World Journal of Applied Review
www.worldreviewjournal.com
Online ISSN:
Received: 25-07-2025, Accepted: 24-08-2025, Published: 09-08-2025
Volume 1, Issue 1, Jul-Sep, 2025, Page No. 1-7

Formulation and evaluation of an emollient cream developed from Marigold (*Calendula officinalis*) extract

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Abstract
Skin dryness and irritation are common dermatological concerns often treated with emollient creams that hydrate and soothe the skin. With increasing interest in herbal formulations, *Calendula officinalis* (commonly known as marigold) has gained attention for its anti-inflammatory, antimicrobial, and skin-healing properties. This study aimed to formulate and evaluate an emollient cream incorporating marigold extract to determine its effectiveness and suitability for topical application.
Marigold flowers were collected, shade-dried, and subjected to ethanolic extraction using the maceration method. The extract was then incorporated into a cream base formulated using standard emulsifying agents, humectants, and stabilizers. Three different formulations (F1, F2, F3) with varying concentrations of marigold extract were prepared and evaluated.
Physicochemical parameters including pH, viscosity, spreadability, stability (under accelerated conditions), and organoleptic properties were assessed. Microbial load testing and in *vitro* skin irritation studies using egg membrane and patch testing on human volunteers were also conducted. Additionally, the moisturizing efficacy was evaluated using a corneometer over a 4-week period.
The results indicated that all formulations were stable and met acceptable cosmetic standards. Among them, F2 (with a moderate concentration of extract) showed the best balance of spreadability, skin absorption, and moisturizing effect without causing irritation. The cream exhibited good antimicrobial properties and helped improve skin hydration significantly compared to the base cream.
In conclusion, the study demonstrated that an emollient cream formulated with *Calendula officinalis* extract is effective, stable, and safe for topical use. The incorporation of marigold extract enhanced the therapeutic value of the cream, making it a promising alternative to synthetic skin care products. Further clinical studies are recommended to validate long-term benefits and potential for commercial development.

Keywords: Marigold extract, *Calendula officinalis*, emollient cream, herbal cosmetics, skin hydration, cream formulation, anti-inflammatory, topical herbal therapy

Introduction

Skin, being the largest organ of the human body, plays a vital role in protecting internal organs, regulating temperature, and providing a barrier against environmental threats. Maintaining the skin's integrity and hydration is crucial, particularly in conditions where the skin becomes dry, irritated, or inflamed. One of the most commonly used approaches to manage such conditions is the topical application of emollient creams. Emollients are substances that soften and moisturize the skin, reduce itching and flaking, and help restore the skin barrier. They are widely used in the treatment of dermatological conditions such as eczema, psoriasis, and xerosis. In recent years, the cosmetic and pharmaceutical industries have shown a growing interest in incorporating herbal extracts into skincare products due to the rising demand for natural and sustainable alternatives to synthetic compounds.

Among the various medicinal plants utilized in dermatology and skincare, *Calendula officinalis*, commonly known as marigold, has received considerable attention. Native to Southern Europe and widely cultivated throughout the world, marigold is known for its bright orange or yellow flowers and has a long history of use in traditional medicine. The flowers of *Calendula officinalis* are rich in bioactive compounds such as flavonoids, triterpenoids, carotenoids, saponins, and essential oils, which contribute to its anti-inflammatory, antimicrobial, wound healing, and antioxidant properties. These pharmacological attributes make marigold a promising candidate for topical formulations aimed at improving skin health.

The increasing prevalence of skin conditions associated with dryness and inflammation has prompted researchers to explore plant-based ingredients in topical applications. According to the World Health Organization (WHO), approximately 20% of children and 10% of adults globally suffer from atopic dermatitis or eczema, conditions where emollient therapy is a cornerstone of management. Furthermore, the global skincare market, valued at over USD 135 billion in 2023, reflects a growing consumer inclination towards herbal and organic skincare products. Despite this trend, there remains a significant gap in the systematic development and evaluation of herbal emollient formulations, particularly those incorporating *Calendula officinalis*.

Several studies have highlighted the therapeutic benefits of marigold extract in wound healing and anti-inflammatory treatments. In clinical settings, marigold-based ointments have been used to treat minor burns, cuts, and dermatitis with promising results. However, most of these applications have focused on high-potency formulations for acute conditions rather than everyday cosmetic use. Limited research has been directed toward developing and standardizing a stable emollient cream from marigold extract that is suitable for regular application on dry and

sensitive skin. This study aims to address this gap by formulating a cream with varying concentrations of marigold extract and evaluating its physicochemical properties, stability, skin compatibility, and moisturizing efficacy.

The primary objective of this research is to formulate an emollient cream containing *Calendula officinalis* extract and to assess its suitability as a natural moisturizer for skin care. Specific objectives include: [1] extracting the active components from *Calendula officinalis* flowers using ethanol; [2] developing a stable cream base incorporating different concentrations of the extract; [3] evaluating the physicochemical properties such as pH, viscosity, spreadability, and stability of the formulations; and [4] assessing the moisturizing effect, safety profile, and antimicrobial activity of the cream through in *vitro* and in *vivo* methods. The central hypothesis is that marigold extract, when formulated into an emollient cream, will enhance skin hydration and provide additional therapeutic benefits without causing irritation or adverse effects.

In reviewing existing literature, it becomes evident that while marigold extract has been studied for its pharmacological benefits, there is a paucity of data concerning its use in cosmetic emollient formulations. Some studies have focused on its wound healing properties, revealing that marigold extract accelerates epithelialization and collagen synthesis in damaged skin. Others have explored its antimicrobial activity, demonstrating efficacy against a variety of skin pathogens, including *Staphylococcus aureus* and *Candida albicans*. However, these studies often employ hydroalcoholic solutions or ointments intended for short-term use. There is a lack of comprehensive research that evaluates long-term usage, sensory acceptance, and moisturizing performance in a cream base designed for daily application.

This study attempts to bridge the gap between traditional knowledge and modern formulation science by developing a standardized emollient cream with marigold extract that is both effective and acceptable to consumers. By employing modern formulation techniques and evaluation parameters, the study provides an evidence-based approach to integrating herbal medicine into everyday skincare.

The scope of this research includes the selection and extraction of active compounds from marigold flowers, the formulation of different cream prototypes, and a detailed evaluation of their physicochemical, biological, and sensory attributes. The study is structured as follows: the first section deals with the preparation and standardization of the marigold extract; the second discusses the formulation process and selection of excipients; the third presents the results of laboratory tests conducted to evaluate the creams; and the final section discusses the findings in the context of existing literature, concluding with recommendations for further research and potential commercial application.

Given the increasing awareness of the side effects of synthetic additives and the growing demand for clean-label cosmetic products, the development of a natural emollient cream using *Calendula officinalis* extract holds substantial promise. This research is not only relevant to academic and pharmaceutical circles but also to the broader consumer market that is shifting toward safer and more sustainable skin care alternatives. By combining traditional herbal knowledge with modern scientific methods, this study aims to deliver a product that addresses a common skin concern using safe, effective, and natural ingredients.

Methods

This study employed a quantitative experimental research design to formulate and evaluate an emollient cream developed from *Calendula officinalis* (marigold) extract. The objective was to develop a stable and effective herbal cream using standardized procedures and to analyze its physicochemical properties, safety, and moisturizing efficacy. All experimental procedures were conducted in a controlled laboratory environment, ensuring replicability and consistency.

Collection and Preparation of Plant Material

Fresh marigold flowers (*Calendula officinalis*) were collected from a local organic farm during full bloom. The flowers were thoroughly washed with distilled water to remove dirt and debris, then shade-dried at room temperature for seven days to preserve their active constituents. Once dried, the flowers were ground into a fine powder using a mechanical grinder and stored in airtight containers away from light and moisture until extraction.

Extraction of Marigold

The powdered marigold flower was subjected to ethanolic extraction using the cold maceration method. Approximately 100 grams of dried powder were soaked in 500 mL of 95% ethanol for 72 hours in a clean, amber-colored glass container, with occasional stirring. The extract was then filtered using Whatman filter paper No. 1. The filtrate was concentrated using a rotary evaporator under reduced pressure at a temperature not exceeding 45°C, yielding a thick, semi-solid extract. This extract was stored in a refrigerator at 4°C for further use in cream formulation.

Formulation of Emollient Cream

Three different formulations (F1, F2, and F3) were prepared with varying concentrations of marigold extract—2.5%, 5%, and 7.5% respectively. The cream base was composed of standard cosmetic ingredients including emulsifying wax, stearic acid, cetyl alcohol, liquid paraffin, glycerin, and distilled water. The oil phase (waxes, paraffin, and extract) was heated to 70°C while the aqueous phase (glycerin and water) was heated separately to the same temperature. The aqueous phase was gradually added to the oil phase with constant stirring using a mechanical stirrer until a homogenous cream was formed. The final cream was allowed to cool at room temperature before being transferred into sterile glass containers.

Sample Size and Sampling Method

For in *vivo* skin testing and acceptability evaluation, a purposive sampling method was used to select 20 healthy adult volunteers (aged 18–45) with no known dermatological conditions or allergies. The sample included an equal number of male and female participants to ensure balanced feedback. Informed consent was obtained from all participants prior to participation, and they were briefed about the purpose and procedures of the study. Ethical clearance was obtained from the institutional review board.

Physicochemical Evaluation of Formulated Creams

All three formulations were subjected to a range of physicochemical tests to assess quality, stability, and performance.

- **pH Measurement**: The pH of the creams was measured using a digital pH meter at room temperature. A 1g sample of cream was dispersed in 10 mL of distilled water for accurate reading.
- **Viscosity**: A Brookfield viscometer was used to determine the viscosity of each formulation. Measurements were taken at a constant spindle speed and recorded in centipoise (cP).
- **Spreadability**: Spreadability was evaluated by placing 1g of cream between two glass slides and applying a known weight. The diameter of the spread cream was measured after a fixed time.
- **Stability Testing**: Accelerated stability studies were conducted by storing the cream at three different temperature conditions (4°C, room temperature, and 40°C) for 30 days. Observations for color change, phase separation, and odor were recorded weekly.
- **Homogeneity and Texture**: Each cream was visually and tactilely evaluated for uniformity, smoothness, and ease of application.

In *Vitro* Antimicrobial Testing

To assess the antimicrobial activity of the formulated creams, agar well diffusion method was used. Test organisms included *Staphylococcus aureus* and *Escherichia coli*. Sterile nutrient agar plates were inoculated with bacterial suspensions, and wells were filled with the cream formulations. After 24 hours of incubation at 37°C, the zone of inhibition around each well was measured in millimeters.

In *Vitro* Skin Irritation Test

To ensure the formulations were safe for human use, a preliminary irritation test was conducted using egg membrane as a surrogate for human skin. Cream samples were applied to isolated egg membranes and observed over 24 hours for signs of irritation such as discoloration or structural degradation.

In *Vivo* Skin Compatibility and Moisturizing Efficacy

Volunteers were instructed to apply a small quantity (approximately 1g) of each cream formulation on different areas of their forearms twice daily for four weeks. The application sites were evaluated weekly for:

- **Moisturizing effect**: Measured using a corneometer, which records the hydration level of the stratum corneum.
- **Skin irritation**: Monitored visually and through participant feedback for signs such as redness, itching, or rash.
- **User acceptability**: At the end of four weeks, participants completed a short survey rating the cream's texture, absorption, fragrance, and overall satisfaction on a Likert scale (1–5).

Analytical Tools and Data Analysis

Data collected from physicochemical tests and in *vivo* evaluations were analyzed using Microsoft Excel and SPSS software. Descriptive statistics (mean, standard deviation) were calculated for all quantitative parameters. One-way ANOVA was used to compare the three formulations in terms of spreadability, moisturizing effect, and antimicrobial activity. A significance level of $p < 0.05$ was considered statistically significant.

Ethical Considerations

All procedures involving human volunteers were conducted in accordance with ethical guidelines for biomedical research. Participants were informed about the study's purpose, risks, and their right to withdraw at any time without penalty. Signed informed consent was obtained from each participant. Confidentiality of personal data was strictly maintained, and no identifying information was disclosed in the study report. Additionally, no animal testing was conducted for this study.

Limitations and Quality Control

While efforts were made to ensure accuracy and consistency, some limitations include the relatively small sample size and short duration of the moisturizing effect study. All instruments used for evaluation were calibrated prior to testing, and each test was conducted in triplicate to improve reliability. Cream preparation and evaluations were carried out under aseptic conditions to prevent microbial contamination.

Results

The present study was designed to formulate and evaluate emollient creams containing varying concentrations of *Calendula officinalis* (marigold) extract. Three formulations—F1 (2.5%), F2 (5%), and F3 (7.5%)—were prepared and tested to assess their physicochemical characteristics, antimicrobial activity, skin compatibility, and moisturizing efficacy. The findings are presented below in a structured format, covering each set of evaluations.

Physicochemical Properties

1. pH Evaluation

The pH values of the three cream formulations remained within the acceptable range for topical application (pH 4.5–7.0). F1 recorded a mean pH of 6.45, F2 had a pH of 6.38, and F3 showed a slightly lower pH of 6.30. These values indicate that all formulations are suitable for application on human skin without causing acid-base imbalance or irritation. There was no significant change in pH during the 30-day stability testing period.

2. Viscosity

The viscosity of the creams was measured using a Brookfield viscometer and expressed in centipoise (cP). The results revealed that F1 had a viscosity of 21,500 ± 100 cP, F2 measured 22,300 ± 150 cP, and F3 was slightly more viscous at 23,200 ± 180 cP. An increase in viscosity was observed with a higher concentration of marigold extract,

suggesting a denser formulation at higher extract loads. Despite these variations, all formulations-maintained consistency suitable for smooth topical application.

3. Spreadability

Spreadability was inversely related to viscosity, with F1 demonstrating the highest spreadability (6.2 cm), followed by F2 (5.8 cm), and F3 (5.4 cm) under the same applied force. The results indicate that while the creams were all easily spreadable, higher extract concentrations slightly reduced this property, possibly due to increased thickness.

4. Homogeneity and Texture

All formulations were visually homogenous with no signs of phase separation, clumping, or granulation. The creams appeared smooth and uniform in color, with F1 and F2 being light yellow, while F3 appeared more intensely yellow due to the higher concentration of extract. Textural analysis by hand confirmed that all samples were smooth, non-gritty, and non-sticky, making them cosmetically acceptable.

5. Stability Testing

Over a 30-day period, creams were stored at three different conditions (4°C, room temperature, and 40°C). There was no noticeable change in color, odor, or consistency across all storage conditions. No phase separation or microbial growth was observed. These findings confirm that the formulations were chemically and physically stable under varying environmental conditions.

Antimicrobial Activity

Antimicrobial testing was performed against *Staphylococcus aureus* and *Escherichia coli* using the agar well diffusion method. The zones of inhibition (in mm) are presented below:

Against *Staphylococcus aureus*:

- F1: 10.5 ± 0.2 mm
- F2: 13.8 ± 0.3 mm
- F3: 15.6 ± 0.4 mm

Against Escherichia coli:

- F1: 9.2 ± 0.2 mm
- F2: 11.5 ± 0.3 mm
- F3: 13.3 ± 0.3 mm

A direct correlation was observed between extract concentration and antimicrobial activity. F3, which contained the highest amount of marigold extract, demonstrated the largest zones of inhibition against both organisms. F1 exhibited the lowest antimicrobial effect, although still significant compared to the control (base cream with no extract), which showed no antimicrobial activity.

In *Vitro* Skin Irritation Test

The egg membrane irritation test showed no signs of membrane damage, discoloration, or reaction after 24 hours of exposure to any of the formulations. The results confirm that all three formulations were non-irritant and safe for skin application. The base cream (without extract) also showed no irritation, indicating that both the extract and base ingredients were non-reactive.

In *Vivo* Skin Compatibility and Moisturizing Efficacy

Participant Demographics

A total of 20 volunteers (10 male, 10 female) aged between 18 and 45 years participated in the 4-week in *vivo* study. None of the participants reported any allergic reactions or discomfort during or after the application period.

Moisturizing Effect

Skin hydration levels were recorded weekly using a corneometer. Results are expressed as mean hydration levels (arbitrary units):

Week 0 (Baseline):

- All groups: 32.4 ± 1.1 AU

Week 1:

- F1: 39.2 ± 1.0 AU
- F2: 42.8 ± 1.2 AU
- F3: 45.3 ± 1.3 AU

Week 2:

- F1: 41.5 ± 1.1 AU
- F2: 47.9 ± 1.4 AU
- F3: 50.2 ± 1.5 AU

Week 3:

- F1: 43.0 ± 1.2 AU
- F2: 50.1 ± 1.3 AU
- F3: 53.5 ± 1.4 AU

Week 4:

- F1: 44.3 ± 1.3 AU
- F2: 52.6 ± 1.5 AU
- F3: 56.1 ± 1.6 AU

The data shows a consistent increase in skin hydration across all formulations, with F3 providing the most significant improvement, followed closely by F2. F1 showed moderate moisturizing effects. These results validate the hydrating potential of marigold extract and its dose-dependent efficacy.

Skin Irritation and Safety

Visual inspection and participant feedback throughout the study period showed no signs of erythema, itching, or burning sensation. None of the participants reported adverse skin reactions. This confirms the safety of all three formulations for human use.

User Acceptability Survey

At the end of the 4-week trial, participants were asked to evaluate each cream based on texture, absorption, fragrance, and overall satisfaction using a 5-point Likert scale. The mean scores for each parameter are presented below:

Texture (smoothness and ease of application):

- F1: 4.2
- F2: 4.6
- F3: 4.4

Absorption (how quickly the cream was absorbed):

- F1: 4.5
- F2: 4.7
- F3: 4.3

Fragrance (natural scent of the product):

- F1: 4.0
- F2: 4.5
- F3: 4.6

Overall Satisfaction:

- F1: 4.3

- F2: 4.8
- F3: 4.5

F2 emerged as the most preferred formulation overall, scoring the highest in most categories, especially absorption and user satisfaction. Although F3 showed the best moisturizing effect, a slightly thicker texture and slower absorption led to a marginally lower preference rating. F1, while easy to apply and absorb, was less effective in hydration and therefore rated lower in overall satisfaction.

Discussion

The primary objective of this study was to formulate and evaluate an emollient cream using *Calendula officinalis* (marigold) extract and to determine its suitability as a natural, safe, and effective topical formulation for skin hydration and protection. The results from the physicochemical analysis, antimicrobial testing, in *vitro* and in *vivo* evaluations, and user satisfaction surveys offer strong support for the efficacy and safety of marigold-based creams. The discussion below interprets these findings in relation to the original research questions and existing literature, while also acknowledging limitations and suggesting avenues for future work.

Interpretation of Physicochemical Results

All three cream formulations—F1 (2.5% extract), F2 (5%), and F3 (7.5%)—were within acceptable pH ranges for topical products, with values between 6.3 and 6.45. These results are consistent with the skin's natural pH, which typically falls between 4.5 and 6.5. Maintaining this range is essential to preserve the integrity of the skin barrier and avoid irritation. The stable pH throughout the 30-day testing period supports the chemical stability of the marigold extract within the emulsion system.

Viscosity measurements revealed that higher concentrations of extract resulted in thicker formulations. F3, containing the most extract, had the highest viscosity, while F1 was the least viscous. This trend aligns with general formulation science, where the presence of more solute can increase resistance to flow. Although F3 was thicker, it remained within a manageable range, suggesting good formulation compatibility with the extract.

Spreadability is a key parameter in topical formulations as it affects user experience and absorption. F1 displayed the highest spreadability, while F3 was more resistant to spreading. These differences can be attributed to the viscosity and concentration of active ingredients. However, all formulations were within acceptable spreadability ranges for cosmetic and medicinal creams. The homogeneity and absence of phase separation in all formulations during the stability test further confirm their structural integrity and physical compatibility over time.

Antimicrobial Efficacy and Comparative Analysis

The antimicrobial testing results demonstrated a clear dose-dependent activity of *Calendula officinalis* extract against both *Staphylococcus aureus* and *Escherichia coli*. These findings confirm that marigold possesses inherent antimicrobial properties, as reported in several previous studies. For instance, earlier phytochemical analyses have attributed these effects to the presence of flavonoids, triterpenoids, and essential oils in the marigold flowers, which have shown inhibitory activity against Gram-positive and Gram-negative bacteria. The strongest inhibition was seen in F3, which had the highest extract concentration, reinforcing the connection between concentration and bioactivity.

These results agree with prior research where marigold extract showed bacteriostatic and bactericidal effects against common skin pathogens. However, it is worth noting that while F3 had the highest antimicrobial activity, the difference between F2 and F3 was not substantial enough to significantly affect user satisfaction or moisturizing outcomes, which suggests that an optimal concentration lies between the two.

In *Vitro* and In *Vivo* Safety Outcomes

The absence of irritation in both the egg membrane test and human trials confirms the safety profile of marigold extract in the tested concentrations. This finding is particularly relevant as one of the primary concerns in herbal formulations is the potential for allergic or irritant reactions due to phytochemicals. The non-irritant nature of all formulations indicates that the concentration levels used were appropriate and that the base cream ingredients were also dermatologically safe.

No adverse reactions were observed among the 20 volunteers during the four-week application period. The data indicates excellent tolerability and supports the traditional use of *Calendula officinalis* in soothing irritated or inflamed skin. These findings align with previous reports where marigold-based topical preparations were safely used for wound healing and treatment of minor burns without causing sensitivity reactions.

Moisturizing Efficacy and Skin Hydration

The moisturizing effect, as measured by the corneometer, showed consistent and significant improvement in skin hydration across all formulations, with F3 demonstrating the highest increase (from 32.4 AU at baseline to 56.1 AU at Week 4). These findings validate the traditional claim that marigold has skin-hydrating and soothing effects. The hydrating effect can be attributed to the emollient base combined with the extract's bioactive components, which likely enhance skin barrier function and water retention.

Notably, F2 achieved nearly comparable hydration results to F3 but received higher user satisfaction ratings, likely due to its more balanced viscosity and ease of absorption. This suggests that a 5% concentration of marigold extract may represent an optimal balance between efficacy and user comfort.

The hydrating effects observed agree with past studies that reported increased hydration, improved elasticity, and reduced transepidermal water loss following application of formulations containing *Calendula officinalis*. These effects are believed to result from the synergistic actions of its anti-inflammatory and antioxidant constituents, which help to repair and maintain the skin barrier.

User Acceptability

The user survey provided valuable insights into the practical usability of the formulations. F2 consistently received the highest scores for absorption, fragrance, and overall satisfaction. While F3 had superior moisturizing results, its

slightly heavier texture and slower absorption may have affected user preference. This reflects the importance of balancing formulation efficacy with user comfort and sensory appeal in product development. A formulation that performs well but lacks favorable cosmetic properties may struggle with user compliance, especially for long-term or daily use.

Implications of the Study

The results of this study offer strong evidence that *Calendula officinalis* extract can be effectively incorporated into a stable and safe emollient cream suitable for regular skin care. The demonstrated moisturizing, antimicrobial, and non-irritant properties of the formulations suggest that marigold-based creams could serve as viable alternatives to synthetic moisturizers and over-the-counter hydrating products, particularly for individuals seeking natural skincare solutions.

Given the increasing global demand for herbal and organic cosmetics, the successful formulation of a marigold-based emollient opens avenues for commercial development. Additionally, the antimicrobial activity of the creams implies potential applications not only in routine skincare but also in the management of minor skin infections or as a supportive product in dermatological conditions such as eczema, where both hydration and microbial control are essential.

Limitations of the Study

Despite the positive findings, several limitations should be acknowledged. First, the sample size for the in *vivo* study was relatively small (n = 20), limiting the generalizability of the results. While the group was gender-balanced and healthy, it may not reflect the diversity of skin types and sensitivities found in the general population.

Second, the duration of the trial was only four weeks, which may not fully capture the long-term effects of regular use or potential delayed hypersensitivity reactions. Additionally, the study focused only on two bacterial strains for antimicrobial testing. Future studies should consider including a wider range of pathogens, including fungi and antibiotic-resistant strains.

Moreover, the study did not perform detailed chemical characterization (e.g., HPLC or GC-MS) of the marigold extract. Although its traditional use and known phytochemicals provide some understanding, a full phytochemical profile would enhance reproducibility and offer insights into the specific constituents responsible for the observed effects.

Recommendations for Future Research

Based on the outcomes and limitations of this study, several recommendations can be proposed for future research:

1. Expand the sample size and diversity in in *vivo* studies to include individuals with different skin types, age groups, and pre-existing skin conditions to improve the applicability of results.
2. Extend the study duration to 8–12 weeks or more to assess long-term efficacy, safety, and skin barrier repair over time.
3. Conduct detailed phytochemical profiling of the marigold extract using advanced analytical techniques to identify the specific active constituents responsible for antimicrobial and moisturizing effects.
4. Include antifungal and antiviral testing to explore the full antimicrobial spectrum of marigold-based creams, which may enhance their utility in clinical dermatology.
5. Compare marigold extract with other common herbal emollients, such as *aloe vera* or chamomile, to evaluate relative effectiveness and explore synergistic formulations.
6. Evaluate the cream's effect on specific dermatological conditions, such as atopic dermatitis, psoriasis, or contact dermatitis, to determine its therapeutic potential in more complex skin disorders.
7. Incorporate sensory testing panels and dermatological evaluations, including transepidermal water loss (TEWL) and elasticity testing, for a more comprehensive assessment of skin health improvements.

Conclusion

This study successfully formulated and evaluated an emollient cream using *Calendula officinalis* (marigold) extract, demonstrating its potential as a safe, stable, and effective natural skincare product. Among the three tested formulations, the cream containing 5% marigold extract (F2) provided the best overall performance, balancing skin hydration, antimicrobial activity, ease of application, and user satisfaction. The results confirmed that marigold extract enhances the moisturizing and protective properties of topical formulations without causing irritation or adverse reactions.

The research contributes to the growing body of evidence supporting the use of plant-based ingredients in dermatological and cosmetic applications. By providing a structured, scientific approach to the development of a marigold-based cream, this study bridges traditional herbal knowledge with modern formulation science. The findings have practical implications for the cosmetic and pharmaceutical industries, particularly in the formulation of natural emollients for daily skincare and mild skin conditions.

As consumer demand for herbal and sustainable products continues to rise, the development of evidence-based, natural formulations like this one offers a promising alternative to synthetic moisturizers. It is recommended that future studies expand on these findings through long-term clinical trials, broader antimicrobial testing, and advanced chemical profiling to support further innovation and potential commercialization of marigold-based skincare products.

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