream base. Stirring was continued during the cooling process to obtain a smooth, homogeneous, and stable formulation. The finished cream was transferred into airtight containers and stored under appropriate conditions until further evaluation.

Evaluation of Formulated Cream

The prepared formulation was evaluated for various quality parameters to determine its suitsbility for topical applications. The assessment included examination of physical appearance, pH determination, homogeneity, spreadability, viscosity, washability, skin irritation assessment, phase separation study, and consistency evaluation [17,18,21,40].

1) Physical Appearance
Approximately 1 g of formulated cream was spread on a clean glass slide and visually examined under normal daylight conditions. Characteristics such as color, odor, texture, smoothness, grittiness, and phase separation.

2) pH Determination
A quantity of 1 g of cream was accurately weighed and dispersed in 10 mL of distilled water. The dispersion was allowed to stand for 2 hours at room temperature (25 ± 2°C). The pH was measured using a calibrated digital pH meter. Measurements were performed in triplicate and expressed as mean ± SD.

3) Homogeneity Test
A quantity of 0.5 g of prepared cream was gently spread on the clean glass slide and examined usually for uniformity, lumps, coarse particles, and grittiness.

4) Spreadability Study
1 g of cream was placed between two glass slides. A weight of 100 g was applied for 5 minutes to obtain a uniform film. An additional load of 20 g was attached to the upper slide through a pulley system and the time required for the slide to travel 7.5 cm was recorded.

5) Viscosity Measurement
Approximately 50 g of cream was transferred into a 100 mL beaker. Viscosity was measured at 25 ± 2°C using brook field viscometer spindle No. 64 at 20 rpm. The Readings were noted after stabilization of the spindle.

6) Washability Test
About 0.5 g of cream was applied to a marked skin area (5 cm^2) and allowed to remain for 5 minutes. The area was washed with running tap water, and the ease of removal was assessed visually.

7) Skin Irritation Assessment
Approximately 0.5 g of cream was applied uniformly over a skin surface of 2 cm × 2 cm. The application site was monitored after 24 hours for any signs of erythema, edema, itching, redness, or irritation.

Observation Scale:
- 0 = No visible irritation
- 1 = Slight irritation
- 2 = Moderate irritation
- 3 = Severe irritation

8) Phase Separation Study
The cream was packed into a glass containers and stored at:
- 25 ± 2°C (Room Temperature)
- 40 ± 2°C / 75 ± 5% RH

for a period of 30 days. Samples were observed at intervals of 0, 7, 15, and 30 days for phase separation, creaming, cracking, or liquefaction.

9) Consistency Evaluation
Approximately 1 g of cream was examined manually by pressing between fingers and spreading on a glass surface. Texture, smoothness, semisolid nature, and ease of application were assessed periodically during storage.

Antimicrobial Evaluation
The antimicrobial activity of the developed cream was assessed using the agar well diffusion method. Sterile nutrient agar medium was prepared and poured into Petri dishes followed by inoculation with the selected test microorganism after solidification, Wells of equal size were made in the agar using a sterile cork borer, and predetermined quantities of the formulation were carefully introduced into the wells. Appropriate positive and negative controls were maintained throughout the experiment to ensure the reliability of the findings. The inoculated plates were incubated under suitable environmental conditions, and antimicrobial efficacy was assessed by measuring the diameter of the clear inhibition zones formed around each well {20,21}

Stability Studies
Stability testing was performed to assess the ability of the formulated cream to maintain its physical and chemical characteristics under various storage environments. Samples of the formulation were stored at refrigerated conditions (4°C), ambient temperature (25°C), and accelerated temperature conditions (40°C) for a period of one month.

Periodic observations were made examined for variations in appearance, color, odor, texture, pH, viscosity, and phase separation [21, 40, 37]. The results obtained during storage were compared with initial values to evaluate the stability and expected shelf-life of the prepared polyherbal cream [21, 40, 37].

4. Results and Discussion

Phytochemical Screening

Preliminary Phytochemical Analysis of Ethanolic Leaf Extracts

S. No.	Phytochemical Constituent	Hibiscus rosa-sinensis	Ocimum sanctum	Citrus limon
1	Alkaloids	+	+	+
2	Flavonoids	+	+	+
3	Tannins	+	+	+
4	Glycosides	+	+	+
5	Saponins	+	+	–
6	Terpenoids	+	+	+
7	Phenolic Compounds	+	+	+

(+ = Present; – = Absent)

Qualitative phytochemical analysis of the ethanolic leaf extracts conformed the prescence of several imported secondary metabolites in the selected medicinal plants. The extracts of *Hibiscus rosa-sinensis*, *Ocimum sanctum*, and *Citrus limon* were found to contain alkaloids, flavonoids, tannins, glycosides, terpenoids, and phenolic compounds. These phytoconstituents are widely recognized for their diverse particularly antimicrobial effects.

Flavonoids and phenolic compounds contribute significantly to antioxidant defense by neutralizing free radicals and reducing oxidative stress. Tannins are known to possess astringent properties that may support tissue repair and wound management. Terpenoids and alkaloids have been reported to exhibit microbial properties by effecting microbial cell function through various disruption of cellular integrity and metabolic processes.

Saponins were detected in *Hibiscus rosa-sinensis* and *Ocimum sanctum* extracts but were not observed in *Citrus limon*. Despite this variation, the overall phytochemical composition of the three plants indicates the potential for complementary and synergistic therapeutic effects. The presence of multiple bioactive constituents supports their selection as active ingredients in the development of a polyherbal antimicrobial cream.

Evaluation of Polyherbal Cream

S.No.	Parameter	Result Obtained	Interpretation
1	Physical Appearance	Smooth, uniform, light yellow cream with pleasant odor	Acceptable
2	pH	6.4 ± 0.1	Suitable for skin application
3	Homogeneity	Homogeneous, free from lumps and grittiness	Good
4	Spreadability	7.8 ± 0.3 g·cm/s	Easily spreadable
5	Viscosity	18,500 ± 250 cP	Moderate viscosity, suitable for topical use
6	Washability	Easily washable with water	Acceptable
7	Skin Irritation	No redness, itching, or edema observed	Non-irritant
8	Phase Separation	Not observed during storage period	Stable formulation
9	Consistency	Smooth, semisolid, uniform texture	Satisfactory

Evaluation of the prepared cream indicated favorable physicochemical characteristics. The formulation displayed a smooth texture and uniform appearance without evidence of coarse particles or aggregation, suggesting successful emulsification and proper incorporation of ingredients.

The pH value of 6.2 was found to be compatible with normal skin conditions, reducing the likelihood of irritation following topical application. Homogeneity and consistency assessments confirmed that the formulation maintained a uniform structure throughout the preparation.

Good spreadability was observed, allowing easy distribution over the skin surface. The measured viscosity provided adequate retention on the application site while maintaining ease of use. The cream was readily removable with water, confirming the characteristics of an oil-in-water emulsion system.

No adverse reactions such as redness, itching, or irritation were detected during the safety assessment, indicating good skin compatibility. Furthermore, the absence of phase separation demonstrated the physical stability of the emulsion. Collectively, these findings suggest that the developed polyherbal cream possesses desirable properties for topical therapeutic use.

Antimicrobial Activity

Antimicrobial Activity of Standard and Polyherbal Formulation

S. No.	Sample	Concentration (µg/ml)	Zone of Inhibition (mm)	Observation
1	Standard Drug	50	1.5, 1.9	Moderate inhibition
		100	2.1, 1.9, 2.3	Enhanced inhibition
2	Polyherbal Cream	100	No zone observed	No inhibition
		200	No zone observed	No inhibition
		400	2.2, 2.0, 1.6	Noticeable inhibition

The antimicrobial investigation demonstrated differences in the inhibitory effects of the standard drug and the formulated polyherbal cream. The standard reference exhibited clear antimicrobial activity at both tested concentrations, with larger inhibition zones observed at the higher concentration, indicating a concentration-dependent response.

The polyherbal formulation did not produce measurable inhibition at concentrations of 100 µg/ml and 200 µg/ml. However, antimicrobial activity became evident at 400 µg/ml, where distinct inhibition zones were recorded. This finding suggests that the herbal formulation requires a comparatively higher concentration to achieve effective microbial suppression.

The observed antimicrobial effect may be attributed to the collective action of phytochemicals present in the extracts, including flavonoids, tannins, phenolic compounds, terpenoids, and essential oils. These constituents are known to interfere with microbial growth and survival through multiple mechanisms, including disruption of cell

membranes, inhibition of enzyme activity, interference with nucleic acid synthesis, and alteration of metabolic pathways.

Although the activity of the polyherbal cream was lower than that of the standard drug, its effectiveness at higher concentrations highlights its potential as a natural antimicrobial topical preparation. The synergistic interaction among the bioactive phytoconstituents may contribute to the observed antimicrobial activity and supports the development of polyherbal formulations as safer alternatives to synthetic antimicrobial agents.

Stability Studies

S. No.	Test	Storage Condition	Initial Observation	Observation After 30 Days	Inference
1	Temperature Stability	4°C, 25°C, 40°C	Light green, smooth	No significant change	Stable
2	Phase Separation	Room temperature and 40°C	No separation	No separation	Stable
3	pH Stability	Room temperature and 40°C	6.2	6.1	Stable
4	Viscosity Stability	4°C, 25°C, 40°C	Moderate viscosity	No significant variation	Stable
5	Organoleptic Properties	All storage conditions	Pleasant odor and smooth texture	No change observed	Stable

Stability Study Results of Polyherbal Cream

The stability assessment demonstrated that the polyherbal cream maintained its quality throughout the study period. Storage under refrigerated, ambient, and accelerated conditions did not produce any noticeable alterations in color, odor, texture, or overall appearance, indicating excellent physical stability.

No evidence of phase separation was detected during the observation period, confirming the effectiveness of the emulsification system. The pH value remained nearly constant, showing only a minimal decrease from 6.2 to 6.1, which remained within the acceptable range for topical formulations.

Viscosity measurements also remained consistent, suggesting preservation of the structural characteristics of the cream. Organoleptic properties such as appearance, odor, and texture remained unchanged during storage, further supporting the stability of the formulation.

These results indicate that the developed polyherbal cream possesses satisfactory storage stability and is capable of retaining its physicochemical characteristics under different environmental conditions. Such stability is essential for maintaining product quality, efficacy, and patient acceptability during its shelf life

5. Conclusion

The present investigation successfully developed and evaluated a polyherbal topical cream incorporating 70% ethanolic extracts of *Hibiscus rosa-sinensis*, *Ocimum sanctum*, and *Citrus limon*. Phytochemical analysis confirmed the presence of important bioactive constituents, including flavonoids, alkaloids, tannins, glycosides, terpenoids, and phenolic compounds, which are known to contribute to antimicrobial and protective activities

The formulated cream exhibited desirable physicochemical characteristics such as suitable pH, good homogeneity, satisfactory spreadability, moderate viscosity, easy washability, and absence of skin irritation. These properties indicate that the formulation is appropriate for topical application and offers good user acceptability

Antimicrobial studies demonstrated that the polyherbal formulation possesses inhibitory activity against the tested microorganism, particularly at higher concentrations. The observed activity may be attributed to the combined action of the phytochemicals present in the selected plant extracts The synergistic interaction among the herbal constituents appears to enhance the overall biological effectiveness of the formulation.

Stability evaluation revealed that the cream remained physically and chemically stable under different storage conditions without significant alterations in appearance, pH, viscosity, odor, or texture. The absence of phase separation further confirmed the stability of the emulsion system.

Based on the findings of the present study, the developed polyherbal cream can be considered a promising natural topical formulation with antimicrobial potential. The formulation demonstrated satisfactory safety, stability, and performance characteristics, supporting its possible application in herbal skincare products. Future investigations involving extended stability studies, detailed pharmacological assessments, and clinical evaluations may further establish its therapeutic value and commercial applicability

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