NATURAL HAIR CARE: FORMULATING AND EVALUATING A HERBAL SHAMPOO BLEND

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ABSTRACT

The growing demand for natural and eco-friendly personal care products has spurred interest in herbal shampoos. This research paper presents the formulation and evaluation of a herbal shampoo incorporating a blend of beneficial botanical ingredients: aloe vera gel, soapnut (reetha) extract, bhringraj (Eclipta alba), lavender oil, grapefruit seed extract, xanthan gum, citric acid, hibiscus extract, and distilled water. The aim is to create a shampoo that not only effectively cleanses the hair but also provides nourishment and promotes overall hair health.

Aloe vera gel was selected for its soothing and moisturizing properties, while soapnut extract served as the natural surfactant, ensuring gentle cleansing. Bhringraj was included for its renowned hair-strengthening and growth-promoting effects. Lavender oil was chosen for its soothing fragrance and scalp conditioning benefits, and grapefruit seed extract acted as a natural preservative. Xanthan gum was utilized as a thickening agent to enhance the shampoo's viscosity, and citric acid was employed to adjust the pH to a scalp-friendly level. Hibiscus extract was added for its conditioning properties, providing a natural shine and softness to the hair.

The formulation process Involved careful blending of these ingredients to achieve a stable and homogenous mixture. The shampoo was then subjected to various evaluations, including physical and chemical stability tests, foaming capacity, and pH measurement. Additionally, the effectiveness of the herbal shampoo was assessed through user trials, focusing on parameters such as cleansing efficiency, ease of application, rinse-ability, and post-wash hair feel.

Results indicated that the formulated herbal shampoo possessed desirable physicochemical properties, maintained stability over time, and provided satisfactory cleansing and conditioning effects. User feedback highlighted improvements in hair texture, reduced scalp irritation, and enhanced overall hair health.

In conclusion, the herbal shampoo formulated in this study presents a viable alternative to conventional shampoos, offering natural and effective hair care with minimal chemical additives. Further studies may explore the long-term benefits and potential enhancements to this formulation to cater to diverse hair types and conditions.

KEYWORDS: *Herbal shampoo, Natural Hair Care, Botanical Ingredients, Eco-friendly Shampoo, Hair Nourishment, Hair Growth, Scalp Health, Natural Surfactant, Conditioning Agents, pH Balance, Formulation Stability.*

INTRODUCTION

The global personal care industry has witnessed a significant shift towards natural and eco-friendly products in recent years. This trend is driven by growing consumer awareness about the potential adverse effects of synthetic chemicals found in conventional hair care products. Herbal shampoos, formulated with plant-based ingredients, offer a promising alternative by combining the cleansing power of nature with the therapeutic benefits of various botanicals. This study focuses on the formulation and evaluation of an herbal shampoo containing a blend of aloe vera gel, soapnut (reetha) extract, bhringraj (Eclipta alba), lavender oil, grapefruit seed extract, xanthan gum, citric acid, hibiscus extract, and distilled water.

Aloe vera (Aloe barbadensis) is widely recognized for its moisturizing and soothing properties, making it an ideal ingredient for hair and scalp care. It contains proteolytic enzymes that help repair dead skin cells on the scalp, promoting a healthy scalp environment conducive to hair growth. Soapnut (Sapindus mukorossi), also known as reetha, has been traditionally used in hair cleansing due to its natural surfactant properties, which produce a gentle lather and effectively remove dirt and oil without stripping the hair of its natural oils.[1]

Bhringraj (Eclipta alba), a revered herb in Ayurvedic medicine, is known for its ability to promote hair growth and reduce hair fall. It strengthens hair follicles and helps prevent premature greying. Lavender oil (Lavandula angustifolia) offers a soothing fragrance and has antimicrobial properties that help maintain a healthy scalp, while grapefruit seed extract acts as a natural preservative, extending the shelf life of the shampoo without the need for synthetic chemicals.

Xanthan gum, a natural polysaccharide, is employed as a thickening agent to enhance the shampoo's texture and application ease. Citric acid is used to adjust the pH of the shampoo, ensuring it matches the natural pH of the scalp, which is slightly acidic. This is crucial for maintaining the scalp's protective acid mantle, which can be disrupted by alkaline shampoos. Hibiscus (Hibiscus rosa-sinensis) extract is included for its conditioning properties, adding shine and softness to the hair while promoting overall hair health.

The primary objective of this research is to develop an herbal shampoo that not only effectively cleanses the hair but also provides nourishment and promotes overall hair health. The study involves a detailed formulation process, followed by rigorous evaluations of the shampoo's physicochemical properties, stability, and performance through user trials. By focusing on natural ingredients with well-documented benefits, this research aims to contribute to the growing body of knowledge supporting the efficacy and safety of herbal hair care products.

In summary, this study highlights the potential of combining various herbal ingredients to create a balanced and effective shampoo. The results of this research could pave the way for further advancements in the formulation of natural hair care products, meeting the increasing consumer demand for safe and sustainable alternatives to conventional shampoos.

Ingredients, Equipment, Steps
Ingredients
1. Aloe Vera Gel: 10% (soothing and moisturizing properties)
2. Soapnut (Reetha) Extract: 5% (natural surfactant for gentle cleansing)
3. Bhringraj (Eclipta Alba) Extract: 2% (promotes hair growth and reduces hair fall)
4. Lavender Oil: 0.5% (fragrance and antimicrobial properties)
5. Grapefruit Seed Extract: 0.2% (natural preservative)
6. Xanthan Gum: 0.3% (thickening agent)
7. Citric Acid: 0.2% (pH adjuster)
8. Hibiscus Extract: 1% (conditioning properties)
9. Distilled Water: 80.8% (solvent)

Equipment
1. Beakers (500 mL, 250 mL)
2. Graduated Cylinders (100 mL, 50 mL)
3. Digital Scale
4. Magnetic Stirrer with Stirring Bar
5. pH Meter
6. Measuring Spoons
7. Droppers
8. Heating Mantle
9. Thermometer
10. Funnel
11. Fine Mesh Strainer or Cheesecloth
12. Mixing Spatula
13. Storage Bottles

Steps

Preparation of Herbal Extracts

1. Soapnut Extract:
   - Weigh 50 grams of dried soapnut (reetha).
   - Boil in 500 mL of distilled water for 30 minutes.
   - Allow to cool and strain using a fine mesh strainer or cheesecloth.
   - Collect the liquid extract and set aside.
2. Bhringraj Extract:
   - Weigh 20 grams of dried bhringraj leaves.
   - Boil in 250 mL of distilled water for 30 minutes.
   - Allow to cool and strain using a fine mesh strainer or cheesecloth.
   - Collect the liquid extract and set aside.
3. Hibiscus Extract:
   - Weigh 20 grams of dried hibiscus flowers.
   - Boil in 250 mL of distilled water for 30 minutes.
   - Allow to cool and strain using a fine mesh strainer or cheesecloth.
   - Collect the liquid extract and set aside.

Formulation of Shampoo

1. Base Mixture:
   - Measure 80.8% (approximately 808 mL) of distilled water into a large beaker.
   - Gradually add 10% (100 mL) of aloe vera gel to the distilled water while stirring continuously with a magnetic stirrer.
2. Incorporating Extracts:
   - Add the prepared soapnut extract (5%, 50 mL) into the base mixture and stir thoroughly.
   - Add the bhringraj extract (2%, 20 mL) and hibiscus extract (1%, 10 mL) into the base mixture, ensuring even distribution.
3. Thickening:
   - Slowly add 0.3% (3 grams) of xanthan gum to the mixture while stirring vigorously to avoid clumping. Continue stirring until the mixture reaches a uniform consistency.[2]

4. pH Adjustment:
   - Add 0.2% (2 grams) of citric acid to the mixture to adjust the pH to a scalp-friendly level (around 5.5). Use a pH meter to check and adjust accordingly.[3]
5. Adding Oils and Preservatives :
   - Add 0.5% (5 mL) of lavender oil and 0.2% (2 mL) of grapefruit seed extract to the mixture. Stir gently to ensure the oils are well incorporated.
6. Final Mixing:
   - Continue stirring the entire mixture on a magnetic stirrer until all ingredients are uniformly mixed.
7. Storage:
   - Transfer the prepared shampoo into clean storage bottles using a funnel.
   - Label the bottles with the date of preparation and the batch number.

Formula :

Sr.No.	Ingredients	Quantity Taken (For 500ml)	Category
1	Aloe vera gel	50 ml	Moisturizer/Soothing Agent
2	Soapnut (Reetha) Extract	25 ml	Natural Surfactant
3	Bhringraj (Eclipta Alba) Extract	10 ml	Hair Growth Promoter
4	Lavender oil	2.5 ml	Fragrance/Antimicrobial
5	Grapefruit Seed Extract	1 ml	Natural Preservative
6	Xanthan Gum	1.5 ml	Thickening Agent
7	Citric Acid	1 ml	pH Adjuster
8	Hibiscus Extract	5 ml	Conditioning Agent
9	Distilled water	Upto 402 ml	Solvent/ Base

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Drug profile & Excipients profile
1] Aloe vera gel:

- Taxonomical Classification:
  - Kingdom: Plantae
  - Class: Liliopsida
  - Order: Asparagales
  - Family: Asphodelaceae
  - Genus: Aloe
  - Species: Aloe barbadensis
- Common Name: Aloe vera
- Pharmaceutical Uses: Moisturizer, soothing agent for skin and scalp, wound healing.
- Physiological Characteristics: Succulent plant with thick, fleshy leaves containing a gel-like substance.
- Pharmacodynamic Property: Anti-inflammatory, wound healing, moisturizing.
- Pharmacokinetic Property: Topical application, absorption through the skin.

2. Soapnut (Reetha) Extract
- Taxonomical Classification:
  - Kingdom: Plantae
  - Class: Magnoliopsida
  - Order: Sapindales
  - Family: Sapindaceae
  - Genus: Sapindus
  - Species: Sapindus mukorossi

- Common Name: Soapnut, Reetha
- Pharmaceutical Uses: Natural surfactant for cleansing hair and skin.
- Physiological Characteristics: Soapnuts are the fruit of the soapnut tree, containing saponins that produce lather when mixed with water.
- Pharmacodynamic Property: Cleansing, foaming.
- Pharmacokinetic Property: External use, minimal absorption.[4]

3. Bhringraj (Eclipta Alba) Extract

- Taxonomical Classification:
  - Kingdom: Plantae
  - Class: Magnoliopsida
  - Order: Asterales
  - Family: Asteraceae
  - Genus: Eclipta
  - Species: Eclipta alba
- Common Name: Bhringraj
- Pharmaceutical Uses: Hair growth promoter, scalp health, anti-dandruff.
- Physiological Characteristics: Herbaceous plant with small, white flowers and narrow leaves.
- Pharmacodynamic Property: Hair growth stimulation, scalp nourishment.
- Pharmacokinetic Property: Topical application, absorption through the scalp.[5]

4. Lavender O

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- Taxonomical Classification:
  - Kingdom: Plantae
  - Class: Magnoliopsida
  - Order: Lamiales
  - Family: Lamiaceae
  - Genus: Lavandula
  - Species: Lavandula angustifolia
- Common Name: Lavender oil
- Pharmaceutical Uses: Fragrance, antimicrobial, scalp soothing.
- Physiological Characteristics: Essential oil extracted from lavender flowers, with a characteristic floral scent.
- Pharmacodynamic Property: Antimicrobial, soothing.
- Pharmacokinetic Property: Topical application, absorption through the skin.

5. Grapefruit Seed Extract

- Taxonomical Classification:
  - Kingdom: Plantae
  - Class: Magnoliopsida
  - Order: Sapindales
  - Family: Rutaceae
  - Genus: Citrus
  - Species: Citrus paradisi
- Common Name: Grapefruit seed extract
- Pharmaceutical Uses: Natural preservative, antimicrobial.
- Physiological Characteristics: Extract derived from the seeds and pulp of grapefruit.
- Pharmacodynamic Property: Antimicrobial, preservative.
- Pharmacokinetic Property: External use, minimal absorption.[6]

6. Xanthan Gum

- Pharmaceutical Uses: Thickening agent, stabilizer.
- Physiological Characteristics: Polysaccharide produced by fermentation of sugars by the bacterium Xanthomonas campestris.
- Pharmacodynamic Property: Thickening, stabilizing.
- Pharmacokinetic Property: Not absorbed systemically.

7. Citric Acid

- Pharmaceutical Uses: pH adjuster, chelating agent.
- Physiological Characteristics: Organic acid found in citrus fruits.
- Pharmacodynamic Property: pH adjustment, chelation of metal ions.
- Pharmacokinetic Property: Metabolized in the body, excreted in urine.[7]

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8. Hibiscus Extract

- Taxonomical Classification:
  - Kingdom: Plantae
  - Class: Magnoliopsida
  - Order: Malvales
  - Family: Malvaceae
  - Genus: Hibiscus
  - Species: Hibiscus rosa-sinensis
- Common Name: Hibiscus
- Pharmaceutical Uses: Conditioning agent, hair softener, scalp health.
- Physiological Characteristics: Flowering plant with large, colorful flowers.
- Pharmacodynamic Property: Conditioning, softening.
- Pharmacokinetic Property: Topical application, minimal absorption.

Advantages and Disadvantages of Herbal Shampoo Formulation

Advantages

1. Natural Ingredients:
   - Advantages: The use of natural ingredients like aloe vera gel, soapnut extract, bhringraj, lavender oil, grapefruit seed extract, hibiscus extract, and distilled water ensures that the shampoo is free from harmful chemicals, making it safer for long-term use. Natural ingredients are less likely to cause scalp irritation and allergic reactions compared to synthetic chemicals.
   - Disadvantages: Natural ingredients can vary in potency and consistency, which may affect the overall effectiveness and stability of the product.
2. Moisturizing and Soothing Properties:
   - Advantages: Aloe vera gel provides excellent moisturizing and soothing benefits, which can help alleviate dry scalp and dandruff. It also promotes healing of the scalp.
   - Disadvantages: The effectiveness of aloe vera can decrease over time if not properly preserved.
3. Cleansing Efficiency:
   - Advantages: Soapnut (reetha) extract serves as a natural surfactant that effectively cleanses the hair without stripping it of its natural oils, which is gentler on the scalp and hair.
   - Disadvantages: The cleansing power of soapnut may not be as strong as synthetic surfactants, potentially requiring more product for effective cleansing.
4. Hair Growth Promotion:
   - Advantages: Bhringraj is known for its ability to promote hair growth and reduce hair fall, providing an added benefit of thicker and healthier hair.
   - Disadvantages: Results may vary among users, and it may take time to observe noticeable improvements in hair growth.
5. Antimicrobial Properties:
   - Advantages: Lavender oil and grapefruit seed extract have antimicrobial properties, which help maintain a healthy scalp environment and prolong the shelf life of the shampoo.

- Disadvantages: Essential oils can sometimes cause allergic reactions or sensitivities in some individuals.
6. Conditioning Benefits:
   - Advantages: Hibiscus extract adds conditioning benefits, leaving hair soft and shiny. It helps in detangling hair and adds volume.
   - Disadvantages: Some users may find hibiscus extract less effective compared to synthetic conditioners in terms of detangling and smoothness.
7. Thickening Agent:
   - Advantages: Xanthan gum provides a desirable thick consistency to the shampoo, improving its application and user experience.
   - Disadvantages: If not properly dispersed, xanthan gum can form lumps, affecting the texture of the shampoo.
8. pH Balance:
   - Advantages: Citric acid helps in maintaining the pH balance of the shampoo, which is crucial for maintaining the scalp's natural protective barrier.
   - Disadvantages: Incorrect pH balance can lead to scalp irritation or reduced effectiveness of the shampoo.
9. Environmental Benefits:
   - Advantages: The use of biodegradable and eco-friendly ingredients makes the herbal shampoo environmentally friendly, reducing the impact on aquatic life and pollution.
   - Disadvantages: Natural ingredients might require more careful sourcing and sustainable practices to ensure environmental benefits.
10. Consumer Appeal:
   - Advantages: Increasing consumer awareness and demand for natural and organic products make herbal shampoos more appealing in the market.
   - Disadvantages: The perception of higher cost for natural ingredients can make herbal shampoos more expensive than conventional ones.

Future Trends and Traditional Knowledge in Herbal Shampoo Formulation
Future Trends
1. Increased Consumer Demand for Natural Products:
   - Trend: There is a growing consumer preference for natural and organic personal care products. This shift is driven by increased awareness of the potential health risks associated with synthetic chemicals and a desire for sustainable and eco-friendly products.
   - Impact: Formulations using ingredients like aloe vera gel, soapnut extract, bhringraj, lavender oil, grapefruit seed extract, xanthan gum, citric acid, and hibiscus extract are likely to gain popularity. Companies may focus on enhancing the efficacy and sensory attributes of herbal shampoos to meet consumer expectations.

2. Advancements in Extraction and Processing Techniques:
   - Trend: Innovations in extraction and processing technologies can improve the quality and consistency of botanical ingredients. Techniques like supercritical fluid extraction and microwave-assisted extraction can yield purer and more potent extracts.
   - Impact: Improved extraction methods can enhance the therapeutic benefits of ingredients such as bhringraj and hibiscus extract, making herbal shampoos more effective.

3. Integration of Modern Science with Traditional Knowledge:
   - Trend: There is a growing interest in validating traditional herbal remedies through scientific research. This involves studying the pharmacological properties of traditional ingredients and their mechanisms of action.
   - Impact: Combining traditional knowledge with modern scientific validation can enhance the credibility and acceptance of herbal shampoos. Research-backed claims can also help in marketing and regulatory approval.
4. Personalized Hair Care:
   - Trend: The trend towards personalized and customized hair care products is gaining momentum. Consumers are seeking products tailored to their specific hair types and concerns.
   - Impact: Formulators can develop variations of herbal shampoos targeting different hair issues such as dandruff, hair fall, and dry scalp. Personalized formulations can include specific concentrations of ingredients like aloe vera for hydration or soapnut for cleansing.
5. Sustainable and Ethical Sourcing:
   - Trend: Ethical sourcing and sustainability are becoming critical considerations for consumers. This includes using sustainably harvested ingredients and ensuring fair trade practices.
   - Impact: Companies may prioritize sourcing ingredients like aloe vera and hibiscus extract from sustainable and ethical suppliers. Transparent supply chains and certifications (e.g., organic, fair trade) can enhance brand trust and consumer loyalty.
6. Packaging Innovations:

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- Trend: Eco-friendly and sustainable packaging solutions are gaining importance. Consumers are increasingly looking for products with minimal environmental impact.

- Impact: Using biodegradable, recyclable, or refillable packaging for herbal shampoos can align with the eco-conscious values of consumers. Innovative packaging solutions can also differentiate products in a competitive market.[8]

Traditional Knowledge

1. Aloe Vera (Aloe barbadensis):

- Traditional Use: Aloe vera has been used for centuries in various cultures for its healing, soothing, and moisturizing properties. It is commonly applied to the skin and hair for its hydrating and anti-inflammatory effects.

- Modern Application: Aloe vera gel is a popular ingredient in herbal shampoos for its ability to soothe the scalp, reduce dandruff, and promote hair health.

2. Soapnut (Reetha) (Sapindus mukorossi):

- Traditional Use: Soapnut has been traditionally used in Indian and Southeast Asian cultures as a natural cleanser for hair and skin. Its saponin content creates a natural lather that cleanses effectively without stripping natural oils.

- Modern Application: Soapnut extract is valued in herbal shampoos for its gentle cleansing properties and ability to maintain scalp health.

3. Bhringraj (Eclipta alba):

- Traditional Use: In Ayurvedic medicine, bhringraj is revered for its ability to promote hair growth and prevent hair loss. It is often used in hair oils and treatments for scalp health.

- Modern Application: Bhringraj extract is included in herbal shampoos to enhance hair growth, reduce hair fall, and improve overall hair quality.

4. Lavender Oil (Lavandula angustifolia):

- Traditional Use: Lavender oil has been used for centuries for its calming and antimicrobial properties. It is often used in aromatherapy and as a natural remedy for skin and scalp issues.

Evaluation and Observation of Herbal Shampoo Formulation

Evaluation Parameters

1. Organoleptic Evaluation:

- Appearance: The shampoo should have a uniform, homogenous appearance with no phase separation.

- Color: The color should be consistent with the natural extracts used, typically ranging from light brown to amber.

- Odor: The fragrance should be pleasant, typically reflecting the lavender oil and other natural extracts.

2. pH Measurement:

- Method: Use a pH meter to measure the pH of the shampoo.

- Observation: Ideal pH range should be between 4.5 to 5.5 to match the natural pH of the scalp and hair.

- Result: The formulated shampoo showed a pH of 5.0, which is within the ideal range.

3. Foaming Ability and Foam Stability:

- Method: Measure the foam volume after shaking a fixed amount of shampoo solution and observe the foam stability over time.

- Observation: The foam volume and stability should be sufficient to ensure good cleansing properties.

- Result: The shampoo produced a moderate amount of stable foam, which lasted for over 5 minutes, indicating good cleansing ability.

4. Viscosity Measurement:

- Method: Use a Brookfield viscometer to measure the viscosity.

- Observation: The viscosity should be appropriate for easy application and distribution through the hair.

- Result: The viscosity of the shampoo was measured at 1500 cP (centipoise), indicating a suitable consistency.

5. Surface Tension Measurement:

- Method: Use a tensiometer to measure the surface tension of the shampoo solution.

- Observation: Lower surface tension indicates better wetting and spreading properties.

- Result: The surface tension was measured at 30 dynes/cm, which is conducive to good spreading and cleansing.

6. Cleaning Efficiency:

- Method: Evaluate the shampoo's ability to remove oil and dirt from hair tresses.

- Observation: Hair tresses should be cleaned effectively without leaving residue.

- Result: The shampoo effectively removed oil and dirt from the hair tresses, leaving them clean and non-greasy.

7. Wet Combability and Dry Combability:

- Method: Assess the ease of combing hair tresses after washing with the shampoo.

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- Observation: Hair should be easy to comb when wet and after drying, indicating good conditioning properties.
- Result: The shampoo showed good wet and dry combability, with minimal tangling and smooth feel.

8. Conditioning Effect:
   - Method: Evaluate the softness and smoothness of hair after washing with the shampoo.
   - Observation: Hair should feel soft, smooth, and manageable.
   - Result: Hair treated with the shampoo was soft, smooth, and manageable, indicating good conditioning effects.

9. Skin Irritation Test:
   - Method: Perform a patch test on human volunteers to check for any adverse reactions.
   - Observation: No redness, itching, or irritation should be observed.
   - Result: The shampoo did not cause any skin irritation or allergic reactions in the volunteers, indicating it is safe for use.

10. Microbial Contamination Test:
    - Method: Test for the presence of bacteria, fungi, and molds in the shampoo formulation.
    - Observation: The shampoo should be free from harmful microbial contamination.
    - Result: No microbial contamination was detected, indicating the shampoo is microbiologically safe.

Detailed Evaluation Test, Results and Observations

1. Organoleptic Evaluation:
   - Observation: The shampoo had a homogenous appearance with a light brown color. The odor was pleasant, dominated by the lavender oil fragrance.
   - Result: Passed.

2. pH Measurement:
   - Observation: The pH of the shampoo was measured at 5.0.
   - Result: Passed.

3. Foaming Ability and Foam Stability:
   - Observation: The shampoo produced a moderate amount of stable foam, lasting over 5 minutes.
   - Result: Passed.

4. Viscosity Measurement:
   - Observation: The viscosity was 1500 cP, indicating a suitable consistency for application.
   - Result: Passed.

5. Surface Tension Measurement:
   - Observation: The surface tension was 30 dynes/cm, indicating good spreading and cleansing properties.
   - Result: Passed.

6. Cleaning Efficiency:
   - Observation: The shampoo effectively cleaned the hair tresses, removing oil and dirt.
   - Result: Passed.

7. Wet Combability and Dry Combability:
   - Observation: Hair tresses were easy to comb when wet and after drying.
   - Result: Passed.

8. Conditioning Effect:
   - Observation: Hair felt soft, smooth, and manageable after using the shampoo.
   - Result: Passed.

9. Skin Irritation Test:
   - Observation: No adverse reactions were observed in the volunteers.
   - Result: Passed.

10. Microbial Contamination Test:
    - Observation: No microbial contamination was detected.
    - Result: Passed.

CONCLUSION

The formulated herbal shampoo was evaluated using various parameters and showed promising results. It had a pleasant appearance and odor, suitable pH, good foaming ability, appropriate viscosity, and effective cleaning and conditioning properties. The shampoo was safe for use, showing no signs of skin irritation or microbial contamination. These results indicate that the herbal shampoo is effective and safe for regular use, aligning with consumer preferences for natural and gentle hair care products.

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