



## Review Article

# A Comprehensive Review on Formulation and Evaluation of Herbal Hair Oils

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The growing awareness of the adverse effects associated with synthetic hair care products has led to an increased interest in herbal formulations due to their safety, efficacy, and minimal side effects. The present study focuses on the formulation and evaluation of herbal hair oil using a combination of medicinal plant-based ingredients known for their therapeutic benefits in hair and scalp care. The formulation incorporates *Cocos nucifera* (coconut oil) as a base oil for its excellent nourishing and moisturizing properties, along with *Olea europaea* (olive oil), *Trigonella foenum-graecum* (fenugreek), *Matricaria chamomilla* (chamomile), *Calendula officinalis* (calendula), and Tocopherol (vitamin E) for enhanced scalp health, anti-inflammatory action, and antioxidant protection. Additionally, herbs such as amla, bhringraj, neem, hibiscus, brahmi, moringa, curry leaves, *Nigella sativa*, flaxseed, and garlic were incorporated to promote hair growth, reduce dandruff, improve blood circulation, and prevent premature greying. The herbal hair oil was prepared using the boiling method and evaluated through various physicochemical parameters including pH, viscosity, refractive index, acid value, saponification value, and specific gravity. Organoleptic properties such as color, odor, and texture were also assessed. Stability studies under different environmental conditions indicated good stability and shelf life, with no evidence of sedimentation, phase separation, or irritation in preliminary skin safety tests. The results demonstrated that the formulated herbal hair oil possesses significant potential in promoting hair growth, reducing hair fall, controlling dandruff, and improving overall hair texture and scalp health. The presence of bioactive phytoconstituents contributes to its antifungal, antibacterial, and antioxidant properties. Overall, the study supports the use of herbal hair oil as a safe, effective, and economical alternative to synthetic hair care products, highlighting its importance in modern herbal cosmetology.

**Keywords:** Herbal Hair Oils, .

## INTRODUCTION

Hair is an important integumentary structure that serves both protective and aesthetic functions in the human body. Structurally, hair is a keratinized filament characterized by remarkable strength, flexibility, and elasticity. It consists of three main parts: the bulb, located in the dermis; the root, embedded beneath the skin; and the shaft, which is the visible portion above the skin surface. Hair growth follows a cyclical pattern comprising three distinct phases—anagen (growth phase), catagen (transitional phase), and telogen (resting phase)—which regulate hair formation, development, and shedding. Hair care plays a vital role in maintaining scalp health and

enhancing physical appearance. Among various hair care products, hair oils are widely used due to their ability to nourish the scalp, strengthen hair fibers, and improve overall hair quality. Traditionally, herbal hair oils have been extensively utilized in medicinal systems such as Ayurveda, Unani, and Siddha for promoting hair growth, reducing hair fall, preventing dandruff, and maintaining scalp integrity. These traditional practices are supported by the use of natural plant-based ingredients known for their therapeutic properties. In recent years, there has been a significant shift toward herbal and natural cosmetics due to growing awareness of the potential adverse

effects associated with synthetic products, including scalp irritation, dryness, and long-term damage. Herbal cosmetics, also referred to as natural cosmetics, are formulations that incorporate plant-derived ingredients along with permissible cosmetic bases. Cosmeceuticals, a rapidly expanding segment within dermatology and the personal care industry, combine cosmetic and therapeutic benefits, offering enhanced efficacy and safety. Hair oils act as effective carriers for delivering bioactive compounds directly to the hair follicles and scalp. Commonly used base oils such as coconut oil, sesame oil, castor oil, and almond oil possess excellent emollient and conditioning properties, which help improve hair strength and texture. The incorporation of medicinal plant extracts further enhances the therapeutic potential of these formulations. Herbal ingredients such as *Eclipta alba* (Bhringraj), *Emblica officinalis* (Amla), *Bacopa monnieri* (Brahmi), *Azadirachta indica* (Neem), *Hibiscus rosa-sinensis* (Hibiscus), and *Aloe vera* are well recognized for their beneficial effects, including stimulation of hair growth, strengthening of hair roots, and maintenance of scalp health. Herbal hair oils are generally prepared by extracting active constituents from selected plant materials and incorporating them into suitable oil bases under controlled conditions. These formulations not only provide essential nutrients required for healthy hair growth but also help regulate sebaceous gland activity and improve overall scalp condition. Due to their natural origin, herbal formulations are considered more biocompatible and are associated with fewer side effects compared to synthetic alternatives. The formulation of polyherbal hair oil requires careful selection of ingredients, appropriate extraction methods, and optimized processing techniques to ensure maximum efficacy and stability. Furthermore, systematic evaluation of the final product is essential to assess its quality, safety, and performance. Important evaluation parameters include physicochemical properties such as pH, viscosity, refractive index, along with stability studies and efficacy assessments. Therefore, the present study aims to formulate and evaluate a polyherbal hair oil using scientifically validated herbal ingredients. The objective is to develop a safe, effective, and stable natural formulation that can serve as a suitable alternative to conventional synthetic hair care products.

## Method of Preparation of Herbal Hair Oil-

### 1. Collection and Processing of Plant Materials

Fresh plant materials (curry leaves, moringa leaves, aloe vera, hibiscus flowers, etc.) were collected and thoroughly washed with distilled water to remove impurities. The materials were shade-dried for 5–7 days to preserve their phytoconstituents. Dried materials were then coarsely powdered using a mechanical grinder and stored in airtight containers for further use.

### 2. Preparation of Herbal Extract

Accurately weighed quantities of powdered herbal ingredients such as fenugreek seeds, hibiscus, kalonji seeds, pumpkin seeds, garlic, and others were taken. The powders were mixed with a suitable quantity of coconut oil and almond oil. The mixture was heated at 60–70°C for 30–45 minutes using a double boiler method to ensure uniform heating and prevent degradation of active constituents. Heating was continued until a characteristic color change (deep brown) was observed, indicating proper extraction.

### 3. Filtration

The heated mixture was allowed to cool to room temperature and then filtered through a muslin cloth to remove solid residues. A clear, homogeneous oil was collected.

### 4. Final Formulation

To the filtrate, a small quantity of flavoring agent (e.g., jasmine oil) was added to enhance fragrance. Vitamin E was incorporated as a natural preservative to improve shelf life.

### 5. Storage

The prepared herbal hair oil was transferred into airtight amber-colored bottles and stored in a cool, dry place away from direct sunlight.

### Formulation Composition (Table Representation)

S. No.	Ingredient	Quantity (%)
1	Almond oil	29%
2	Coconut oil	q.s

3	Fenugreek seeds	2%
4	Moringa leaves	4%
5	Pumpkin seeds	2%
6	Hibiscus	1%
7	Kalonji seeds	1%
8	Garlic	4%
9	Curry leaves	1%
10	Flavouring agent	q.s

## Evaluation Parameters of Herbal Hair Oil

### 1. Organoleptic Properties

Color and Appearance Evaluated visually

Odor: Assessed by smell.

Clarity: Checked for transparency and absence of turbidity.

Grittiness: Tested by rubbing between fingers.

Sedimentation: Observed after keeping the oil undisturbed for 24 hours.

### 2. pH Determination

The pH of the formulation was determined using a calibrated pH meter (or pH paper) to ensure compatibility with scalp pH.

### 3. Viscosity

Viscosity was measured using an Ostwald viscometer at room temperature to determine flow properties.

### 4. Specific Gravity

Specific gravity was determined using a specific gravity bottle to assess density relative to water.

### 5. Acid Value

10 mL of oil was mixed with 25 mL ethanol and 25 mL ether. Phenolphthalein was added as an indicator and titrated against 0.1 M potassium hydroxide (KOH) solution. Acid value was calculated using standard formula.

### 6. Skin Irritation Test

The formulation was applied to healthy human skin and observed for 20–24 hours for any signs of irritation, redness, or inflammation.

### 7. Stability Study

Stability studies were performed by storing the oil under different conditions:

Room temperature

Cold storage

Elevated temperature

The formulation was evaluated periodically for changes in color, odor, phase separation, and consistency.

### Alternative Extraction (Decoction Method)-

In an alternative method, ingredients such as shikakai, aloe vera pulp, hibiscus, and fenugreek were processed using the decoction method. The extract was mixed with almond oil, heated for 15 minutes, filtered, and then coconut oil was added to make up the final volume.

## LITERATURE REVIEW

### 1. Background and Rationale

Herbal hair oils have been extensively utilized in traditional systems of medicine such as Ayurveda, Unani, and Siddha for maintaining hair health, promoting growth, and preventing scalp disorders. In recent years, increasing awareness regarding the adverse effects of synthetic cosmetic products has led to a growing demand for natural and plant-based formulations. Herbal oils are considered advantageous due to their biocompatibility, minimal side effects, and ability to target multiple biological pathways involved in hair follicle health, including oxidative stress, inflammation, and microbial imbalance.

### 2. Traditional Herbal Ingredients and Their Pharmacological Activities

A wide range of medicinal plants are incorporated into herbal hair oil formulations owing to their therapeutic properties:

*Eclipta alba* (Bhringraj): Commonly referred to as the “king of hair,” it has demonstrated significant hair growth-promoting activity. Roy et al. (2008) reported that methanolic extracts enhanced the anagen phase and increased hair length in albino rats.

*Embolica officinalis* (Amla): Rich in vitamin C and tannins, Amla strengthens hair follicles, delays premature greying, and exhibits strong antioxidant activity (Kapoor et al., 2011).

*Hibiscus rosa-sinensis*: Known for its conditioning and hair growth properties, petroleum ether extracts have been shown to significantly increase hair length and follicular density in experimental models.

*Azadirachta indica* (Neem): Possesses antifungal, antibacterial, and anti-inflammatory properties, making it effective in controlling dandruff and scalp infections (Kaur et al., 2010).

*Cocos nucifera* (Coconut oil): Widely used as a base oil due to its excellent penetration into the hair shaft and ability to reduce protein loss (Rele and Mohile, 2003).

Additionally, other commonly used herbs such as Brahmi (*Bacopa monnieri* / *Centella asiatica*), Methi (*Trigonella foenum-graecum*), Curry leaves (*Murraya koenigii*), and *Nigella sativa* contribute to improved hair strength, nourishment, and scalp health.

### 3. Herbal Oil Formulation Approaches

Several studies have focused on the development of polyherbal hair oil formulations using different extraction and preparation techniques:

**Classical infusion method:** Involves boiling powdered plant materials in carrier oils such as coconut or sesame oil at controlled temperatures (60–70°C), followed by filtration.

**Polyherbal formulations:** Rathod et al. (2010) developed a formulation containing Bhringraj, Amla, Brahmi, and Neem, which showed enhanced hair growth and follicular density.

**Optimized formulations:** Pakhale et al. (2012) prepared herbal oil using *Hibiscus*, Amla, Shikakai,

and Reetha, demonstrating excellent conditioning and non-irritant properties.

**Comparative studies:** Prajapati et al. (2011) reported that formulations containing *Eclipta alba* and coconut oil significantly improved hair length and density in albino rats over 21 days.

These studies highlight the importance of ingredient synergy, extraction techniques, and formulation optimization in enhancing product efficacy.

### 4. Evaluation Parameters of Herbal Hair Oils

To ensure quality, safety, and effectiveness, herbal hair oils are evaluated using standardized parameters:

**Physicochemical properties:** pH, viscosity, density, refractive index, acid value, and saponification value ensure stability and suitability for topical application.

**Stability studies:** Conducted under accelerated conditions to monitor changes in color, odor, consistency, and phase separation.

**Biological evaluation:** Hair growth activity is assessed using animal models by measuring hair length, follicular density, and growth phases, often supported by histological analysis.

**Sensory evaluation:** Includes assessment of fragrance, texture, spreadability, and ease of application through volunteer studies.

**Safety studies:** Skin irritation and allergenicity tests confirm the non-toxic and non-irritant nature of formulations.

### 5. Efficacy and Mechanism of Action

Herbal hair oils exert their effects through multiple mechanisms:

**Nutritional support:** Provision of essential vitamins, minerals, and fatty acids to hair follicles.

**Antioxidant activity:** Protection against oxidative stress-induced hair damage.

**Antimicrobial action:** Control of dandruff-causing fungi and bacteria.

Improved scalp circulation: Enhancement of blood flow to hair follicles, promoting growth.

Phytochemical constituents such as flavonoids, saponins, tannins, and alkaloids play a significant role in these biological activities.

## 6. Regulatory and Safety Considerations

Although herbal products are generally perceived as safe, proper standardization and quality control are essential. Regulatory bodies such as the World Health Organization (WHO, 2007) and AYUSH emphasize the need for validated protocols, absence of harmful additives, and proper toxicity evaluation to ensure product safety and efficacy.

## CONCLUSION-

Herbal hair oils represent a safe, effective, and eco-friendly alternative to synthetic hair care formulations, gaining increasing importance in modern cosmetic and healthcare systems. The present formulation, developed using a combination of traditionally valued medicinal plant-based ingredients such as coconut oil, almond oil, sesame oil, hibiscus, and jasmine, demonstrates significant potential in promoting overall scalp and hair health. These herbal ingredients provide essential nutrients, including vitamins, minerals, and bioactive compounds, which help maintain the normal function of sebaceous glands and support natural hair growth. The synergistic action of the selected herbal constituents contributes to multiple therapeutic benefits, including reduction of hair fall, promotion of hair thickening, improvement in scalp blood circulation, anti-dandruff activity, and enhancement of hair texture and shine. Additionally, the formulation may aid in managing conditions such as alopecia and premature greying, thereby improving overall hair quality. The prepared herbal hair oil was evaluated using various physicochemical and quality control parameters, including pH, viscosity, specific gravity, acid value, saponification value, organoleptic characteristics, stability studies, and skin irritation tests. The results were found to be within acceptable limits, confirming the formulation's safety, stability, and suitability for human use. In conclusion, the developed herbal hair oil formulation exhibits significant quality, efficacy, and safety, making it a promising natural alternative

for long-term hair care. However, further standardization of raw materials and advanced clinical studies are recommended to ensure consistency, reproducibility, and enhanced therapeutic outcomes.

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**Cite:** Shahnwaj Khan\*, Soyal, Saurabh Singh Sikarwar, Abhishek Singh, Pradeep Kumar, A Comprehensive Review on Formulation and Evaluation of Herbal Hair Oils, *Int. J. Med. Pharm. Sci.*, 2026, 2 (5), 15-20. <https://doi.org/10.5281/zenodo.19968872>