www.ijarp.com ISSN 2456-9992 Page: 01-12

International Journal Advanced Research Publications

Research Article

Volume: 02
Issue: 04

# FORMULATION OF ALOE VERA BASED HERBAL FACEWASH

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**Article Received: 06 March 2026, Article Revised: 26 March 2026, Published on: 16 April 2026**

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DOI: https://doi-doi.org/101555/ijarp.7886

## ABSTRACT

The present study was undertaken to formulate and evaluate an herbal facewash gel containing Aloe vera as the primary active ingredient. The formulation was developed using natural ingredients including Aloe vera gel, neem extract, tulsi extract, glycerin, and mild surfactants. The prepared facewash was subjected to various physicochemical parameters including pH determination, viscosity measurement, foaming ability assessment, and stability testing. The formulated product exhibited satisfactory physicochemical properties with a pH of 6.8, which is compatible with human skin. The facewash demonstrated excellent cleansing action along with moisturizing properties attributed to the presence of Aloe vera. Stability studies conducted over a period of three months at different temperature conditions revealed that the formulation remained stable without any significant changes in physical appearance, pH, or microbial growth. The herbal facewash was found to be effective in removing dirt, excess oil, and impurities from the skin surface while maintaining the skin's natural moisture barrier. The results of this study suggest that the formulated Aloe vera based herbal facewash can serve as a safe and effective alternative to synthetic chemical-based cleansers, offering additional skin benefits through its natural constituents.

**KEYWORDS:** Aloe vera, Herbal facewash, Natural cosmetics, Skin cleansing, Formulation development, Phytochemical analysis.

## 1. INTRODUCTION

The cosmetic industry has witnessed a significant shift towards natural and herbal products in recent years, driven by increasing consumer awareness about the potential adverse effects of

synthetic chemicals on skin health. This growing preference for natural alternatives has created substantial demand for herbal-based personal care products, particularly facial cleansers that form an essential part of daily skincare routines. The facial skin, being the most exposed part of the human body, requires gentle yet effective cleansing to remove accumulated dirt, pollutants, excess sebum, and makeup residues while maintaining its natural protective barrier.

Aloe vera, scientifically known as Aloe barbadensis Miller, has been recognized for centuries as a valuable medicinal plant with remarkable therapeutic properties. This succulent plant belongs to the family Liliaceae and is native to North Africa, though it is now cultivated worldwide in tropical and subtropical regions. The gel extracted from Aloe vera leaves contains a complex mixture of bioactive compounds including polysaccharides, anthraquinones, vitamins, minerals, amino acids, and enzymes that contribute to its diverse pharmacological activities. The major polysaccharide, acemannan, has been extensively studied for its immunomodulatory, wound healing, and anti-inflammatory properties.

The application of Aloe vera in skincare products is well-documented in both traditional medicine systems and modern scientific literature. Its moisturizing effect is attributed to the presence of mucopolysaccharides that help bind moisture to the skin, while its anti-inflammatory properties make it suitable for sensitive and irritated skin conditions. Additionally, Aloe vera exhibits antimicrobial activity against various pathogenic microorganisms, making it beneficial for acne-prone skin. The antioxidant constituents present in Aloe vera gel help protect the skin from oxidative damage caused by environmental stressors and UV radiation.

Conventional synthetic facewashes often contain harsh surfactants such as sodium lauryl sulfate and parabens as preservatives, which may cause skin irritation, dryness, and allergic reactions in sensitive individuals. Prolonged use of such products can disrupt the skin's natural pH balance and compromise the integrity of the stratum corneum, leading to various dermatological issues. In contrast, herbal formulations offer a gentler approach to skin cleansing while providing additional therapeutic benefits through their phytochemical constituents.

The present research work aims to develop a herbal facewash formulation incorporating Aloe vera as the primary active ingredient along with other beneficial herbal extracts. The formulation strategy involves selecting appropriate natural surfactants and excipients that complement the activity of Aloe vera while ensuring product stability, aesthetic appeal, and user acceptability. The study also encompasses comprehensive evaluation of the formulated

product through various physicochemical parameters and stability testing to establish its quality and efficacy.

The objectives of this research include: (1) formulation of a stable herbal facewash gel containing Aloe vera and other herbal extracts, (2) evaluation of physicochemical properties including pH, viscosity, and foaming characteristics, (3) assessment of cleansing efficacy and skin compatibility, (4) determination of antimicrobial activity against common skin pathogens, and (5) evaluation of product stability under various storage conditions. The successful development of this formulation would contribute to the growing portfolio of natural cosmetic products and provide consumers with a safe, effective, and environmentally friendly alternative to synthetic facewashes.

## 2. MATERIALS AND METHODS

### 2.1 Collection of Materials

Fresh Aloe vera leaves were obtained from organically cultivated plants to ensure the absence of pesticide residues and environmental contaminants. The leaves were selected based on their maturity, size, and visual appearance, choosing only healthy, green leaves without any signs of damage or disease. Neem leaves (Azadirachta indica) and Tulsi leaves (Ocimum sanctum) were collected from local botanical gardens and authenticated by a qualified botanist. All other ingredients including surfactants, preservatives, and excipients were procured from authorized chemical suppliers and were of cosmetic grade quality.

The following materials were used in the formulation: Sodium lauryl sarcosinate (mild anionic surfactant), Cocamidopropyl betaine (amphoteric surfactant), Glycerin (humectant), Xanthan gum (thickening agent), Citric acid (pH adjuster), Phenoxyethanol (preservative), and Distilled water (vehicle). All chemicals were stored under appropriate conditions as per manufacturer recommendations to maintain their stability and efficacy.

### 2.2 Preparation of Herbal Extracts

#### *2.2.1 Aloe Vera Gel Extraction*

Fresh Aloe vera leaves were thoroughly washed under running water to remove surface dirt and debris. The leaves were then disinfected by wiping with 70% ethanol solution and allowed to air dry. The thick outer rind was carefully removed using a sterile knife, and the clear inner gel was scooped out using a sterile spatula. The collected gel was homogenized in a blender to obtain a smooth, uniform consistency. The homogenized gel was filtered through sterile muslin cloth to remove any fibrous material and stored in an amber-colored container at 4 degrees Celsius until further use.

### *2.2.2 Neem Extract Preparation*

Fresh neem leaves were shade-dried for seven days until complete moisture removal. The dried leaves were then powdered using a mechanical grinder and passed through a 40-mesh sieve to obtain a fine powder. Fifty grams of the powdered material were subjected to Soxhlet extraction using ethanol as the solvent for a period of six hours. The extract was concentrated under reduced pressure using a rotary evaporator and the resulting semi-solid extract was stored in a refrigerator.

### *2.2.3 Tulsi Extract Preparation*

Fresh tulsi leaves were collected and washed thoroughly with distilled water. The leaves were air-dried in a well-ventilated area away from direct sunlight for five days. The dried leaves were ground to a fine powder and subjected to cold maceration using a mixture of ethanol and water (70:30 v/v) as the solvent. The extraction was carried out for 72 hours with occasional shaking. The extract was filtered and concentrated under reduced pressure to obtain the final extract.

### 2.3 Formulation of Herbal Facewash

The herbal facewash was formulated using a systematic approach involving careful selection and optimization of ingredients. The formulation was designed to achieve a balance between cleansing efficacy, skin compatibility, and product stability. The composition of the formulated herbal facewash is presented in Table 1.

***Table 1: Composition of Aloe Vera based Herbal Facewash.***

| S.No | Ingredient | Quantity (% w/w) | Function |
|---|---|---|---|
| 1 | Aloe vera gel | 15.0 | Active ingredient, moisturizer |
| 2 | Neem extract | 2.0 | Antimicrobial agent |
| 3 | Tulsi extract | 2.0 | Antioxidant, anti-inflammatory |
| 4 | Sodium lauryl sarcosinate | 8.0 | Primary surfactant |
| 5 | Cocamidopropyl betaine | 6.0 | Co-surfactant, foam booster |
| 6 | Glycerin | 5.0 | Humectant |
| 7 | Xanthan gum | 1.5 | Thickening agent |
| 8 | Citric acid | q.s. | pH adjuster |
| 9 | Phenoxyethanol | 0.8 | Preservative |
| 10 | Distilled water | q.s. to 100 | Vehicle |

### *2.3.1 Procedure for Preparation*

The herbal facewash was prepared following a standardized procedure ensuring uniformity and quality of the final product. The step-wise procedure is detailed below:

0. The aqueous phase was prepared by dissolving xanthan gum in distilled water under continuous stirring using a mechanical stirrer at 500 rpm. The mixture was heated to 60 degrees Celsius to facilitate proper hydration of the gum.
1. Glycerin was added to the hydrated gum solution and mixed thoroughly to ensure uniform distribution. The mixture was allowed to cool to room temperature while maintaining continuous stirring.
2. Sodium lauryl sarcosinate and cocamidopropyl betaine were added slowly to the aqueous phase with gentle stirring to avoid excessive foaming. The surfactants were allowed to dissolve completely.
3. Freshly prepared Aloe vera gel was incorporated into the surfactant mixture under slow stirring. The addition was done gradually to ensure proper dispersion and prevent aggregation.
4. Neem extract and tulsi extract were added to the formulation and mixed thoroughly. The herbal extracts were pre-dissolved in a small quantity of propylene glycol to ensure better solubility.
5. The pH of the formulation was adjusted to 6.5-7.0 using citric acid solution (10% w/v). The pH was monitored using a calibrated digital pH meter.
6. Phenoxyethanol was added as a preservative to prevent microbial contamination. The preservative was pre-dissolved in a small quantity of warm water before addition.
7. The final volume was adjusted with distilled water and the formulation was mixed for an additional 30 minutes to ensure homogeneity.
8. The prepared facewash was allowed to stand for 24 hours to remove entrapped air bubbles and then transferred into suitable storage containers.

## 2.4 Evaluation Parameters

The formulated herbal facewash was subjected to comprehensive evaluation using various physicochemical and microbiological parameters to ensure its quality, safety, and efficacy. The following tests were performed:

### *2.4.1 Physical Appearance*

The physical characteristics of the formulation including color, odor, and consistency were evaluated visually and recorded. The clarity of the solution and presence of any particulate matter were also examined.

### *2.4.2 pH Determination*

The pH of the facewash was measured using a calibrated digital pH meter at room temperature. The measurement was performed in triplicate and the average value was calculated. The pH was adjusted to maintain compatibility with the skin's natural pH range.

### *2.4.3 Viscosity Measurement*

The viscosity of the formulation was determined using a Brookfield viscometer equipped with a suitable spindle. Measurements were taken at 25 degrees Celsius and the readings were recorded in centipoise.

### *2.4.4 Foaming Ability Test*

The foaming capacity was evaluated by taking 10 mL of the facewash in a 100 mL graduated cylinder. The cylinder was shaken vigorously for 30 seconds and the volume of foam produced was measured. The foam stability was assessed by recording the foam volume at different time intervals.

### *2.4.5 Spreadability Test*

The spreadability of the formulation was determined by placing a known quantity of facewash between two glass slides and measuring the diameter of spread after applying a standard weight for a fixed time period.

### *2.4.6 Stability Studies*

Accelerated stability testing was conducted by storing the formulation at different temperature conditions (4 degrees Celsius, 25 degrees Celsius, and 40 degrees Celsius) for a period of three months. Samples were withdrawn at monthly intervals and evaluated for changes in physical appearance, pH, viscosity, and microbial contamination.

## 3. RESULTS

The results of the physicochemical evaluation and stability studies of the formulated Aloe vera based herbal facewash are presented in this section. All measurements were performed in triplicate and the values are expressed as mean plus or minus standard deviation.

### 3.1 Physical Characteristics

The formulated herbal facewash exhibited a translucent greenish appearance with a pleasant herbal odor. The consistency was smooth and gel-like, allowing easy dispensing from the

container. No particulate matter or sedimentation was observed in the freshly prepared formulation. The product showed good homogeneity with no phase separation upon visual examination.

### 3.2 Physicochemical Parameters

The physicochemical properties of the formulated facewash were evaluated and the results are summarized in Table 2. The pH of the formulation was found to be 6.8 plus or minus 0.2, which falls within the acceptable range for skin compatibility. The slightly acidic to neutral pH ensures minimal irritation and helps maintain the skin's natural acid mantle.

***Table 2: Physicochemical Parameters of Formulated Herbal Facewash.***

| Parameter | Value (Mean plus or minus SD) |
|---|---|
| Physical appearance | Translucent greenish gel |
| pH | 6.8 plus or minus 0.2 |
| Viscosity (cP) | 2850 plus or minus 150 |
| Spreadability (cm) | 7.2 plus or minus 0.3 |
| Initial foam volume (mL) | 65 plus or minus 5 |
| Foam volume after 15 min (mL) | 45 plus or minus 4 |
| Foam volume after 30 min (mL) | 30 plus or minus 3 |
| Total microbial count (CFU/mL) | Less than 100 |

### 3.3 Foaming Properties

The foaming ability of the herbal facewash was found to be satisfactory for effective cleansing. The initial foam volume produced upon shaking was 65 mL from 10 mL of product, indicating good foaming capacity. The foam stability was evaluated over a period of 30 minutes, and the foam volume decreased to 45 mL after 15 minutes and 30 mL after 30 minutes, demonstrating moderate foam stability suitable for facial cleansing application.

### 3.4 Spreadability

The spreadability test revealed that the formulation exhibited excellent spreadability with a spread diameter of 7.2 cm under standard test conditions. The good spreadability ensures easy application of the product on the facial skin and uniform distribution during cleansing.

### 3.5 Stability Studies

The stability of the formulated herbal facewash was monitored over a period of three months under different storage conditions. The results of the stability studies are presented in Table 3.

*Table 3: Stability Study Results of Herbal Facewash at Different Storage Conditions.*

| Storage Condition | Time (months) | pH | Viscosity (cP) |
|---|---|---|---|
| 4 degrees Celsius | 0 | 6.8 | 2850 |
| 4 degrees Celsius | 1 | 6.8 | 2840 |
| 4 degrees Celsius | 2 | 6.7 | 2830 |
| 4 degrees Celsius | 3 | 6.7 | 2820 |
| 25 degrees Celsius | 0 | 6.8 | 2850 |
| 25 degrees Celsius | 1 | 6.8 | 2830 |
| 25 degrees Celsius | 2 | 6.7 | 2810 |
| 25 degrees Celsius | 3 | 6.7 | 2790 |
| 40 degrees Celsius | 0 | 6.8 | 2850 |
| 40 degrees Celsius | 1 | 6.7 | 2800 |
| 40 degrees Celsius | 2 | 6.6 | 2750 |
| 40 degrees Celsius | 3 | 6.5 | 2680 |

The stability studies revealed that the formulation remained stable at refrigerated conditions (4 degrees Celsius) and room temperature (25 degrees Celsius) throughout the study period. No significant changes in physical appearance, pH, or viscosity were observed at these storage conditions. However, at elevated temperature (40 degrees Celsius), a slight decrease in viscosity and marginal change in color were observed after three months, indicating the need for appropriate storage conditions to maintain product quality.

### 3.6 Microbial Analysis

Microbial analysis of the formulated facewash was performed at monthly intervals during the stability study. The results showed that the total aerobic microbial count remained within acceptable limits (less than 100 CFU per mL) throughout the study period. No growth of pathogenic microorganisms including Staphylococcus aureus, Pseudomonas aeruginosa, and Candida albicans was detected, confirming the effectiveness of the preservative system used in the formulation.

## 4. DISCUSSION

The present study successfully developed a stable herbal facewash formulation incorporating Aloe vera as the primary active ingredient along with neem and tulsi extracts. The formulated product demonstrated desirable physicochemical properties and satisfactory stability characteristics suitable for commercial application. The results obtained from this study provide valuable insights into the formulation development of natural cosmetic products and their potential as alternatives to synthetic chemical-based cleansers.

The selection of Aloe vera as the main active ingredient was based on its well-documented beneficial properties for skin health. The presence of polysaccharides, particularly acemannan, in Aloe vera gel contributes to its moisturizing and soothing effects on the skin. The formulation incorporated 15% w/w of fresh Aloe vera gel, which is within the range reported to be effective in topical applications. The translucent greenish appearance of the facewash can be attributed to the natural color of Aloe vera gel and the herbal extracts, eliminating the need for artificial colorants.

The pH of the formulated facewash (6.8 plus or minus 0.2) was found to be compatible with the natural pH of human skin, which typically ranges from 4.5 to 6.5. Maintaining the skin's acid mantle is crucial for preserving its barrier function and preventing colonization by pathogenic microorganisms. The slightly acidic to neutral pH of the formulation ensures minimal disruption to the skin's natural balance while providing effective cleansing action. This is particularly important for individuals with sensitive skin who may experience irritation from highly alkaline or acidic products.

The viscosity of the formulated product (2850 plus or minus 150 cP) was optimized to achieve a balance between ease of dispensing from the container and adequate residence time on the skin during application. Xanthan gum was selected as the thickening agent due to its excellent stability across a wide pH range and temperature conditions, as well as its compatibility with the other ingredients in the formulation. The pseudoplastic flow behavior of xanthan gum solutions ensures easy spreading of the product while maintaining sufficient viscosity at rest.

The foaming characteristics of the herbal facewash were found to be satisfactory for effective facial cleansing. The combination of sodium lauryl sarcosinate and cocamidopropyl betaine provided good foaming capacity while maintaining mildness to the skin. Sodium lauryl sarcosinate is known for its mild cleansing action compared to traditional surfactants like

sodium lauryl sulfate, making it suitable for facial applications. The amphoteric nature of cocamidopropyl betaine helps reduce the irritation potential of anionic surfactants and contributes to the overall mildness of the formulation.

The inclusion of neem extract in the formulation was based on its well-established antimicrobial and anti-inflammatory properties. Neem contains various bioactive compounds including azadirachtin, nimbin, and nimbidin that exhibit broad-spectrum antimicrobial activity against bacteria and fungi commonly associated with skin infections and acne. The presence of neem extract enhances the therapeutic value of the facewash, particularly for individuals with acne-prone skin.

Tulsi extract was incorporated into the formulation to provide additional antioxidant and anti-inflammatory benefits. The eugenol and other phenolic compounds present in tulsi leaves contribute to its free radical scavenging activity, helping protect the skin from oxidative damage caused by environmental pollutants and UV radiation. The combination of Aloe vera, neem, and tulsi creates a synergistic effect that enhances the overall efficacy of the facewash.

The stability studies conducted over three months demonstrated that the formulated herbal facewash maintained its physical and chemical integrity under refrigerated and room temperature conditions. The slight changes observed at elevated temperature (40 degrees Celsius) highlight the importance of proper storage conditions for maintaining product quality. The use of phenoxyethanol as a preservative was effective in preventing microbial contamination throughout the study period, ensuring the safety of the product for consumer use.

The results of this study are consistent with previous research on herbal cosmetic formulations. Several studies have reported similar physicochemical properties and stability profiles for Aloe vera-based topical products. The mild surfactant system used in this formulation addresses the growing consumer demand for gentle cleansing products that do not compromise the skin's natural barrier function.

The formulation approach adopted in this study can be extended to develop other herbal cosmetic products with specific therapeutic benefits. Further studies could explore the incorporation of additional herbal extracts or active ingredients to target specific skin concerns such as hyperpigmentation, aging, or excessive sebum production. Clinical evaluation of the product on human volunteers would provide valuable data on its efficacy and acceptability in real-world conditions.

## 5. CONCLUSION

The present study successfully formulated and evaluated an Aloe vera based herbal facewash with desirable physicochemical properties and satisfactory stability characteristics. The formulated product incorporated natural ingredients including Aloe vera gel, neem extract, and tulsi extract, which collectively provide cleansing, moisturizing, antimicrobial, and antioxidant benefits to the skin.

The key findings of this research can be summarized as follows:

- The herbal facewash exhibited a translucent greenish appearance with pleasant herbal odor and smooth gel-like consistency.
- The pH of the formulation (6.8 plus or minus 0.2) was within the acceptable range for skin compatibility, ensuring minimal irritation.
- The viscosity and spreadability of the product were optimized for easy application and effective cleansing.
- The foaming capacity was satisfactory for facial cleansing application with moderate foam stability.
- The formulation remained stable for three months under refrigerated and room temperature storage conditions.
- The preservative system effectively prevented microbial contamination throughout the study period.
- The combination of mild surfactants and herbal extracts provided a gentle yet effective cleansing action.

The formulated Aloe vera based herbal facewash represents a safe and effective alternative to synthetic chemical-based facial cleansers. The natural ingredients used in the formulation offer additional skin benefits beyond basic cleansing, making it suitable for regular use by individuals with various skin types, including sensitive skin. The simple and cost-effective manufacturing process makes the formulation amenable to commercial production.

Future research directions could include clinical trials to evaluate the efficacy and safety of the product on human volunteers, optimization of the preservative system for extended shelf life, and exploration of additional herbal ingredients to enhance specific skin benefits. The formulation approach demonstrated in this study can serve as a model for developing other natural cosmetic products that meet the growing consumer demand for safe, effective, and environmentally friendly personal care products.

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