Formulation And Development of Herbal Shampoo

Khan Kahekasha Mohsin[1], Prof. Shaikh Maviya Patel[2]
[1]*Student, Aurangabad Pharmacy College, Chhatrapati Sambhajinagar*
[2]*Assistant Professor, Aurangabad Pharmacy College, Chhatrapati Sambhajinagar*

***Abstract*—The aim of this project was to prepare and evaluate a herbal shampoo using natural ingredients such as Amla, Reetha, Shikakai, Hibiscus, Neem, Aloe vera, and Lemon juice, with Jasmine oil as fragrance and Potassium sorbate as preservative.**
Synthetic shampoos often contain harsh chemicals that may cause scalp irritation, hair damage, and loss of natural oils. Herbal formulations are mild, eco-friendly, and rich in natural saponins, vitamins, and antioxidants that help cleanse and nourish the hair.
In this work, the herbal extracts were prepared, filtered, and combined in proper proportion to develop a smooth and effective shampoo base. The formulated shampoo was evaluated for appearance, pH, viscosity, foam formation, stability, and cleansing ability. The results indicated that the prepared herbal shampoo had acceptable physical properties and provided good cleansing and conditioning effects.
Thus, a safe, effective, and economical herbal shampoo was successfully developed using commonly available herbal ingredients.

***Index Terms*—Herbal shampoo, Reetha, Shikakai, Amla, Hibiscus, Aloe vera, Jasmine oil, Potassium sorbate.**

I. INTRODUCTION

Hair plays an important role in the overall appearance and personality of a person. Healthy, shiny, and strong hair is a sign of good health and proper hygiene. To maintain this, regular cleansing of hair and scalp is essential to remove dirt, oil, sweat, and other environmental pollutants. The product that performs this cleansing function effectively is known as a shampoo.

A shampoo is a hair care formulation containing cleansing agents, conditioners, and other additives that help to clean the hair, improve its appearance, and maintain its natural moisture balance. It is generally available in liquid, gel, or powder form and is used by massaging onto wet hair followed by rinsing with water.

However, most commercial shampoos available in the market contain synthetic surfactants such as sodium lauryl sulfate (SLS) or sodium laureth sulfate (SLES). These synthetic detergents, though effective in cleansing, often cause scalp irritation, dryness, and hair damage when used regularly. Moreover, chemical-based shampoos can disturb the natural pH balance of the scalp and strip away essential oils that protect the hair shaft.

To overcome these disadvantages, herbal shampoos have become a popular alternative. They are made using natural ingredients like Amla, Reetha, Shikakai, Hibiscus, Neem, and Aloe vera, which contain natural saponins and nutrients that gently cleanse and nourish the scalp without side effects. Herbal shampoos are biodegradable, non-toxic, and environmentally friendly compared to synthetic formulations.

1.1 Definition of Herbal Shampoo

A herbal shampoo is a hair-cleansing formulation that contains plant-derived ingredients as active cleansing, conditioning, and therapeutic agents. These natural components include herbs, plant extracts, essential oils, and other biologically active compounds that help maintain healthy hair and scalp.

Herbal shampoos are usually free from synthetic colors, artificial fragrances, and harsh chemicals. Instead, they rely on naturally occurring surfactants such as saponins, found in Reetha (Sapindus mukorossi) and Shikakai (Acacia concinna), to create foam and remove dirt effectively.

1.2 Importance of Herbal Shampoo

1. Mild Cleansing: Herbal shampoos gently

remove dirt and excess oil without stripping the hair's natural oils.

2. Safety: Natural ingredients cause minimal irritation or allergic reactions compared to chemical surfactants.

3. Nourishment: Herbal extracts provide vitamins, minerals, and antioxidants that promote healthy hair growth.

4. Eco-friendly: They are biodegradable and cause less environmental pollution.

5. Therapeutic Benefits: Many herbs have medicinal properties such as antifungal, antibacterial, and anti-dandruff effects.

6. Economical: Most herbal ingredients are easily available and inexpensive, making the product affordable.

1.3 Hair and Scalp Structure

To understand the working of shampoos, it is essential to know the basic structure of hair and scalp.

Each hair strand consists of three main layers:

1. Cuticle: The outermost layer made of keratin cells that protect the inner layers.
2. Cortex: The middle layer responsible for hair strength, elasticity, and color.
3. Medulla: The innermost layer that may be present in thick hair strands.

The scalp contains hair follicles, sebaceous glands, and sweat glands. Sebaceous glands secrete sebum, a natural oil that lubricates and protects hair from dryness. Excess sebum, however, can trap dust and microorganisms, leading to dandruff or scalp infections. Therefore, regular cleansing is essential.

1.4 Advantages of Herbal Shampoo Over Synthetic Shampoo

Sr. No	Herbal Shampoo	Synthetic Shampoo
1	ade from natural plant-based ingredients	de from synthetic surfactants and chemicals
2	Mild and safe for scalp	May cause irritation and dryness
3	Biodegradable and eco-friendly	Non-biodegradable and polluting
4	Provides nourishment and conditioning	Only cleans without nourishment
5	ess expensive and locally available ingredients	Expensive due to synthetic additives
6	Free from side effects	May lead to hair fall or scalp sensitivity

1.5 Common Herbs Used in Shampoo Formulation

1. Reetha (Sapindus mukorossi):

Contains natural saponins which act as foaming and cleansing agents. Helps remove dirt and excess oil without damaging hair.

2. Shikakai (Acacia concinna):

Known as a natural hair cleanser and conditioner. It strengthens hair roots and gives natural shine.

3. Amla (Emblica officinalis)

Rich in vitamin C and antioxidants.
Prevents premature greying, promotes hair growth, and strengthens follicles.

4. Hibiscus (Hibiscus rosa-sinensis):

Helps in conditioning, reduces dandruff, and promotes smooth and silky hair.

5. Neem (Azadirachta indica):

Possesses strong antibacterial and antifungal properties. Effective in treating dandruff and scalp infections.

6. Aloe vera:

Provides moisture and hydration to the scalp, giving a cooling and soothing effect.

7. Lemon Juice:

Acts as a natural pH balancer, controls excess oil, and adds shine.

8. Jasmine Oil:

Used as fragrance and helps to soften the hair strands.

1.6 Objective of Using Herbal Ingredients

The main objective behind using natural herbs in shampoo is to combine cleansing, conditioning, and therapeutic properties in a single formulation without any harmful chemical additives. Herbal ingredients help maintain the pH balance, scalp health, and natural texture of hair while improving its strength and appearance.

II. AIM AND OBJECTIVES

Aim:

The main aim of the present work is to prepare and evaluate a polyherbal shampoo using natural ingredients such as Reetha, Shikakai, Amla, Hibiscus, Neem, Aloe vera, Lemon juice, and Jasmine oil with Potassium sorbate as preservative.

The goal is to formulate a mild, effective, and eco-friendly shampoo that can cleanse, nourish, and protect hair without causing side effects.

Objectives

1. To select suitable herbal ingredients having cleansing, conditioning, and antimicrobial properties.

2. To prepare a polyherbal shampoo using traditional and modern formulation techniques.

3. To evaluate the physical and chemical parameters of the prepared shampoo such as pH, foam height, viscosity, and stability.

4. To compare the performance of the prepared herbal shampoo with marketed formulations.

5. To develop a stable and aesthetically acceptable herbal shampoo using locally available ingredients.

III. REVIEW OF LITERATURE

A review of literature provides information on the previous work done in the same field. It helps to understand the progress of research, identify the knowledge gap, and support the selection of ingredients and formulation method. Several studies have been carried out on the preparation and evaluation of herbal shampoos using various natural ingredients.

Below are some important research works and findings related to herbal shampoo formulation:

2.1 Herbal Shampoo Formulated Using Reetha, Amla, and Shikakai

Singh et al. (2017) developed a herbal shampoo using Reetha, Amla, and Shikakai extracts. The study showed that Reetha provided natural foaming and cleansing action due to its saponin content, while Amla and Shikakai acted as hair-strengthening and conditioning agents.

The formulated shampoo was evaluated for pH, foam height, and dirt dispersion and found to be comparable with marketed shampoos. The study concluded that herbal ingredients can effectively replace synthetic surfactants in shampoo formulations.

2.2 Herbal Shampoo from Aloe vera and Hibiscus

Patel and Sharma (2018) prepared a polyherbal shampoo using Aloe vera and Hibiscus extracts. The shampoo produced good foam and maintained a pH range of 6.0–6.5, which is suitable for scalp and hair.

Aloe vera acted as a moisturizing and soothing agent, while Hibiscus improved the texture and shine of hair. The herbal shampoo also showed better conditioning effects compared to synthetic formulations.

2.3 Formulation Containing Neem and Lemon Extracts

Gupta et al. (2019) studied the antimicrobial effect of Neem and Lemon in a herbal shampoo. The formulation exhibited excellent antibacterial and antifungal activity against Candida albicans and Staphylococcus aureus.

Lemon juice balanced the pH and reduced dandruff, while Neem helped to prevent scalp infections. The researchers suggested that the inclusion of such herbs could make herbal shampoos both cleansing and therapeutic.

2.4 Use of Saponin-Rich Herbs for Foaming

Reddy et al. (2020) investigated the natural foaming capacity of Reetha and Shikakai. The results indicated that saponins present in these herbs can produce sufficient foam without the need for artificial surfactants.

Although the foam height was slightly lower than commercial shampoos, the cleaning efficiency and mildness to the scalp were significantly better.

2.5 Comparative Study of Herbal and Synthetic Shampoos

Deshmukh and Kaur (2021) compared herbal shampoos with synthetic ones containing SLS and SLES. The herbal shampoos were found to be less irritating, more stable, and better tolerated by users.

Consumers reported smoother, shinier hair with less dryness and breakage. The study concluded that herbal shampoos are a safer and eco-friendly alternative.

2.6 Development of Polyherbal Shampoo Containing Amla, Hibiscus, and Aloe vera

Shaikh et al. (2022) prepared a polyherbal shampoo using Amla, Hibiscus, and Aloe vera extracts. The formulation showed optimum pH, viscosity, and cleansing ability. It also improved hair texture after regular use.

The authors emphasized that such combinations

enhance the synergistic effect of multiple herbs — cleansing, conditioning, and protecting the hair simultaneously.

2.7 Evaluation of Preservatives in Herbal Formulations

Chaudhari et al. (2023) explored different natural and synthetic preservatives for herbal cosmetics. It was observed that Potassium sorbate (0.1–0.2%) effectively prevented microbial growth without affecting product stability or safety.

This preservative is widely accepted for herbal formulations due to its mild action and compatibility with natural ingredients.

2.8 Role of Essential Oils in Herbal Shampoo

Bhattacharya and Mehta (2023) reported that essential oils such as Lavender, Jasmine, and Rosemary oil not only impart pleasant fragrance but also provide therapeutic benefits like stress relief and scalp nourishment.

Jasmine oil was found to condition hair strands, reduce frizz, and improve fragrance retention, making it an ideal replacement for synthetic perfumes.

Summary of Literature Review

From the above studies, it can be concluded that herbal ingredients such as Reetha, Shikakai, Amla, Neem, Aloe vera, Hibiscus, and Lemon juice are widely used for preparing effective herbal shampoos.

These ingredients are rich in saponins, flavonoids, alkaloids, and essential oils, which contribute to their cleansing, conditioning, and antimicrobial effects.

The literature supports that herbal shampoos:

Are safer for long-term use, Possess adequate cleansing power, Maintain scalp health,

Are environmentally sustainable.

Based on the findings, this project aims to formulate a polyherbal shampoo using a suitable combination of natural ingredients with Jasmine oil as fragrance and Potassium sorbate as preservative to achieve a balanced, stable, and effective product.

IV. MATERIALS AND METHODOLOGY

1. Materials Used

The materials used for the preparation of herbal shampoo were collected from local sources and verified for authenticity. All ingredients were of analytical or cosmetic grade.

Sr. No.	Name of Ingredient	Botanical Name	Quantity	Function / Role
1	Reetha (Concentrated)	Sapindus mukorossi	20 ml	Natural cleanser, foaming agent (rich in saponins)
2	Shikakai	Acacia concinna	10 ml	Natural conditioner, improves hair strength
3	Amla	Emblica officinalis	6 ml	Hair growth promoter, antioxidant
4	Hibiscus	Hibiscus rosa-sinensis	4 ml	Natural conditioner, adds shine and smoothness
5	Neem leaves	Azadirachta indica	3 ml	Antibacterial, antifungal, anti-dandruff agent
6	Aloe vera gel	Aloe barbadensis miller	6 ml	Moisturizer, soothes scalp, adds smoothness
7	Lemon juice	Citrus limon	1 ml	Natural pH balancer, adds shine, removes oil
8	Jasmine oil	-	3-4 drop	Few drops Fragrance, conditioning, improves hair texture
9	Distilled water	-	Q.s up to 60 ml	Vehicle

2 Method of Preparation

The herbal shampoo was prepared by extraction and mixing method using aqueous extracts of selected herbs.

Step 1: Preparation of Herbal Extracts

1. Weigh 10 g each of Reetha, Shikakai, and Amla, and 5 g each of Neem and Hibiscus.
2. Add them to 200 mL of distilled water and soak overnight (6–8 hours).
3. Boil the soaked mixture for about 30 minutes until the volume reduces to half (approximately 100 mL).
4. Cool the mixture and filter through muslin cloth to obtain a clear extract.

Step 2: Addition of Conditioning Agents

1. Add Aloe vera gel (5 mL) and Lemon juice (2 mL) to the filtered extract.
2. Stir continuously to mix well using a glass rod or magnetic stirrer at moderate speed until a homogeneous mixture forms.

Step 3: Addition of Fragrance and Preservative

1. Add few drops of Jasmine oil to provide pleasant fragrance and smooth texture.

2. Add Potassium sorbate (0.1%) as preservative and stir until completely dissolved.

3. Adjust the final volume with distilled water to 100 mL.

Step 4: Filtration and Storage

1. Filter the prepared shampoo through muslin cloth to remove coarse particles.

2. Transfer the final product into a clean, labeled amber bottle.

3. Store in a cool, dry place away from direct sunlight.

4. 3 Flow Chart for Preparation

Collection of Herbal Ingredients → Drying and Powdering → Soaking Overnight → Boiling and Extraction → Filtration → Addition of Aloe vera and Lemon juice → Addition of Jasmine oil and Preservative → Volume Adjustment → Filtration → Storage

4.4 Expected Appearance

The prepared herbal shampoo was expected to be light brownish to greenish in color with a smooth consistency and pleasant jasmine fragrance. It should produce moderate foam and show a pH suitable for scalp (5.5–6.5).

Herbal Drugs Included in the Shampoo Formulation

1. Amla (Emblica officinalis) Family: Phyllanthaceae Common Name: Indian Gooseberry Part Used: Fruit

Description:

Amla is one of the richest natural sources of Vitamin C and antioxidants. It has been traditionally used in Ayurveda for strengthening hair follicles and preventing premature greying. It nourishes the scalp and promotes healthy hair growth.

Active Constituents:

Vitamin C, Tannins, Gallic acid, Ellagic acid, Flavonoids, Polyphenols. Pharmacological Actions:

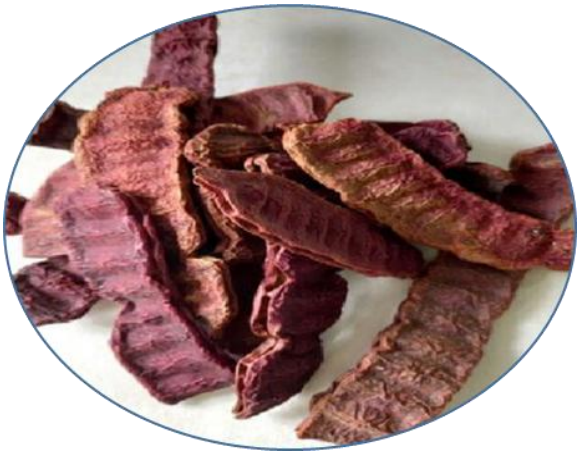
Antioxidant: Protects hair from oxidative stress Hair Growth Promoter: Strengthens hair follicles Anti-dandruff: Reduces fungal infections

Conditioner: Improves hair texture and shine

Role in Shampoo:

Amla prevents hair fall, enhances hair strength, and gives natural shine and smoothness. It helps maintain scalp health and supports hair growth.

2. Shikakai (Acacia concinna) Family: Fabaceae
Common Name: Soap Pod Part Used: Pods



Description:
Shikakai is a traditional natural cleanser widely used in India as a shampoo base. It contains natural saponins which clean the scalp without stripping natural oils.

Active Constituents:
Saponins, Tannins, Flavonoids, Oxalic acid, Citric acid. Pharmacological Actions:
Cleansing: Removes dirt and excess oil Anti-dandruff: Prevents scalp infections
Conditioning: Makes hair soft and manageable

Role in Shampoo:
Acts as a mild natural foaming & cleansing agent, improves hair softness, and reduces scalp dryness.

3. Reetha (Sapindus mukorossi)

Family: Sapindaceae Common Name: Soapnut Part Used: Fruit pericarp

Description:
Reetha fruits contain natural surfactants known as saponins. It is traditionally used as a shampoo and soap alternative.

Active Constituents:
Saponins, Sugars, Fatty acids. Pharmacological Actions:
Natural Surfactant: Produces foam and cleanses scalp

Anti-microbial: Prevents dandruff-causing bacteria & fungi Hair Softening: Maintains natural moisture

Role in Shampoo:
Acts as a primary foaming and cleansing ingredient, providing gentle cleaning without harmful chemicals.

4. Neem (Azadirachta indica)

Family: Meliaceae Part Used: Leaves

Description:

Neem is known for its powerful antibacterial and antifungal actions. It purifies the scalp and prevents dandruff and infections.

Active Constituents:
Azadirachtin, Nimbin, Nimbidin, Quercetin, Triterpenoids. Pharmacological Actions:
Antimicrobial: Removes dandruff-causing organisms
Anti-inflammatory: Reduces scalp irritation
Antiseptic: Prevents itching and infections
Role in Shampoo:

Used to control dandruff, relieve itching, and maintain a healthy scalp microbiome.

5. Aloe Vera (Aloe barbadensis Miller)

6. Family: Asphodelaceae
Part Used: Leaf gel

Description:
Aloe vera gel contains polysaccharides, vitamins, and enzymes that help nourish and condition hair.

Active Constituents:
Aloin, Anthraquinones, Vitamins, Amino acids, Polysaccharides, Enzymes. Pharmacological Actions: Moisturizing: Hydrates scalp and hair Healing: Soothes damaged scalp Conditioner: Improves smoothness and shine
Role in Shampoo:
Used as a natural conditioner, reducing frizz, dryness, and split ends.

Evaluation Parameters for Herbal Shampoo

Sr. No.	Parameter	Method / Test Procedure	Standard / Acceptable Range
1.	Physical Appearance	Visual inspection for colour, clarity, texture	Should be smooth, uniform & appealing
2.	Odour	Sensory evaluation	Pleasant and acceptable
3.	pH	pH meter	5.5 – 7.0 (mild for scalp)
4.	Foam Formation	Cylinder shake method	Rich & stable foam
5.	Foam Stability	Time taken for foam collapse	Should remain stable for ≥ 5 min
6.	Wetting Time	Canvas disc method	Should wet within 2 min
7.	Dirt Dispersion Test	Water + India ink + shampoo	Dirt should remain in water not foam
8.	Viscosity	Brookfield viscometer or spindle	Should be smooth and pourable
9.	Surface Tension	Drop count method	Lower than distilled water (~30–35 dynes/cm)
10.	Solid Content	Evaporation method	Should remain in a balanced range
11.	Cleansing Action	Oil + dust removal test	Should clean efficiently
12.	Conditioning Effect	Hair strand test	Should improve smoothness & shine
13.	Stability Study	Stored at RT & 40°C for 30 days	No change in colour, odour, pH
14.	Microbial Limit Test (optional)	Plate count method	Should be within permissible limits

V. RESULTS AND DISCUSSION

The prepared herbal shampoo was evaluated for its various physicochemical parameters and compared with a standard marketed shampoo. The results obtained from different evaluation tests are discussed below:

1. Physical Appearance and Colour

The formulated herbal shampoo showed an attractive natural brownish-green colour with a pleasant herbal odour due to the presence of ingredients like reetha, amla, shikakai, hibiscus, and aloe vera. The formulation was smooth in texture and free from any coarse particles or sediments.

2. pH

The pH of the herbal shampoo was found to be in the range of 6.0 – 6.5, which is near to the natural pH of scalp and skin. This indicates that the shampoo is mild and suitable for regular use without causing irritation or dryness.

3. Foam Height and Stability

The formulation produced sufficient and stable foam. The foam was found to be stable for more than 5 minutes, indicating good cleansing and foaming ability comparable to marketed shampoos.

4. Dirt Dispersion Test

The shampoo showed very little dirt in the foam layer, which confirms its good cleansing property and ability to remove oil and dust effectively from hair and scalp.

5. Wetting Time

The wetting time was found to be less than 2 minutes, showing that the shampoo spreads easily on wet hair and forms a good lather.

6. Surface Tension

The surface tension of the formulated shampoo was reduced effectively compared to distilled water, which confirms the cleansing action of natural saponins present in reetha and shikakai.

7. Viscosity

The viscosity of the herbal shampoo was found to be moderate and easily pourable, indicating good consistency and ease of application.

8. Stability Study

The prepared formulation was kept at room temperature and observed for 30 days. There were no changes in colour, odour, or consistency, confirming the stability of the shampoo.

9. Overall Evaluation

All the parameters of the prepared herbal shampoo were found to be within acceptable limits and comparable to that of marketed formulations. The natural ingredients provided good cleansing, conditioning, and mildness to the scalp and hair.

V. CONCLUSION AND FUTURE SCOPE

Conclusion:

The present study was carried out to formulate and evaluate an herbal shampoo using natural ingredients such as Reetha (Sapindus mukorossi), Amla (Emblica officinalis), Shikakai (Acacia concinna), Hibiscus (Hibiscus rosa-sinensis), and Aloe vera (Aloe barbadensis).

The formulation was successfully developed by using a simple maceration technique and showed excellent physicochemical characteristics such as good foaming ability, proper consistency, and stability.

The evaluation results indicated that the prepared herbal shampoo is mild, stable, and effective in cleansing the hair and scalp without causing irritation. Due to the presence of natural saponins and conditioning agents, it provides both cleansing and nourishing effects. The product was also found to be free from synthetic surfactants and harmful chemicals, making it safer for long- term use compared to commercial synthetic shampoos.

Hence, it can be concluded that the formulated herbal shampoo is an eco- friendly, economical, and efficient alternative to synthetic shampoos for maintaining healthy hair and scalp.

VI. FUTURE SCOPE

The present formulation can be optimized further by incorporating additional natural conditioners like Bhringraj, Fenugreek, or Neem extract to enhance its therapeutic value.

The antimicrobial and antifungal activities of the

shampoo can be evaluated to confirm its effectiveness against scalp infections such as dandruff or itching.
Clinical and consumer studies can be conducted to assess safety, user acceptance, and long-term benefits.
Large-scale production and stability testing under different storage conditions can be performed for commercial formulation development.
Further research may include formulation of herbal conditioner or 2-in-1 shampoo-conditioner combinations using similar natural ingredients.

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