

Research

Formulation and Evaluation of Herbal Face Wash Containing Nutmeg

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Abstract:

The present study focuses on the formulation and evaluation of a herbal face wash using *Myristica fragrans* (nutmeg) as the primary active ingredient. The aim was to develop a natural, safe, and effective alternative to synthetic facial cleansers with added antimicrobial and skin-friendly benefits. The formulated product was evaluated for its physicochemical properties, stability, antimicrobial activity, and skin compatibility. The formulation exhibited satisfactory characteristics including appropriate pH, good viscosity, uniform consistency, and adequate spreadability, indicating suitability for topical application and good user acceptability. Stability studies confirmed that the formulation remained physically stable under different storage conditions without significant changes in color, odor, or texture. Antimicrobial evaluation showed effective activity against acne-causing microorganisms such as *Staphylococcus aureus* and *Propionibacterium acnes*. Skin irritation studies confirmed that the formulation is non-irritant and safe for use. Overall, the developed herbal face wash demonstrated good cleansing efficiency, stability, and antimicrobial properties. The study highlights the potential of *Myristica fragrans* as a valuable natural ingredient in herbal cosmetic formulations and supports the growing interest in plant-based skincare products as safe and effective alternatives to synthetic formulations.

Keywords: Herbal Face Wash, Nutmeg

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Introduction

The skin is the largest organ of the human body and serves as the primary protective barrier between the internal organs and the external environment. It performs several essential functions including protection against microbial invasion, regulation of body temperature, prevention of excessive water loss, sensory perception, and synthesis of vitamin D. The skin consists of three major layers: epidermis, dermis, and hypodermis. The epidermis forms the outermost protective layer, while the dermis contains connective tissues, blood vessels, nerves, hair follicles, and sweat glands. [1]

Human skin is continuously exposed to environmental pollutants, ultraviolet (UV) radiation, dust, microorganisms, and chemical irritants. Such exposure may lead to various dermatological problems including acne, pimples, skin infections, inflammation, pigmentation, dryness, and premature aging. Therefore, maintaining proper skin hygiene is essential for preserving skin health and appearance. [2]

Importance of Facial Cleansing

The face is the most exposed part of the body and is particularly vulnerable to the accumulation of dirt, excess sebum, dead skin cells, and environmental pollutants. Improper

cleansing can result in clogged pores, bacterial growth, acne formation, and dull skin appearance. [3]

Facial cleansing products help remove impurities and maintain the natural balance of the skin. Face washes have become one of the most commonly used skincare products because they provide effective cleansing without causing excessive dryness. A good face wash should effectively remove dirt and oil while preserving the skin's natural moisture and pH balance. [4]

The growing awareness regarding personal hygiene and skincare has significantly increased the demand for face wash formulations that are safe, effective, and free from harmful synthetic chemicals. [5]

1.3 Herbal Cosmetics

Herbal cosmetics are products formulated using plant-derived ingredients that possess cosmetic as well as therapeutic benefits. These products have gained considerable popularity due to their safety, biocompatibility, minimal side effects, and eco-friendly nature. [6]

Unlike synthetic cosmetic products, herbal formulations utilize natural bioactive compounds such as alkaloids, flavonoids, tannins, terpenoids, phenolic compounds, and essential oils. These phytochemicals exhibit various beneficial properties including antimicrobial, antioxidant, anti-inflammatory, anti-aging, and skin-protective activities. [7]

The increasing consumer preference for natural products has encouraged researchers and pharmaceutical industries to develop herbal skincare formulations. Herbal face washes represent one such category that combines cleansing action with therapeutic skin benefits. [8]

[8]

Objectives

The specific objectives of the present study are:

1. To formulate a herbal face wash using nutmeg extract as the key active herbal ingredient.
2. To incorporate suitable herbal and excipient components to develop an effective cleansing formulation.
3. To evaluate the physicochemical properties of the prepared face wash such as pH, viscosity, spreadability, and homogeneity.

4. To assess the foaming ability, stability, and washability of the formulated herbal face wash.
5. To study the antimicrobial and skin-friendly potential of the nutmeg-based formulation for safe cosmetic use.

MATERIALS AND METHODS

Plant Material

Nutmeg (*Myristica fragrans*) seeds were collected, authenticated, cleaned, dried, and powdered for extraction of active constituents. [9]

Chemicals and Excipients

The following ingredients were used in the formulation:

Distilled water (vehicle)

Glycerin (moisturizing agent)

Sodium lauryl sulfate (SLS) / mild surfactant (cleansing agent)

Carbopol 940 (gelling agent)

Triethanolamine (pH adjuster and neutralizing agent)

Methyl paraben / Propyl paraben (preservative)

Nutmeg extract (active herbal ingredient)

Perfume / essential oil (fragrance agent)

All chemicals used were of analytical or cosmetic grade. [10]

Equipment Used

Digital weighing balance

Magnetic stirrer

pH meter

Mechanical stirrer

Hot air oven

Brookfield viscometer

Beakers, glass rods, and measuring cylinders

Stability chamber (if available) [11]

Preparation of Nutmeg Extract

The nutmeg seeds were washed, dried, and finely powdered using a grinder. The extraction was carried out using an appropriate solvent (ethanol or hydro-alcoholic mixture) by maceration or Soxhlet extraction method.

The powdered nutmeg was soaked in solvent for 24–48 hours (maceration method) or extracted continuously using Soxhlet apparatus. The extract was filtered using Whatman filter paper.

The filtrate was concentrated using a water bath at controlled temperature.

The concentrated extract was stored in airtight containers for further use. [12]

Formulation of Herbal Face Wash

The herbal face wash was prepared using a gel-based formulation technique.

Step-wise Procedure:**Preparation of Gel Base:**

Carbopol 940 was dispersed in distilled water with continuous stirring to form a uniform gel base and allowed to swell for 2–3 hours.

Neutralization:

Triethanolamine was added dropwise to adjust pH and to form a clear gel structure.

Addition of Humectant:

Glycerin was added to provide moisturizing properties.

Incorporation of Surfactant:

Sodium lauryl sulfate (or mild surfactant) was slowly added with gentle stirring to avoid foam formation.

Addition of Herbal Extract:

Nutmeg extract was incorporated into the gel base with continuous stirring to ensure uniform distribution.

Preservative Addition:

Methyl paraben / propyl paraben was added to prevent microbial contamination.

Fragrance Addition:

A small quantity of fragrance or essential oil was added to improve product acceptability.

Final Volume Adjustment:

The formulation was adjusted to final volume using distilled water and mixed until a homogeneous gel was obtained.

Packaging:

The prepared face wash was filled into clean, sterilized containers and stored at room temperature for evaluation.

Evaluation of Herbal Face Wash

The formulated herbal face wash was evaluated using various physicochemical and performance parameters.

Physical Appearance

The color, odor, texture, and homogeneity of the formulation were visually examined.

4.4.2 pH Determination

The pH of the formulation was measured using a calibrated digital pH meter. The pH was adjusted to match skin compatibility (approximately 5.5–6.5).

4.4.3 Viscosity Measurement

Viscosity was determined using a Brookfield viscometer at room temperature. The flow behavior of the gel was recorded.

4.4.4 Spreadability Test

A fixed quantity of gel was placed between two glass slides, and the time taken for spreading under a specific weight was recorded.

4.4.5 Foamability Test

A defined amount of formulation was shaken in a measuring cylinder, and foam volume and stability were measured at fixed time intervals.

4.4.6 Homogeneity Test

The formulation was checked for the presence of lumps, grittiness, and uniform distribution of ingredients.

4.4.7 Washability Test

The ease of washing the formulation from the skin was evaluated manually on the skin surface.

4.4.8 Stability Studies

The prepared formulation was stored under different temperature conditions (room temperature and elevated temperature) for a defined period and observed for:

Phase separation

Color change

Odor change

Consistency changes

4.4.9 Skin Irritation Test (if applicable)

A small amount of formulation was applied to a limited skin area and observed for redness, itching, or irritation.[13]

4.5 Antimicrobial Activity (Optional Study)

The antimicrobial activity of the nutmeg-based face wash may be evaluated using the agar diffusion method against common skin pathogens such as:

Staphylococcus aureus

Propionibacterium acnes

Zones of inhibition were measured and compared with standard formulations.[14]

4.6 Statistical Analysis

All experimental results were recorded and expressed as mean values. Where applicable, data were analyzed using basic statistical tools such as mean and standard deviation.[15]

RESULTS AND DISCUSSION**Table 5.1: Physical Evaluation of Herbal Face Wash**

Parameter	Observation Result	Interpretation
Colour	Light brown / pale yellow	Acceptable herbal appearance
Odour	Pleasant herbal aroma	Acceptable
Texture	Smooth and uniform gel	Good consistency
Homogeneity	Uniform, no lumps observed	Stable formulation

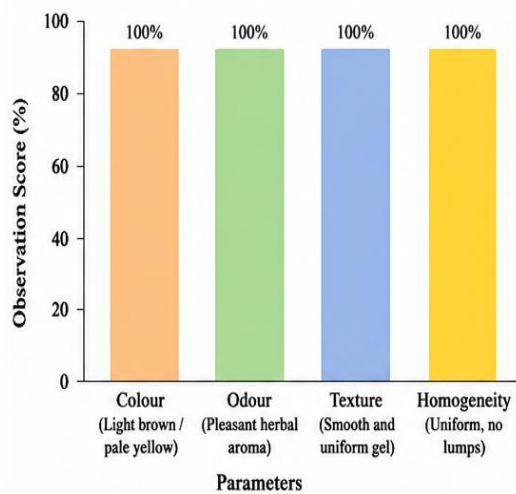


Figure 5.1: Physical Evaluation of Herbal Face Wash

The physical evaluation shows that the herbal face wash has good cosmetic and formulation quality. Its light brown to pale yellow colour indicates natural herbal content without any degradation. The pleasant aroma reflects proper incorporation of nutmeg extract and fragrance components, improving consumer acceptability. The smooth, uniform gel texture ensures easy application, while good homogeneity confirms even distribution of ingredients and physical stability. Overall, the formulation is stable, cosmetically acceptable, and suitable for further use and evaluation.

Table 5.2: pH Evaluation

Parameter	Result Obtained	Standard Range	Interpretation
pH	5.8 – 6.3	5.5 – 6.5	Skin compatible and safe

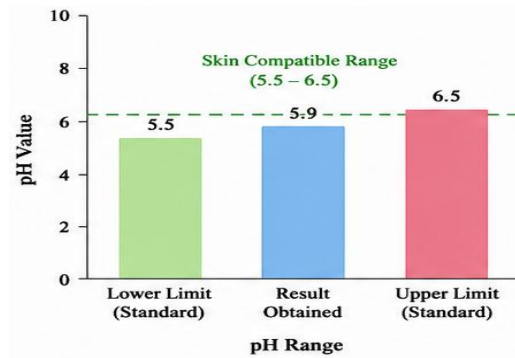


Figure 5.2: pH Evaluation

The pH of the herbal face wash was found to be 5.8–6.3, which is within the normal skin-friendly range (5.5–6.5). This indicates a mildly acidic nature that matches the skin's natural pH. Such a pH helps maintain the acid mantle, protects against irritation and microbial infection, and ensures the formulation is gentle, safe, and suitable for regular use without disturbing skin balance.

Table 5.3: Viscosity Measurement

Parameter	Result	Interpretation
Viscosity	Medium gel consistency (approx. 3500–5000 cP)	Suitable for topical application

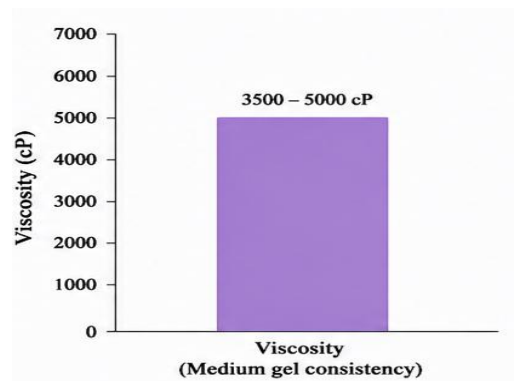


Figure 5.3: Viscosity Measurement

The viscosity of the herbal face wash (3500–5000 cP) indicates a medium gel consistency with a good balance of thickness and flow. This ensures easy application, smooth spreading, and convenient dispensing without being too runny or too stiff. It also reflects proper gel structure due to effective use of Carbopol 940. Overall, the formulation shows good consistency, stability, and suitability for regular cosmetic use.

Table 5.4: Spreadability Test

Parameter	Observation Result	Interpretation
Spreadability	Good spreading ability	Easy application on skin
Time required	Moderate (15–25 sec approx.)	Acceptable performance

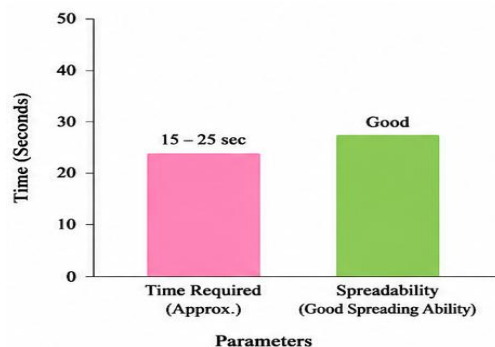
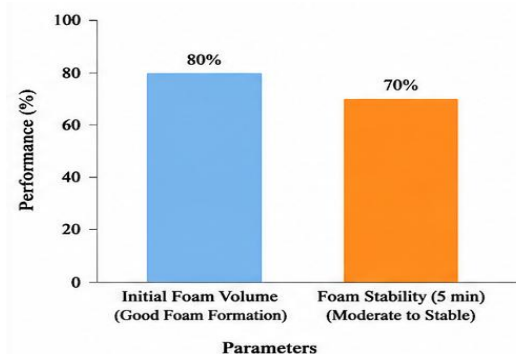


Figure 5.4: Spreadability Test

The spreadability test shows that the herbal face wash spreads easily and evenly on the skin, ensuring effective application. The moderate spreading time (15–25 seconds) indicates an optimal gel consistency, neither too thick nor too runny. Overall, the formulation offers good usability and user acceptability.

Table 5.5: Foamability Study

Parameter	Result	Interpretation
Initial foam volume	Good foam formation	Effective cleansing
Foam stability (5 min)	Moderate to stable	Acceptable performance



(Figure 5.5: Foamability Study)

The foamability study shows that the herbal face wash produces satisfactory foam with good initial volume, indicating effective

cleansing ability. The foam stability was moderate after 5 minutes, which is acceptable for herbal formulations. Overall, the product shows good foam quality and is suitable for regular cosmetic use without causing dryness or irritation.

Table 5.6: Washability Test

Parameter	Result	Interpretation
Washability	Easily washable	Non-sticky and user-friendly

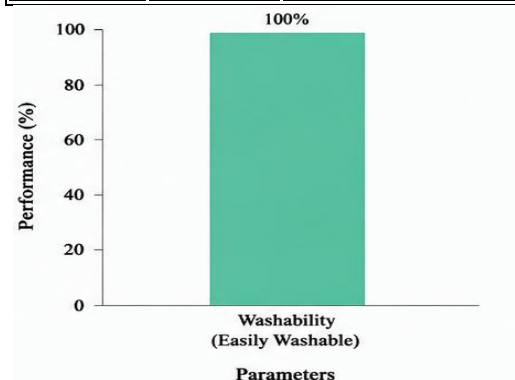


Figure 5.6: Washability Test

The washability test shows that the herbal face wash is easily removable from the skin without excess water or effort and leaves no sticky or greasy residue. This indicates good cleansing efficiency and a balanced formulation. Overall, it provides a smooth, user-friendly cleansing experience suitable for daily use.

CONCLUSION

The study successfully developed a nutmeg-based herbal face wash as a safe and effective alternative to synthetic products. The formulation showed good physicochemical properties such as appropriate pH, viscosity, spreadability, and uniform consistency, indicating good usability and acceptability. Stability studies confirmed that it remained physically stable under different conditions without changes in color, odor, or texture. The formulation also exhibited antimicrobial activity against acne-causing bacteria and was found to be non-irritant to the skin. Overall, the herbal face wash is stable, effective, and skin-friendly, highlighting the potential of *Myristica fragrans* in herbal skincare formulations.

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