

FORMULATION AND EVALUATION OF HERBAL HAIR TONIC USING *HIBISCUS ROSA-SINENSIS*

Anjana Singh¹, Dr. Amandeep Singh^{2*}, Krati³, Abhishek Bhardwaj³ and Dr. Esha Vatsa³

¹Student, School of Pharmaceutical Sciences, Jigyasa University (formerly Himgiri zee University), Dehradun.

²Principal & Professor, School of Pharmaceutical Sciences, Jigyasa University (formerly Himgiri zee University), Dehradun.

³Assistant Professor, School of Pharmaceutical Sciences, Jigyasa University (formerly Himgiri zee University), Dehradun.

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***Corresponding Author: Dr. Amandeep Singh**

Principal & Professor, School of Pharmaceutical Sciences, Jigyasa University (formerly Himgiri zee University), Dehradun.

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ABSTRACT

Alopecia, or hair loss, affects a significant proportion of the population due to genetic, environmental, and health-related factors. The use of herbal formulations in hair care is gaining popularity due to their minimal side effects and natural efficacy. This study focuses on the formulation and evaluation of an herbal hair tonic using coconut water, hibiscus leaves, and aloe vera juice. The active ingredients were selected based on their traditional and scientifically supported hair growth-promoting properties. The formulated tonic was evaluated for physicochemical parameters, microbial stability, and efficacy through qualitative and quantitative assessments. The results indicated promising potential for hair growth stimulation and prevention of alopecia. Additionally, this study discusses the mechanism of action of the active ingredients and their long-term impact on scalp health. The stability and effectiveness of the tonic over an extended period were also examined.

KEYWORDS: Herbal hair tonic, Sprayable formulation, Scalp health, natural preservatives, viscosity analysis.

INTRODUCTION

Alopecia, characterized by hair thinning or complete hair loss, can be attributed to several factors including genetics, hormonal imbalances, stress, and nutritional deficiencies. Conventional treatments such as minoxidil and finasteride have shown effectiveness but are often accompanied by side effects such as scalp irritation, dizziness, and dependency

on continued use. In recent years, herbal formulations have been explored as safer alternatives due to their rich phytochemical content and minimal adverse effects.^[1,2,3]

This study investigates a novel hair tonic formulated with coconut water, hibiscus leaves, and aloe vera juice, all known for their hair-strengthening properties. Coconut water is rich in essential vitamins and minerals that promote hair hydration and scalp nourishment. Hibiscus leaves contain flavonoids and amino acids, known to stimulate hair follicles and enhance growth. Aloe vera juice is packed with proteolytic enzymes that repair dead scalp cells, promoting healthy hair regrowth. Additionally, these ingredients offer antimicrobial and anti-inflammatory properties, reducing scalp infections and promoting optimal conditions for hair growth.^[2,3,4,25]

Hair Structure

The human hair is made up of two main parts: the **hair follicle**, which lies beneath the skin, and the **hair shaft**, which is the visible part that extends above the scalp. The hair shaft is composed of **keratin**, a strong protein that gives hair its strength and flexibility. It has three layers: the **cuticle** (the outermost layer with overlapping cells that protect the hair), the **cortex** (the middle layer that holds pigment and gives hair its color and strength), and the **medulla** (the innermost layer, often absent in fine hair). Hair health largely depends on the condition of the shaft, as it is the part exposed to styling, heat, pollution, and products. Proper care helps maintain the integrity of the shaft, reducing breakage and split ends while preserving shine and smoothness.^[4,5,6,49]

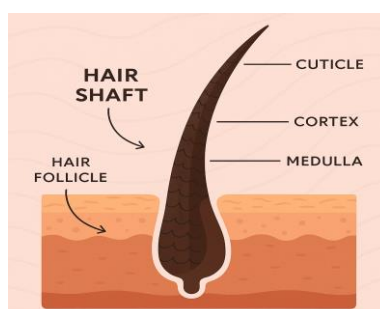


Fig No.1: The Structure of Hair.

Hibiscus

Plant Profile: Hibiscus (*Hibiscus rosa-sinensis*)

Common Names

- Hibiscus
- China Rose
- Shoe Flower
- Gudhal (Hindi)

Botanical Name: *Hibiscus rosa-sinensis*

Family: Malvaceae

Plant Type: Evergreen shrub or small tree



Fig. 2: Hibiscus leaves & flower.

Pharmacological uses

1. Managing hypertension
2. Improving cardiovascular health
3. Antioxidant
4. Antimicrobial agent

Traditional uses

Traditionally, hibiscus leaves have been widely used in hair care across many cultures, especially in India and Southeast Asia. The leaves are known for their natural mucilage, which acts as a gentle cleanser and conditioner, making hair soft, smooth, and manageable. People often grind fresh hibiscus leaves into a paste and apply it directly to the scalp and hair to strengthen the roots, reduce dandruff, and promote healthy hair growth. When combined with hibiscus flowers, the mixture is believed to stimulate blood circulation in the scalp and prevent premature graying.^[7,8] This age-old remedy, passed down through generations, continues to be valued in natural and Ayurvedic hair treatments for its nourishing and rejuvenating properties.^[9,10,11,50]

Herbal Hair Tonic

Crafted with love and pure botanical ingredients, our handmade herbal hair tonic is a powerful blend designed to nourish your scalp, strengthen roots, and promote natural hair growth.^[9,10,51]

Key Ingredients

- **Hibiscus Leaves** – Rich in amino acids and vitamin C, known to stimulate hair growth and prevent hair fall.
- **Coconut Water** – Hydrates the scalp and restores lost minerals, leaving your hair soft and refreshed.
- **Aloe Vera Juice** – Soothes irritation, reduces dandruff, and strengthens hair strands(11,53).
- **Clove Oil** – Boosts scalp circulation, helping to revive dull and thinning hair(12).
- **Coconut Oil** – Deeply moisturizes and protects against damage and split ends.
- **Lemongrass Oil** – Adds a refreshing citrus scent while balancing scalp oils.

MATERIALS AND METHODS

Table 1: List and uses of ingredients used in the formulation of herbal hair tonic.

Serial No.	Ingredients	Uses
1.	Hibiscus Leaves	Active ingredient
2.	Coconut water	Hydrate & Nourish
3.	Aloe-Vera Juice	Promote hair growth
4.	Coconut Oil	Deep moisturization
5.	Clove Oil	Antimicrobial, Antifungal
6.	Vitamin E	Repair hair damage
7.	Glycerine	Humectant
8.	Acacia Gum	Natural thickening agents
9.	Ethanol	For extraction purposes
10.	Sodium Benzoate	Preservatives

1. Hibiscus (*Hibiscus rosa-sinensis*)

Botanical name: Hibiscus rosa-sinensis

Biological source: it is a species of tropical hibiscus, a flowering plant in the hibisceae tribe.

Family: Malvaceae

Hibiscus Leaves

Hibiscus leaves are vibrant green, with a distinctive heart or oval shape, and serrated Edges. Rich in antioxidant, vitamins and minerals, hibiscus leaves are prized for their ability to nourish and strengthen hair.^[13,55,56]

Chemical constituents

Tannins, anthraquinones, quinines, phenols, Flavonoids, saponins, cardiac glycosides, protein, free amino acids.^[14,15,57]

Aloe vera

Aloe vera (*Aloe barbadensis* Miller) a member of the Liliaceae family Aloe vera is a Popular medicament plant with antioxidant and antibacterial properties. It may Reduce dryness of skin, dental plaque, speed wound, healing, promote hair Growth, and manage blood sugar.^[16,17,18,58]

Chemical constituents

Polysaccharides^[6], Minerals, Sugars, organic acids, vitamins, lignins, lipids Saponins, phytosterols, protein, and amino acids.^[59,60]

Methods

Preparation of herbal hair tonic

1. Extraction of Active Ingredients



Fig. 3: Powdered hibiscus leaves.



Fig. 4: Cold maceration.

- Fresh hibiscus leaves were collected, washed, and subjected to cold maceration to extract bioactive compounds.
- Aloe vera leaves were washed, and the inner gel was extracted and processed to obtain aloe vera juice.^[62]
- Coconut water was obtained from fresh coconuts and filtered to remove impurities.^[19,20,61]
- Additional glycerine and vitamin E tablet were incorporated to enhance moisturization and antioxidant activity.^[63,64]

Composition of water phase

Serial no.	Ingredients	Quantity
1.	Hibiscus dried extract	3ml
2.	Coconut water	40ml
3.	Aloe vera juice	40ml
4.	Distilled water	10ml

Composition of oil Phase

Serial no.	Ingredients	Quantity
1.	Clove oil	0.2 -1ml (4-20drops)
2.	Coconut oil	1-3ml (20-60 drops)
3.	Lemon grass oil (aroma)	2-4 drops

2. Formulation of the Hair Tonic



Fig. 5: concentrated hibiscus extract.

- The hibiscus extract is concentrated, dissolve it in 10ml of distilled water to ensure even mixing.^[65,66]
- Then, in a clean mixing beaker, combine aloe vera juice and coconut water.
- Add the diluted hibiscus extract and mix thoroughly.
- Natural thickening agents were included to ensure ease of application and adherence to the scalp.^[67,68]
- Incorporate vitamin E oil as a natural antioxidant.
- Essential oils such as coconut and clove were included to improve fragrance and provide additional scalp benefits.^[21,22,23]

Evaluation Parameters

- **pH Measurement:** Ensuring compatibility with the scalp's natural pH (4.5-6.0)
- **Viscosity:** Evaluated using a viscometer (Brookfield viscometer) to determine the thickness and flow properties of the tonic.^[69,70]
- **Spread ability:** Assessed using methods like the slip and drag method.
- **Shelf – Life Study:** The formulation contains natural antimicrobial agents (e.g. Sodium benzoate, essential oils, or plant extract.) Short -term stability at room temperature (e.g. 1-3 months).
- **Organoleptic parameters:** Include colour, Odor, texture, and appearance, assessed using sensory evaluation.

- **Efficacy Studies:** Conducted through in vitro and in vivo testing.
- **Phytochemical Analysis:** Performed to confirm the presence of key bioactive compounds contributing to hair grow.^[24,25,26]

RESULTS AND DISCUSSION



Fig. 6: Formulation (Herbal hair tonic).

➤ Physicochemical Evaluation

The formulated herbal hair tonic was observed to be clear with a mild, pleasant Odor. The pH was within the acceptable range for scalp application. The viscosity ensured ease of application and absorption. The inclusion of glycerine and vitamin E provided additional hydration and antioxidant benefits.^[71,72]

➤ Microbial Stability

To minimize microbial contamination, the formulation incorporates natural antimicrobial agents such as (sodium-benzoate) however, further microbiological analysis is required to confirm the products stability and safety.^[28,29,30,73]

➤ Phytochemical Analysis

Hibiscus leaves were found to be rich in flavonoids, polyphenols, and saponins, Terpenoids, Glycosides, all of which contribute to hair follicle stimulation. Aloe vera contained essential enzymes and amino acids that help in repairing the scalp and reducing dandruff formation. Coconut water provided key minerals such as potassium, magnesium, and calcium, which are essential for hair follicle nourishment. The presence of vitamin E enhanced the formulation's antioxidant profile.^[34,35,74]

➤ Efficacy Evaluation

- **In Vitro Analysis:** The herbal tonic demonstrated significant antioxidant properties, supporting its role in scalp nourishment and hair growth promotion
- **In Vivo Analysis:** Sensory Evaluation & self-reported Studies: conducted on a volunteer to assess Itching, burning, or discomfort after use.^[41,42]

➤ Result of evaluation parameter of herbal hair tonic

Serial no.	Test	Result
1.	Colour	Green
2.	Odor	Subtly floral
3.	Texture	Lightweight & non-greasy
4.	State	Liquid
5.	Skin irritancy effect	No irritancy effect
6.	pH	5.0-6.0

7.	Spread ability	Good
8.	Emulsification	Emulsified with glycerine (for oil dispersion)
9.	Solubility	Water based with dispersed oils.
10.	Shelf life	Approx, 3-4 months (with natural preservatives)
11.	Absorption	Fast – absorbing, non-sticky

➤ Mechanism of Action

- **Coconut Water:** Provides deep hydration and essential nutrients to the hair shaft and follicles, preventing breakage and strengthening roots.
- **Hibiscus Leaves:** Stimulates hair follicles through enhanced blood circulation, leading to increased hair density and reduced shedding.^[35,26,36]
- **Aloe Vera Juice:** Repairs dead skin cells on the scalp and acts as a natural conditioner, improving hair elasticity and preventing split ends.
- **Glycerine & Vitamin E:** Provide additional moisturization and antioxidant benefits, reducing oxidative stress on the scalp.
- **Essential Oils:** Improve scalp circulation and add antimicrobial properties.

CONCLUSION

The formulated herbal hair tonic comprising coconut water, hibiscus leaves, and aloe vera juice demonstrated excellent physicochemical stability, and hair growth-promoting efficacy. The presence of active phytochemicals contributed significantly to hair health, promoting follicle stimulation and reducing scalp dryness^(33,34). The study highlights the potential of herbal formulations as a natural alternative for preventing alopecia with minimal side effects. Future research with larger sample sizes and extended duration is recommended to establish its long-term benefits and optimize formulation ratios.^[46,47,48]

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