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Formulation and Evaluation of Polyherbal Medicated Shampoo Using Natural Herbal Ingredients

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ABSTRACT

Herbal cosmetic products have become increasingly popular because many people are now aware of the side effects caused by synthetic hair care products. Commercial shampoos often contain chemical ingredients such as synthetic surfactants, parabens, preservatives, and artificial fragrances that may lead to scalp irritation, dryness, hair fall, and weakening of hair after continuous use. Due to these concerns, herbal shampoos are being preferred as safer and more natural alternatives for routine hair care.

The present study was carried out to formulate and evaluate a polyherbal medicated shampoo using natural ingredients including Amla (*Phyllanthus emblica*), Shikakai (*Acacia concinna*), Reetha (*Sapindus mukorossi*), Aloe vera (*Aloe barbadensis Miller*), Rosemary (*Rosmarinus officinalis*), Fenugreek (*Trigonella foenum-graecum*), Rice water (*Oryza sativa*), and Flaxseed (*Linum usitatissimum*). These ingredients were selected because of their traditional use in hair care and their beneficial medicinal properties, including cleansing, conditioning, antioxidant, antimicrobial, moisturizing, and hair growth–promoting activities.

The shampoo was prepared using soaking, heating, extraction, filtration, and mixing methods. Reetha and Shikakai helped in cleansing and foam formation due to the presence of natural saponins, while Aloe vera and Flaxseed improved smoothness and conditioning of the hair. Rosemary and Fenugreek supported scalp nourishment and helped reduce hair fall. Rice water contributed to amino acids and nutrients that improved hair strength and texture.

The prepared formulation was evaluated for various parameters, including color, odor, pH, foamability, viscosity, cleansing ability, conditioning effect, and stability. The results showed that the shampoo possessed good consistency, acceptable pH, pleasant odor, stable foam, and effective cleansing properties. The study concluded that the developed polyherbal shampoo can be used as a safe, economical, and effective alternative to synthetic shampoos for maintaining healthy hair and scalp.

I. INTRODUCTION

Hair plays an important role in enhancing the appearance and personality of an individual. Healthy, shiny, and strong hair is often considered a sign of good health and proper hair care. However, due to changing lifestyles, environmental pollution, stress, unhealthy food habits, and excessive use of chemical-based cosmetic products, various hair problems such as dandruff, dryness, hair fall, split ends, and premature greying have become very common [1].

Nowadays, many commercial shampoos available in the market contain synthetic chemicals, including Sodium Lauryl Sulfate (SLS), parabens, silicones, preservatives, and artificial fragrances. Although these products provide quick cleansing and foaming effects, their long-term use may damage the natural structure of hair and scalp. Continuous exposure to harsh chemicals can remove natural oils from the scalp, weaken hair roots, and sometimes lead to irritation, itching, dryness, and excessive hair fall [3].

SHAMPOO

Shampoo is one of the most used cosmetic products for cleaning hair and the scalp. It helps remove dirt, sweat, excess oil, dead skin cells, and environmental impurities that accumulate on the scalp during daily activities. The word “shampoo” is derived from the Hindi word “Champo,” which means massage. Traditionally, hair cleansing was performed using natural herbs and oils, but with industrial development, synthetic shampoos became more common [1, 3].

Modern shampoos generally contain surfactants, preservatives, conditioning agents, fragrances, and thickening agents [4]. Synthetic surfactants are mainly responsible for cleansing and foam formation; however, continuous use of chemical-based shampoos may damage the hair shaft and scalp over time. Many people experience problems such as scalp irritation, dryness, roughness, itching, and hair fall because of

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prolonged exposure to harsh chemical ingredients[2, 5].

TYPES OF SHAMPOO

Different types of shampoos are available in the market depending on hair type, scalp condition, and specific hair care needs. Each type of shampoo is prepared for a particular purpose and provides different benefits.

- **Liquid Shampoo**
- **Gel Shampoo**
- **Cream Shampoo**
- **Powder Shampoo**
- **Baby Shampoo**
- **Medicated Shampoo**
- **Conditioning Shampoo**
- **Herbal Shampoo**
- **Anti-Dandruff Shampoo**

HERBAL SHAMPOO

Herbal shampoos are cosmetic preparations made using medicinal plants and natural ingredients that help cleanse and nourish the hair and scalp [5, 7]. Unlike synthetic shampoos, herbal shampoos contain naturally occurring bioactive compounds that are generally mild and safe for regular use.

BENEFITS OF HERBAL SHAMPOO

Herbal shampoos provide several advantages over synthetic shampoos because they contain natural plant-based ingredients that are gentle on the scalp and hair.

Some important benefits of herbal shampoo include:

- Cleanses the scalp without damaging the natural hair structure [7].
- Maintains the normal pH balance of the scalp [10].
- Helps reduce dandruff and itching [8].
- Promotes healthy hair growth [12].
- Strengthens hair roots and follicles [13].
- Reduces excessive hair fall and breakage [2].
- Improves softness, shine, and smoothness of hair [11].
- Helps maintain natural scalp oils [17].
- Suitable for regular and long-term use
- Eco-friendly and biodegradable in nature

Because of these advantages, herbal shampoos are becoming increasingly preferred for routine hair care applications.

FUNCTIONS OF HERBAL SHAMPOO

The main function of herbal shampoo is to clean the hair and scalp while maintaining the natural health and appearance. In addition to cleansing, herbal shampoos provide several therapeutic and cosmetic benefits [15].

The important functions of herbal shampoo include:

- Removal of dirt, sweat, and excess oil from the scalp
- Cleansing of hair without causing excessive dryness
- Conditioning and moisturization of hair fibers
- Improvement of softness and smoothness
- Nourishment of scalp tissues and hair roots
- Reduction of dandruff and scalp irritation
- Enhancement of natural shine and texture
- Protection of scalp and hair from environmental damage

Herbal shampoos, therefore, act as multifunctional cosmetic preparations that not only clean the hair but also help improve overall scalp and hair health.

ANATOMY OF HAIR

Hair is an integrated part of the human body that contributes significantly to physical appearance and personality [1]. Healthy hair reflects the overall condition of scalp and body health. Hair mainly consists of a protein called keratin along with water, lipids, and minerals [3]. Structurally, it is divided into the visible hair shaft above the surface and the hair root embedded inside the dermis. The shaft features three concentric regions: the innermost medulla, the intermediate cortex containing pigment grains, and the outer protective cuticle layer.

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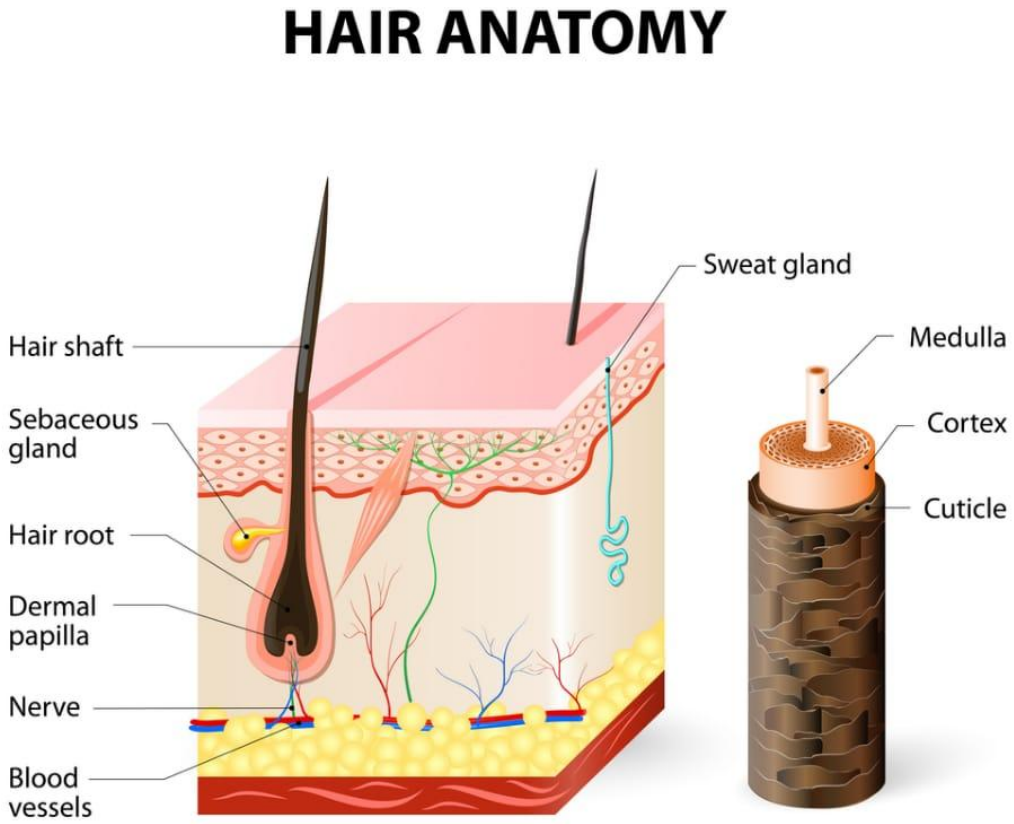

Figure No.1: Human Hair Anatomy here

OBJECTIVES OF THE STUDY

The present study was carried out with the following objectives:

1. To formulate a polyherbal medicated shampoo using natural herbal ingredients.
2. To prepare a safer alternative to synthetic shampoos containing harsh chemicals.
3. To evaluate the physicochemical properties of the prepared formulation.
4. To study the cleansing and conditioning performance of the shampoo.
5. To investigate the role of herbal ingredients in improving scalp and hair health.
6. To reduce scalp irritation and hair damage caused by synthetic surfactants.
7. To develop an economical and effective herbal shampoo suitable for regular use.
8. To promote the use of herbal cosmetic products in daily hair care practices.

BOTANICAL NOMENCLATURE OF HERBAL INGREDIENTS

The herbal ingredients used in the preparation of the polyherbal medicated shampoo were selected based on their traditional medicinal importance and beneficial effects on hair and scalp health. [13]. These plants contain several natural bioactive compounds that help improve cleansing, conditioning, nourishment, and protection of hair.

Common Name	Botanical Name	Family	Major Constituents
Amla	*Phyllanthus emblica*	Phyllanthaceae	Vitamin C, tannins, antioxidants
Shikakai	*Acacia concinna*	Fabaceae	Natural saponins
Reetha	*Sapindus mukorossi*	Sapindaceae	Saponins, cleansing agents
Aloe vera	*Aloe barbadensis Miller*	Asphodelaceae	Polysaccharides, vitamins
Rosemary	*Rosmarinus officinalis*	Lamiaceae	Essential oils, flavonoids

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Common Name	Botanical Name	Family	Major Constituents
Fenugreek	*Trigonella foenum-graecum*	Fabaceae	Proteins, nicotinic acid
Flaxseed	*Linum usitatissimum*	Linaceae	Omega-3 fatty acids, mucilage
Rice	*Oryza sativa*	Poaceae	Amino acids, inositol

These herbal ingredients work together to provide better cleansing, conditioning, antioxidant protection, scalp nourishment, and improvement in overall hair quality [15].

MATERIALS USED

The ingredients used in the formulation of the polyherbal medicated shampoo were selected because of their beneficial effects on scalp and hair care. Each ingredient contributes a specific property such as cleansing, conditioning, moisturization, antioxidant activity, hair strengthening, or scalp nourishment.

Table No. 1: Ingredients of Herbal Shampoo

Sr. No.	Ingredient	Quantity	Role in Formulation
1	Amla Extract	5.0 % w/v (or 5g)	Strengthens hair roots
2	Shikakai Extract	5.0 % w/v (or 5g)	Natural cleanser
3	Reetha Extract	5.0 % w/v (or 5g)	Natural foaming agent
4	Aloe vera Gel	10.0 % w/v (or 10g)	Moisturizer and conditioner
5	Rosemary Oil/ Extract	2.0 % w/v (or 2g)	Promotes hair growth
6	Fenugreek Extract	2.0 % w/v (or 2g)	Reduces hair fall
7	Rice water	5.0 % v/v (or 5ml)	Repairs damaged hair
8	Flaxseeds Mucilage	5.0 % w/v (or 5g)	Natural conditioning agent
9	Vitamin E	0.5 % v/v (or 0.5ml)	Antioxidant and scalp nourisher
10	Fragrance	q.s.	Improves odor
11	Shampoo base	q.s. to make 100%	Provides consistency and cleansing support

All ingredients used in the formulation were natural and selected carefully to provide maximum therapeutic and cosmetic benefits with minimal side effects.

ACTIVE INGREDIENT PROFILE

Amla (*Phyllanthus emblica*)

Amla is one of the most important medicinal plants used in Ayurvedic hair care preparations. It is rich in Vitamin C, tannins, flavonoids, and antioxidants that help strengthen hair roots and improve scalp health [13].

Shikakai (*Acacia concinna*)

Shikakai has been traditionally used as a natural hair cleaner for many years. It contains natural saponins that help remove dirt, excess oil, and impurities from the scalp without causing excessive dryness [17].

Reetha (*Sapindus mukorossi*)

Reetha, commonly known as soapnut, acts as a natural cleansing and foaming agent due to the presence of saponins. It effectively cleans the scalp and removes excess sebum and dirt from hair fibers [17].

Aloe vera (*Aloe barbadensis Miller*)

Aloe vera is widely used in cosmetic and medicinal preparations because of its moisturizing and soothing properties. It contains vitamins, amino acids, minerals, enzymes, and polysaccharides that nourish the scalp and improve hydration [11].

Rosemary (*Rosmarinus officinalis*)

Rosemary contains essential oils and antioxidant compounds that help improve blood circulation in the scalp. Better circulation helps nourish hair follicles and supports healthy hair growth [12]. .

Fenugreek (*Trigonella foenum-graecum*)

Fenugreek seeds contain proteins, nicotinic acid, lecithin, flavonoids, and other nutrients beneficial for hair health. These nutrients help strengthen hair roots and repair damaged hair fibers [13].

Flaxseed (*Linum usitatissimum*)

Flaxseed is rich in omega-3 fatty acids, proteins, vitamins, minerals, and mucilage. During heating, Flaxseed releases a gel-like mucilage that works as a natural conditioner and thickening agent [16]

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Rice Water (*Oryza sativa*)
Rice water also reduces roughness and improves softness and shine of hair. It forms a protective layer around hair fibers and reduces breakage.
Vitamin E
Vitamin E acts as a powerful antioxidant that helps protect scalp tissues and hair follicles from oxidative damage caused by pollution and environmental stress [4].
Fragrance
Fragrance is added to improve the odor and overall consumer acceptability of the formulation. It provides a pleasant aromatic smell to the shampoo [14].
Shampoo Base
The shampoo base acts as the carrier medium for herbal ingredients. It helps improve consistency, spreadability, cleansing ability, and overall appearance of the shampoo formulation [14].

METHOD OF PREPARATION

Preparation of Polyherbal Medicated Shampoo
The polyherbal medicated shampoo was prepared using simple herbal extraction and heating methods to obtain the beneficial constituents from the selected medicinal plants. Proper care was taken during preparation to maintain the cleanliness, uniformity, and stability of the formulation [16].

Step 1: Collection and Weighing of Ingredients
All herbal ingredients, including Amla, Shikakai, Reetha, Rosemary, Fenugreek seeds, Flaxseeds, Aloe vera, and Rice water, were collected and weighed accurately according to the required quantity.

Table No. 2 Content of Formulation

Ingredient	Quantity
Amla	5.0 g
Shikakai	5.0 g
Reetha	5.0 g
Rosemary	2.0 g
Fenugreek seeds	2.0 g
Flaxseeds	5.0 g
Rice water	5.0 ml
Aloe vera	10.0 g
Vitamin E	0.5 ml
Fragrance	q.s.
Shampoo base	q.s. to make 100 ml

Step 2: Overnight Soaking
Amla, Shikakai, Reetha, Rosemary, Fenugreek seeds, and Rice water were soaked overnight in purified water.
This soaking process helped:
- soften the herbal materials
- improve extraction of active constituents
- release natural phytochemicals into water

The overnight maceration also helped extract:
- saponins
- antioxidants
- proteins
- flavonoids
- mucilage

from the herbal ingredients.
Step 3: Grinding and Mixing
On the next day, the soaked ingredients were blended properly along with the same soaking water to obtain a smooth and uniform mixture.
Grinding helped break down the herbal materials and release the beneficial constituents more effectively into the preparation.
Step 4: Heating and Extraction
Approximately one liter of purified water was added to the blended mixture. The preparation was then heated on a low flame with continuous stirring.
Heating continued until:
- The volume was reduced to nearly half
- The mixture developed a slightly thick gel-like consistency

Continuous stirring helped:
- Preventing burning
- Avoid settling of ingredients
- Maintain uniform heating

During heating, natural cleansing agents from Reetha and Shikakai and beneficial nutrients from Amla, Rosemary, and Fenugreek were extracted into the solution.
Step 5: Filtration
After heating, the formulation was allowed to cool for some time and then filtered using muslin cloth or fine filtration material.
This process separated the liquid herbal extract from the remaining solid plant residue.
The obtained filtrate appeared smooth and dark brown in color.
Step 6: Secondary Extraction
The remaining herbal residue was again mixed with approximately half liter of water to obtain maximum extraction of active constituents.
Flaxseeds and freshly prepared Aloe vera gel were then added to the mixture.
For preparation of Aloe vera gel:

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- Fresh Aloe vera stems were washed properly
- The outer peel was removed carefully
- The yellow latex portion was discarded
- Transparent inner gel was collected

Removal of yellow latex was important because it may cause scalp irritation in some individuals.

Step 7: Mucilage Formation

The mixture containing Flaxseed and Aloe vera was heated again on low flame.

During heating:

- Flaxseed releases natural mucilage
- Aloe vera releases moisturizing constituents

This step improved:

- Viscosity
- Smoothness
- Conditioning property
- Spreadability of shampoo

Continuous stirring was maintained to obtain uniform preparation.

Step 8: Final Filtration

The preparation was filtered again after sufficient extraction. The remaining residue was pressed through cloth to recover maximum herbal extract and mucilage.

This improved the concentration and effectiveness of the final formulation.

Step 9: Addition of Vitamin E and Fragrance

After cooling the filtrate to room temperature:

- Vitamin E drops were added
- Fragrance was incorporated

Vitamin E helped improve antioxidant activity and scalp nourishment, while fragrance improved the overall odor and consumer acceptability of the shampoo.

The preparation was mixed thoroughly to ensure uniform distribution.

Step 10: Addition of Shampoo Base

Finally, the shampoo base was added gradually with continuous stirring until a homogeneous shampoo formulation was obtained.

The shampoo base helped improve:

- Consistency
- Cleansing ability
- Foam formation
- Stability
- Texture of the preparation

The final shampoo appeared smooth, viscous, and uniformly mixed

Step 11: Packaging and Storage

The prepared polyherbal medicated shampoo was transferred into clean airtight containers and labeled properly.

The containers were stored in a cool and dry place away from direct sunlight to maintain product stability and prevent contamination.

Flow Chart of Preparation Procedure

Collection of Herbal Ingredients
↓
Weighing of Ingredients
↓
Overnight Soaking (Maceration)
↓
Grinding and Mixing
↓
Heating with Water
↓
Formation of Gel-like Consistency
↓
Primary Filtration
↓
Additionof Aloe vera and Flaxseed
↓
Secondary Heating
↓
Mucilage Formation
↓
Final Filtration
↓
Additionof Vitamin E and Fragrance
↓
Additionof Shampoo Base
↓
Homogeneous Herbal Shampoo Obtained
↓
Packaging and Storage

EVALUATION PARAMETERS

The prepared polyherbal medicated shampoo was evaluated for various physical and performance parameters to assess its quality, stability, effectiveness, and suitability for hair-care applications[14].

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Table No. 3 Quantitative Evaluation Results for the Polyherbal Medicated Shampoo

Sr. No.	Parameter	Observed Result	Evaluation Method
1	pH (10% solution, 25 °C)	6.7	Digital pH meter
2	Foam Volume (Initial)	168 mL	Cylinder-shake test
3	Foam Volume (After 5 min)	141 mL	Cylinder-shake test
4	Foam Retention	≈ 84%	Calculated
5	Viscosity	≈ 3,400 cP	Brookfield-type viscometer
7.	Skin / Scalp Irritation	None observed	Use observation

Organoleptic Evaluation

The developed shampoo was visually evaluated for physical attributes including color, scent, clarity, and consistency.

Observed Characteristics

Parameter	Observation
Color	Dark brown
Odor	Pleasant herbal odor
Texture	Smooth
Appearance	Homogeneous
Consistency	Viscous liquid

The formulation showed a smooth texture with uniform consistency and no visible phase separation.

Determination of pH

The pH of shampoo is an important factor because it affects scalp compatibility and hair texture. Highly alkaline shampoos may damage the cuticle layer of hair and lead to dryness and roughness. The pH of the prepared formulation was determined using a digital pH meter [14, 20] and was found to be 6.7 (Table No. 3), which falls within the ideal, safe range for herbal cosmetic preparations.

Foamability and Foam Retention

Foam formation is an important property of shampoos because consumers generally associate foam with cleansing efficiency.

The prepared formulation produced:

- stable foam
- dense foam
- uniform foam

This was mainly due to the natural saponins present in Reetha and Shikakai.

The foam remained stable for a satisfactory period, indicating good cleansing performance[17].

Viscosity Determination

Viscosity determines the thickness, flow property, and ease of application of shampoo formulations.

The prepared shampoo showed satisfactory viscosity because of the presence of:

- Flaxseed mucilage
- Aloe vera gel
- Shampoo base

Proper viscosity improves:

- Spreadability
- Stability
- Handling properties
- Retention time on scalp

The formulation was neither too thick nor too thin, making it easy to apply and wash off[14].

The shampoo remained homogeneous and showed no microbial contamination or instability.

II. RESULTS AND DISCUSSION

The formulated polyherbal medicated shampoo showed satisfactory physical appearance and cosmetic properties. The formulation appeared smooth, homogeneous, and dark brown in color with a pleasant herbal odor. No phase separation or instability was observed during the storage period.

Overall, the synergistic combination of herbal ingredients provided cleansing, conditioning, antioxidant, moisturizing, and hair-strengthening effects in a single formulation. The prepared shampoo can therefore be considered a safer and more effective alternative to synthetic shampoos for regular hair care use.

"The quantitative evaluation of the formulated shampoo yielded highly satisfactory results (Table No. 3). The pH was observed to be 6.7, which aligns with the ideal slightly acidic range required to prevent hair cuticle damage. Furthermore, the formulation exhibited a foam retention of approximately 84% and an optimal viscosity of ~3,400 cP, ensuring excellent spreadability and cleansing efficacy without causing any skin irritation."

ADVANTAGES OF THE FORMULATED POLYHERBAL SHAMPOO

The prepared polyherbal medicated shampoo offers several advantages over conventional synthetic shampoos because it contains natural herbal ingredients with multiple beneficial properties.

- **Natural Cleansing Action**
- **Reduced Chemical Exposure**
- **Improved Hair Nourishment**
- **Conditioning and Moisturization**
- **Antioxidant Protection**
- **Anti-Dandruff Activity**
- **Eco-Friendly Nature**

- **Better Consumer Acceptability**

The shampoo showed:

- Pleasant odor
- Smooth texture
- Good foamability

III. CONCLUSION

The current research successfully established a stable, functional polyherbal medicated shampoo leveraging a traditional complex of Phyllanthus emblica, Acacia concinna, Sapindus mukorossi, and supporting botanical extracts. The experimental findings suggest that the formulation meets the required parameters for safe, economical, and stable daily hair care use. Transitioning toward polyherbal configurations offers an effective paradigm to minimize the global incidence of chemical contact dermatitis and hair damage triggered by synthetic commercial shampoos.

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