

Formulation and Assessment of Herbal Hair Serum for Hair Growth Treatment

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ABSTRACT

The usage of chemical-laden hair products, hormone imbalances, and environmental stressors all contribute to the common worry of hair loss. Banana flower extract, orange oil, fenugreek seed extract, reetha extract, vitamin E, castor oil, methylparaben, and aloe vera gel are the ingredients used in this study to create and assess a herbal hair serum. Through the synergistic effect of natural components, the recipe was created to nourish, encourage hair growth, and enhance scalp health. This serum's physicochemical characteristics, such as its pH, viscosity, stability, spreadability, and microbial load, were assessed. The formulation was found to be stable, pH-balanced, and aesthetically pleasing. The serum's potential as a safe and efficient herbal hair care product is supported by preliminary user comments that indicated improvements in hair texture, decreased hair fall, and increased hair density. The formulation was found to be stable, pH-balanced, and aesthetically pleasing. The serum's potential as a safe and efficient herbal hair care product is supported by preliminary user comments that indicated improvements in hair texture, decreased hair fall, and increased hair density.

Keywords: Vitamin E, banana flower, hair development, herbal hair serum, and scalp care

I. INTRODUCTION:

A person's appearance and mental health are greatly influenced by their hair. However, stress, pollution, hormone imbalances, and the regular use of chemical-based hair treatments have all contributed to other issues including hair loss, thinning, and poor hair development. Herbal and natural hair care solutions are becoming more and more popular as people become more conscious of the negative consequences of synthetic cosmetics.

Because herbal formulations include bioactive phytoconstituents and have fewer adverse effects, they are thought to be safer and more effective. Numerous natural substances with demonstrated hair-promoting qualities are highlighted in traditional medical knowledge. Banana flower extract, orange oil, fenugreek seed extract, reetha extract, vitamin E, castor oil, aloe vera gel, and methylparaben as a preservative are among the natural ingredients included in this study's formulation of a herbal hair serum.

Antioxidants and flavonoids, which are abundant in banana flowers, promote scalp nourishment and lessen oxidative stress on hair follicles. Orange oil has antibacterial properties and increases blood circulation. It is well known that fenugreek seeds fortify hair roots and stop dandruff. A natural cleanser called Reetha helps keep the scalp clean without using harsh chemicals. Aloe vera gel calms the scalp and acts as a natural gel base, while castor oil and vitamin E support hydration, follicle healing, and increased hair elasticity.

The objective of this study is to create a herbal hair serum that is both stable and effective, as well as to assess its physicochemical properties and initial efficacy in boosting hair growth. The goal of this formulation is to provide a sustainable, safe, and natural substitute for traditional hair care products.

1. HAIR: One of a mammal's distinguishing traits, hair serves a variety of purposes, including providing protection from the elements, such as heat, cold, etc. Along with these sebaceous and sweat glands, hair is one of the vital body parts that are thought to be protective appendages and an accessory structure of the integument.

Hair structure:

- There are two components to hair:
- Hair Follicle: The Follicle is a club-like

structure in the skin. At the apex of the follicle, there may be a network of blood vessels that provide nutrients to support and encourage hair development. This is known as the papilla. The communication between the dermis and epidermis results in each follicle.

- There are three sections to the follicle:

 1. Infundibulum: reaches from the sebaceous gland entrance level to the follicle's surface opening.
 2. Isthmus: Reaches the point where the arrector pili muscle inserts from the infundibulum.
 3. Inferior segment: A tuft of loose, vascularized connective tissue known as the dermal papilla invaginates the base of the bulb. Numerous blood vessels can be seen in the hair's papilla, which also supplies nutrients for hair growth.

- Hair Shaft: There are three layers to the hair shaft:

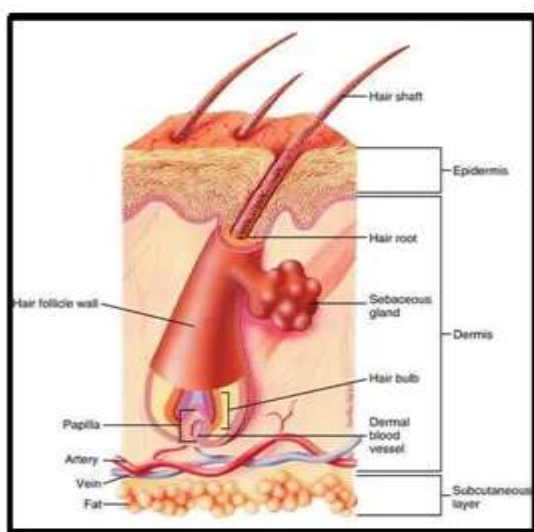


Fig1: Structure of Hair

1. The bulb, root, and shaft are the fundamental components of hair.
2. Among the well-known issues with hair are split ends, dandruff, lice, hair fall, and grey hair.
3. Despite its seemingly straightforward appearance, a hair is one of the body's most intricate systems. There are two structures in hair.

Types of hair:

The hair follicle determines the curl pattern of the hair, which is the main indicator of hair type. Hair type is largely determined by genetics. Oprah Winfrey's stylist for decades, Andre Walker, is

1. Medulla: The middle portion of hair is called the medulla. It will either be divided or segmented, or it will be continuous or doubled. They frequently resemble hollow tubes or are crammed with cells.

Most hairs lack the medulla, although others may have a damaged or discontinuous medulla. It forms the midpoint of the hair shaft. This layer is usually absent in very fine hairs.

2. Core: The melanin (hair pigment), which makes up the majority of the hair shaft, is what gives hair its color.
3. Cuticle: The cuticle is the transparent outer layer of the hair shaft. It is made up of overlapping scales that protect the inner layers of the hair. These scales point to the proximal end of the hair, which is closest to the scalp, and the distal end.

recognized for developing a method that divides hair into four curl forms. Type 1 is Straight Type 2 is Wavy Type 3 is Curly Type 4 is Coily.

CYCLE OF HAIR GROWTH:

There are three stages in the hair development cycle:

1. Anagen stage (development)
2. The transitional catagen stage
3. Stage Telogen (Rest)

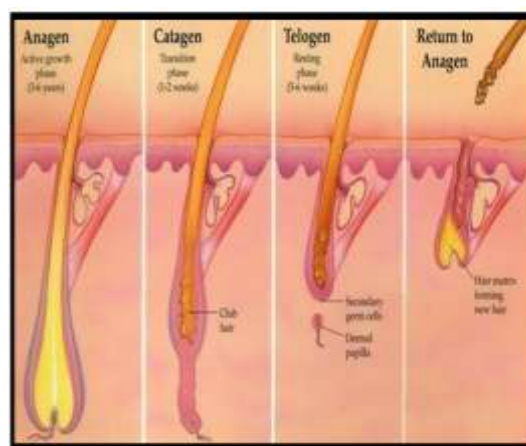


Fig2 Hair Growth Cycle

1. Anagen phase: This is the stage during which hair grows. The duration of the anagen phase is two to six years. The new hair that stopped growing is pushed out of the follicle by a new hair.
2. Catagen phase: 3% of all hairs are in the catagen phase at any given moment, which is a transitional stage. This stage lasts for two to three weeks.
3. Telogen phase: This is the period of rest that lasts for

two to three months. The club hair is fully developed and the hair follicle is at rest during the telogen phase.

2. What is meant by hair serum?

A styling substance called hair serum is applied to the hair's surface. One type of liquid hair care product is hair serum. It is more viscous than water. Hair serums are silicone-based styling solutions that add more shine, moisture, and softness to your hair by coating its surface.

Hair serums are used on damaged hair, which makes them appropriate for use:

- 1] Straight
- 2] Wavering
- 3] Curly
- 4] Coily

The Advantages Of Hair Serum

- 1) Shield hair from the effects of the environment.
- 2) Hair serum does wonders for softening, smoothing, and silky hair.
- 3) Manage frizz.
- 4) Make it smoother.
- 5) Increase sharpness and straightness
- 6) To guard against harm

Hair Serum Disadvantage-

Your hair will grow heavy, flat, and dull if you keep using it for a few days. Skin irritation, peeling, and dryness can result from accumulation on the scalp.

ADVERSE IMPACT OF HAIR SERUM USE

1. Problems might arise from both normal and excessive use. Hair gradually becomes dry and unhealthy.
2. This is the result of applying an inflammatory-reducing serum to your scalp.
3. The silicones that hair serum contains in your hair will suffer from having long hair.
4. Steer clear of the scalp as much as you can.
5. It may become greasy and irritate the skin.

MATERIALS AND METHODS:

We purchased the crude medication needed for our project from a local Ayurvedic medical store. The formulation for the herbal hair serum was made using the following ingredients.

Hair serum ingredients:

1. ALOEVERA



Fig.3 Aloe Vera

- *Aloe barbadensis* Miller is its botanical name.
- Liliaceae is the family.
- SYNONYME: Kumari, Musab Bar, Aloe.

The leaves of several varieties of aloe vera, including *Aloe barbadensis*, *Aloe pernyi*, *Aloe spicata*, and *Aloe African*, are its biological source.

- **CHEMICAL CONSTITUENTS:** Anthraquinone glycoside is measured in aloe vera. Aloin, barbaloin, and aloe-emodin are all found in aloe vera.
- **USES:** Aloe vera gel is a clear, slightly viscous liquid with good moisturizing qualities that can strengthen hair, improve texture, and repair dead skin on the scalp. It also acts as an emollient and has antioxidant qualities.

2. Reetha:



Fig.4 Reetha

- Botanical name: *Sapindus mukorossi*
- Family- Sapindaceae
- Synonym- Ritha, Aritha, Indian soapberry, soapnut, washnut, soapberry.
- Biological source - It is obtained from the dried fruit of *Sapindus mukorossi* and *Sapindus trifolius*.
- Chemical constituents: Saponins like oleanane, dammarane, triterpenes, etc.

- Uses: Surfactant, anti-inflammatory, fungicidal, etc.

3. Fenugreek:



Fig.5 Fenugreek

- Name in botany: *Trigonella foenum-graecum*
- Family: Leguminosae
- Methi, Methika, Alholva, and Chandrika are synonyms.
- Biological Source: *Trigonella foenum-graecum* seeds that have been dried are the source.
- Chemical components: alkaloids, flavonoids, vitamin B, saponins, etc.
- Applications: antimicrobial, hair growth promoter

3. Banana Flower:



Fig.6 Banana Flower

- *Musa acuminata*, a species of wild banana, is its botanical name.
- Biological Source: The banana bloom is the flower of the *Musa acuminata* plant, a wild banana species indigenous to Southeast Asia.
- Family: Musaceae family; synonym: banana blossom. It is a purple flower that resembles a teardrop and is found at the tips of banana clusters.
- Chemical components: Minerals, vitamins, and phytochemicals including flavonoids and tannins are among the many chemical components

found in banana blossoms.

- Applications: Banana flower extracts, antioxidants, and antimicrobials can strengthen hair roots, encourage hair growth, and lessen hair loss.

4. CASTOR OIL:



Fig.7 Castor Oil

- Synonym: Ricinus oil; botanical name: *Ricinus communis*; family: Euphorbiaceae.
- Biological source: *Ricinus communis* seeds are cold-expressed to produce castor oil, a fixed oil.
- Chemical components: 80% ricinoleic acid, fatty acids (isoricinoleic, linoleic, stearic, and isosteric acids);
- Applications: promotes hair development; reduces dandruff; reduces inflammation; and gives hair roots the nourishment they need.

6. Vitamin E

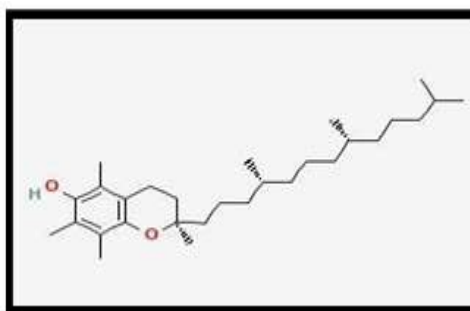


Fig.8 Vitamin E

- D- α -tocopherol; (+)- α -tocopherol are synonyms.
- Chemical components: It is made up of a class of substances having neuroprotective qualities called tocopherols and tocotrienols. Vitamin E is a supplement that promotes hair growth by boosting capillary circulation in the scalp, which in turn helps to increase the volume of hair. A micronutrient that is physiologically

ecessary, vitamin E has applications in pharmaceuticals, medicine, cosmetics, and food.

- Uses: Prevents premature graying of the hair by acting as an antioxidant.

7. Methyl Paraben:

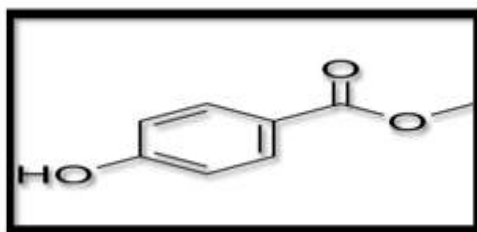


Fig.8 Methyl Paraben

- Other names include methyl paraben, methyl p-hydroxybenzoate, and Nipagin M.
- IUPAC name: methyl 4-hydroxybenzoate.
- Uses: Preservative
- Molar mass: 152.15 g/mol
- Chemical formula: C₈H₈O₃

8. Orange Oil:



Fig.9 Orange Oil

- Citrus sinensis is the botanical name; it belongs to the Rutaceae family; it is also known as sweet orange oil, citrus sinensis, or citrus aurantium.
- Biological source: Citrus aurantium dulcis, or orange peel oil, is the scientific name for the orange tree that yields the oil. Usually, orange oil is derived from the fruit's peel.
- Chemical constituents: D-limonene, a cyclic monoterpene, makes up the majority of orange oil (up to 90%). α -pinene, sabinene, myrcene, and trace amounts of oxygenated chemicals like citral and linalool are other important ingredients.
- Applications: antibacterial, anti-inflammatory, and fragrance agent

1. List of Instruments:

Table No: 01 List of Instruments

Sr.No.	Instrument Name
1	Hot Plate
2	Magnetic Stirrer
3	Digital pH meter
4	Hot Air Oven
5	Digital Weighing Balance
6	Hot Air Oven, Beaker, Stirrer, Measuring Cylinder

2. List of Chemicals:-

Table No: 02 List of Chemicals

Sr. No.	Name of chemicals
1	Ethanol (Extraction) Methanol
2	Methyl Paraben

• EXTRACTION OF CRUDE DRUG

1. ALOE VERA:

Fresh, mature, and healthy aloe vera leaves were gathered and cleaned with purified water. The outer portion of the leaf was then longitudinally dissected with a sterile knife following the appropriate drying of the leaves in a hot air oven. The sterile knife was then used to cut away the colorless parenchymatous tissue, which is aloe vera gel. The fibers and contaminants are then eliminated by filtering it through muslin cloth. The preparation was then done using the filtrate, or filter product, which is a transparent aloe vera gel.

2. Reetha:

1. Reetha (Sapindus mukorossi) dried fruit was gathered from a nearby Ayurvedic pharmacy in Pune.
2. Next, a mortar and pestle were used to crush the fruit.
3. The dried fruit's seeds were separated.
4. Next, using a magnetic stirrer, the powdered pericarp was kept for six hours straight in order to extract the ethanol.
5. Filter paper was then used to filter the final extract.
6. After that, the resultant solution was kept and utilized once more to make herbal hair serum.

3. Banana Flower:

- The quality and desirable bioactive components of fresh banana blossoms are taken into consideration.
- To expand their surface area, banana flowers are cleaned, rinsed, and cut.
- To enable the solvent to extract the bioactive components, the plant material is soaked in 50 milliliters of ethanol for a full day.
- The solvent containing the chemicals that were extracted from the plant material is separated from the mixture by filtering it.

HAIR SERUM FORMULATION TABLE:

Table No: 03 FORMULATION

Sr. no	Ingredients	Batch F1	Batch F2	Batch F3	Batch F4	Batch F5	Role of ingredients
1.	Sapindus mukorossi Extract	q.s.	q.s.	q.s.	q.s.	q.s.	Surfactant
2.	Aloe Gell	-----	-----	-----	2.5g	5g	Gelling agent
3.	Trigonella foenum-graecum (seeds)	0.5ml	1ml	0.5ml	2ml	2ml	Hair growth stimulant
4.	Banana flower (extract)	1.5ml	2ml	3.5ml	4ml	5ml	Colouring agent
5.	Linum usitatissimum (seeds)	3.5ml	4ml	5ml	-----	-----	Gelling agent
6.	Citrus sinensis (powder)	1g	2g	2.5g	-----	-----	Anti-oxidant
7.	Castor oil	1ml	1ml	1ml	1ml	1ml	Hair growth stimulant
8.	Vitamin E (Evion 400mg)	1 capsule	1 capsule	1 capsule	1 capsule	1 capsule	Anti-oxidant
9.	Methyl Paraben	0.5ml	1ml	1.2ml	1.5ml	2ml	Preservative
10.	Orange oil	1-2 drops	1-2 drops	1-2 drops	1-4 drops	1-4 drops	Perfuming agent
11.	Distilled water	q.s.	q.s.	q.s.	q.s.	q.s.	Vehicle

HERBAL HAIR SERUM PROCEDURE:

Four steps are involved in making 25 ml of herbal hair serum:

Solution 1:

- Put 5g of aloe vera gel in a beaker.
- Add one pill of vitamin E (Evion 400mg) and one milliliter of cold-pressed castor oil to the resulting gel.
- Use a magnetic stirrer to mix the solution for half an hour.
- Next, gradually add the extract until a uniform solution is achieved.

Solution 2:

- Put 1g of dried fenugreek seeds and 20 ml of distilled water in a beaker. Bring the mixture to a boil for five minutes.
- Next, filter the mixture.

Solution 3:

- Take 5 milliliters of extract from banana flowers.

Solution 4:

- Add solutions 1 and 2 to a beaker while stirring constantly with a stirrer.
- Next, add solution three drop at a time until the desired color is achieved, and keep stirring with a glass rod.

3. Add 1-2 drops of orange oil, which serves as a fragrance agent, and around 1 milliliter of methyl paraben, which serves as a preservative, to this mixture.



Fig.10.Prepared Herbal Serum

II. RESULTS AND DISCUSSION:

1. Physical Appearance:

The manufactured herbal serum's physical appearance was carefully examined through visual inspection. The developed formulation was found to have the good characteristic qualities indicated in the table.

Sr.no	Parameters	Observation
1.	Colour	Brownish
2.	Odour	Odourless
3.	Appearance	Homogenous

Table No 04. physical appearance

2. pH determination:

A buffer solution with pH values of 4 and 7 was used to calibrate the digital pH meter. After then, the electrode was submerged in serum and watched until readings were steady. Additionally, it was found that the manufactured

4. Use a magnetic stirrer to mix the solution for fifteen minutes.
5. Keep serum in a tightly sealed container.

herbal serum had a pH of 4.91, which is optimal for hair.



Fig 11. pH Meter

3. Spreadability:

Two slides are taken, one slide is placed on top of the other, and two drops of the hair serum formulation are applied on one side of the first slide. It was discovered that the formulation could spread 4.5 cm.

4. Stability:

The produced herbal hair serum was stored in a tightly sealed jar at room temperature for a week. After a week, the pH and viscosity were measured and contrasted with the initial readings.

5. Skin Irritation Test:

Two hours after the serum is applied, the skin is examined for redness or itching. Neither redness nor itching were noticed.

6. Antimicrobial Examination:

After three days, the herbal hair serum's antimicrobial activity was assessed and determined to be between one and two centimeters around the well-prepared source.

Tabel No 05. Zone of Inhibition

Sr no	SAMPLE	ZONE OF INHIBITION	ANTI-MICROBIAL ACTIVITY
1.	Sample-1	14.28mm	Moderate
2.	Sample-2	13.55mm	Moderate



TabelNo05.ZoneofInhibition

Result: Sample 1 showed a clear zone of inhibition measuring 14.28mm and Sample 2 showed a clear zone of 13.15mm. Hence No microbial growth was observed.

RESULT TABLE:

TableNo.06.ResultsofPreparedFormulation

Srno.	EvaluationParameters	Results
1.	Colour	Brownish
2.	Odour	Odourless
3.	Appearance	Homogenous
4.	pH	4.91
5.	Spreadability	4.5cm (Good)
6.	Stability(pH)	Good
7.	Skin Irritation	NoSkinIrritation
8.	Anti.Microbialtest	NoGrowthObserved

III. CONCLUSION:

According to the created formulation's results, herbal hair serum offers a variety of vital nutrients that are necessary to maintain the sebaceous gland's healthy function and promote the growth of natural hair. The usage of herbal cosmetics has undergone a significant transformation in the fields of personal hygiene and healthcare. Therefore, there is a lot of commotion in the herbal cosmeceutical individual care or personal health care industry, which is truly focusing and paying particular attention to the development of cosmetics based on herbs. Similar to today, it is a rapidly expanding market with enormous potential in the years to come. The use of bioactive components in cosmetic formulation delivers nutrients that are essential for maintaining healthy,

beautiful hair and has a positive effect on body characteristics. It can be concluded that the prepared herbal hair serum improved consistency and had a positive impact on the mechanism of hair development. Since ancient times, medicinal plants have been utilized to cure hair diseases due to their lower risk of adverse effects and hypersensitive reactions. It's time to switch to natural hair care products instead of chemical-laden ones. Many herbal medications are recommended by India's traditional medical system to promote hair growth. The finest aspect is that the herbal extract will give hair microprotein supplements and sufficient nourishment, which will make the hair safe and healthy.

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