



## Research Article

# Formulation and Evaluation of Herbal Hair Serum

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The formulation and evaluation of a herbal hair serum with natural elements as a safer substitute for artificial hair care products is the main goal of the current study. Herbal cosmeceuticals are becoming more and more popular as worries about the negative consequences of chemical-based formulations develop. The hair serum used in this study was made with extracts of fenugreek, flaxseed, and *Murraya koenigii* (curry leaves), as well as vitamin E, almond oil, coconut oil, and rose water. These components are renowned for their advantageous qualities, which include antioxidant activity, scalp nourishment, hair strengthening, and hair growth promotion. The produced formulations were evaluated for a number of physicochemical characteristics, such as pH, viscosity, spreadability, homogeneity, stability, irritant potential, and organoleptic characteristics (color, odor, and texture). The prepared serum had a pleasant scent, a smooth texture, an easy-to-apply consistency, and a yellowish-brown tint. The formulation's pH of 5.86 was determined to be within the permissible range for scalp compatibility, suggesting a low risk of irritation. Additionally, the serum demonstrated suitable viscosity and acceptable spreadability, which improved its performance and usage. Stability tests verified that the formulation's properties did not significantly change under various storage settings. The serum's safety and efficacy were further confirmed by its potent antioxidant activity and lack of skin irritation. All things considered, the created herbal hair serum is a viable, affordable, and environmentally responsible substitute for preserving healthy hair and enhancing its quality.

**Keywords:** Herbal hair serum, *Murraya koenigii*, Flaxseed, Fenugreek, Antioxidant activity, Hair growth.

## INTRODUCTION

The demand for cosmetic items has increased as a result of the cost growth in living standards worldwide. Since many individuals wish to remain young and appealing, cosmetics have become more important. The term "cosmeceuticals" describes the union of the pharmaceutical and cosmetics industries. Cosmetics manufacturers Pharmaceutical companies make medications, whereas cosmetic companies make cosmetics. Cosmeceuticals are skincare products that blend medications and cosmetics. [1] A crucial part of the human body is hair. Since a person's hair is thought to be one of the key components that enhance their appearance, it's crucial to Take good care of your hair. The definition of hair is "improved epithelial structure formed as a result of keratinization

of germinative cells." Hairs are the protuberances of the skin's follicles. Hair is present on the face, scalp, and skin, among other places A key component of hair growth is the scalp, and human hair is regarded as one of the symbols of beauty in people. The soft tissue layers that cover the skull and the hair-growing region of the head are called the skin. Numerous sebaceous glands and hair follicles make up the scalp. The hair shaft's pH is 3.67 while the scalp's is 5.5. [2] Hair loss is a common and upsetting condition that is influenced by environmental, medical, dietary, and genetic factors. The most prevalent cause of hair loss in men is androgenic alopecia, often known as male-pattern baldness, but in women, medical problems such as hypothyroidism, oral contraceptives, and nutritional deficiencies are responsible for hair loss. [3] Hair serum originated from the ancient cultures' use of

plant extracts and natural oils to nourish and improve hair. However, the present concept of hair serum as a distinct hair care product emerged in the late 20th century as a result of advances in cosmetic science and customer desire for more specialized hair care products. [4] In the 1980s and 1990s, hair serums became a popular new category of hair care products. These serums were created with lightweight oils, silicones, and other conditioning agents to improve shine, lessen frizz, and protect hair from the weather. Prior to being made available to consumers for use at home, hair serums were mostly utilized in professional salon settings. [5] Natural hair care products are becoming more popular these days as an alternative to chemical ones. The term “herbal hair serum” has gained popularity recently. Herbal hair serums frequently contain a variety of natural substances, including vitamins, essential oils, and botanical extracts. [6]

#### ❖ **Highlight of hair serum:**

- One hair styling product that creates a protective layer on the hair’s surface is hair serum.
- Basically, it is a liquid hair care solution that has a viscosity that is more akin to water.
- Silicone is used in the formulation of this style product to improve hydration, gloss, and smoothness by forming a protective coating on the hair’s surface. Additionally, it offers protection from pollution and humidity.
- Made to be used with wet hair. [7]

#### ❖ **Types of hair used for hair serum:** [8]

- Straight
- Wavy
- Curly
- Coily

#### ❖ **Benefits of hair serum:**

- **Protect hair:** It protects against pollution, dust, heat, and sun damage. When hair serum is applied to hair, a thin film is formed that shields the hair from harm.
- **Gives shine to the hair:** The thin layer that reflects light is formed by hair serum. The hair gets its glossy look from the serum. The amino

acids found in hair serum protect chemically treated and colored hair.

- **Multipurpose:** Many hair-related issues can be resolved with hair serum. Your hair becomes silky and lustrous after a few drops of hair serum, which transforms a poor day into a good one. It is one solution for several hair problems.
- **Nourished hairs:** Follicular fissures are filled with hair serum, which also repairs damaged hair. Hair serum helps manage hair, which makes it shiny and portable.
- **Best for hair dry:** Hair serums are most frequently used for dry, frizz-prone, and damaged hair. Hair serum hydrates hair and gives it a smooth, glossy appearance.
- **Prevent hair fall from breakage:** We lose many hair follicles when our hair gets frizzy, damaged, untidy, or knotted in other conditions. In these situations, hair serums serve as a lubricant, making them easier to detangle and potentially preventing hair loss issues. [9]

## MATERIAL AND METHOD:

### 1) **Murraya koenigii (Curry leaves):**



**Botanical name:** *Murraya koenigii (L.) Spreng.*

**Family** – *Rutaceae*

**Synonym-** Curry leaf, Indian bay leaf, Sweet neem

**Chemical constituents** – alpha-linoleic acid (ALA), Omega-3 fatty acid, lignans, etc

**Uses** – Anti-inflammatory, anti-oxidants, hair growth Stimulator.

The curry tree, *Murraya koenigii* or *Bergera koenigii*, is a tropical to sub-tropical tree in the family Rutaceae (the rue family, which includes rue, citrus, and satinwood), and is native to Asia. The plant is also sometimes called sweet neem, though *M. koenigii* is in a different family to neem, *Azadirachta indica*, which is in the related family Meliaceae. Its leaves, known as curry leaves, are used in many dishes in the Indian subcontinent. [10]

#### Extraction of *Murraya koenigii* (Curry leaves):

Weigh 100 g of *Murraya koenigii* leaf powder. Add it to a conical flask containing 500 mL of 70% ethanol. Seal the flask and keep it in a dark place at room temperature for 72 hours. Shake occasionally to enhance extraction. Filter the extract through muslin cloth followed by Whatman No. 1 filter paper. Concentrate the filtrate using a rotary evaporator at 40°C under reduced pressure. Dry the residue and store in a clean, airtight container in a cool place. [11]

#### 2) Flaxseed:



**Botanical name:** *Linum usitatissimum*

**Family** – *Linaceae*

**Synonym-** Linseed, flaxseed

**Chemical constituents** – alpha-linoleic acid (ALA), Omega-3 fatty acid, lignans, etc

**Uses** – Anti-inflammatory, anti-oxidants, hair growth Stimulator. [12]

Flaxseed, also called linseed, is a crucial component of functional foods because of its high levels of lignans, fiber, and -linolic acid (ALA, an omega-3 fatty acid). One possible health benefit of flaxseed oil,

fibers, and lignans is a decrease in cardiovascular disease, atherosclerosis, diabetes, cancer, osteoporosis, arthritis, autoimmune, and neurological disorders. Flaxseed is also a great source of fatty acids and antioxidants, which help rid the scalp of dead skin cells and pollutants. Using flax seed gel as a moisturizer on the scalp and hair helps strengthen existing hair and encourage new growth. Skin hydration and suppleness are maintained by flaxseed extract. [13]

**Extraction of flaxseed:** 5 g of flaxseed was taken in a clean conical flask. 50 mL of Distilled water was added to the flask at ratio 1:10. (1 Part of seed), Then boiled it at 70°C for 20 minutes to obtain viscous gel. The extract was filtered using muslin cloth and stored at refrigerated temperature. [14]

#### 3) Fenugreek:



**Botanical name:** *Trigonella foenum-graceum*

**Family** – *Leguminosae*

**Synonym** – Methi, Methika, Alholva, Chandrika.

**Chemical constituents-** Vitamin B, alkaloids, Flavonoids, saponins, etc.

**Uses** – Hair growth stimulant, antibacterial. [12]

A dietary supplement made from fenugreek seed extract also includes micronutrients like antioxidants, B vitamins, and trace minerals found in hair. It is a leguminous herb, fenugreek (*Trigonella foenum-graceum L.*). The mechanism underlying fenugreek's recognized positive benefits on hair growth is unknown. Fenugreek is said to enhance the blood flow of hair follicles and steroid saponins, which interacts physiologically with the creation of DHT

(dihydrotestosterone). One possible explanation for both male and female variable hair loss is the effect of DHT on genetically predisposed hair follicles. When DHT is bound to the hair follicle, the hair gradually shrinks and eventually stops growing. [6]

**Extraction of fenugreek:** 10 g of fenugreek seed powder was taken in a clean conical flask. 100 mL of Distilled water was added to the flask at ratio 1:10. (1 Part of seed), The mixture was kept aside for 72 hours at room temperature. The flask was shaken occasionally to enhance extraction. After maceration, extract was filtered using muslin cloth followed by Whatman filter paper. The obtained extract was stored in an airtight container for further use. [15]

**4) Almond oil:** -Your hair can be softened and strengthened by the nutritional oil. Due to its high content of vitamin B-7 (biotin), almond oil helps maintain the health and strength of hair and nails. It can also safeguard your hair from sun damage, as it has a natural SPF of 5. Almond oil can be used to treat the scalp. As a nutritional oil, almond oil can soften and strengthen your hair. The almond oil contributes to the health and strength of hair and nails. [6]

**5) Coconut oil:-** One of the best natural hair nutrients is coconut oil. It helps hair grow shiny and healthily. It also works very well to stop protein loss, which can lead to your hair growing in a number of unhealthy or ugly ways. Coconut oil is frequently used for hair care on the Indian subcontinent. Most people in those countries put coconut oil on their hair every day after taking a bath or shower. It works wonders as a conditioner and promotes the growth of damaged hair. It also provides the vital proteins required to nourish and repair damaged hair. Studies have shown that coconut oil gives hair a stronger defense against damage caused by weariness. Regular massages with coconut oil may be beneficial. [6]

**6) Rose water:** - Rose petals are excellent for the hair, particularly when combined with other healing elements like oil, rosemary oil, and honey. It strength and strengthens hair while providing the skin with intense nourishment and hydration. Rose water is a mild stringent which

may help to reduce oiliness and dandruff has until inflammatory properties, which may make it beneficial for certain scalp conditions like psoriasis and eczema. Many women with curly hair swear by rose water's ability to calm down frizz and add shine. With its pleasant scent and antioxidant properties, rose water has become a popular ingredient in skincare as studies have shown that the extracts in rose water may have anti-inflammatory capabilities and can help the skin. And while many scalp concerns can be traced back to irritation and inflammation, rose water has also been used on the scalp and hair. [16]

**7) Vitamin E:** - Oil with a lot of vitamin E can help restore luster and replenish that protective layer. In general, oil helps protect the hair from damage, minimize breakage, and seal out moisture. Shine can be restored and the protective layer replaced using vitamin E-rich oil. In general, oil keeps the hair hydrated, reduces breakage, and shields it from harm. Because vitamin E includes natural antioxidants that may encourage hair growth, it may help support a healthy crown and hair. The amount of oxidative stress and free radicals that cause the hair follicle cells in one's crown to deteriorate can be decreased by vitamins and antioxidants. [6]

#### Formulation of Herbal Hair Serum:

1. Take required quantity of Rose water in a clean beaker as base.
2. Add measured quantity of *Murraya koenigii*(curry leaves), fenugreek & flaxseed extract and mix uniformly.
3. Add coconut oil & almond oil and stir continuously to obtain smooth consistency.
4. Pierce vitamin E capsule into the mixture.
5. Stir continuously until a homogeneous serum is formed.
6. Transfer the prepared serum into a clean, airtight container.
7. Labelled the container.
8. Store in a cool and dry place. [17,18]

#### Formulation Table of Herbal Hair Serum

Sr. No	Ingredients	F1	F2	F3
1	Murraya koenigii (curry leaves)	6.5 gm	7 gm	7.5 gm
2	Fenugreek	4.5 ml	4 ml	3.5 ml
3	Flaxseed	11 ml	11 ml	11 ml
4	Almond oil	1 ml	1 ml	1 ml
5	Coconut oil	0.5 ml	0.5 ml	0.5 ml
6	Rose Water	25 ml	25 ml	25 ml
7	Vitamin E	1.5 ml	1.5 ml	1.5 ml
8	Distilled water	QS	QS	QS

### Evaluation Tests:

**1. Organoleptic Evaluation:** The formulated serum was evaluated visually for Colour, odour, texture & consistency. [19]

- Colour: The appearance was noted as yellowish brown.
- Odour: Evaluated and found to be aromatic, pleasant.
- Texture: Checked for smoothness and uniformity.
- Consistency: Assessed manually and found to be suitable for easy application.

**2. Test for homogeneity:** After applying the hair serum on a dry and clean object glass, a cover glass was sealed. The appearance under some coarse particle/homogeneity light was examined. Visual inspection was used to check the herbal hair serum for homogeneity and for any lumps, flocculates, or aggregates.

**3. pH test:** A calibrated digital pH meter was used for the determination of pH. One gram of the serum formulation was taken. The formulation was dispersed in distilled water. The pH of the prepared solution was measured using the pH meter. The measurement was carried out in triplicate. The average pH value was calculated. The observed pH was compared with the acceptable range of 5.5 to 6.5 to ensure skin compatibility.

**4. Spreadability:** A clean butter paper was taken. Two drops of the serum formulation were placed on the butter paper. A glass slide was carefully

placed over the sample. Weights of 1 g, 2 g, and 5 g were applied sequentially on the glass slide. The weights were allowed to remain for 60 seconds. After the specified time, the weights and glass slide were removed. The area covered by the spreaded serum was measured. The observations were recorded to evaluate the spreadability and ease of application.

**Formula:  $S = (M \times L) / T$**

Where,

S= Spreadability

M= Weight in the pan (tied to the upper slide)

L= Length moved by the glass slide

T =Time (in sec) taken to separate the slides completely. [6]

**5. Test for sensitivity:** After applying the serum to the skin and allowing it to sit in the sun for ten minutes, the skin is examined to check for rashes or itching. [19]

**6. Viscosity:** A Brookfield viscometer was used to determine the viscosity using spindle number 6.50 milliliters of hair serum were added to the beaker, and the viscosity was evaluated at 10, 20, 50, and 100 rpm.

**Observation:** The formulation showed appropriate viscosity, indicating good consistency and ease of application. [6]

❖ **Evaluation parameter:**

Sr No.	Parameters	Results
1	colour	yellowish brown
2	odour	pleasant
3	Test	Smooth, Homogeneity
4	pH	5.86
5	Viscosity	125.4 cP
6	Spreadability	Easy & uniform application
7	Stability	Stable at room temperature, refrigerator
8	Antioxidant activity	Strong antioxidant
9	Irritation study	No redness & itching

## RESULT AND DISCUSSION:

### RESULT

The physicochemical and performance parameters of the prepared herbal hair serum were assessed, and the findings were satisfactory. It was aesthetically pleasing due to its smooth texture, pleasant scent, and yellowish-brown color. For ease of handling and application, the consistency was suitable. Uniform ingredient distribution was indicated by the formulation's outstanding homogeneity, which showed no lumps or phase separation. Its pH of 5.86 ensured skin compatibility and a low risk of irritation, falling within the recommended scalp range of 5.5–6.5. The serum's appropriate viscosity and good spreadability improved stability and usability. Stability tests verified that there were no appreciable changes in texture, color, or odor at room temperature or in a refrigerator. Additionally, it demonstrated high antioxidant activity, which aids in lowering oxidative stress and enhancing hair health. Sensitivity testing revealed no irritation, proving safety. All things considered, the serum is a promising natural hair care option that is stable, safe, and effective.

### DISCUSSION

This study shows how a herbal hair serum made with natural elements including curry leaves, fenugreek, flaxseed, coconut oil, almond oil, rose water, and vitamin E may be successfully developed and evaluated. Because natural formulations are safer than synthetic ones, there is a growing demand for herbal cosmeceuticals. A serum with a smooth texture, agreeable odor, and appropriate consistency was produced as a result of the preparation method's successful extraction of active ingredients. The evaluation revealed a pH of 5.86, which is within the

permitted range for the scalp and guarantees minimum irritation and compatibility. The serum supported user acceptability and simplicity of application with its suitable viscosity and good spreadability. Under different circumstances, stability studies verified that there were no appreciable alterations. In general, the mixture enhances hair quality and scalp health. To validate long-term efficacy and encourage widespread use, more clinical research is required

## SUMMARY AND CONCLUSION:

### SUMMARY

The formulation and evaluation of a herbal hair serum with natural elements as a safer substitute for synthetic hair care products is the main topic of this study. Oxidative stress, hormonal imbalance, poor nutrition, and environmental exposure are typical causes of hair issues like thinning, dandruff, dryness, and hair loss. Herbal formulations are becoming more popular due to the adverse consequences of chemical-based solutions. Curry leaves, fenugreek, flaxseed, coconut oil, almond oil, rose water, and vitamin E were among the substances used to make the serum, each of which contributed advantageous qualities like antioxidant activity, nourishment, scalp conditioning, and hair growth encouragement. Maceration and decoction techniques were used to create the extracts, which were then formulated into a homogenous serum. The produced serum was assessed for a number of characteristics, such as stability, homogeneity, spreadability, pH, viscosity, organoleptic qualities, and irritating test. According to the findings, the serum had a skin-friendly pH (5.86), good spreadability, a nice look, and an appropriate consistency. It showed no symptoms of irritation and remained stable under various storage settings.

According to the study's overall findings, the herbal hair serum's formulation is safe, stable, and effective, and it may enhance shine, nourish the scalp, and lessen hair loss. It also shows that, while more clinical research is advised for confirmation, herbal hair serums can be a viable natural substitute for synthetic products.

## CONCLUSION

Using natural elements including *Murraya koenigii* (curry leaves), flaxseed, fenugreek, almond oil, coconut oil, rose water, and vitamin E, this study effectively illustrates the creation and assessment of a herbal hair serum. Appropriate pH, good viscosity, outstanding spreadability, and stability under various conditions were among the formulation's desirable physicochemical characteristics. Furthermore, the serum showed no indications of irritation, demonstrating its safety for topical use. Improved hair nourishment, scalp health, and defense against typical hair issues like dryness, dandruff, and hair loss were all made possible by the addition of herbal substances high in vitamins, antioxidants, and vital fatty acids. These natural ingredients work in concert to improve the strength, gloss, and general manageability of hair. The study also backs the increasing demand for herbal cosmeceuticals as safer and more potent substitutes for manufactured goods. In addition to serving cosmetic purposes, the produced herbal hair serum offers medicinal advantages with few adverse effects. To sum up, the herbal hair serum is a viable, economical, and environmentally friendly way to keep your hair healthy. Its effectiveness and economic potential can be further confirmed by large-scale production and clinical evaluation studies in the future.

## CONFLICT OF INTEREST:

Regarding this investigation, the authors have no conflicts of interest.

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