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Preparation And Evaluation of Herbal Shampoo

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Abstract: Herbal shampoos have gained popularity due to their perceived natural benefits and potentially fewer side effects compared to synthetic counterparts. This study focuses on the formulation and evaluation of a herbal shampoo using extracts of natural herbs. The preparation involved selecting appropriate herbs, extracting their active components, and formulating them into a shampoo base. The evaluation process included assessment of various parameters such as pH, foamability, cleansing ability, hair conditioning, and sensory attributes like odor and appearance. Results indicated that the herbal shampoo exhibited desirable characteristics, including mildness, effective cleansing, and pleasant aroma. Further studies could explore optimizing the formulation for specific hair types and investigating long-term effects on hair health. Overall, the preparation and evaluation of this herbal shampoo offer promising insights into the development of natural hair care products with potential benefits for consumers.

1. INTRODUCTION

The global personal care industry has witnessed a significant shift towards natural and herbal products in recent years, spurred by consumer awareness of the potential adverse effects of synthetic ingredients. This trend is particularly evident in the hair care sector, where individuals are increasingly seeking gentler, more nourishing alternatives to traditional shampoos. Herbal shampoos, formulated with botanical extracts and plant-based ingredients, have emerged as a popular choice among consumers seeking to maintain healthy hair without exposing themselves to harsh chemicals.[1]

The appeal of herbal shampoos lies in their perceived benefits, including their ability to cleanse the hair and scalp effectively while also providing nourishment and promoting overall hair health. Unlike conventional shampoos that may contain sulfates, parabens, and other synthetic compounds, herbal formulations typically rely on natural ingredients known for their cleansing, moisturizing, and conditioning properties. These ingredients often include herbs such as aloe vera, chamomile, rosemary, and lavender, as well as essential oils and plant extracts.[2]

One of the key advantages of herbal shampoos is their potential to minimize the risk of adverse reactions such as scalp irritation, dryness, and hair damage. Many individuals with sensitive skin or scalp conditions find relief in using herbal products that are free from harsh chemicals and artificial fragrances. Additionally,

herbal shampoos are often perceived as being more environmentally friendly, as they may contain biodegradable ingredients and avoid the use of synthetic additives that can harm ecosystems.[3]

Given the growing demand for herbal hair care products, there is a need for rigorous research and development efforts to formulate effective and reliable herbal shampoos. This includes the identification of suitable plant-based ingredients, the optimization of formulation parameters, and the evaluation of product performance and safety. By conducting comprehensive studies on the formulation and evaluation of herbal shampoos, researchers can contribute to the advancement of natural hair care solutions that meet the needs and preferences of modern consumers.[4]

1.1. Scope of present study:

The primary objective of this project is to formulate a herbal shampoo using carefully selected botanical extracts and natural ingredients. The formulation will be designed to provide effective cleansing, conditioning, and nourishment for the hair and scalp, while also being gentle and non-irritating.[5]

1. Selection of Herbal Ingredients: Research will be conducted to identify suitable herbs, essential oils, and plant extracts with beneficial properties for hair care. Factors such as cleansing efficacy, moisturizing ability, and compatibility with different hair types will be considered.[6]

2. Formulation Development: Based on the selected herbal ingredients, various shampoo formulations will be developed and optimized through experimentation. The aim is to create a balanced formula that achieves the desired cleansing and conditioning effects without the need for synthetic additives.[7]

3. Evaluation of Product Performance: The formulated herbal shampoos will undergo rigorous testing to assess their efficacy in terms of cleansing, moisturizing, and improving hair health. This will include laboratory tests, as well as sensory evaluations involving human volunteers.

4. Safety Assessment: The safety of the herbal shampoo formulations will be evaluated to ensure that they meet regulatory standards and do not pose any risks to human health. This will involve conducting compatibility tests, skin irritation studies, and microbiological analyses.[8]

1.2. Advantages of herbal shampoo:

1. Natural ingredients: Herbal shampoos typically contain natural ingredients like plant extracts, essential oils, and herbs, which can be gentler on the scalp and hair compared to synthetic chemicals.

2. Reduced chemical exposure: Since herbal shampoos often avoid harsh chemicals like sulphates and parabens, they may reduce the risk of scalp irritation and sensitivity.

3. Nourishing properties: Many herbal ingredients have moisturizing, strengthening, and nourishing properties that can help improve the overall health and appearance of the hair.[9]

4. Environmentally friendly: Herbal shampoos are often biodegradable and environmentally sustainable, reducing the environmental impact compared to shampoos containing synthetic ingredients.[10]

1.3. Disadvantages of herbal shampoo:

1. Limited effectiveness: Herbal shampoos may not be as effective at cleansing the scalp and hair as shampoos containing synthetic detergents, especially for people with oily or heavily soiled hair.

2. Shorter shelf life: Since herbal shampoos typically lack synthetic preservatives, they may have a shorter shelf life and require more frequent replacement.[11]

3. Allergic reactions: While natural ingredients are generally considered safer, some people may still experience allergic reactions or sensitivities to certain herbs or essential oils used in herbal shampoos.

4. Higher cost: Herbal shampoos often come with a higher price tag compared to conventional shampoos due to the use of premium natural ingredients and manufacturing processes.[12]

2.MATERIALS AND EQUIPMENTS

2.1. Table 1. Materials used in experimental work

All other chemicals used were of analytical grades

Sr. No.	Material	Source
1	Soap Nut Extract	Ishwar Deshmukh Institute of Pharmacy, lab
2	Amla Extract	Ishwar Deshmukh Institute of Pharmacy, lab
3	Shikakai Extract	Ishwar Deshmukh Institute of Pharmacy, lab
4	Hibiscus	Ishwar Deshmukh Institute of Pharmacy, lab
5	Bhring Raj Extract	Ishwar Deshmukh Institute of Pharmacy, lab
6	Aloe	Ishwar Deshmukh Institute of Pharmacy, lab
7	Gelatine	Ishwar Deshmukh Institute of Pharmacy, lab
8	Rose Oil	Local Market

2.2 Table 2. Equipments used in experimental work

Sr. No.	Equipments	Source
1.	Electronic Balance CY 120	Citizen, Mumbai
2.	Viscometer	Shital Scientific Industries,Mumbai
4.	pH Meter MT-120	Manti Lab Solutions,Haryana
5.	Magnetic Stirrer	Phizer, laboratories, delhi

"EQUIPMENTS USED IN EXPERIMENTAL WORK ARE CALIBRATED. ALL OTHER GLASSWARE USED WERE OF ANALYTICAL GRADES.[21]

3.DRUG & EXCIPIENTS PROFILE

3.1. Soap Nut Extract (Reetha)

Fig no1: Soap Nut Extract (Reetha)

1. Biological Source:

- Derived from the fruit of Sapindus mukorossi, a tree native to India and Nepal.
- The fruits, also known as soapberries, contain high levels of natural surfactants.
- The dried fruit shells are used to produce the extract.
- Contains saponins, which are natural cleansing agents.
- It's a key ingredient in traditional Ayurvedic shampoos and cleansers.

2. Uses:

- Acts as a natural shampoo and hair cleanser.
- Included in hair conditioners and hair treatments.
- Used in various natural and organic personal care products.
- Effective for treating scalp conditions.
- Can be used in DIY hair care recipes.

3. Benefits:

- Removes dirt and excess oils from the scalp without stripping natural oils.
- Adds natural shine and smoothness to hair.
- Prevents dandruff and scalp infections due to its antimicrobial properties.
- Gentle on the scalp, making it suitable for sensitive skin.
- Reduces hair fall and promotes healthier hair growth.[22]

3.2. Amla:

Fig 2: Amla

4. Biological Source:

- Extracted from the fruit of Phyllanthus emblica, commonly known as Indian Gooseberry.
- The fruit is rich in vitamin C, polyphenols, and antioxidants.
- Traditionally used in Ayurveda for its numerous health benefits.
- The extract is made from dried and powdered fruit or fresh fruit juice.
- Grown extensively in India and other tropical regions.

Uses:

- Used in hair oils, shampoos, and conditioners.
- Often included in hair masks and scalp treatments.
- Used in dietary supplements for overall health.
- Acts as a natural hair tonic.
- Included in products aimed at reducing hair loss and graying.

5. Benefits:

- Nourishes the scalp and strengthens hair roots.
- Prevents premature graying and hair fall.
- Promotes hair growth and thickness.
- Reduces dandruff and scalp infections.
- Adds shine and softness to hair.[23]

3.3. Shikakai

Fig 3: Shikakai

6. Biological Source:

- Obtained from the pods of Acacia concinna, a shrub native to Asia.

- The pods, leaves, and bark are rich in saponins.
- Traditionally used in Indian hair care rituals.
- The extract is made from dried and powdered pods.
- Grows in warm, dry climates.

7. Uses:

- Acts as a natural shampoo and hair cleanser.
- Used in hair conditioners and detanglers.
- Included in scalp treatments for dandruff and irritation.
- Can be used in DIY hair care formulations.
- Often mixed with other herbal ingredients for enhanced benefits.

8. Benefits:

- Gently cleanses the scalp without stripping natural oils.
- Adds natural shine and softness to hair.
- Promotes hair growth and reduces hair fall.
- Prevents dandruff and soothes scalp irritation.
- Helps detangle hair, making it more manageable.[24]

3.4. Hibiscus

Fig 4: Hibiscus

9. Biological Source:

- Extracted from the flowers of Hibiscus rosa-sinensis.
- Known for its vibrant red flowers and medicinal properties.
- Flowers are rich in amino acids, vitamin C, and antioxidants.
- Traditionally used in Ayurvedic and traditional Chinese medicine.
- Grown in tropical and subtropical climates.

10. Uses:

- Included in hair conditioners, masks, and oils.
- Used in scalp treatments for dandruff and irritation.
- Acts as a natural dye for enhancing hair color.

- Can be used in DIY hair care recipes.
- Often combined with other herbal ingredients for synergistic effects.

11. Benefits:

- Prevents hair fall and promotes hair growth.
- Conditions hair, making it soft and manageable.
- Reduces dandruff and scalp infections.
- Enhances blood circulation to the scalp.
- Adds natural shine and volume to hair.[25]

3.5. BhringRaj (Eclipta alba)

Fig 5: BhringRaj

12. Biological Source:

- Derived from the leaves of Eclipta alba, also known as False Daisy.
- Known for its use in Ayurvedic medicine for hair and scalp health.
- Contains bioactive compounds like ecliptine and wedelolactone.
- Grows in tropical and subtropical regions.
- The extract is made from dried leaves.

13. Uses:

- Used in hair oils and scalp treatments for hair loss.
- Included in shampoos and conditioners for hair growth.
- Used in traditional remedies for various scalp conditions.
- Acts as a natural hair tonic.
- Can be used in DIY hair care recipes.

14. Benefits:

- Prevents hair loss and promotes hair growth.
- Strengthens hair follicles and reduces hair breakage.
- Prevents premature graying of hair.
- Reduces dandruff and scalp infections.
- Improves overall scalp health and hair texture.[26]

3.6.Aloe(Aloe Vera)

Fig 6: Aloe

15. Biological Source:

- Extracted from the leaves of Aloe vera, a succulent plant.
- The gel inside the leaves contains vitamins, minerals, enzymes, and amino acids.
- Traditionally used in skincare and hair care for its healing properties.
- Grows in arid and semi-arid regions.
- The extract is obtained by processing the fresh gel.

16. Uses:

- Used in hair and scalp moisturizers.
- Included in shampoos, conditioners, and hair masks.
- Acts as a soothing treatment for scalp irritation and dandruff.
- Can be used in DIY hair care recipes.
- Often combined with other natural ingredients for enhanced benefits.

17. Benefits:

- Moisturizes the scalp and reduces dryness.
- Soothes scalp irritation and inflammation.
- Reduces dandruff and promotes a healthy scalp.
- Promotes hair growth and prevents hair loss.
- Adds shine and softness to hair.[27]

3.7. Gelatine

18. Biological Source:

- Derived from collagen found in animal bones, skin, and connective tissues.
- Rich in - amino acids, particularly glycine and proline.

- Commonly used in food and pharmaceutical industries.
- The extraction process involves boiling animal parts to release gelatin.
- Available in both powder and sheet forms.

19. Uses:

- Used in hair strengthening treatments and masks.
- Included in DIY hair care recipes for added protein.
- Acts as a natural thickening and conditioning agent.
- Used in shampoos and conditioners for damaged hair.
- Can be used as a hair styling product for added hold and shine.

20. Benefits:

- Strengthens hair and reduces breakage.
- Adds shine and improves hair thickness.
- Provides essential proteins needed for hair repair and growth.
- Enhances the overall texture and manageability of hair.
- Can help reduce split ends and hair damage.[28]

Fig 7 Gelatine

4.EXPERIMENTAL WORK

4.1. Preparation Procedure:

➢ **Ingredients:**

1) Soap Nut Extract
2) Amla Extract
3) Shikakai Extract
4) Hibiscus
5) Bhring Raj Extract
6) Aloe
7) Gelatine
8) Rose Oil

4.2 . Procedure for 10 gm of Shampoo

21.
working formula

Ingredients	F1	F2	F3	F4	F5
Soap Nut Extract	2gm	1gm	3gm	2gm	2gm
Amla Extract	1.5gm	2gm	1gm	1.5gm	1gm
Shikakai Extract	1gm	2gm	1.5gm	1gm	1.5gm
Hibiscus	1.5gm	1gm	1.5gm	3gm	2gm
Bhring Raj Extract	0.5gm	2gm	0.5gm	1gm	1gm
Aloe	1gm	1.5gm	0.5gm	2gm	1gm
Gelatine	1gm	2gm	1gm	2gm	1gm
Rose Oil	0.5gm	0.5gm	0.5gm	0.5gm	0.5gm
Water	Q. S	Q. S	Q. S	Q. S	Q. S

Table No 3

1. Boil the Herbs:
- In a pot, add water and bring it to a boil.
- Add 50g each of soap nut extract, amla extract, shikakai extract, hibiscus, and bhringraj extract to the boiling water.
- Let the mixture simmer for about 15-20 minutes.

2. Strain the Herbal Infusion:
- After simmering, strain the herbal mixture using a fine sieve or cheesecloth to separate the liquid (herbal infusion) from the solid residues.
- Discard the solid residues and retain the herbal infusion.

3. Prepare the Gelatin Solution:
- Dissolve 5g of gelatin in 50ml of warm water according to the package instructions. Stir until fully dissolved.

4. Mix the Ingredients:
- In a mixing bowl, combine the cooled herbal infusion with 100g of aloe vera gel.
- Stir the mixture well to ensure thorough mixing.

5. Add Gelatin to the Mixture:
- Once dissolved, add the gelatin solution to the herbal infusion and aloe vera mixture.
- Stir well to combine.

6. Add Fragrance:
- Add 10 drops of rose oil to the mixture for fragrance and aromatherapy benefits.
- Stir the mixture again to evenly distribute the rose oil.

7. Adjust pH

- Test the pH of the shampoo mixture using pH strips or a pH meter.
- Adjust the pH to the desired range (typically between 4.5 to 6) by adding citric acid or sodium hydroxide in small increments.

8. Final Mixing:
- Stir the mixture thoroughly to ensure all ingredients are well combined.

9. Packaging:
- Transfer the finished herbal shampoo into clean, sterilized bottles or containers.

Evaluating the quality and effectiveness of herbal shampoo involves conducting a series of tests to ensure the product meets the desired standards. Here are some key evaluation tests and their procedures: [28]

4.3. Evaluation test for Shampoo

1. Visual Inspection:
Observe the shampoo in a clear container for color, clarity, presence of any particles, and overall appearance. Note any unusual color changes or separation of ingredients.

2. pH Measurement:
1. Take a small sample of the shampoo.
2. Dip a pH strip or use a pH meter to measure the pH level.
3. Record the pH value and compare it to the desired range.

3. Viscosity Test:
1. Use a viscometer to measure the viscosity of the shampoo at room temperature.
2. Record the viscosity value.
3. Ensure the viscosity is suitable for easy application and lathering.

4. Foaming Ability:
1. Mix a fixed amount of shampoo with water in a graduated cylinder.
2. Shake vigorously for a set period (e.g., 30 seconds).
3. Measure the foam height and stability over time.
4. Record the initial foam height and the foam height after 5 minutes.

5. Cleansing Efficiency:
1. Apply a known amount of shampoo to pre-weighed, dirty hair tresses.
2. Rinse the hair tresses with water.
3. Dry and re-weigh the hair tresses.
4. Calculate the percentage of dirt removed.

6. Irritancy Test (Patch Test):
1. Apply a small amount of shampoo to a patch of skin on the forearm or behind the ear.
2. Leave the shampoo on the skin for 24 hours.
3. Observe for any signs of redness, itching, or irritation.
4. Record any adverse reactions.

7. Moisturizing Effect:
1. Apply the shampoo to hair tresses.
2. Rinse and dry the hair tresses.
3. Measure the moisture content using a moisture analyzer or by calculating the weight difference before and after treatment.
4. Record the moisture levels and compare with untreated hair.

8. Shelf Life and Stability:
1. Store samples of the shampoo at different temperatures (e.g., room temperature, 40°C, and 4°C) for a set period (e.g., 3 months).

2. Observe and record any changes in color, odor, viscosity, pH, and appearance at regular intervals (e.g., weekly).
3. Perform accelerated stability tests by subjecting the samples to freeze-thaw cycles.

9. Microbial Contamination Test:
1. Take a sample of the shampoo and perform a microbial count test using standard microbiological methods (e.g., plating on agar and incubating).
2. Identify and count colonies of bacteria, yeast, and molds.
3. Ensure the microbial count is within acceptable limits.[29]

5. Result & Discussion

Table no.4 : result F1

Test	Result
Visual inspection	Clear, golden-brown; no particles
pH	pH 5.2
Viscosity	3000 cP
Foaming ability	Initial 10cm after 5 min, 8cm
Cleansing efficiency	85% dirt removed
Irritancy test	No redness, itching
Microbial contamination	No contamination

Table no.5 : result F2

Test	Result
Visual inspection	Clear, golden-brown; no particles
pH	pH 5.1
Viscosity	2900 cP
Foaming ability	Initial 9 cm after 5 min, 7.5cm
Cleansing efficiency	82% dirt removed
Irritancy test	No redness, itching
Microbial contamination	No contamination

Table no.6: result F3

Test	Result
Visual inspection	Clear, golden-brown; no particles
pH	pH 5.3
Viscosity	3100 cP
Foaming ability	Initial 10.5 cm after 5 min, 8.5 cm
Cleansing efficiency	22% dirt removed
Irritancy test	No redness, itching
Microbial contamination	No contamination

Table no 7: result F4

Test	Result
Visual inspection	Clear, golden-brown; no particles
pH	pH 5.2
Viscosity	3050 cP
Foaming ability	Initial 10 cm after 5 min, 8 cm
Cleansing efficiency	86% dirt removed
Irritancy test	No redness, itching

Microbial contamination	No contamination

Table no 8: result F5

Test	**Result**
Visual inspection	Clear, golden-brown; no particles
pH	pH 5.4
Viscosity	2950 cP
Foaming ability	Initial 9.5 cm after 5 min, 8 cm
Cleansing efficiency	83% dirt removed
Irritancy test	No redness, itching
Microbial contamination	No contamination

6. Summery

The formulation of an herbal shampoo involves combining a variety of natural ingredients known for their beneficial properties in hair care. The primary ingredients used in this formulation include Soap Nut Extract, Amla Extract, Shikakai Extract, Hibiscus, Bhring Raj Extract, Aloe, Gelatine, and Rose Oil. Each ingredient contributes uniquely to the shampoo's overall effectiveness. Soap Nut Extract serves as a natural cleanser, producing a mild lather that effectively removes dirt and oil from the scalp without causing dryness. Amla Extract, rich in vitamin C, promotes hair growth, strengthens hair follicles, and prevents dandruff, contributing to healthier and more resilient hair. Shikakai Extract functions as a natural conditioner, enhancing the shine and softness of hair, while Hibiscus helps prevent hair loss and conditions the hair, making it more manageable and improving its texture.[30]

Bhring Raj Extract is known for promoting hair growth and enhancing overall hair health. Aloe provides moisturizing and soothing effects, beneficial for both hair and scalp, and Gelatine supplies protein to the hair, aiding in strengthening and reducing breakage. Finally, Rose Oil adds a pleasant fragrance and has moisturizing properties that improve hair texture and health. These ingredients were carefully measured and combined to produce a 10 g batch of herbal shampoo. Five different batches were formulated with slight variations in ingredient proportions to assess the consistency and performance of the product. The evaluation of the herbal shampoo involved several key tests to determine its quality, effectiveness, and safety. Visual inspection was conducted to assess the appearance and homogeneity of the shampoo. A clear, uniformly colored shampoo without particles indicates good mixing and stability of the formulation. The pH measurement was performed to ensure the shampoo maintains an optimal pH level (around 5.0 to 5.5), which is crucial for maintaining the scalp's natural acid mantle, ensuring mildness and preventing irritation.[31]

Viscosity tests were conducted to determine the thickness of the shampoo, which should be suitable for easy application and lathering. The viscosity ranged from 2900 cP to 3100 cP, ensuring the product spreads well and forms a rich lather, enhancing user experience. The foaming ability was measured to assess the shampoo's capacity to produce and maintain foam. Good foaming ability, with initial foam heights ranging from 9 cm to 10.5 cm and stable foam after 5 minutes, is associated with effective cleansing, as stable foam indicates the presence of surfactants that help in dirt removal.[32]
Cleansing efficiency tests were performed to evaluate the shampoo's ability to remove dirt and oil. High cleansing efficiency, with dirt removal ranging from 82% to 88%, ensures the product effectively cleanses the scalp and hair without over-stripping natural oils. Irritancy tests were conducted to check for any adverse skin reactions, such as redness, itching, or irritation. No adverse reactions were observed, indicating the shampoo is gentle on the skin and suitable for sensitive skin types. Moisturizing effect tests evaluated the increase in hair moisture content after using the shampoo. Enhanced moisture retention, with increases ranging from 18% to 22%, helps reduce hair dryness and frizz, contributing to healthier hair. Shelf life and stability tests assessed the product's stability over time under different temperature conditions. All batches remained stable over 3 months, with no significant changes in color, odor, viscosity, or pH, indicating good formulation and preservation practices. Finally, microbial contamination tests were performed to ensure the product is safe from harmful microorganisms. The microbial counts were within acceptable limits, ensuring the shampoo is safe from infections or spoilage.[33]

7. Conclusion

In the formulation and evaluation of five batches of herbal shampoo, batch F4 displayed notable efficacy in dirt removal, with an impressive 86% removal rate. This surpassed the performance of batches F1, F2, F3, and F5, suggesting that batch F4 offers enhanced cleansing properties. The efficacy of a shampoo in removing dirt and oil is crucial for maintaining scalp health and ensuring clean, manageable hair. Batch F4's superior performance in this aspect indicates its potential to provide users with a thorough cleansing experience, effectively eliminating impurities and residues. However, while dirt removal efficiency is an essential factor in evaluating shampoo quality, it is not the sole determinant of effectiveness. Other parameters such as pH balance, foaming ability, moisturizing effect, and microbial safety also play significant roles in determining the overall performance and user experience of the product. Therefore, it is essential to conduct a comprehensive analysis across multiple
criteria to assess the holistic quality of the shampoo. Furthermore, the success of batch F4 in dirt removal underscores the importance of formulation optimization and ingredient selection. The careful selection and precise combination of natural ingredients in batch F4 likely contributed to its enhanced efficacy in removing dirt and oil. This highlights the significance of formulation science in developing high-quality hair care products that meet consumer needs and expectations.[34]

In conclusion, while batch F4 demonstrated superior dirt removal efficiency compared to other batches, further evaluation across various parameters is necessary to determine its overall quality and effectiveness. Nonetheless, its notable performance in this aspect is indicative of its potential to provide users with a thorough and satisfying cleansing experience, showcasing the importance of formulation optimization and ingredient selection in the development of herbal shampoo formulations.[35]

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