

**International Journal of Research Publication and Reviews** 

Journal homepage: www.ijrpr.com ISSN 2582-7421

# **Evaluation of a Polyherbal Face Cream for Dermatological Applications Using Natural Ingredients**

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## ABSTRACT:

**Background**: Herbal cosmetics are increasingly favored for their natural ingredients and minimal side effects compared to synthetic alternatives. Aloe vera and saffron, known for their moisturizing, anti-acne, and skin-brightening properties, offer potential for effective topical formulations. This study aimed to formulate and evaluate a herbal face cream incorporating aloe vera, saffron, almond oil, vitamin E, and glycerin to enhance skin hydration, brightness, and acne control.

**Methods**: The herbal face cream was prepared by blending aloe vera gel and glycerin, followed by the incorporation of almond oil, vitamin E, and saffron in an oil-in-water emulsion. Three batches were formulated with varying ingredient concentrations and evaluated for physical characteristics (color, odor, consistency), pH, spreadability, viscosity, washability, non-irritancy, and phase separation. Stability was assessed over 24–48 hours, and a non-irritancy test was conducted to ensure dermal safety.

**Results**: The optimized formulation (Batch 3), containing 6 g aloe vera gel, 1 ml almond oil, 2 ml glycerin, 1.5 ml vitamin E, and saffron (q.s.), exhibited a smooth, yellowish-green texture, neutral pH (7), and high spreadability (26.20 g.cm/s). The viscosity was 1672.23 centipoise, indicating suitable consistency for topical application. No phase separation or irritancy was observed, and the cream demonstrated good washability and emollient properties. The formulation's stability and homogeneity were maintained, with aloe vera and saffron contributing to its moisturizing and brightening effects, respectively.

**Conclusion**: The optimized herbal face cream demonstrated favorable physicochemical properties, stability, and dermal safety, making it a promising natural cosmetic for skin brightening, moisturizing, and anti-acne applications. Further studies are needed to evaluate its long-term stability and clinical efficacy across diverse skin types.

Keywords: Herbal face cream, Aloe vera, Saffron, Skin brightening

## 1. Introduction

Cosmetics have been integral to human culture for centuries, serving to enhance appearance and address skin-related concerns. The term "cosmetic" originates from the Greek word "kosmestikos," meaning to adorn, and encompasses products designed for beautification, skin protection, or therapeutic purposes (Chauhan & Gupta, 2020). Among cosmetic formulations, creams are widely used topical preparations due to their ease of application, versatility, and ability to deliver active ingredients to the skin (Rai et al., 2019). Defined as viscous liquid or semi-solid emulsions, creams can be oil-in-water (O/W) or water-in-oil (W/O) systems, with their consistency determined by the proportion of oil and water phases (Sahu et al., 2016). Herbal creams, formulated with natural ingredients, have gained popularity for their perceived safety and efficacy in addressing skin conditions such as dryness, acne, and hyperpigmentation, offering an alternative to synthetic cosmetics that may cause adverse effects (Patil et al., 2017).

The global demand for herbal cosmetics has surged, driven by consumer preference for natural products free from harmful synthetic chemicals (Varma, 2011). Herbal creams incorporate plant-derived ingredients, such as aloe vera, saffron, and almond oil, which are rich in bioactive compounds like vitamins, flavonoids, and antioxidants (Surjushe et al., 2008). Aloe vera (Aloe barbadensis Miller), a member of the Asphodelaceae family, is renowned for its moisturizing, anti-inflammatory, and wound-healing properties, attributed to its content of anthraquinones, polysaccharides, and amino acids (Sánchez et al., 2020). Studies have demonstrated aloe vera's ability to enhance collagen production and reduce skin dryness, making it a valuable base for cosmetic creams (West & Zhu, 2003). Similarly, saffron (Crocus sativus L.), derived from the Iridaceae family, is prized for its anti-pigmentation and anti-wrinkle effects, mediated by active constituents like crocin, crocetin, and safranal, which inhibit tyrosinase activity and matrix metalloproteinases (MMPs) involved in skin aging (Akhtar et al., 2014).

Additional ingredients, such as almond oil, vitamin E, and glycerin, further enhance the efficacy of herbal creams. Almond oil, extracted from Prunus dulcis, provides moisturizing and anti-inflammatory benefits, protecting the skin from oxidative stress and UV-induced damage (Ahmad, 2010). Vitamin E, a potent antioxidant, stabilizes the skin barrier and mitigates photoaging, while glycerin acts as a humectant, maintaining skin hydration and softness (Darr et al., 1996; Padmawar & Bhadoriya, 2017). These ingredients collectively address common skin concerns, including acne, dullness, and premature aging, aligning with the growing trend of cosmeceuticals—hybrid products that combine cosmetic and pharmaceutical benefits (Mohiuddin, 2019).

Despite the increasing use of herbal creams, the formulation process requires careful optimization to ensure stability, efficacy, and consumer acceptability. Parameters such as pH, spreadability, viscosity, and non-irritancy are critical for developing a product that meets dermatological standards (Uddandu Saheb et al., 2018). Previous studies have highlighted the challenges of achieving stable emulsions with herbal ingredients, often due to phase separation or inconsistent texture (Shukla & Kashaw, 2019). This study aims to formulate and evaluate an herbal face cream incorporating aloe vera, saffron, almond oil, vitamin E, and glycerin, with the objective of providing skin brightening, moisturizing, and anti-acne effects. By optimizing ingredient concentrations across multiple batches, this research seeks to develop a stable and effective herbal cream, contributing to the advancement of natural cosmetic formulations.

## 2. Materials and Methods

### 2.1. Materials

The ingredients used in the formulation of the herbal face cream were selected based on their known skin benefits. Aloe vera gel served as the base of the cream due to its soothing and hydrating properties. Glycerin was used as a humectant, as well as a solvent and preservative, helping to retain moisture and improve shelf life. Almond oil was incorporated to enhance skin complexion, while Vitamin E was added for its antioxidant properties, which help prevent oxidative damage to the skin. Saffron was included as the active ingredient due to its traditional usage in skin brightening formulations. The formulation and evaluation processes required specific equipment. A weighing balance was used for accurately measuring all ingredients in the desired quantities. A Brookfield viscometer, fitted with spindle number 63, was employed to determine the viscosity of the final formulation

## 2.2. Methods

#### 2.2.1. Method of Cream Formulation

The formulation of the herbal face cream was carried out in sequential steps using porcelain dishes. In the first porcelain dish, aloe vera gel was taken and mixed with glycerin using continuous stirring until a homogeneous mixture was achieved. In the second dish, almond oil was combined with Vitamin E and mixed thoroughly. This oil-phase mixture was gradually added to the aloe vera–glycerin blend with continuous unidirectional stirring to ensure emulsion formation. Once a smooth cream base was developed, saffron was added and uniformly blended into the formulation.

#### Batch 1

In the first trial batch, 4 gm of aloe vera gel, 3 ml of almond oil, 1 ml of glycerin, and 1 ml of Vitamin E were used, with saffron added in a quantity sufficient (q.s.) to the formulation. However, this batch showed signs of phase separation upon standing, indicating formulation instability.

#### Batch 2

For the second batch, the quantity of almond oil was reduced to 1.5 ml while maintaining other components as in Batch 1. This batch demonstrated improved miscibility but lacked optimal consistency, rendering it unsuitable.

#### **Final Batch**

The final optimized batch was prepared using 6 gm of aloe vera gel, 1 ml of almond oil, 2 ml of glycerin, 1.5 ml of Vitamin E, and saffron q.s. This formulation resulted in a cream with desirable consistency, homogeneity, and stability, making it suitable for further evaluation.

#### 2.2.2. Evaluation Of Herbal Face Cream

#### 2.2.2.1. Physical Evaluation

The formulated herbal face cream was visually examined for its physical parameters, including color, odor, consistency, and physical state. The cream displayed a uniform appearance with a characteristic odor. It exhibited satisfactory consistency when applied manually and maintained a smooth, semi-solid state.

#### 2.2.2.2. pH Determination

The pH of the final formulation was measured using pH paper. The cream was found to have a skin-friendly pH within the acceptable dermatological range.

#### 2.2.2.3. Spreadability

Spreadability was evaluated by placing a small quantity of the cream between two glass slides and applying a specific weight for a fixed time. The time required to separate the slides was recorded. Spreadability was calculated using the formula  $S = m \times 1 / t$ , where m is the mass placed on the upper slide, 1 is the length moved, and t is the time in seconds.

### 2.2.2.4. Washability

To test washability, the cream was applied to the skin, and the ease of removal using water was assessed. The formulation was found to be easily washable, leaving minimal residue.

## 2.2.2.5. Non-Irritancy Test

The non-irritancy potential of the cream was assessed by applying a small amount to the skin and observing for signs of redness or irritation over a 24–28 hour period. No adverse effects were recorded, confirming the cream's suitability for topical use.

## 2.2.2.6. Viscosity

Viscosity of the final batch was determined using a Brookfield viscometer. The test was performed using spindle number 63 at a standard RPM to ensure reproducibility. The cream exhibited appropriate viscosity for easy application and stability.

#### 2.2.2.7. Phase Separation

To evaluate the physical stability of the formulation, the cream was stored in a wide-mouth container at room temperature, and the formulation was observed for phase separation after 24 hours. No separation of the oil and aqueous phases was observed in the final batch, indicating emulsion stability.

## 2.2.2.8. After Feel

The after-feel of the cream was assessed for emolliency, slipperiness, and the amount of residue left after application. The final formulation was found to be pleasant to use, with good spreadability and minimal residue, leaving the skin soft and moisturized.

## 3. Results

## 3.1. Evaluation parameters

The present study involved the formulation and evaluation of an herbal face cream using natural ingredients such as aloe vera gel, almond oil, glycerin, vitamin E, and saffron. The final formulation was subjected to various evaluation parameters, and the results are as follows:

#### 3.1.1. Physical parameters

**Color:** The cream appeared yellowish-green in color, which was visually appealing and indicative of the natural ingredients used. **Odor:** The odor of the cream was found to be characteristic and pleasant, matching the herbal components.

State: The formulation was semisolid in nature, making it suitable for easy topical application.

Consistency: The cream exhibited a smooth consistency, ensuring uniform application over the skin.

#### 3.1.2. pH

The measured pH of the formulation was 7, which is neutral and compatible with human skin, indicating it is safe for use.

#### 3.1.3. Spreadability

The spreadability of the cream was found to be 26.20 g·cm/s, suggesting that the cream can be easily and evenly spread on the skin surface.

#### 3.1.4. Washability

The herbal cream was easily washable with water, leaving no sticky or oily residue.

## 3.1.5. Non-Irritancy Test

No signs of irritation or redness were observed during the 24-28 hour observation period, indicating that the cream is non-irritant and skin-friendly.

## 3.1.6. Viscosity

The viscosity of the final cream formulation was recorded as 1672.23 cP using a Brookfield viscometer, which reflects its acceptable flow and application properties.

## 3.1.7. Phase Separation

No phase separation was observed after 24 hours of storage, confirming the emulsion stability of the cream.

#### 3.1.8. After Feel

Upon application, the cream left an emollient effect on the skin, providing a soft and moisturized feel without greasiness. These results suggest that the formulated herbal face cream is stable, safe, and effective for potential cosmetic use.

## 4. Discussion

The present study focused on the formulation and evaluation of a herbal face cream incorporating aloe vera, saffron, almond oil, vitamin E, and glycerin to achieve skin brightening, moisturizing, and anti-acne effects. Three batches were prepared with varying ingredient concentrations, and the final batch (Batch 3) was optimized, demonstrating desirable physical properties, including a neutral pH (7), high spreadability (26.20 g.cm/s), and no phase separation or irritancy. These results align with the growing body of evidence supporting the efficacy of herbal ingredients in cosmetic formulations for improving skin health and appearance (Chauhan & Gupta, 2020; Surjushe et al., 2008).

Batch 3, containing 6 g aloe vera gel, 1 ml almond oil, 2 ml glycerin, 1.5 ml vitamin E, and saffron (q.s.), exhibited a smooth, yellowish-green consistency and emollient after-feel, making it suitable for daily use. The neutral pH is critical for skin compatibility, as deviations can disrupt the skin's natural barrier, leading to irritation or dryness (Mohiuddin, 2019). Previous studies have emphasized the importance of pH optimization in herbal creams, with Uddandu Saheb et al. (2018) reporting that a pH close to the skin's natural range (4.5–7) enhances tolerability and efficacy (Uddandu Saheb et al., 2018). The high spreadability of the cream facilitates uniform application, ensuring effective delivery of active ingredients, a property corroborated by Shukla and Kashaw (2019), who noted that spreadability is a key determinant of consumer acceptance in topical formulations (Shukla & Kashaw, 2019).

Aloe vera, the primary base of the cream, contributed to its moisturizing and anti-acne properties. Sánchez et al. (2020) demonstrated that aloe vera's polysaccharides and amino acids enhance skin hydration and promote collagen synthesis, reducing acne-related inflammation and improving skin texture (Sánchez et al., 2020). The incorporation of saffron further enhanced the cream's skin-brightening effects, likely due to its crocin and crocetin components, which inhibit tyrosinase activity and melanogenesis, as reported by Akhtar et al. (2014) (Akhtar et al., 2014). These findings are consistent with our observation of a yellowish-green color, indicative of saffron's pigment-modulating properties, which contribute to a radiant complexion.

Almond oil and vitamin E provided additional benefits, including protection against oxidative stress and UV-induced damage. Ahmad (2010) highlighted almond oil's ability to penetrate skin pores, reducing blackheads and maintaining skin suppleness, which supports its role in our formulation (Ahmad, 2010). Similarly, Darr et al. (1996) found that vitamin E's antioxidant properties stabilize the skin barrier and mitigate photoaging, complementing saffron's anti-wrinkle activity (Darr et al., 1996). Glycerin, acting as a humectant, ensured sustained skin hydration, a property validated by Padmawar and Bhadoriya (2017), who noted glycerin's role in preventing excessive dryness in herbal cosmetics (Padmawar & Bhadoriya, 2017). The absence of phase separation in Batch 3 indicates a stable emulsion, overcoming challenges observed in earlier batches, such as phase separation in Batch 1 and poor consistency in Batch 2, which aligns with challenges reported in herbal cream formulations (Shukla & Kashaw, 2019).

The non-irritancy test confirmed the cream's safety for topical use, with no redness or irritation observed after 24–48 hours. This is consistent with Surjushe et al. (2008), who reported that aloe vera and saffron are well-tolerated in dermatological applications due to their anti-inflammatory properties (Surjushe et al., 2008). However, limitations of this study include the lack of long-term stability testing and clinical trials to assess efficacy in diverse skin types. Future research should focus on accelerated stability studies and in vivo testing to validate the cream's performance under varying environmental conditions and skin conditions.

## 5. Conclusion

This study successfully formulated and evaluated a herbal face cream using aloe vera, saffron, almond oil, vitamin E, and glycerin, with Batch 3 identified as the optimized formulation. The cream exhibited excellent physical properties, including neutral pH, high spreadability, and non-irritancy, making it suitable for skin brightening, moisturizing, and anti-acne applications. These findings underscore the potential of herbal ingredients in developing safe and effective cosmetic products. Further studies are warranted to evaluate long-term stability and clinical efficacy to support broader application in the cosmetic industry.

#### Acknowledgements

We extend our deepest gratitude to our professor and mentor, Dr. Dhara Chavda, for the opportunity to undertake this project and for their invaluable guidance. Our sincere appreciation goes to our college for providing the necessary resources, enabling us to enhance our experimental skills and explore pharmaceutical formulation development. We are thankful to everyone who contributed to this project; their insights and support were crucial to its timely completion.

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