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# REVIEW ON FORMULATION AND EVALUATION OF HERBAL HAIR SERUM

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**ABSTRACT**

*Hair loss is a prevalent concern influenced by environmental stressors, hormonal imbalances, and the use of chemical-laden hair products. This study aims to formulate and evaluate a herbal hair serum using banana flower extract, orange oil, t"entigreek seed extract, reetha extract, vitamin E, castor oil, mcthylparabcn, and aloc vera gel.*

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**KEYWORDS**: *Hcrhal hair scrun, Hair $wwth, hanana flnwcr, (Jmngc nil, Fcnugrcck, Rcctha cxtract, Alnc vera. Vitamin E. Caxtur ui I, Scaly carc*

## INTRODUCTION

Hair plays a vital role in an individual's appearance and psychological well-being. However, problems like hair fall, thinning, and poor hair growth have become increasingly common due to factors such as stress, pollution, hormonal imbalance, and the frequent use of chemical-based hair products. The growing awareness of the adverse effects of synthetic cosmetics has led to a rising demand for herbal and natural
alternatives in hair care.

Herbal formulations are considered safer and more effective due to their minimal side effects and presence of bioactive phytoconstituents. Traditional medicinal knowledge highlights several natural ingredients with proven hair-promoting properties. In this study, a herbal hair serum is formulated using a blend of natural ingredients including banana flower extract, orange oil, fenugreek seed extract, reetha extract, vitamin E, castor oil, aloe vera gel, and methylparaben as a preservative.

Banana flower is rich in antioxidants and flavonoids, which support scalp nourishment and reduce oxidative stress on hair follicles. Orange oil improves blood circulation and provides antimicrobial benefits. Fenugreek seeds are known to strengthen hair roots and prevent dandruff. Reetha, a natural cleanser, helps maintain scalp hygiene without harsh chemicals. Castor oil and vitamin E contribute to hydration, follicle repair, and enhanced hair elasticity, while aloe vera gel soothes the scalp and serves as a natural gel base.

The aim of this research is to develop a stable and effective herbal hair serum and evaluate its physicochemical characteristics and preliminary effectiveness in promoting hair growth. This formulation is intended to offer a natural, safe, and sustainable alternative to conventional hair care products.

## 1. HAIR-

Hair is one of the characteristics features of mammals and has various function such as protection against external factors i.e. heat,
cold, etc. Hair is one of the important parts of body considered to be protective appendages on the body and Accessory structure of
the integument along with Sebaceous gland and sweat gland.

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## 1.1. Structure of hair:

❖ **Hair consists of two parts:**

- **Hair Follicle:**

The Follicle is a structure in the skin that resembles a club. There can be a network of blood vessels at the top of the follicle that
supply nutrients to nourish and promote hair growth. We refer to this as the papilla. Every follicle is the result of a communication
between the dermis and epidermis.

- The folicle is segmented into three parts:

1. **Infundibulum**: extends from the follicle's surface opening to the sebaceous gland entrance level.
2. **Isthmus:** Extends from the infundibulum to the level of insertion of the arrector pilli muscle.
3. **Inferior segment:** The base of bulb is invaginated by a tuff of vascularized loose connective tissue

   called dermal papilla. The papilla of the hair contains many blood vessels and provides nourishment for hair growth.

- **Hair Shaft:**

**The hair shaft is divided into three layers:**

**1. Medulla**: The medulla is the centre section of hair. It will either be continuous or doubled, or it will be divided or segmented.
They are often packed with cells or resemble a hollow tube. The medulla is absent from the majority of hairs, but it might be broken or discontinuous in others. It creates the hair shaft's midsection. Particularly fine hairs typically lack this layer.

2. **Cortex**: The greatest portion of the hair shaft, or melanin (hair pigment), is what gives hair its colour.

**3. Cuticle:** The hair shaft's transparent outer coat may be called the cuticle. It is constructed from overlapping scales that shield
the hair's inner layers. The hair's proximal end, which is closest to the scalp, and distal end are where the scales point.

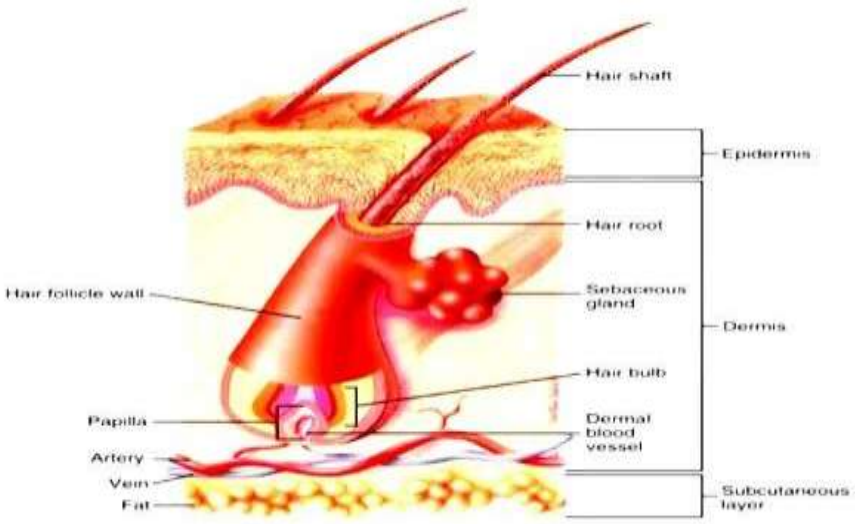



**Fig 1: Structure of Hair**

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1. The basic part of hair is bulb, root and shaft.
2. Hair fall, dandruff, lice, Split end, grey hair are some of the well known problems related to hair.
3. A piece of hair looks simple but it is one of the most complicated structures in body. Hair is made up of two structures

### 1.2. Hair types

Hair type is primarily based on the curl pattern of the hair, which is determined by the hair follicle. Genetics play a key role in determining hair type. Andre Walker, who has been Oprah Winfrey's stylist for decades, is credited with creating a system that classifies hair into one of four curl patterns.

- Type 1: Straight
- Type 2: Wavy
- Type 3: Curly
- Type 4: Coily

### 1.3. HAIR GROWTH CYCLE :

**Hair growth cycle consists of 3 stages: -**

1. Anagen stage (Growth)
2. Catagen stage (Transition)
3. Telogen stage (Rest)

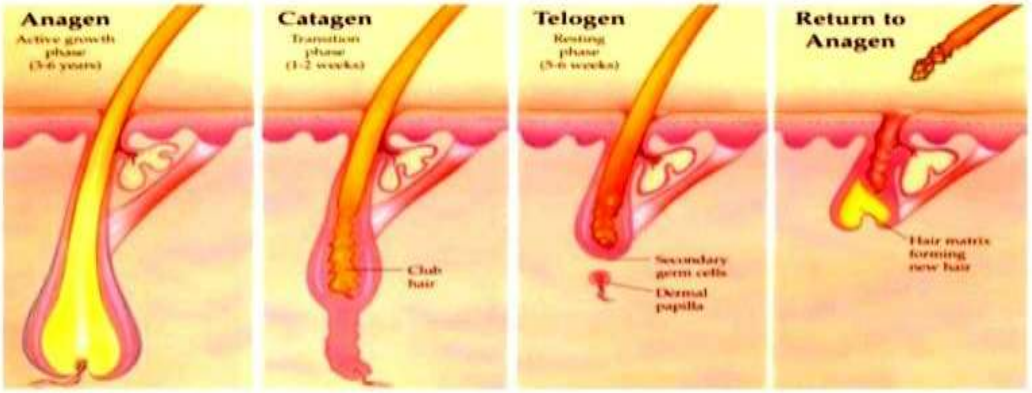



**Fig 2 Hair Growth Cycle**

**1. Anagen phase: -**
The anagen phase is the growth phase of the hair. The Anagen phase will last from Between 2-6 years. A new hair pushes the new hair that stopped growing up and out of the follicle.

**2. Catagen phase: -**
The catagen phase is a transitional stage and 3% of all hairs are in this phase at any given time. This phase lasts for 2-3 weeks.

**3. Telogen phase: -**
The telogen phase is the resting phase which lasts for about 2-3 months. During the telogen phase, the hair follicle is at rest and the
Club hair is completely formed.

### 2. Definition of Hair serum

Hair serum is a styling agent that coats the surface of the hair. Hair serum is a liquid hair care product. It's thicker than water. Hair serums are silicone-based styling products that coat the surface of your hair to give it extra shine, moisture, and softness.

**2.1 Hair serums are applied to wet hair, which is suitable for using hair serums.**

1]Straight
2]Wavy
3]Curly
4]Coily

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### 2.2 ADVANTAGE OF HAIR SERUM –

1) Protects hair from environmental influences.
2) Hair serum can effectively soften, smooth and smooth hair.
3) Control frizz.
4) Increase smoothness.
5) Improve straightness and sharpness
6) To protect against damage

### 2.3 DISADVANTAGE OF HAIR SERUM-

If you continue to use it for a few days, your hair will become heavy, flat and lack luster. Accumulation on the scalp can cause dryness, peeling, and skin irritation.

### 2.3 SIDE EFFECT OF USING HAIR SERUM –

1. Normal use and excessive use can cause problems Hair becomes unhealthy and eventually becomes dry.
2. This is what happens when you apply serum to your scalp For inflammation.
3. The silicone contained in hair serum is Long hair is harmful to your hair.
4. Avoid applying to the scalp as much as possible. It can become oily and cause inflammation.

### 2.4 BENEFITS OF USING HAIR SERUM –

1) Protect your hair- Hair serum forms a layer on top of your hair. Therefore, it provides excellent protection against heat, sunlight, damage, dirt, dust and environmental pollution. Hair serum prevents hair damage.
2) Hair care- It nourishes the hair and makes it manageable. Hair serum fills the cracks in the hair follicles and nourishes brittle and damaged hair.
3) Multipurpose: Hair serum solves many hair problems, not just a single problem. No wonder it is called the complete solution to all hair problems. Just a few drops will nourish your hair and transform its appearance.
4) Adds shine to your hair. Hair serums form a layer on many hairs that acts as a light reflector, adding shine. Hair serums are made up of amino acids and protect hair that has been colored or chemically treated.

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## LITERATURE REVIEW

| Sr. No. | Author Name | Year | Research Paper Name | Work |
|---|---|---|---|---|
| 1 | Singh V. et al. | 2015 | Phytochemical and Hair Growth Activities of Sapindus mukorossi | Reported saponins in Sapindus have cleansing and anti-dandruff properties, beneficial for scalp health. |
| 2 | Dhanotia R. et al. | 2017 | Aloe vera: A Plant with Multiple Benefits | Aloe vera promotes hair growth by increasing blood circulation and moisturizing the scalp. |
| 3 | Chauhan NS et al. | 2014 | Trigonella foenum-graecum (Fenugreek): A Review on Its Hair Benefits | Fenugreek seeds strengthen hair shafts and promote follicular development due to phytoestrogens. |
| 4 | Kundu S. et al. | 2019 | Pharmacognostic and Therapeutic Uses of Banana Flower | Banana flower contains antioxidants and flavonoids that may reduce oxidative stress on the scalp. |
| 5 | Ahmed F. et al. | 2016 | Evaluation of Castor Oil as a Potential Hair Growth Enhancer | Ricinoleic acid in castor oil increases blood flow to scalp and supports hair regeneration. |
| 6 | Shinde M. et al. | 2018 | Topical Use of Vitamin E in Hair Care Products | Vitamin E reduces oxidative stress, prevents hair loss, and adds shine to hair strands. |
| 7 | Patel R. et al. | 2020 | Methyl Paraben as a Preservative in Herbal Cosmetic Formulations | Acts as an antimicrobial agent ensuring product stability and shelf life. |
| 8 | Jaiswal A. et al. | 2021 | Effect of Citrus-Based Oils on Hair and Skin | Orange oil provides fragrance, promotes scalp health, and has mild cleansing properties. |
| 9 | WHO Guidelines | 2012 | Use of Distilled Water in Topical Herbal Formulations | Used as a solvent base to ensure formulation clarity, uniformity, and safety. |

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## NEED OF WORK

There is a growing need for herbal hair serums as more people experience hair-related issues such as hair fall, dandruff, dryness, and scalp irritation, often caused or worsened by the regular use of chemical-based hair products. These synthetic formulations may provide temporary results but can damage the scalp and hair in the long term. As awareness about the harmful side effects of such chemicals increases, consumers are shifting toward natural, plant-based alternatives. Herbal hair serums are formulated using extracts from medicinal plants, which are rich in vitamins, antioxidants, and essential nutrients that help nourish the scalp, strengthen hair roots, and promote healthy hair growth. Unlike chemical treatments, herbal serums are gentle, safe for long-term use, and suitable for all hair types. Additionally, the development of herbal serums supports eco-friendly and sustainable practices by utilizing natural resources and minimizing environmental impact. Therefore, there is a strong need to develop effective herbal hair serums that address common hair problems while meeting consumer preferences for natural and holistic hair care solutions.

## Aim and Objective

**Aim**: To formulate and evaluate a herbal hair serum for promoting hair growth using natural plant-based ingredients.

**Objective**: To formulate a herbal hair serum using natural ingredients and evaluate its effectiveness in promoting hair growth and improving overall hair and scalp health.

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## PLAN OF WORK



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# MATERIAL AND EQUIPMENT

## 1. ALOE VERA



**Fig.3 Aloe Vera**

- Botanical name Aloe barbadensis Miller
- **FAMILY:** Liliaceae
- **SYNONYME**: Aloe, Musab bar, kumari.
- **BIOLOGICAL SOURCE**: It is the leaves of various species of aloe-vera- aloe barbadense, aloe perryi, aloe spicata, aloe African
- **CHEMICAL CONSTITUENTS:** Aloe vera are measure source of anthraquinone glycoside. Aloe vera contain aloin, barbaloin, aloe-emodin.
- **USES:** To make stronger hair, it provides antioxidant properties and also act an emollient, Improve texture of hair, Repair dead skin on the scalp, aloe vera gel is slightly viscous & clear liquid having good moisturizing properties.

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## 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 trifoliatus.
- **Chemical constituents:** Saponins like oleanane, dammarane, triterpenes, etc.
- **Uses:** Surfactant, anti-inflammatory, fungicidal, etc.

## 3. Fenugreek:



**Fig.5 Fenugreek**

- **Botanical name**: Trigonella foenum- graecum
- **Family** – Leguminosae
- **Synonym** – Methi, Methika, Alholva, Chandrika.

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- **Biological Source** – It is obtained from the dried seeds to Trigonella foenum- graecum.
- **Chemical constituents**- Vitamin B, alkaloids, flavonoids, saponins, etc
- **Uses** – Hair growth stimulant, antibacterial.

### 4. Banana Flower:



**Fig.6 Banana Flower**

- **Botanical name**: Musa acuminata (wild banana species)
- **Family** – Musaceae family
- **Synonym** – banana blossom
- **Biological Source** – The banana blossom is the flower of the Musa acuminata plant, a wild banana species native to Southeast Asia. It's a teardrop-shaped, purple-colored flower that grows at the tip of banana clusters.
- **Chemical constituents**- Banana flowers contain a variety of chemical constituents, including minerals, vitamins, and phytochemicals like flavonoids and tannins.
- **Uses** – Antimicrobial , Antioxidant , banana flower extracts can promote hair growth, reduce hair loss, and strengthen hair roots.

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## 5. CASTOR OIL :



**Fig.7 Castor Oil**

- **Botanical name:** Ricinus communis
- **Family** – Euphorbiaceae
- **Synonym -** Ricinus oil.
- **Biological source -** Castor oil is the fixed oil obtained by the cold expression of the seeds of Ricinus communis.
- **Chemical constituents** – 80% riconeleic acid, fatty acids such as isoricinoleic, linoleic, stearic and isosteric acids.
- **Uses** – Hair growth stimulator, anti-dandruff, anti-inflammatory, provides required nourishment to hair root.

## 6. Vitamin E:

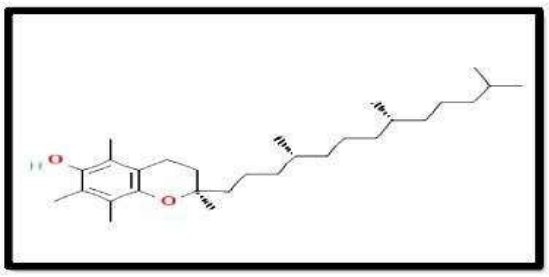


**Fig.8 Vitamin E6**

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- **Synonym** – (+)-α-Tocopherol; D-α-Tocopherol
- **Chemical constituents:** It is composed by tocopherols and tocotrienols, which is group of compounds with neuroprotective properties. For hair, vitamin E is a source of supplement that improves hair growth by increasing capillary circulation in the scalp, thereby help improving hair volume. Vitamin E is a physiologically essential micronutrient and has been applied in various fields including medicine, pharmaceutics, cosmetics and foods.
- **Uses**- Anti-oxidant agent, prevents premature hair greying.

**7. Methyl Paraben:**

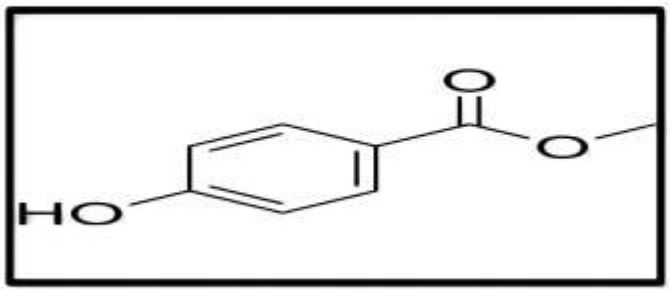



**Fig.8 Methyl Paraben**

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

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## 8. ORANGE OIL :



**Fig.9 Orange Oil**

- **Botanical name:** Citrus sinensis
- **Family** – Rutaceae
- **Synonym** - Sweet Orange Oil, Citrus sinensis, Citrus aurantium
- **INCI Name:** Citrus aurantium dulcis (orange) peel oil
- **Biological source** - This is the scientific name for the orange tree from which the oil is derived. Orange oil is typically extracted from the peel of the fruit.
- **Chemical constituents** – Orange oil primarily consists of d-limonene, a cyclic monoterpene, which can make up about 90% of the oil. Other significant constituents include α-pinene, sabinene, myrcene, and smaller amounts of oxygenated compounds like linalool and citral.
- **Uses** – Perfuming Agent, antibacterial and anti-inflammatory properties

- **List of Instruments:**

| Sr. No. | Instrument Name |
|---|---|
| 1 | Hot Plate |
| 2 | Magnetic Stirrer |
| 3 | Digital Ph meter |
| 4 | Hot Air Oven |

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| | |
|---|---|
| 5 | Digital Weighing Balance |
| 6 | Hot Air Oven, Beaker, Stirrer, Measuring Cylinder |

**Table: 1 List of Instruments**

### 1. List of Chemicals: -

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

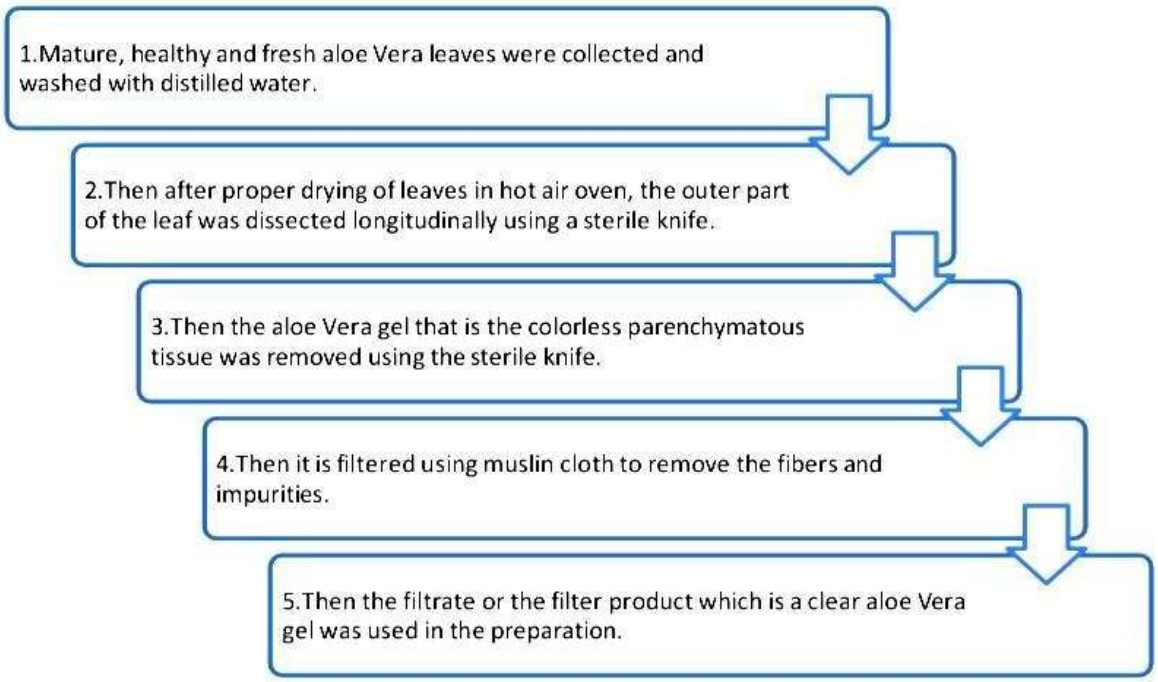
**Table: 2 List of Chemicals**

## CRUDE DRUG SELECTION:

Based on the literature survey, plants such as Aloe vera, Banana flower and Reetha were studied for their potential benefits in promoting hair growth, along with properties like antifungal activity and scalp conditioning. These plants were collected or purchased from local sources.

## EXTRACTION OF CRUDE DRUG:

### 1. ALOE VERA:



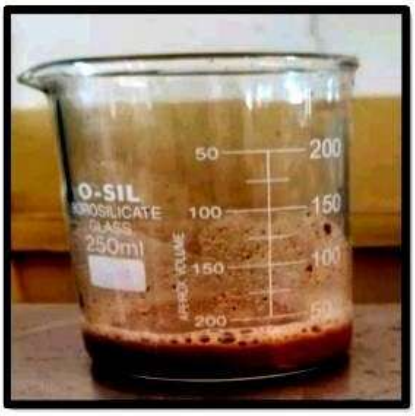
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**Fig.10 Aloe Gell**

## 2. REETHA:

1. The dried fruit of Reetha (Sapindus mukorossi) was collected from local Ayurvedic Pharmacy store in pune.
2. The fruit were then crushed using Mortar & Pestle.
3. Seeds from the dried fruit were separated.
4. Then, the powdered pericarp was subsequently maintained for ethanol extraction for 6 hours continuously using magnetic stirrer.
5. Later, the resulting extract was filtered using filter paper.






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**Fig.11 Reetha Extraction**

### 3. Banana Flower:

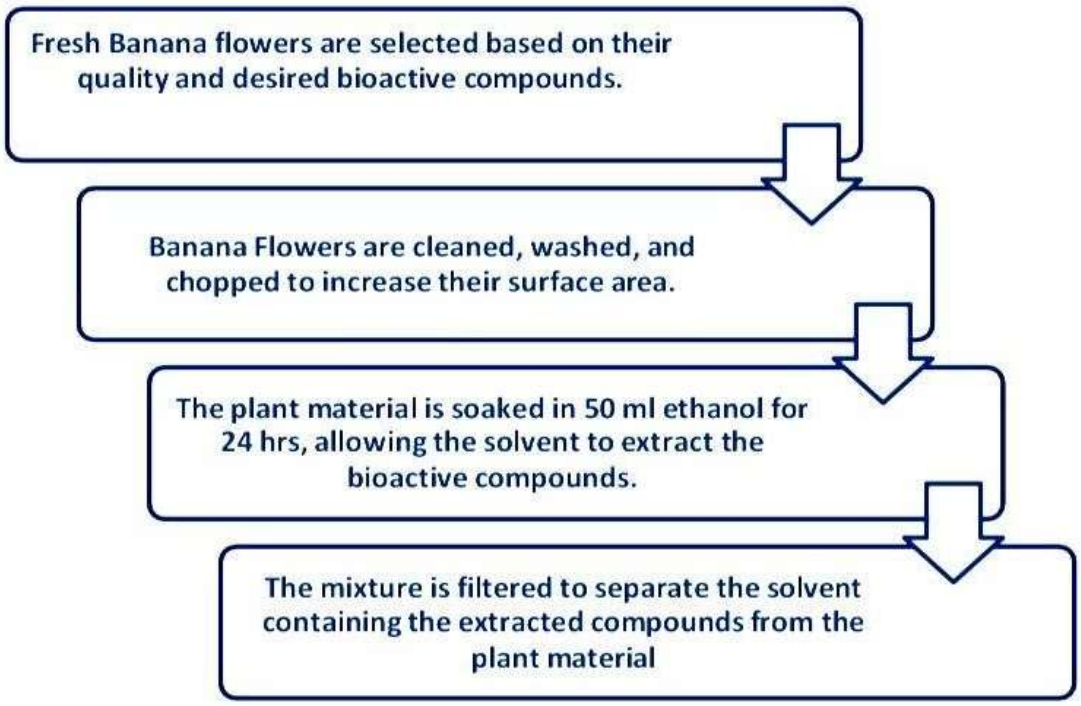





**Fig. 12 MACERATION OF BANANA FLOWER**

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## FORMULATION TABLE OF HAIR SERUM:

| Sr. No | Ingredients | Qty (25ml) | Property |
|---|---|---|---|
| 1. | Sapindus mukorossi extract | q.s. | Surfactant |
| 2. | Aloe Gell | 5g | Gelling agent |
| 3. | Trigonella foenum-graecum (seeds) | 2ml | Hair growth stimulant |
| 4. | Banana flower (powder) | 5ml | Colouring agent |
| 5. | Castor oil | 1ml | Hair growth stimulant |
| 6. | Vitamin E | 1capsule (Evoin 400mg) | Anti-oxidant |
| 7. | Methyl Paraben | 1ml | Preservative |
| 8. | Orange oil | 1-2 drops | Perfuming agent |
| 9. | Distilled water | q.s. | Vehicle |

**Table: 3 FORMULATION**

## PROCEDURE FOR HERBAL HAIR SERUM:

### Preparation of 25ml of Herbal hair serum is divided into four parts : -

**Solution 1 –**

1. In a beaker, add 5g Aloe vera gel.
2. To the obtained gel, add 1 capsule of Vitamin E (Evion 400mg) and 1ml of cold pressed castor oil.
3. Mix the solution using magnetic stirrer for 30 minutes.
4. After, add reetha extract drop wise until homogeneous solution is obtained

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**Solution 2 –**

1. In a beaker, add 1g of dried fenugreek seeds in 20ml of distilled water and boil the solution for 5 mins.
2. Then Filter the solution .

**Solution 3:**

1. Take 5 ml of Banana flower extract.

**Solution 4:**

1. In a beaker, add solution 1 and solution 2 with continuous stirring with a stirrer.
2. Then, add solution 3 drop wise until suitable colour is obtained and continue stirring with a glass rod.
3. To this solution, add about 1ml of methyl paraben that acts as a preservative and 1-2 drops of orange oil which acts as perfuming agent.
4. Mix the solution using magnetic stirrer for 15 minutes.
5. Store serum in well closed container.




**Fig.13 Prepared Herbal Serum**

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# RESULTS AND DISCUSSION

## 1. Physical Appearance:

The physical appearance of the prepared herbal serum was checked manually by visual inspection. It was found that the prepared formulation has good characteristic properties listed in table.

| Sr.no | Parameters | Observation |
|---|---|---|
| 1. | Colour | Brownish |
| 2. | Odour | Odour less |
| 3. | Appearance | Homogenous |

**Table4. physical appearance**

## 2. Determination of pH:

The digital pH meter was calibrate using buffer solution of pH 4 and pH 7. Then, the electrode was soaked into serum and observed until stable readings were observed. And The pH of the prepared herbal serum was observed to be 4.91 which is ideal for hair.




**Fig14.pH Meter**

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### 3. Spreadability:

Two slides are taken, 10 drops of formulation of hair serum was placed at the one side of first slide and another slide was placed on the first slide. The formulation was found to have spread ability of 4.5cm.

### 4. Stability –

The prepared herbal hair serum was kept for a week at room temperature in a well closed container. The pH and viscosity was determined after a week and compared with the original values.




**Fig.15 pH Stability**

### 5. Skin Irritation Test:

After applying the serum to the skin, it is checked for any redness or itching after two hours. There was no redness or itching observed.



**Fig16. Skin irritation test**

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## 6. Anti-Microbial Test:

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

**Tabel 5. Zone of Inhibition**



**Fig.17. Anti-microbial activity**

**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.

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## RESULT TABLE:

| Sr no. | Evaluation Parameters | Results |
|---|---|---|
| 1. | Colour | Brownish |
| 2. | Odour | Odour less |
| 3. | Appearance | Homogenous |
| 4. | pH | 4.91 |
| 5. | Spreadability | 4.5 cm (Good) |
| 6. | Stability(pH) | Good |
| 7. | Skin Irritation | No Skin Irritation |
| 8. | Anti. Microbial test | No Growth Observed |

**Table.6 Results**

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# CONCLUSION

Results have shown that herbal hair serum provides various essential nutrients needed to preserve the proper function of the sebaceous gland and support the growth of natural hair. In the personal hygiene and health care system, the use of herbal cosmetics has changed by several folds. Therefore, the herbal cosmeceutical individual care or personal health care industry, which is actually concentrating and paying extra care on the production of herbal-based cosmetics, has a considerable clamor. As nowadays, in the coming years, it is a fast-developing market with a mammoth scope. In cosmetic formulation, the use of bioactive ingredients has a valuable impact on body characteristics and offers nutrients that are important for preserving good and beautiful hair. It can be inferred that prepared herbal hair serum had a beneficial effect on the mechanism of hair growth and increased consistency.

Medicinal plants have been used for the treatment of hair disease since antiquity because of fewer side effects and hypersensitivity reaction. It is time to dump the chemical-laden hair care products in favour of natural alternatives. The traditional system of medicine in India acclaims a number of herbal drugs for hair growth promotion. The best part is that herbal extract will provide microprotein supplements to hair and provide enough nourishment, resulting in safe and sound hair.

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