



Review Article

Eco-Friendly Herbal Shampoo: Formulation, Benefits, Testing

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ABSTRACT

Herbal shampoos have grown in popularity due to their natural components and supposed advantages for hair health. This study describes the formulation of a herbal shampoo using plant extracts recognized for their therapeutic properties, such as Aloe vera, Hibiscus, and Amla. The shampoo was prepared to offer cleansing, hydrating, and strengthening effects while reducing the use of harsh chemicals. The formulation process involved adjusting the proportions of surfactants, thickeners, and herbal extracts to obtain the required consistency and stability. The final product was assessed for its physicochemical characteristics, antimicrobial potential, and user acceptance through sensory testing. The findings showed that the herbal shampoo demonstrated desirable attributes, making it a suitable alternative to conventional synthetic shampoos

INTRODUCTION

Shampoos are among the most commonly used cosmetic products for cleansing the hair and scalp in everyday life. Herbal shampoos are cosmetic formulations that, through the use of traditional Ayurvedic herbs, are intended to clean the hair and scalp similarly to regular shampoos. They are used to remove excess oils, dandruff, dirt, environmental impurities, and more.

Herbal shampoo is a type of cosmetic product that utilizes plant-based herbs as an alternative to the synthetic shampoos available in the market. Herbal shampoos have become significant because

people today prefer natural products over chemical ones, as they have been shown to promote better health. The awareness and demand for herbal-based cosmetic products are increasing, mainly because these products are considered safe and free from adverse effects.

2. ANATOMY OF HAIR :

Hair is composed of nearly 95% keratin, a fibrous, helical protein (shaped like a coil) that forms an essential part of the skin and its appendages (body hair, nails, etc.).

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The structure of hair consists of three distinct layers:

Medulla: The innermost portion of the hair shaft, consisting of an amorphous, soft, and oily material.

Cuticle: The thin, protective outer covering that contains nutrients beneficial for hair development. It is highly keratinized, with scale-like cells arranged in overlapping layers, measuring about 60 micrometers in length and approximately 6 micrometers in width.

Cortex: The principal part of the hair, containing long keratin chains that provide strength, elasticity, and flexibility. The cortical cells are held together by an intercellular “cement” rich in lipids and proteins.

Hair Growth Cycle:

The hair growth cycle consists of four stages:

Anagen (growth phase): The active growing stage, lasting for several years.

Catagen (transition phase): In this short phase, the hair follicle contracts and hair growth slows down.

Telogen (resting phase): The dormant stage where hair growth halts and a new hair initiates growth, gradually pushing the old one out.

Exogen phase: The final stage of the cycle, during which the hair strand fully detaches from the scalp and is shed



Hair Care :

“Hair texture and shine are generally linked to the surface characteristics of hair, whereas the strength of hair depends on the hair cortex. For this reason, hair products that enhance the structural soundness of hair fibers and improve tensile strength are available, along with formulations that

boost hair volume, minimize frizz, improve hair manageability, and encourage new hair growth. Interestingly, modern cosmetic preparations are designed to cleanse hair of debris and to restore and enhance hair physiology. For instance, intensive conditioning agents can temporarily replenish the F-layer, improving moisture retention in the cortex and restoring some of the

diminished physical qualities of hair. Thus, the increase in hair luster is a major advantage of contemporary products.”

3. How Shampoo works & why shampoo is preferred:

Shampoo cleanses by removing sebum from the hair. Sebum is an oil released by the hair follicles that is easily absorbed by the hair strands and forms a protective coating. Although sebum safeguards the protein framework of the hair from damage, this protection has a drawback. It tends to attract dirt, styling residues, and scalp flakes. Surfactants detach the sebum from the hair shafts and thereby eliminate the impurities attached to it. While both soaps and shampoos contain

surfactants, soap binds to oils with such strong affinity that it removes them more aggressively.

The chemical processes involved in hair cleansing are similar to those of conventional soap. Healthy, undamaged hair has a water-repelling (hydrophobic) surface to which skin lipids like sebum adhere, but water is initially resisted. These lipids do not come off easily when the hair is rinsed with plain water. Anionic surfactants greatly lower the interfacial surface tension and enable the removal of sebum from the hair shaft. The non-polar oily substances on the hair surface are solubilized into the micellar structures of the shampoo and are washed away during rinsing. There is also significant removal through a “roll-up” mechanism, where the surfactant lifts the oil layer off the hair.



Drawbacks for herbal shampoo:

- Inconsistent quality: The quality of raw ingredients may fluctuate due to factors like seasonal variations, farming practices, and processing methods, resulting in uneven product performance.
- Slower results: Herbal formulations might take a longer duration and regular application to produce visible improvements compared to chemical-based
- Shorter shelf life: They often rely on natural preservatives, which may be less potent,

leading to reduced shelf stability and possible degradation.

- Risk of allergic reactions: Even though generally gentler, herbal components such as essential oils can still provoke hypersensitivity reactions or irritations in certain individuals.
- Limited regulation: The herbal cosmetic sector is less strictly monitored, causing variations in product standards and labeling accuracy, and some items might contain undeclared additives.
- Odor: Natural botanicals may carry strong or hard-to-mask scents.

Ideal properties of herbal shampoo:

- Use of natural ingredients: Formulated with safe, plant-derived ingredients free from harsh chemicals.
- Good foaming ability: Should produce adequate lather for easy application, even with mild natural surfactants.
- Balanced pH: Ideally maintains a pH close to that of the scalp (around 5–6) to prevent irritation and dryness.
- Pleasant fragrance: Should have a natural, non-irritating scent derived from herbs or essential oils.
- Effective conditioning: Should leave hair soft, manageable, and smooth without requiring synthetic conditioners.
- Stability and acceptable shelf life: Should remain stable, with ingredients that do not separate or degrade quickly.

- Non-irritating and hypoallergenic: Must minimize the risk of allergic reactions or sensitivities.
- Eco-friendly: Made using biodegradable ingredients and sustainable herbal sources.
- Free from harmful additives: Should avoid parabens, sulfates, silicones, and artificial dyes.

4. Ingredients & Methods of Formulation:

Ingredient	Quantity (%)	Primary Function
Neem leaves powder	9%	Antibacterial, scalp health
Hibiscus flower powder	12%	Conditioning, shine
Aloe vera powder	7%	Moisturizing, soothing
Shikakai powder	22%	Natural detergent, cleansing
Bhringaraj powder	5%	Promotes hair growth
Amla powder	25%	Anti-dandruff, strengthens roots
Soap nut powder	20%	Foaming, gentle cleanser
Rose oil	q.s	Fragrance, calming
Gelatin	q.s	Gelling agent, binding

Formulation:

The formulation of the herbal shampoo was prepared according to the specified formula. To the 10% gelatin solution, the herbal extract was incorporated and blended by continuous shaking at intervals of 20 minutes. Additionally, 1 ml of lemon juice was introduced with steady stirring. To enhance the fragrance of the preparation, an adequate amount of essential oil (rose oil) was included, and the final volume was adjusted to 100 ml using the gelatin solution

5. Evaluation Parameters of Herbal Shampoo:



The formulated shampoo underwent assessment for overall product performance, including examination of organoleptic attributes, pH value, physicochemical parameters, and solid residue content. To ensure product quality, specific analytical tests were performed to determine surface tension, foam volume, foam persistence, and wetting time in accordance with standard procedures.

1. Visual assessment:

The developed formulation was examined for its appearance, including color, transparency, scent, and foam characteristics.

2. pH Determination:

The pH of a 10% v/v solution of the herbal shampoo in distilled water was measured using a pH analyzer at ambient temperature.

3. Determination of solid content percentage:

Approximately 4 g of the shampoo was weighed into a dry, clean evaporating dish. The liquid fraction was removed by heating on a hot plate. After complete drying, the weight and percentage of solid content were calculated.

4. Dirt dispersion:

Two drops of the shampoo were introduced into a test tube containing 10 ml of distilled water. One

drop of India ink was added, the tube was sealed, and shaken ten times. The distribution of ink within the foam was observed and classified as none, slight, moderate, or heavy.

5. Foam stability test:

Foam stability was evaluated using the cylinder shake method. About 5 ml of a 1% shampoo solution was placed in a graduated cylinder and shaken vigorously ten times. Foam height was recorded after 1 minute and again after 4 minutes.

6. Stability study:

The prepared shampoo was subjected to a stability evaluation at a controlled room temperature of 25–30°C for a period of 4 weeks.

7. Skin irritation test:

A small quantity of the herbal shampoo was applied to the skin for 5 minutes, rinsed off, and monitored for any signs of irritation or inflammation.

8. Microbial examination:

A sterile petri dish was filled with 1 ml of the shampoo under aseptic conditions and allowed to solidify. The plates were incubated at 37°C for 24 hours and inspected for microbial growth.

Evaluation test	Formulated shampoo
Color	Brown
Transparency	Clear
Odor	Good
pH of 10% solution	7
Solid contents (%)	23.25
Foam volume (ml)	25
Foam type	dense, small
Surface tension (dynes/cm)	35.18
Wetting time (s)	120 s



6. Advantages and Disadvantages of herbal shampoo:

Advantages of Herbal Shampoo:

1. Mild and gentle on hair: Herbal shampoos are usually less harsh and help maintain natural scalp oils.
2. Free from harmful chemicals: Typically avoid parabens, sulfates, silicones, and synthetic fragrances.
3. Eco-friendly: Made from biodegradable, plant-based ingredients, making them environmentally safe.
4. Beneficial therapeutic effects: Herbal extracts may provide additional benefits such as reducing dandruff, soothing the scalp, or strengthening hair.
5. Suitable for sensitive skin: Many herbal formulations are hypoallergenic and less likely to irritate the scalp.
6. Natural fragrance: Pleasant aroma derived from essential oils or herbal ingredients.

Disadvantages of Herbal Shampoo:

1. Inconsistent quality: Natural ingredients can vary in potency due to seasonal or cultivation differences.
2. Slower visible results: Benefits may take longer to appear compared to chemical-based formulations.
3. Shorter shelf life: Often contain mild or natural preservatives, leading to reduced stability.
4. Risk of allergies: Some herbs or essential oils can trigger sensitivities or allergic reactions.
5. Lower foaming ability: Herbal shampoos may produce less lather, which some users may perceive as reduced cleaning power.
6. Higher cost: Quality herbal ingredients and extraction methods can make these products more expensive.

7. Marketed herbal shampoos:

List of Few Popular Brands Are:

- Himalaya
- Khadi
- Patanjali
- Dabur Vattika
- Mamaearth
- Wow Skin Science

CONCLUSION

Herbal shampoo offers a natural, effective, and gentle alternative to conventional synthetic shampoos. Formulated with plant-derived ingredients, it provides cleansing, conditioning, and therapeutic benefits without the harsh effects commonly associated with chemical-based products. The incorporation of herbal extracts not only supports scalp health but also nourishes the hair, making it suitable for long-term use and ideal for individuals with sensitive skin or those seeking chemical-free hair care solutions.

Compared to synthetic shampoos, herbal formulations stand out due to their biodegradability, minimal side effects, and lower risk of irritation. They help maintain the natural balance of the scalp, promote healthier hair growth, and contribute to reduced environmental pollution. Although they may show gradual results and have a shorter shelf life, their overall safety profile and holistic benefits make them a preferable choice for sustainable and gentle hair care.

In essence, herbal shampoos combine traditional knowledge with modern formulation techniques to deliver a safe, eco-friendly, and health-conscious approach to hair cleansing and maintenance, making them an increasingly valuable alternative to synthetic counterparts.



REFERENCES

1. Pranjali Varshney and Dr. Rishi Kumar. (2024). A REVIEW ON FORMULATION OF HERBAL SHAMPOO. *World Journal of Pharmaceutical Science and Research*, 3(5), 338-352.
<https://doi.org/10.5281/zenodo.14024936>
2. Pathare, Jay Sharad, Sonali Uppalwar, and Abhishek Kumar Sen. 2024. "A Review on Herbal Shampoo." *International Journal of Research Publication and Reviews*, Volume 5, Issue 11 (November 2024), pp. 7433-7437.
3. Pawan Maurya, Shashikant Maury, Piyush Yadav, Manoj Kumar Yadav, Suraj Maurya, Satyam Jaysawal, Department of pharmacy, Prasad Institute of Technology, Jaunpur, Uttar Pradesh (India)
4. Gazi, Ayesha Siddiqua, Syeda Adiba Sameen, Sayyada Hajira, Zehra Unnisa, and Mariya Fathima. 2025. "Herbal Shampoo: A Review". *Journal of Pharmaceutical Research International* 37 (2): 118-33.
<https://doi.org/10.9734/jpri/2025/v37i27661>

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