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## Formulation And Evaluation Of Herbal Shampoo

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### Abstract

The present study focuses on the formulation and evaluation of a herbal shampoo using natural ingredients known for their hair care benefits. The primary objective is to develop an effective, eco-friendly, and safe alternative to synthetic shampoos by incorporating plant-based components such as Shikakai (*Acacia concinna*), Reetha (*Sapindus mukorossi*), Amla (*Phyllanthus emblica*), Neem (*Azadirachta indica*), and Aloe vera. These herbs were selected based on their traditional use and scientifically recognized properties, including cleansing, antimicrobial, anti-dandruff, and conditioning effects. The formulated shampoo was evaluated for physicochemical parameters such as pH, foaming ability, viscosity, and dirt dispersion capacity. Results indicate that the herbal shampoo met standard quality parameters and showed promising cleansing and conditioning properties, making it a suitable natural alternative for regular hair care. This formulation contributes to the growing demand for sustainable and chemical-free personal care products. The increasing demand for natural and chemical-free personal care products has led to a surge in the development of herbal cosmetics, particularly in hair care. This study presents the formulation and evaluation of a herbal shampoo using a combination of traditionally used medicinal plants known for their beneficial effects on scalp health and hair maintenance. The aim was to create a mild, non-toxic, biodegradable shampoo that offers cleansing, conditioning, and therapeutic benefits without the adverse effects associated with synthetic surfactants and preservatives. The formulation included extracts of Shikakai (*Acacia concinna*), Reetha (*Sapindus mukorossi*), Amla (*Phyllanthus emblica*), Neem (*Azadirachta indica*), and Aloe vera. These herbs were chosen based on their rich saponin content, antimicrobial properties, anti-inflammatory effects, and proven role in promoting hair growth and scalp health. The preparation involved aqueous extraction of the plant materials, followed by blending in specific proportions to achieve desired viscosity, foamability, and cleansing power. Physicochemical evaluations were conducted to assess pH, surface tension, solid content, foaming index, dirt dispersion, and stability over time. The shampoo maintained an ideal pH (4.5–5.5), exhibited adequate foaming, good cleansing efficiency, and was free from synthetic additives. Microbial testing ensured the absence of contamination, and user trials indicated favorable acceptance in terms of texture, fragrance, and after-use feel.

**Keywords:** Herbal shampoo, Reetha, Shikakai, Amla, Neem, Aloe vera, natural formulation, hair care, sustainable cosmetics, phytochemicals

## Introduction

Hair care has long been an essential aspect of personal hygiene and grooming, with shampoos playing a crucial role in cleansing the scalp and maintaining hair health. However, the growing awareness of the adverse effects associated with synthetic ingredients—such as sulfates, parabens, and artificial fragrances—has driven increased interest in natural and herbal alternatives. Herbal shampoos, formulated with plant-derived ingredients, offer a safer, environmentally friendly, and potentially therapeutic alternative to conventional hair care products.

Traditionally, herbs like Reetha (*Sapindus mukorossi*), Shikakai (*Acacia concinna*), Amla (*Phyllanthus emblica*), Neem (*Azadirachta indica*), and Aloe vera have been used in Ayurvedic and folk medicine for their cleansing, antimicrobial, antifungal, anti-inflammatory, and conditioning properties. These botanicals not only cleanse the scalp and hair but also help treat conditions like dandruff, dryness, scalp infections, and hair fall. The natural saponins in Reetha and Shikakai act as mild surfactants, while Amla provides antioxidant support and promotes hair growth. Neem offers antibacterial action, and Aloe vera hydrates and soothes the scalp. The present study focuses on the formulation of a herbal shampoo using these selected plant extracts. The goal is to create a shampoo that is effective in cleaning and conditioning hair while being free from harmful chemicals. In addition to formulation, the shampoo is evaluated for physicochemical parameters such as pH, foaming ability, viscosity, and stability to ensure its efficacy and quality. This work aims to contribute to the growing body of research supporting natural and sustainable cosmetic formulations, while offering a product that meets both consumer expectations and environmental standards.

Hair hygiene is a vital aspect of daily personal care routines, contributing not only to aesthetic appearance but also to scalp health. Over the past few decades, the global market has been dominated by synthetic shampoos, which often contain harsh chemicals such as sodium lauryl sulfate (SLS), parabens, silicones, and artificial fragrances. While these components may offer immediate cleansing and foaming effects, long-term use has been associated with scalp irritation, dryness, allergic reactions, and environmental pollution due to their non-biodegradable nature. Consequently, there is a growing consumer shift toward natural, herbal-based products that are perceived as safer and more environmentally responsible.

Herbal shampoos, prepared using plant-derived extracts and natural surfactants, present an appealing alternative. These formulations draw from centuries of traditional knowledge—especially from systems like Ayurveda and Unani—which have identified various herbs beneficial for maintaining healthy hair and treating common scalp disorders. Unlike their synthetic counterparts, herbal shampoos are typically free from harmful additives and emphasize holistic care by combining cleansing, nourishment, and therapeutic effects in one formulation.

The present study seeks to formulate a herbal shampoo using a synergistic blend of five well-documented herbs:

- *Sapindus mukorossi* (Reetha), known for its natural saponin content that produces mild foam and acts as a natural cleanser.
- *Acacia concinna* (Shikakai), traditionally used to strengthen hair roots and prevent dandruff.
- *Phyllanthus emblica* (Amla), rich in vitamin C and antioxidants, supports hair growth and scalp nourishment.
- *Azadirachta indica* (Neem), a powerful antimicrobial agent effective against dandruff and scalp infections.
- Aloe vera, which acts as a moisturizing and soothing agent, maintaining scalp hydration and pH balance.

These ingredients were selected based on their individual and combined benefits for scalp cleansing, sebum regulation, antimicrobial action, and hair strengthening. In the formulation process, emphasis was placed on maintaining optimal physicochemical properties such as pH (ideally between 4.5 and 5.5 to match scalp pH), viscosity for user acceptability, foam stability, and overall product stability. The evaluation of the

shampoo also included microbiological testing and user perception studies to assess the safety, efficacy, and market readiness of the final product. This research contributes to the increasing demand for plant-based personal care products by providing a formulation that is not only effective but also aligned with global trends toward sustainability and natural health solutions.

## Historical and traditional use of herbal ingredients:

### 1. Traditional Chinese Medicine (TCM)

#### Origins & Philosophy:

- TCM dates back over 2,000 years and is rooted in Taoist philosophy.
- Health is seen as a balance between opposing forces: **Yin** (passive, cooling) and **Yang** (active, warming).
- The **Five Elements** (Wood, Fire, Earth, Metal, Water) relate to organs and natural phenomena.
- Herbal remedies are personalized and often used in combination for synergy.

#### Common Herbs & Uses:

- **Ginseng (Ren Shen):** Boosts Qi (vital energy), helps with fatigue, and enhances physical and mental stamina.
- **Licorice Root (Gan Cao):** Harmonizes other herbs in a formula, soothes sore throats, relieves spasms, and detoxifies.
- **Astragalus (Huang Qi):** Strengthens Wei Qi (immune defense), promotes healing, and combats fatigue.
- **Dang Gui (Angelica sinensis):** Known as “female ginseng,” used for blood nourishment and menstrual disorders.

#### Typical Formulas:

- **Liu Wei Di Huang Wan:** A foundational kidney yin tonic.
- **Yin Qiao San:** For early-stage colds and flu.

### 2. Ayurveda (India)

#### Origins & Philosophy:

- Ayurveda is over 3,000 years old and rooted in Vedic texts.
- Health depends on balance among the three **Doshas**:
  - **Vata (Air/Ether):** Movement and communication.
  - **Pitta (Fire/Water):** Digestion and transformation.
  - **Kapha (Earth/Water):** Structure and lubrication.
- Herbs are used to balance these doshas and support **Agni** (digestive fire).

#### Common Herbs & Uses:

- **Turmeric (Haldi):** Anti-inflammatory, used in digestive disorders, skin conditions, and joint issues.
- **Ashwagandha:** Adaptogen; reduces stress, supports the nervous system, and enhances stamina.
- **Neem:** Antimicrobial; purifies blood, used for acne, and oral health.
- **Brahmi (Bacopa):** Brain tonic; improves memory and reduces anxiety.

### Typical Formulas:

- **Triphala:** A blend of three fruits used for detoxification and digestion.
- **Chyawanprash:** Herbal jam for immunity and vitality.

### 3. Western Herbalism

#### Origins & Philosophy:

- Rooted in Greco-Roman medicine (Hippocrates, Galen) and medieval European herbal traditions.
- Herbs are seen as natural ways to stimulate the body's innate healing capacity.
- It emphasizes whole-plant medicine and traditional knowledge passed through generations.

#### Common Herbs & Uses:

- **Chamomile:** Calming; for sleep, digestion, and inflammation.
- **Echinacea:** Immune stimulant; used in colds and infections.
- **St. John's Wort:** Used for mild depression and nerve pain.
- **Peppermint:** Relieves digestive issues like gas and bloating.

#### Influential Texts:

- **Dioscorides' De Materia Medica** (1st century CE)
- **Nicholas Culpeper's Complete Herbal** (17th century)

### 4. Indigenous & Folk Medicine

#### Origins & Philosophy:

- Passed orally through generations across Native American, African, and other indigenous cultures.
- Herbal medicine is deeply spiritual, often tied to rituals and connection with nature.
- Healers like shamans, curanderos, and herbalists play central roles.

#### Native American Uses:

- **Willow Bark:** Pain relief (source of salicin, like aspirin).
- **Elderberry:** Boosts immunity; used in cold and flu season.
- **Yarrow:** Stops bleeding, speeds healing.

#### African Traditional Uses:

- **Devil's Claw:** Used for joint pain, arthritis, and inflammation.
- **Baobab Fruit:** Rich in vitamin C and fiber; used for nutrition and diarrhea.
- **Moringa:** Highly nutritious; used for energy, malnutrition, and detox.

### 5. Islamic and Unani Medicine

#### Origins & Philosophy:

- Developed during the Islamic Golden Age (8th–13th century).
- Based on Greco-Arabic theories of the **four humors** (blood, phlegm, yellow bile, black bile).
- Promotes balance through diet, herbs, lifestyle, and spiritual practice.

**Key Figures & Texts:**

- **Ibn Sina (Avicenna):** His *Canon of Medicine* was a major influence in East and West.
- **Al-Razi (Rhazes):** Also contributed to herbal and systemic medicine.

**Common Herbs & Uses:**

- **Black Seed (*Nigella sativa*):** Called “a cure for everything but death”; used for immunity, inflammation, and respiratory health.
- **Senna Leaves:** Natural laxative.
- **Fenugreek:** Used for lactation, diabetes, and digestion.
- **Henna:** Cooling herb used topically and ceremonially.

Herbal ingredients are commonly used in shampoos for their natural cleansing, soothing, moisturizing, or strengthening properties. Here’s a list of **commonly used herbs in shampoos**, their traditional uses, and benefits for hair and scalp:

**Common Herbs in Shampoo and Their Benefits**

Herb	Traditional Use	Benefits in Shampoo
<b>Aloe Vera</b>	Used in Ayurveda and Egyptian medicine for burns and skin.	Soothes scalp, hydrates hair, reduces dandruff.
<b>Chamomile</b>	European herbalism; calming herb.	Adds shine to blonde hair, soothes irritated scalp, anti-inflammatory.
<b>Rosemary</b>	Mediterranean tradition; stimulates blood flow.	Promotes hair growth, reduces dandruff, strengthens follicles.
<b>Lavender</b>	Traditional European and aromatherapy use.	Calms scalp, has antibacterial properties, promotes hair growth.
<b>Neem</b>	Used in Ayurveda for skin and scalp issues.	Antifungal, antibacterial; combats dandruff and scalp infections.
<b>Hibiscus</b>	Ayurveda and tropical regions for hair growth.	Strengthens roots, promotes growth, adds shine and volume.
<b>Tea Tree (Melaleuca)</b>	Aboriginal medicine for skin conditions.	Powerful antiseptic; fights dandruff, itchiness, and fungal scalp conditions.
<b>Amla (Indian Gooseberry)</b>	Ayurveda superfruit.	Strengthens hair, prevents greying, promotes thickness.
<b>Shikakai</b>	Traditional Indian hair cleanser.	Natural cleanser, strengthens roots, prevents dandruff without stripping natural oils.
<b>Bhringraj</b>	Used in Ayurveda for hair loss.	Encourages hair regrowth, improves scalp health.
<b>Peppermint</b>	Used in Western and Asian traditions.	Invigorates scalp, improves circulation, provides cooling effect.
<b>Sage</b>	Mediterranean and Native American traditions.	Balances oil production, darkens greying hair naturally, antifungal.

<b>Nettle</b>	European folk medicine.	Rich in silica and sulfur; helps reduce hair loss and improves shine.
<b>Fenugreek (Methi)</b>	Ayurveda for hair fall and dandruff.	Reduces hair thinning, softens hair, soothes scalp irritation.

### Why Use Herbal Shampoos?

- **Gentler on scalp** than chemical alternatives.
- **Fewer synthetic fragrances and sulfates.**
- **Targeted treatments** for dandruff, dryness, hair fall, etc.
- Align with **eco-conscious or Ayurvedic** lifestyles.

### Challenges & Limitations in Herbal Shampoo Formulation

#### 1. Stability Issues

- **Degradation of herbal actives:** Natural extracts can oxidize, degrade, or lose potency over time.
- **Microbial growth:** Herbal ingredients (especially aqueous or powdered ones) are prone to contamination without strong preservatives.
- **Color & texture changes:** Natural colorants like hibiscus or neem may fade or cause unexpected changes over time.

#### 2. Preservation Complexity

- **Conflict with “natural” claims:** Strong preservatives like parabens are effective but often avoided in herbal products.
- **Natural preservatives (e.g., potassium sorbate, sodium benzoate)** may not be broad-spectrum enough on their own.
- **Essential oils alone are not sufficient** as preservatives despite antimicrobial properties.

#### 3. Foam and Sensory Performance

- Many herbal or natural surfactants (like soapnuts, shikakai) produce less foam, which consumers often perceive as less effective—even if cleaning power is adequate.
- Achieving a **pleasant texture, scent, and rinse feel** using mostly natural ingredients is difficult.

#### 4. Formulation Complexity

- **Incompatibility issues:** Herbal powders or extracts may destabilize emulsions, react with surfactants, or precipitate.
- **Standardization:** Potency of herbal extracts can vary due to season, source, or processing—leading to inconsistent efficacy.

#### 5. Regulatory and Safety Concerns

- **Lack of clinical validation:** Many herbal claims are based on traditional use, not rigorous testing.
- **Irritation potential:** Some herbs or essential oils (e.g., tea tree, neem, cinnamon) can cause allergic reactions or scalp irritation in sensitive users.
- **Labeling laws:** Regulatory bodies may require evidence for any therapeutic claims (e.g., “promotes hair growth”).

## 6. Cost and Supply Chain

- **Sourcing high-quality herbs** sustainably and consistently can be expensive.
- Herbal extracts often increase the raw material cost compared to synthetic ingredients.
- **Supply chain disruptions** (climate, harvesting season, regulations) can affect availability.

## 7. Consumer Expectations vs. Nature

- Many consumers expect **natural products to perform like synthetic ones** in terms of lather, fragrance, and shelf life, which can be unrealistic.
- “100% natural” shampoos are often **less aesthetically pleasing**, with short shelf life, no strong fragrance, and dull color.

## Solutions & Mitigations

- Use **standardized herbal extracts** from reputable suppliers.
- Combine **natural and safe synthetic preservatives** to ensure shelf stability.
- Educate consumers about **performance differences** in natural vs. synthetic formulations.
- Employ **gentle, biodegradable surfactants** that enhance foam without compromising natural claims.

## Future Prospects of Herbal Shampoos

### 1. Increased Demand for Natural and Clean Beauty

- Rising awareness of harmful chemicals (e.g., sulfates, parabens) has pushed consumers toward herbal and plant-based alternatives.
- Herbal shampoos align with "**clean beauty**", **vegan**, and **cruelty-free** trends.

**Market Insight:** The global herbal shampoo market is projected to grow steadily, driven by demand in Asia-Pacific, Europe, and North America.

### 2. Scientific Validation of Traditional Knowledge

- **Herbal ingredients with proven efficacy** (e.g., amla for hair growth, tea tree for dandruff) will gain trust as more clinical studies emerge.
- Collaboration between **modern cosmetology** and **traditional systems like Ayurveda and TCM** can lead to evidence-backed formulations.

### 3. Advanced Extraction and Delivery Technologies

- **Green chemistry** and **supercritical CO<sub>2</sub> extraction** will produce more potent, pure, and stable herbal actives.
- Use of **nanotechnology** (e.g., nanoemulsions, liposomes) may enhance penetration of herbal ingredients into the scalp and follicles.
- **Encapsulation** of volatile essential oils to prolong shelf life and control release.

### 4. Customization and Personalization

- Growth in **AI-driven diagnostics** and **DNA-based hair care** could lead to tailor-made herbal shampoos based on individual scalp conditions, hair types, or genetic data.
- **DTC (Direct-to-Consumer)** brands are already offering customizable herbal formulations.

## 5. Sustainable and Ethical Practices

- Shift toward **eco-friendly packaging, biodegradable ingredients, and zero-waste formulations.**
- Herbal shampoo brands that emphasize **ethical sourcing** of botanicals (especially endangered ones like sandalwood or bhringraj) will gain consumer trust.

## 6. Regulatory Evolution and Global Recognition

- Herbal products will face **tighter regulations**, especially in claims and safety.
- However, recognition of systems like Ayurveda and TCM in global cosmetic regulations (EU, US FDA) is increasing.

## 7. Integration into Scalp Health and Holistic Wellness

- Future formulations may move beyond cleansing to **treat scalp microbiome, stress-related hair fall, or hormonal imbalances** using adaptogenic herbs.
- Integration with **aromatherapy and mindfulness** as part of a holistic haircare ritual.

## Conclusion:

Herbal shampoos embody a powerful synergy between ancient wisdom and modern cosmetic science. Rooted in time-tested medical systems like Ayurveda, Traditional Chinese Medicine, and folk traditions, they offer natural solutions to common hair and scalp concerns. Despite their growing popularity, formulating effective and stable herbal shampoos comes with challenges—including ingredient instability, limited foaming, and preservation difficulties. However, the future is bright. Advances in extraction methods, delivery systems, and scientific validation are driving innovation. Consumer demand for clean, sustainable, and personalized hair care continues to rise, providing a fertile ground for herbal shampoo brands to thrive. By addressing limitations and embracing technological and regulatory progress, the herbal shampoo industry is poised to deliver products that are not only natural and safe, but also scientifically credible, effective, and eco-conscious.

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