

Herbal Hair Growth and Anti- Hair Fall Serum

Ms. Utkarsha Sudam Katare¹, Ms. Rajeshwari Thokal²

¹*Student, Sayali Charitable Trust's College of Pharmacy Chh. Sambhajinagar*

²*Assistant Professor, Sayali Charitable Trust's College of Pharmacy Chh. Sambhajinagar*

Abstract: Herbal cosmetics are gaining wide importance because they are safe, effective, and free from harmful chemicals. Hair problems such as hair fall, dandruff, dryness, thinning, and slow hair growth are commonly seen in people due to pollution, stress, and frequent use of chemical-based products. Herbal hair serums are useful as they help to nourish the scalp, strengthen the hair roots, and support healthy hair growth. This review focuses on a herbal hair growth and anti-hair fall serum prepared by using Aloe vera gel, Amla extract, Bhringraj extract, Rosemary oil, Hibiscus extract, Vitamin E, and Argan oil. Aloe vera helps in soothing the scalp and maintaining moisture. Amla is a rich source of Vitamin C and acts as an antioxidant to prevent hair damage. Bhringraj is well known in Ayurveda for promoting natural hair growth and reducing hair fall. Rosemary oil improves blood circulation to hair follicles, whereas Hibiscus enhances hair strength and reduces breakage. Vitamin E protects the scalp from oxidative stress, and Argan oil nourishes the hair and prevents split ends. By combining these natural ingredients, the herbal serum helps to improve scalp health, promote hair growth, and control hair fall effectively. Therefore, herbal formulations prepared from natural sources are beneficial for managing different hair-related problems.

Keywords: Aloe vera gel, Amla extract, Bhringraj extract, Rosemary oil, Hibiscus extract, Vitamin E, Argan oil.

I. INTRODUCTION

Healthy, strong, and lustrous hair is considered an important sign of beauty and wellness. However, due to increasing pollution, mental stress, poor nutrition, hormonal imbalance, excessive use of chemical-based hair products, and irregular scalp care, many individuals commonly experience hair-related problems such as hair fall, thinning, breakage, dandruff, dryness, and slow hair growth. These conditions not only affect appearance but also

influence a person's confidence and overall quality of life.

Herbal formulations for hair care have gained wide acceptance because they are safe, natural, and free from harsh chemicals. According to Ayurvedic principles, most hair disorders arise due to imbalance in doshas and impurities in the blood affecting the scalp and hair follicles. Herbal hair serums play a vital role in nourishing the scalp, strengthening hair roots, improving blood circulation, and promoting healthy hair growth.

The herbal hair growth and anti-hair fall serum prepared in this study contains Aloe vera gel, Amla extract, Bhringraj extract, Rosemary oil, Hibiscus extract, Vitamin E, and Argan oil—each known for its traditional and scientific benefits. Aloe vera deeply hydrates the scalp and soothes irritation. Amla, rich in Vitamin C, strengthens hair follicles and reduces breakage. Bhringraj is traditionally recognized as a powerful hair-rejuvenating herb that promotes regrowth and reduces hair fall. Rosemary oil improves microcirculation to hair follicles, enhancing growth and density. Hibiscus helps nourish the hair shaft, making it soft and manageable. Vitamin E acts as an antioxidant, preventing oxidative damage and improving hair shine. Argan oil provides deep nourishment, reduces frizz, and improves overall hair texture.

This combination of herbal ingredients not only supports hair growth but also reduces hair fall, dryness, and scalp infections. The formulation is mild, non-sticky, and suitable for regular use. Due to its natural composition and multifunctional benefits, herbal hair serum serves as an effective alternative to chemical-based hair products for maintaining strong, Healthy and beautiful hair.[1]

Aim:

Ingredients To formulate and evaluate a Herbal Hair Growth and Anti-Hair Fall Serum for promoting healthy, strong, and nourished hair using safe, natural, and effective herbal.

II. OBJECTIVES

1. Due to pollution, stress, poor nutrition, and excessive use of chemical-based hair products, hair becomes weak, dry, and prone to falling. Hence, the objective is to develop a natural herbal serum that strengthens hair roots and reduces hair fall.
2. To prepare a polyherbal formulation using Aloe vera gel, Amla extract, Bhringraj extract, Hibiscus extract, Rosemary oil, Vitamin E, and Argan oil for overall scalp and hair nourishment.
3. To promote healthy hair growth by improving blood circulation to the scalp and enhancing nourishment of hair follicles.
4. To reduce hair fall by strengthening the hair shaft, improving scalp health, and preventing breakage and thinning.
5. To formulate a serum that helps maintain scalp hydration, reduce dryness, and support a healthy scalp environment.
6. To develop a non-sticky, easy-to-apply, and safe herbal formulation suitable for all hair types.
7. To study the individual role and benefits of each herbal ingredient in promoting hair growth, preventing hair loss, and improving overall hair texture.

III. ANATOMY AND PHYSIOLOGY OF HAIR

Hair is a specialized appendage of the skin that originates from epidermal cells and extends deep into the dermis. It is composed of keratin, a tough fibrous protein that gives structural strength to the hair shaft. The biology of hair is highly complex and includes various anatomical components and physiological processes that together determine the growth, texture, strength, and shedding patterns of hair. Understanding the detailed anatomy and physiology of hair is essential to design an effective herbal hair growth and anti-hair fall serum, as herbal ingredients interact with different layers, cells, and physiological pathways of the hair follicle [2–4].

I. Anatomy of Hair: Anatomically, hair consists of two main parts:

- Hair Shaft – the visible portion above the scalp
- Hair Follicle – the living portion embedded in the dermis and subcutaneous tissue

Both components play critical roles and respond to herbal nourishment.

1. Hair Shaft (External Part): The hair shaft is a dead, keratinized, non-living structure that projects above the skin surface. Although non-living, its appearance and strength reflect the health of the follicle.

The shaft is composed of three concentric layers:

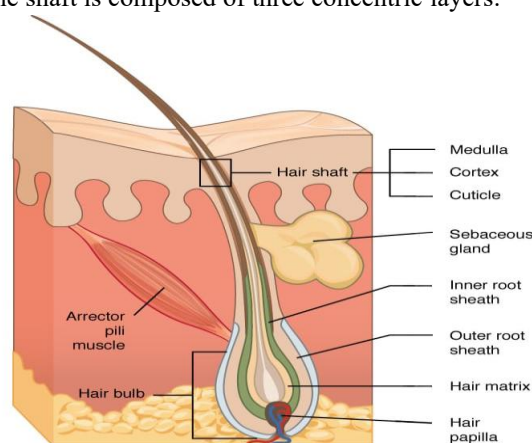


Fig01. Anatomy of hair

a. Cuticle (Protective Layer): The cuticle is the outermost layer. Made up of 6–10 layers of flat, overlapping keratinized cells, arranged like roof shingles. The orientation of these scales determines shine, smoothness, porosity, and overall appearance of hair. A well-aligned cuticle protects hair from:

UV radiation Mechanical damage
Chemical exposure Excessive water loss
Herbal ingredients such as Aloe vera, Vitamin E, Argan oil, Hibiscus extract help in repairing cuticle damage by providing natural conditioning and antioxidant protection [2].

b. Cortex (Structural Layer): The cortex forms 80–90% of total hair mass. Composed of long, spindle-shaped keratin fibers arranged in microfibrils and macrofibrils. Contains melanin pigments that give natural color to hair.

Determines major hair characteristics: Strength, Elasticity, Flexibility, Moisture content

When cortex keratin cross-links weaken, hair becomes brittle and prone to breakage. Amla, Bhringraj, Hibiscus, and Rosemary oil strengthen the cortex by providing nutrients, antioxidants, and minerals.

c. Medulla (Innermost Layer): Soft, spongy central core present mostly in thick, coarse, or mature hair. Not always present in thin or fine hair. Composed of loosely packed, soft keratin. Contributes to insulation and thickness.

2. Hair Follicle (Internal Living Part): The hair follicle is a miniature yet complex organ that regulates hair growth. It is embedded deep into the dermis and attached to sebaceous glands and arrector pili muscles.

A complete follicle includes the following parts:

a. Hair Bulb: Bulb is located at the deepest part of the follicle. Contains matrix cells, the fastest-dividing cells in the human body after bone marrow. Matrix cells differentiate to form the hair shaft and inner root sheath. Melanocytes in the bulb produce melanin, determining hair color [3].

b. Dermal Papilla (Growth Control Center): A cone-shaped, vascularized structure at the base of the bulb. Rich in capillaries, supplying oxygen, amino acids, vitamins, minerals, and growth factors.

Contains fibroblasts that influence:

- 1) Hair follicle size
- 2) Hair shaft thickness
- 3) Growth cycle regulation
- 4) Considered the “brain of the hair follicle.”
- 5) Any damage to the dermal papilla leads to severe hair fall or miniaturization.

Herbal stimulants like Bhringraj, Amla, and Rosemary oil enhance blood circulation and activate dermal papilla cells [2][4]

c. Matrix Cells: Surround the dermal papilla. Responsible for constant division to produce new hair. Rate of matrix cell division determines hair growth speed. Nutritional deficiency or oxidative stress can slow matrix activity → hair thinning.

d. Inner Root Sheath (IRS) : Supports and shapes the hair shaft during early growth.

Composed of three layers:

- Henle’s layer
- Huxley’s layer
- Cuticle of IRS

e. Outer Root Sheath (ORS): Thick, protective layer extending from the bulb to the epidermis. Contains stem cells essential for follicle regeneration. Plays a role in wound healing.

f. Sebaceous Glands: Produce sebum, an oily secretion that lubricates scalp and hair. Maintains softness, prevents dryness, and protects against microbes. Argan oil, Aloe vera, and Vitamin E nourish and regulate sebum composition.

g. Arrector Pili Muscle: Small smooth muscle attached to the follicle. Causes “goosebumps” by contracting. Helps push sebum onto the scalp.

II. Physiology of Hair:

Physiology of hair includes growth cycle, keratinization, sebum production, blood supply, hormonal influence, and nutritional dependence.

1. Hair Growth Cycle: Hair grows in a biological cycle of three phases:

a. Anagen Phase (Active Growth Phase): Lasts 2–7 years depending on genetics. 85–90% of scalp hairs are in anagen at any time. Follicle is long and deep in this phase

Rate of growth = 0.3–0.5 mm/day. Herbal agents like Bhringraj, Amla, Hibiscus, and Rosemary oil prolong anagen phase and increase follicle activity [3].

b. Catagen Phase (Transition Phase) : Short phase lasting 2–3 weeks. Follicle shrinks and detaches from dermal papilla. Only 1–2% of hairs are in catagen.

c. Telogen Phase (Resting & Shedding Phase): Lasts 2–4 months. Hair remains in a dormant state. Club hair eventually sheds naturally. 50–100 hairs/day is normal shedding. Premature shift to telogen causes excessive hair fall. Herbal antioxidants help delay entry into telogen.

2. Keratinization Process: Matrix cells undergo mitosis, differentiate, and move upward. They lose nuclei, fill with hard keratin, and form the hair shaft. This process determines: Strength, Thickness, Texture, Smoothness. Herbs like Amla (rich in vitamin C), Vitamin E, Aloe vera support healthy keratin formation and protect against oxidative stress [2].

3. Sebum Production: Sebaceous gland secretes sebum composed of triglycerides, wax esters, squalene, and free fatty acids.

Provides: Lubrication, Moisturization, Antimicrobial protection

Excess sebum → dandruff, clogged follicles

Low sebum → dry, brittle hair

Herbal oils like Argan oil and Vitamin E help balance sebum composition [3].

4. Blood Supply and Nutrition: Dermal papilla receives rich blood supply from dermal capillaries.

Provides: Amino acids for keratin, Minerals (Zn, Fe), Vitamins (B-complex, A, E, C), Oxygen

Proper blood flow enhances hair thickness and growth. Rosemary oil improves microcirculation.

5. Hormonal and Genetic Influence:

Androgens regulate hair growth.

Excess DHT (dihydrotestosterone) causes follicle shrinkage, leading to androgenic alopecia.

Herbal antioxidants (Amla, Hibiscus, Bhringraj) protect follicular cells from inflammatory and oxidative damage [3].

Hair Growth Cycle: -

The human hair grows in a cyclic pattern, consisting of phases of growth, regression, rest, and shedding. This continuous cycle ensures natural replacement of old hair with new hair. Any disturbance in this cycle—due to stress, hormonal imbalance, nutritional deficiency, or scalp disorders—can lead to excess hair fall. Herbal ingredients such as Bhringraj, Amla, Aloe vera, Rosemary, and Vitamin E help support healthy hair cycling by improving follicular nourishment, enhancing blood circulation, and reducing oxidative stress [2][5].

HAIR GROWTH CYCLE

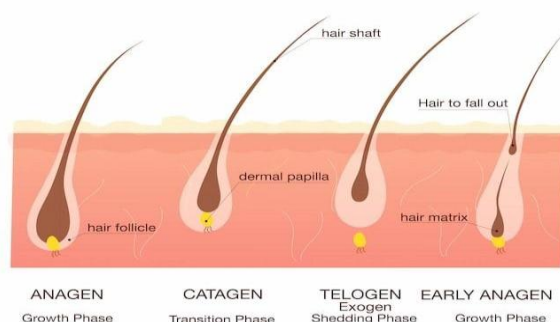


Fig 02. Hair growth cycle

The hair growth cycle has four major phases:

1. **Anagen Phase (Active Growth Phase)**: Represents 85–90% of scalp hair. Lasts 2–6 years depending on genetics. Hair matrix cells rapidly divide and push the hair shaft upward. Melanocytes provide pigmentation to the growing hair. Herbal actives like Bhringraj, Amla, and Rosemary oil enhance microcirculation and prolong the anagen period. Longer anagen = longer and thicker hair strands [2]

2. **Catagen Phase (Transition Phase)**: Short transitional period of 2–3 weeks. Hair growth stops due to shrinkage of the hair follicle. The connection between the dermal papilla and hair bulb weakens. Follicle prepares to enter resting phase. Antioxidant-rich herbs like Vitamin E and Amla help reduce premature entry into catagen.

3. **Telogen Phase (Resting Phase)**: Lasts 2–3 months. Hair follicle is inactive but remains anchored in the scalp. Around 10–15% of hair is in this phase at any time. Nutritional deficiency or stress can shift more hair into telogen → leading to telogen effluvium (excess hair fall). Herbs like Aloe vera and Hibiscus help maintain scalp hydration and support healthy follicle rest [2]

4. **Exogen Phase (Shedding Phase)**:

Final stage where old hair naturally falls out.

Normally 50–100 hairs are shed per day.

Follicle then returns to anagen to start new hair growth.

Strengthening herbs (Bhringraj, Amla, Argan oil) help reduce excessive exogen shedding.

Why the Hair Cycle is Important in Herbal Serum Formulations?

1) Helps identify which phase requires stimulation (anagen),

2) Which requires protection (catagen & telogen),

3) And which requires control of shedding (exogen).

4) Herbal serums work best by enhancing anagen, reducing premature catagen, and preventing excessive shedding, thus promoting overall hair growth and reducing hair fall [2][5]

Types of Hair:

Hair varies greatly among individuals due to genetic, hormonal, nutritional, and environmental factors.

These variations influence hair texture, strength, growth rate, breakage tendency, and response to herbal formulations. Understanding hair types is essential for selecting appropriate herbal ingredients such as Aloe vera, Amla, Bhringraj, Rosemary, Hibiscus, Vitamin E, and Argan oil. Different hair types have different needs for hydration, nourishment, scalp conditioning, and cuticle protection [2][5].



Fig03.Hairs types

1. Based on Hair Shape / Curl Pattern: The curl pattern of hair is determined by follicle shape and the distribution of keratin bonds in the hair shaft [2].

1.1 Straight Hair (Type 1): Hair emerges from round follicles. Smooth and reflective surface makes it appear shiny. Easily becomes greasy because sebum spreads quickly. Requires lightweight, non-sticky serums.

1.2 Wavy Hair (Type 2): “S”-shaped pattern. Moderately shiny but prone to frizz. Needs hydration without heaviness. Herbal serums with aloe vera and hibiscus improve definition.

1.3 Curly Hair (Type 3): Loose to spring-like curls. Cuticle layer lifts easily, making hair dry. Needs deep hydration and slip to prevent tangling. Bhringraj and argan oil help maintain elasticity.

1.4 Coily / Kinky Hair (Type 4) : Very tight curls or zig-zag pattern. Naturally dry and fragile. Breaks easily due to fewer cuticle layers. Requires highly moisturizing herbal oils and butters.

2. Based on Hair Thickness (Strand Diameter): Thickness depends on the diameter of individual hair fibers [5]

2.1 Fine Hair: Small-diameter strands with low strength.

Gets weighed down by heavy oils.

Needs lightweight serums with aloe vera and amla.

2.2 Medium Hair: Balanced thickness and strength.

Responds well to most herbal serums.

Retains moisture better than fine hair.

2.3 Coarse Hair

Large-diameter strands with strong cortex.

Feels rough due to raised cuticles.

Needs rich oils like argan oil and vitamin E for smoothing.

3. Based on Hair Porosity (Moisture Absorption Capacity): Porosity reflects the ability of hair to absorb and retain moisture, depending on cuticle condition [2][6]

3.1 Low Porosity: Cuticles tightly packed.

Products remain on the surface.

Lightweight, water-based serums work best.

3.2 Medium Porosity: Slightly raised cuticles.

Absorbs and retains moisture effectively.

Most herbal blends work well.

3.3 High Porosity: Damaged or lifted cuticles (due to heat, colouring, chemicals).

Absorbs quickly but loses moisture fast.

Needs humectants + sealing oils (aloe vera + argan oil).

4. Based on Hair Density (Number of Strands per Area)

Density determines the volume of the hair [5].

4.1 Low Density: Sparse follicles, scalp easily visible.

Needs lightweight serums to avoid flat appearance.

Helps in anti-hair fall discussions.

4.2 Medium Density

Balanced appearance with normal fullness.

Works well with most products.

4.3 High Density

Appears thick and voluminous.

Needs good detangling agents to reduce breakage.

5. Based on Scalp Type: The scalp environment significantly affects hair growth and fall [6]

5.1 Oily Scalp: Excess sebum production.

Leads to greasiness, dandruff, and hair fall.

Requires non-comedogenic herbal serums.

5.2 Dry Scalp: Poor sebum production.

Causes itching, flaking, and weak roots.

Herbal emollients and hydrating agents helpful.

5.3 Normal Scalp

Balanced oil production.

Most herbal serums work effectively.

5.4 Sensitive Scalp

Easily irritated by chemical products.

Requires mild herbal formulations (aloe vera, hibiscus).

6. Based on Hair Condition / Damage Level:

6.1 Chemically Treated Hair

Dyed, bleached, or straightened hair has damaged cuticles.

Needs reparative, protein-rich herbal serums.

6.2 Heat-Damaged Hair: Excessive use of straighteners/curlers weakens the cortex.

Benefits from vitamin E and argan oil.

6.3 Pollution-Exposed Hair

Dust and pollutants degrade keratin.

Antioxidant herbs like amla and rosemary help.

Hair problems and Hair Causes:

1. Hair Fall (Alopecia): Problem: Excessive shedding or weakening of hair, leading to reduced hair volume. Causes: Nutritional deficiencies (iron, zinc, proteins) [2] Hormonal imbalance (thyroid, PCOS) [2] Stress, anxiety, and lack of sleep [7], Excessive heat styling and chemical treatments [7], Genetic predisposition (androgenic alopecia) [7], Environmental pollution and UV exposure [2]



Fig04.Hairfall

2. Dandruff (Dry or Oily Scalp Flaking): Problem: White flakes, itching, and irritation of the scalp. Causes: Overgrowth of Malassezia fungi [2], Excessive dryness or excess sebum on scalp [7], Harsh chemical shampoos and improper washing [2], Stress and climate change (winter dryness) [7], Poor scalp hygiene [2]



Fig05.Dandruff

3. Premature Greying of Hair: Problem: Loss of natural hair pigment (melanin) before the age of 25–30. Causes: Genetic inheritance [7], Vitamin B12 deficiency [8], Oxidative stress and free-radical damage [7], Smoking and lifestyle factors [8], Prolonged use of chemical dyes [7]



Fig06.greying hairs

4. Dry, Rough, and Damaged Hair: Problem: Hair becomes dull, frizzy, brittle, and easily breakable. Causes: Over-washing with sulfate shampoos [2], Frequent heat styling (straightener, dryer) [7], UV radiation and environmental dust [2], Loss of natural oils, dehydration [8], Poor nutrition (lack of omega fatty acids) [2]



Fig07.dry, rough, damage hairs

5. Split Ends (Trichoptilosis): Problem: Fraying of hair tips due to weakening of the hair shaft. Causes: Mechanical damage from combing wet hair [7], Heat styling and over-shampooing [2], Too much sun and pollution exposure [7], Lack of trimming and dryness [2]



Fig08.split ends

6. Scalp Infections (Fungal/Bacterial): Problem: Weak hair roots, inflammation, itching, and patchy hair loss. Causes: Fungal infections like tinea capitis [2], Bacterial contamination from sweat, dirt [7], Sharing combs or towels [2], Poor scalp hygiene [7]



Fig09.scalp infections

7. Oily Scalp and Greasy Hair
Problem: Excess oil makes the scalp sticky and increases hair fall.
Causes: Overactive sebaceous glands [8]
Hormonal imbalance (adolescence, PCOS) [7]
Humid climate [8]
Heavy oil-based products [2]



Fig10.oily scalp

8. Hair Thinning
Problem: Gradual reduction in hair density, making scalp visible.
Causes:

Aging and hormonal decline [7]
Iron deficiency and malnutrition [2]
Chronic stress and illness [8]
Long-term medication use [7]



Fig11.Hair thinning

Types Of Herbal Hair Serum

1. Based on Formulation Base

a. Water-Based Herbal Serum

Features: Light, non-sticky, quick absorption [9].

Common Herbs: Aloe vera gel, Hibiscus extract, Amla extract [10].

Best For: Oily scalp, sensitive scalp, daily use [9].

b. Oil-Based Herbal Serum

Features: Nourishing, provides lubrication, reduces dryness [11].

Common Herbs/Oils: Rosemary oil, Argan oil, Vitamin E oil, Bhringraj extract (oil-soluble) [10].

Best For: Dry, frizzy, or damaged hair [11].

c. Emulsion-Based Herbal Serum

Features: Balanced hydration + nourishment [9].

Common Ingredients:

Aloe vera gel + Rosemary oil + Argan oil + Herbal extracts (Amla, Bhringraj, Hibiscus) [10]

Best For: Normal to combination scalp types [9]

2. Based on Therapeutic Action

a. Herbal Hair Growth Serum

Purpose: Stimulates follicles and promotes new hair growth [9].

Key Herbs: Bhringraj extract, Rosemary oil, Amla extract, Hibiscus extract [10].

b. Herbal Anti-Hair Fall Serum

Purpose: Reduces hair shedding and strengthens roots [9].

Key Herbs: Amla extract, Aloe vera gel, Bhringraj extract, Vitamin E, Hibiscus extract [11].

c. Herbal Scalp-Nourishing Serum

Purpose: Improves scalp health by reducing dryness, itchiness, and inflammation [10].

Key Herbs: Aloe vera gel, Argan oil, Hibiscus extract, Rosemary oil [11].

d. Herbal Split-End Repair Serum

Purpose: Smooths cuticles and minimizes split ends [10].

Key Herbs: Hibiscus extract, Argan oil, Vitamin E [11].

e. Herbal Heat Protection Serum

Purpose: Protects hair from heat, UV, and pollution [9].

Key Herbs: Amla extract (antioxidants), Rosemary oil, Vitamin E [11].

f. Herbal Frizz-Control Serum

Purpose: Smoothens hair and reduces frizz naturally [10].

Key Herbs: Aloe vera gel, Argan oil, Hibiscus extract [9].

Application Procedure for Herbal Hair Growth Serum:

Step-1: Prepare the Scalp and Hair

Wash your scalp with a mild herbal or sulphate-free shampoo to remove dirt, excess oil, and buildup [12].

Gently towel-dry your hair [12].

Keep the hair slightly damp to enhance serum absorption [12].

Step-2: Divide the Hair into Sections

Use a comb or fingers to part your hair into small, manageable sections [13].

This ensures easier access to the scalp for targeted application [13].

Step-3: Measure and Take the Required Amount of Serum

Shake the bottle gently if required [14].

Take 1–2 mL of serum using a dropper or fingertips [14].

If using a spray type, 5–6 sprays are generally adequate for full scalp coverage [14].

Step-4: Apply the Serum Directly to the Scalp

Place the serum directly on the scalp, especially on thinning or affected areas [12].

Press or tap gently to help the serum settle into the skin [12].

Avoid applying it on hair strands, as scalp serums act mainly on hair follicles [12].

Step-5: Massage the Scalp Slowly and Gently

Massage for 3–5 minutes using fingertips in circular motions [13].

This promotes blood circulation and enhances serum penetration into follicles [13].

Step-6: Leave the Serum Undisturbed

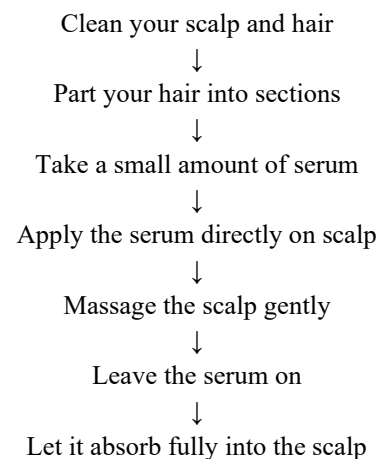
Do not rinse the scalp after application [14].

Allow the serum to completely absorb into the scalp [14].

Step-7: Maintain Regular Usage

Apply the serum once or twice a day (morning and night) for best results [12].

Visible improvements generally appear after 4–8 weeks of consistent use [12]



Advantages of Herbal Hair Serum

1. Provides natural nourishment to scalp due to phytochemicals, vitamins, and antioxidants present in herbs. [15]
2. Reduces hair fall by strengthening hair follicles through herbal actives like amla, bhringraj, and hibiscus. [16]
3. Enhances hair growth by improving microcirculation and stimulating follicles. [16]
4. Moisturizes scalp and hair without heavy synthetic chemicals, giving smoothness and shine. [15]
5. Reduces dandruff and inflammation due to antimicrobial and anti-inflammatory herbal agents. [15]
6. Improves hair texture and reduces frizz because of natural conditioning oils.
7. Has fewer side effects compared to chemical-based serums when properly formulated.
8. Contains antioxidants that protect hair follicles from oxidative stress and damage. [15]

9. Supports long-term hair health as herbs promote follicular nutrition.
10. Environment-friendly and generally biodegradable, making the product more sustainable.

Disadvantages of Herbal Hair Serum

1. Effects may be slower than synthetic serums due to natural action of herbs. [16]
2. Possible risk of allergic reactions to certain herbs or essential oils. [15]
3. Variability in quality depending on source of plant material and extraction method. [16]
4. Shelf life may be shorter due to fewer synthetic preservatives.
5. Strong herbal smell may not be preferred by all users.
6. Consistency and stability of herbal formulations can be difficult to maintain. [16]
7. Some ingredients may oxidize quickly if not stored properly.
8. Limited scientifically proven clinical trials for many herbal ingredients. [15]
9. Potency of herbal actives can decrease over time.
10. Overuse of essential oils (e.g., rosemary) may cause scalp irritation in sensitive individuals. [15]

Benefits of Herbal Hair Serum

1. Controls Frizz [17]
→ Herbal hair serum forms a protective layer over the hair strands.
→ It locks in moisture and shields hair from humidity.
→ This helps tame dry, rough, and frizzy hair, making it smoother.
2. Adds Shine and Gloss [17]
→ Most herbal serums contain Aloe vera gel, Argan oil, and Vitamin E which act as light-reflecting natural conditioners.
→ They instantly enhance the natural shine of hair, making it look healthy and glossy.
3. Detangles Hair [18]
→ Serum smoothens the hair surface, reducing knots and tangles.
→ It makes combing easier and prevents breakage due to pulling.
4. Protects from Heat Damage [18]
→ Acts as a natural barrier against heat from straighteners, curlers, and dryers.

→ Prevents hair from becoming dry or burnt due to excessive heat.

5. Prevents Split Ends [17]

→ Coats the hair shaft and temporarily seals split ends.
→ Reduces the appearance of damaged hair and keeps ends looking healthier.

6. Moisturizes and Hydrates [17]

→ Herbal serums often contain Aloe vera gel, Hibiscus extract, and Vitamin E.
→ These ingredients deeply moisturize dry, brittle hair and restore softness.

7. Reduces Hair Fall [18]

→ Smooth combing with serum reduces breakage-related hair fall.
→ Herbs like Amla extract and Bhringraj extract strengthen roots and minimize hair fall.

8. Treats Scalp Issues [18]

→ Rosemary oil, Hibiscus extract, and Amla extract help reduce dandruff, itching, and infections. → These ingredients have natural antibacterial and antifungal properties.

9. Improves Hair Texture [17]

→ Improves hair quality, making it soft, smooth, and silky.

→ Helps repair chemically treated or damaged hair.

10. Boosts Hair Growth [18]

→ Herbs like Rosemary oil, Bhringraj extract, and Amla extract stimulate blood circulation.
→ Promotes new hair growth and increases hair density over time.

Need of Hair Serum

1. Moisture & Hydration [17]

Provides essential moisture to dry, brittle hair, especially after heat styling or chemical treatments. Helps retain moisture in the hair shaft, preventing dehydration.

2. Frizz Control [17]

Controls frizz and flyaways caused by humidity or dryness.

Ideal for individuals with curly, coarse, or unruly hair.

3. Shine & Lustre [17]

Adds a glossy, healthy shine to dull and lifeless hair. Makes hair appear polished, smooth, and vibrant.

4. Protection from Heat Damage [18]

Shields hair from damaging effects of heat styling tools such as straighteners, blow dryers, and curling rods.

Helps prevent split ends and breakage due to excessive heat exposure.

5. Reduces Hair Fall [18]

Strengthens hair strands and minimizes breakage during brushing or combing.

Herbal formulations nourish the scalp, which may contribute to reduced hair fall.

6. Detangling [17]

Makes hair softer and more manageable, making detangling easier.

Reduces pulling, snapping, and mechanical damage during combing.

Functions of Hair Serum:

1. Smoothing and Cuticle Protection:

Forms a thin, protective film over the cuticle, reducing roughness and improving hair texture. [19]

2. Frizz Control:

Controls static electricity and humidity-induced frizz by sealing the outer cuticle layer. [19]

3. Enhancement of Shine and Gloss:

Improves light reflection on the hair surface, giving hair a glossy, healthy look. [20]

4. Detangling Action:

Reduces friction between hair strands, making combing easier and preventing breakage. [19]

5. Heat & Environmental Protection:

Protects hair from UV damage, pollution, dust, and heat from styling tools. [19]

6. Moisturization & Conditioning:

Acts as a leave-on conditioner, improving softness and hydration of dry or damaged hair. [20]

7. Prevention of Split Ends & Breakage:

Strengthens hair fibres, reducing damage caused by brushing and styling. [19]

8. Improving Hair Manageability:

Makes hair easier to style by aligning and softening the strands. [20]

9. Supporting Hair Growth (Herbal Serums):

Herbal extracts such as Amla, Bhringraj, and Rosemary enhance scalp circulation and nourish follicles. [20]

10. Anti-Hair Fall Action:

Reduces breakage-related hair fall by strengthening and lubricating the hair shaft. [20]

Collection of Herbal Serum Ingredients:

1. Collection of Aloe Vera Leaves (for Aloe Vera Gel)

Best Time to Collect: Early morning or late evening to avoid intense sunlight [2].

Mature, thick leaves from plants aged 1.5–2 years give maximum gel [1].

How to Collect: Cut the outermost mature leaves from the base using a sterilized knife [2].

Allow the yellow latex (aloin) to drain, as it is irritating and usually discarded [2].

Post-Collection Handling:

Wash thoroughly [2].

Peel and extract the clear inner gel [2].

Use immediately or refrigerate in sterilized containers [2].

For powder/long storage: dry the gel at low temperature and pulverize [2].

2. Collection of Amla Fruit (*Embllica officinalis*) for Extract

Best Time to Collect: Late autumn to early winter when fruits are fully mature and greenish-yellow [17].

How to Collect: Handpick fruits gently from healthy, disease-free trees [17].

Avoid overripe, damaged, or fallen fruits [17].

Post-Collection Handling:

Wash fruits to remove dirt [17].

Cut into small pieces and dry in shade or at low temperature (< 45°C) [2]

17]. Store in airtight containers away from heat and moisture [17].

3. Collection of Bhringraj (*Eclipta alba*) for Extract

Best Time to Collect: During the flowering stage—usually late summer to early winter [2].

Collect on dry days in the early morning [2].

How to Collect: Uproot or cut the aerial parts of the plant (leaves and stems) [2].

Select fresh, green, fully developed parts [2].

Post-Collection Handling: Rinse lightly to remove soil [2].

Shade-dry to preserve phytochemicals [2].

Grind into powder or prepare fresh extract [2].

Store in air-tight containers [2].

4. Collection of Rosemary Leaves (for Rosemary Essential Oil)

Best Time to Collect: Mid-morning after dew has dried [17].

Leaves contain maximum essential oil before flowering [17].

How to Collect: Harvest the top 10–12 cm tender branches using clean scissors [17].

Choose aromatic, undamaged leaves from healthy plants [17]. Post-Collection Handling:

Rinse lightly and pat dry [17].

Use fresh for steam-distillation to obtain essential oil [17].

Store extracted oil in amber-colored bottles in a cool, dark place [17].

5. Collection of Hibiscus Flowers/Leaves for Extract

Best Time to Collect: Early morning when flowers and leaves are fresh [2].

Avoid collection during rain or high humidity [2].

How to Collect: Pluck fully opened, bright flowers and young healthy leaves [2].

Avoid yellowing or insect-damaged parts [2].

Post-Collection Handling: Rinse gently to remove dust [2].

Shade-dry or use a dehydrator at $< 40^{\circ}\text{C}$ [1].

Store in airtight containers in a cool, dark place [2].

6. Vitamin E Capsules (Tocopherol)

Collection/Procurement: Purchased from certified pharmaceutical or cosmetic-grade suppliers [17].

Handling: Store below 25°C , protected from direct sunlight [17].

Use clean needles to puncture capsules before extraction [17].

7. Argan Oil (*Argania spinosa*)

Procurement: Obtain from certified cosmetic-grade suppliers [17].

Prefer cold-pressed, unrefined oil for maximum nutrient content [17].

Handling: Store in amber bottles to prevent oxidation [17].

Keep in a cool, dry place away from direct light [17].

IV. HERBAL INGREDIENTS PROFILE

1) ALOEVERA: (Aloe Vera Gel)

Aloe vera (*Aloe barbadensis* Miller) is a widely used medicinal succulent known for its rich hydrating and healing properties, making it a key ingredient in herbal hair growth and anti-hair fall formulations. The inner leaf gel contains polysaccharides, vitamins, minerals, enzymes, amino acids, and antioxidants that nourish the scalp and strengthen hair follicles. Its soothing and

anti-inflammatory action helps calm irritated scalp conditions, while its antimicrobial activity helps reduce dandruff. Aloe vera also improves scalp circulation, supports natural hair growth, enhances moisture retention, and forms a protective layer that adds smoothness and shine, making it highly beneficial in herbal hair serums [21][22].



Fig12.aloevera gel

1. Biological Source

Aloe vera is obtained from the fresh leaves of *Aloe barbadensis* Miller [21]

(Also known as Aloe vera (L.) Burm.f.)

2. Scientific Name

Aloe barbadensis Mille (Synonym: *Aloe vera* (L.) Burm.f.)

3. Family: *Asphodelaceae* (Previously under *Liliaceae*) [21]

4. Chemical Constituents

Aloe vera contains polysaccharides, anthraquinones, vitamins, enzymes, amino acids, minerals, saponins, lignins, and sterols [21,22].

5. Morphological Characteristics

General Plant Features

Stemless or short-stemmed succulent herb [21]

Height: 60–100 cm [21]

Forms a basal rosette of thick fleshy leaves [22]

Adapted to arid and semi-arid climates [21]
 Leaves: Thick, fleshy, lanceolate leaves [22]
 Colour: green to grey-green [21]
 Margins with small white teeth [21]
 Contains clear mucilaginous inner gel [21]
 Smooth surface, sometimes with white spots in young plants [22]
 Taste slightly bitter [22]
 Stem: Very short or almost absent [21]
 Bears the leaf rosette [22]
 Flowers: Tubular, yellow to orange flowers [21]
 Arranged in tall spike-like inflorescence [22]
 Flower stalk long, slender, erect [22]
 Roots: Fibrous root system [21]
 Adapted to store water and survive drought [21]
 External Appearance

Rosette-forming succulent with long, fleshy, serrated leaves filled with transparent gel [22]
 Commonly grown in household gardens and dry regions [21]

6. Parts Used in Hair Serum: Leaf gel, leaf juice, aloe extract (aqueous/gel-based formulation) [21]

7. Benefits of Aloe Vera in Hair Serum

1. Promotes hair growth by increasing blood circulation [22]
2. Reduces hair fall through strengthening action of polysaccharides [21]
3. Treats dandruff due to antimicrobial and antifungal activity [21]
4. Soothes irritated or itchy scalp due to anti-inflammatory effects [21]
5. Deeply hydrates hair and prevents dryness [22]
6. Maintains scalp pH and improves overall scalp health [22]
7. Adds natural shine and smoothness by forming a protective layer [21]

2)AMALA: (Amala extract)

Amla (*Phyllanthus emblica* Linn.), a traditional Ayurvedic powerhouse, is highly valued in herbal hair growth and anti-hair fall formulations due to its exceptional nutrient profile Rich in vitamin C, tannins, flavonoids, and antioxidants, amla deeply nourishes the scalp, strengthens hair roots, and promotes healthier follicular activity. Its antimicrobial and anti-inflammatory properties help control dandruff and maintain scalp cleanliness, while its strong antioxidant action effectively prevents premature greying Amla also enhances collagen production, improves hair

thickness, and adds natural shine and smoothness, making it an essential ingredient in effective herbal hair serums [23][24].



Fig13.Amla

1. Biological Source: Amla is obtained from the fruits of *Phyllanthus emblica* Linn. [23]

(Also known as *Emblica officinalis* Gaertn.)

2. Scientific Name: *Phyllanthus emblica* Linn. (Synonym: *Emblica officinalis* Gaertn.)

3. Family: *Phyllanthaceae*. (Previously placed in *Euphorbiaceae*)

4. Chemical Constituents: Amla contains vitamin C, tannins (emblicanins A & B), flavonoids, polyphenols, amino acids, pectin, fixed oils, and minerals [23][24].

5. Morphological Characteristics

General Plant Features

A small to medium-sized deciduous tree [23]

Common height: 8–18 meters [23]

Upright growth habit with spreading crown [23]

Leaves

Simple, numerous, arranged closely along branchlets [23]

Appear like pinnate leaflets but are individual tiny leaves [23]

Light green colour [24]

Size: 1–2 cm long [23]

Thin and smooth texture [24]

Odour mild; taste intensely sour and astringent due to high vitamin C [24]

Stem: Trunk straight with light brown to grey bark [23]

Bark surface smooth with fine fissures [23]

Branchlets slender and drooping [24]

Flowers: Small, greenish-yellow flowers [24]

Unisexual and borne in clusters in leaf axils [24]

Male flowers more numerous than female [23]

Fruit: Round, smooth, light greenish-yellow fruit [23]

Size: 2–3 cm diameter [23]

Six vertical segment lines clearly visible on surface [23]

Taste: very sour, astringent, rich in vitamin C [24]

Contains a hard, 6-lobed stone [24]

Roots: Strong, fibrous, and deep root system [23]

Adapted to dry and semi-arid conditions [23]

External Appearance: Medium-sized tree with light green leaves and round segmented fruits [24]

Fruits glossy, smooth, and easily identifiable due to segment lines [23]

6. Parts Used in Hair Serum: Fruit, fruit extract, amla oil, amla powder, or juice [24]

7. Benefits of Amla in Hair Serum

1. Promotes hair growth by boosting collagen and follicular activity [23]

2. Strengthens hair roots and reduces hair fall [24]

3. Prevents premature greying due to strong antioxidant properties [24]

4. Treats dandruff via antimicrobial and anti-inflammatory effects [23]

5. Thickens hair shafts and improves volume [23]

6. Maintains scalp pH and conditions scalp [24]

7. Enhances natural shine and smoothness of hair [23]

3)BHRINGRAJ: (Bhringraj extract)

Bhringraj (*Eclipta alba* / *Eclipta prostrata*) is a highly revered herb in Ayurveda, especially known for its powerful hair-revitalizing properties. Rich in coumestans like wedelolactone, flavonoids, alkaloids, and essential nutrients, bhringraj strengthens hair follicles, stimulates rapid hair growth, and significantly reduces hair fall. Its potent antioxidant activity prevents premature greying, while antimicrobial and anti-inflammatory actions help treat dandruff and soothe scalp irritation. By deeply nourishing the scalp and improving blood circulation, bhringraj enhances hair thickness, volume, and overall hair health, making it a key component in herbal hair growth and anti-hair fall serums [25][26]



Fig14. Bhringraj

1. Biological Source: Bhringraj is obtained from the whole aerial parts and leaves of *Eclipta alba* (L.) Hassk. [25] (Updated accepted name: *Eclipta prostrata*)

2. Scientific Name: *Eclipta alba* (L.) Hassk. (Current accepted name: *Eclipta prostrata*)

3. Family: Asteraceae [26]

4. Chemical Constituents: Contains coumestans (wedelolactone), flavonoids, alkaloids, triterpenes, sterols, saponins, polypeptides, essential oils, and minerals [25,26].

5. Morphological Characteristics:

General Plant Features

A small annual herb growing in moist areas [25]

Height: 30–50 cm [25]

Growth habit: creeping or prostrate with branching [26]

Leaves

Simple, opposite, lanceolate leaves [25]

Bright green colour [26]

Size 3–8 cm long

Rough, hairy texture [25]

Margin entire to slightly serrated

Mild herbal smell and bitter taste [26]

Stem

Cylindrical green stems with fine hairs [25]

Slightly ridged structure

Often grows prostrate along the ground [26]

Flowers

Small, solitary, white flowers [25]

Composite inflorescence characteristic of Asteraceae [26]

Yellow disc florets in centre with white ray florets

Diameter: 6–8 mm

Roots

Thin, fibrous, light brown roots [25]

Spread laterally in moist soil [26]

External Appearance

Low-growing green herb with tiny white daisy-like flowers [25][6]

Commonly found near water bodies and damp fields

6. Parts Used in Hair Serum

Leaves, whole plant extract, oil prepared from leaf extract [26]

7. Benefits of Bhringraj in Hair Serum

1. Promotes rapid hair growth by activating follicles [25]

2. Reduces hair fall by strengthening roots [26]

3. Prevents premature greying with strong antioxidants [25]

4. Treats dandruff and scalp infections (antibacterial/antifungal) [26]

5. Improves hair thickness and volume [25]

6. Soothes scalp inflammation and itching [26]

7. Enhances natural shine and smoothness [25]

4) ROSEMARY: (Rosemary oil)

Rosemary (*Rosmarinus officinalis* / *Salvia rosmarinus*) is a highly aromatic medicinal herb widely used in herbal hair growth and anti-hair fall formulations due to its potent bioactive compounds. Rich in essential oils like 1,8-cineole and camphor, along with rosmarinic acid, flavonoids, and antioxidants, rosemary enhances scalp microcirculation, promoting stronger and faster hair growth. Its antimicrobial and antifungal properties help control dandruff and maintain a healthy scalp environment, while its antioxidant action supports delayed premature greying. Rosemary also balances scalp oil production and nourishes hair follicles, improving hair thickness, softness, and natural shine, making it a valuable ingredient in herbal hair serums [27][28].



Fig.15 Rosemary

1. Biological Source: Rosemary is obtained from the fresh or dried leaves and flowering tops of *Rosmarinus officinalis* Linn. [27] (Current accepted name: *Salvia rosmarinus*)

2. Scientific Name: *Rosmarinus officinalis* Linn. (Updated name: *Salvia rosmarinus*)

3. Family: Lamiaceae (Mint family) [28]

4. Chemical Constituents: Contains essential oils (1,8-cineole, α -pinene, camphor, borneol), phenolic diterpenes (carnosic acid, carnosol), phenolic acids (rosmarinic acid), flavonoids (luteolin, apigenin), triterpenes (ursolic acid, oleanolic acid), alkaloids, tannins, antioxidants, and minerals [27][28].

5. Morphological Characteristics:

General Plant Features

Perennial, woody, evergreen shrub [27]

Height: 1–2 meters [27]

Erect, bushy growth habit, highly aromatic [28]

Leaves:

Narrow, linear, needle-like leaves [27]

Colour: dark green upper surface, silver-white underneath [28]

Leathery texture with smooth surface [27]

Strong, refreshing aromatic scent [27]

Taste: pungent, slightly bitter [28]

Stem

Woody brown stems with multiple branches [27]

Younger stems green and flexible [28]

Flowers

Small, bilipped, pale blue to violet flowers [27]

Arranged in clusters along upper leaf axils [28]

Blooming season: spring and early summer [27]

Roots

Deep, fibrous root system [28]

Adapted to dry and rocky soils [28]

External Appearance

Fragrant, bushy herb with needle-like leaves and light blue flowers [27]

Widely grown in Mediterranean regions and herbal gardens [28]

6. Parts Used in Hair Serum

Leaves, leaf extract, rosemary essential oil, aqueous or alcoholic extract of flowering tops [28]

7. Benefits of Rosemary in Hair Serum

1. Stimulates hair growth by improving scalp microcirculation [27]
2. Strengthens hair roots and reduces hair fall [28]
3. Prevents premature greying due to antioxidant-rich constituents [27]
4. Possesses potent antimicrobial activity effective against dandruff [28]
5. Reduces scalp inflammation and soothes irritation [27]
6. Enhances hair thickness and increases overall density [28]
7. Provides natural shine and freshness with its aromatic essential oils

5) Hibiscus: (Hibiscus extract)

Hibiscus (*Hibiscus rosa-sinensis* Linn.) is a widely cherished medicinal plant known for its powerful hair-nourishing properties, making it an essential ingredient in herbal hair growth and anti-hair fall serums. Rich in flavonoids, anthocyanins, mucilage, vitamins, and organic acids, hibiscus helps stimulate hair follicles, promoting stronger and healthier hair growth. Its natural conditioning action deeply hydrates the scalp, controls dryness, and improves hair texture. With strong antioxidant and antimicrobial properties, hibiscus effectively reduces dandruff, soothes scalp irritation, and helps delay premature greying. By strengthening roots and adding natural shine and smoothness, hibiscus supports overall hair health and enhances the efficacy of herbal formulations [29][30].



Fig.16 Hibiscus

1. Biological Source: Hibiscus is obtained from the leaves, flowers, and stems of *Hibiscus rosa-sinensis* Linn. [29]

2. Scientific Name: *Hibiscus rosa-sinensis* Linn.

3. Family: Malvaceae [30]

4. Chemical Constituents: Contains flavonoids (quercetin, kaempferol), anthocyanins, mucilage, vitamins (C and E), organic acids, sterols, and minerals [29][30]

5. Morphological Characteristics:

General Plant Features

Evergreen shrub or small tree [29]

Height: 1–3 meters [29]

Growth habit: upright, bushy, and ornamental [30]

Leaves

Simple, ovate, alternate leaves [29]

Dark green, glossy upper surface, lighter green underneath [30]

Margin: serrated or toothed [29]

Texture: smooth and slightly hairy [30]

Odour: mild, slightly herbal [29]

Taste: slightly astringent [30]

Stem

Woody, cylindrical stem [29]

Light brown to green, sometimes slightly hairy [30]

Flowers

Large, showy, trumpet-shaped flowers [29]

Colour: red, pink, yellow, or orange [29]

Bloom singly or in clusters at branch tips [30]

Petals: 5–7, overlapping, with central prominent staminal column [30]

Roots

Fibrous root system [29]

Adapted to well-drained soils [30]

External Appearance

Bushy ornamental shrub with large, colorful flowers and glossy green leaves [29][30]

Widely grown in tropical and subtropical gardens

6. Parts Used in Hair Serum

Leaves, flower extract, hibiscus powder, or juice [30]

7. Benefits of Hibiscus in Hair Serum

1. Stimulates hair growth by activating follicles [29]
2. Strengthens hair roots and reduces hair fall [30]
3. Prevents premature greying due to antioxidant action [29]
4. Treats dandruff and scalp irritation with antimicrobial activity [30]
5. Deeply conditions and hydrates the scalp [29]
6. Improves hair texture and volume [30]
7. Adds natural shine and smoothness [29]

6)Vitamin E: (Vitamin E Capsule)

Vitamin E, commonly used in capsule form (tocopherol/tocopheryl acetate), is a powerful antioxidant that plays a vital role in herbal hair growth and anti-hair fall serums. It helps neutralize free radicals that weaken hair follicles, thereby reducing hair fall and promoting stronger, healthier hair growth. Its excellent moisturizing properties nourish the scalp, prevent dryness, and reduce frizz by forming a protective layer over the hair shaft. Vitamin E also improves microcirculation in the scalp, ensuring better nutrient delivery to hair roots. Additionally, it supports repair of damaged hair, enhances elasticity, and adds natural shine and smoothness, making it an important component in effective hair care formulations [31][32].



Fig.17 Vitamin E (Capsule)

1.Biological Source: Vitamin E (tocopherols and tocotrienols) used in hair serums is obtained from vegetable oils such as wheat germ oil, sunflower oil, safflower oil, soybean oil, and corn oil [31].

Commercially, Vitamin E capsules contain α -tocopherol or tocopheryl acetate [32].

2. Scientific Name: No single botanical name because Vitamin E is a compound.

Primary active forms: α -Tocopherol / Tocopheryl acetate [31]

3. Family: Not applicable (Vitamin E is a phytochemical), belongs to chemical class: Tocopherols and Tocotrienols [32]

4. Chemical Constituents: α -Tocopherol (most active form γ -Tocopherol Tocotrienols Fatty acid carriers (vegetable oils) Antioxidants for stability (e.g., ascorbyl palmitate) Gelatin capsule shell (gelatin, glycerin, water) [31,32]

5. Morphological Characteristics

General Appearance

Soft, oval or round gelatin-based capsules [31]

Colour: yellow to golden [31]

Filled with clear to pale yellow oily liquid [32]

Texture & Physical Properties

Capsule surface smooth and flexible [31]

Inside liquid thick, oily, pale yellow [32]

Odour: mild, oily or neutral [32]

Taste: oily, slightly bland [31]

Chemical Nature

Fat-soluble vitamin with strong antioxidant activity [31]

Stable in oil but sensitive to light and heat [32]

Easily absorbed and spreads well on hair strands and scalp [32]

6. Parts Used in Hair Serum

Vitamin E capsule oil (tocopherol or tocopheryl acetate)

Extracted liquid from the soft gel capsule [31,32]

7. Benefits of Vitamin E in Hair Serum

1. Acts as a powerful antioxidant, preventing hair damage from free radicals [31]
2. Strengthens hair follicles, reducing breakage and split ends [32]
3. Improves scalp blood circulation, supporting healthy hair growth [31]
4. Deeply nourishes and moisturizes dry, frizzy, or damaged hair [32]
5. Repairs the hair barrier and reduces oxidative stress on scalp [31]
6. Helps reduce dandruff by soothing and balancing the scalp [32]
7. Enhances shine and softness by smoothing the hair cuticle [31]

7) Argan: (Argan oil)

Argan oil, often referred to as “liquid gold,” is a nutrient-rich oil extracted from the kernels of *Argania spinosa*. It is widely used in herbal hair growth and anti-hair fall serums due to its high content of essential fatty acids, vitamin E, antioxidants, and sterols. These components deeply nourish the scalp, strengthen hair follicles, and reduce breakage, helping to control hair fall. Its intense moisturizing ability smoothens the hair shaft, reduces frizz, and repairs damage caused by heat or styling. Argan oil also enhances scalp health by reducing dryness and inflammation while improving overall hair texture, softness, and shine—making it a valuable ingredient in natural hair care formulations [33][34].



Fig. 18 Argan Oil

1. Biological Source: Argan oil is obtained from the kernels (nuts) of *Argania spinosa* (L.) Skeels [33]
2. Scientific Name: *Argania spinosa* (L.) Skeels
3. Family: Sapotaceae [34]
4. Chemical Constituents: Contains essential fatty acids (oleic acid, linoleic acid), vitamin E (α -tocopherol), polyphenols, sterols (schottenol, spinasterol), squalene, carotenoids, triterpenoids, and minor minerals (magnesium, potassium) [33][34]
5. Morphological Characteristics:
 - General Plant Features
 - Evergreen, thorny tree native to Morocco [33]
 - Height: 8–10 meters [33]
 - Growth habit: wide-spreading branches with dense canopy [34]
 - Leaves
 - Small, lanceolate to oval leaves [33]
 - Colour: dark green [34]
 - Size: 2–4 cm long
 - Texture: leathery and tough [33]
 - Odour: mild or none

Taste: slightly bitter [34]

Stem

Rough, gnarled, twisted trunk [33]

Branches often have thorns

Bark: thick, greyish-brown [34]

Flowers

Small, greenish-yellow flowers [33]

Blooming season: spring [44]

Each flower contains five petals

Fruit

Berry-like, oval fruit [33]

Colour when ripe: yellowish-brown [34]

Contains hard nut with 1–3 oil-rich kernels

Outer pulp fleshy when young, becomes dry at maturity

Roots

Deep, extensive roots [33]

Adapted to arid regions [34]

External Appearance

Sturdy, drought-resistant tree with small leaves and thorny branches [33][44]

Rugged desert-tree look, common in Moroccan landscapes

6. Parts Used in Hair Serum

Kernal nuts Cold-pressed argan oil extracted from kernels [34]

7. Benefits of Argan Oil in Hair Serum

1. Deeply moisturizes hair due to high essential fatty acid content [33]
2. Strengthens hair strands and reduces breakage [34]
3. Controls frizz and smoothens dry, rough, or damaged hair [33]
4. Adds natural shine and softness to the hair shaft [34]
5. Protects hair from heat damage and UV radiation [33]
6. Nourishes the scalp, reducing dryness and flakiness [34]
7. Supports healthy hair growth by improving elasticity and reducing split ends [33]

V. METHODOLOGY

1. Objective

To formulate a natural, nutrient-rich herbal hair growth and anti-hair fall serum using Aloe vera gel, Amla extract, Bhringraj extract, Rosemary oil, Hibiscus extract, Vitamin E capsules, and Argan oil, aimed at strengthening hair follicles, promoting growth, and reducing breakage [2][36].

2. Required Materials & Equipment

Ingredients

1. Aloe vera gel (natural / stabilized) – 40 g [2]
2. Amla extract (Phyllanthus emblica) – 10 mL [35]
3. Bhringraj extract (Eclipta alba) – 10 mL [34][36]
4. Hibiscus extract (Hibiscus rosa-sinensis) – 10 mL [35]
5. Rosemary essential oil – 5–6 drops
6. Vitamin E capsules (400 IU) – 2 capsules (~2 mL)
7. Argan oil (cold-pressed) – 6 mL
8. Rose water / Distilled water – q.s. to make 100 mL

Equipment

Beakers, measuring cylinders, water bath, muslin cloth, mortar & pestle, magnetic stirrer, sterile amber bottle [2].

3. Procedure

A. Preparation of Herbal Extracts (Aqueous Extraction) :

(For Amla, Bhringraj, and Hibiscus extracts)

1. Weigh 10 g of each dried plant material (Amla, Bhringraj, Hibiscus) [35][36].
2. Add each herb to 100 mL distilled water in separate beakers.
3. Heat on a water bath for 20–25 minutes until reduced to one-fourth (~25 mL) [36].
4. Filter each extract through muslin cloth / filter paper.
5. Cool to room temperature before use.
6. Store extracts in airtight containers and use immediately [2].

Extraction Table:

Herbal Ingredient	Quantity (g)	Water Added (mL)	Reduced Volume
Amla (dried)	10 g	100 mL	~25 mL
Bhringraj (dried)	10 g	100 mL	~25 mL
Hibiscus petals	10 g	100 mL	~25 mL

Table A – Quantity for Production of decoction

B. Preparation of Gel Base:

Take 40 g of Aloe vera gel in a clean beaker.

Gradually add 20 mL of rose water with continuous stirring.

Mix gently using a magnetic stirrer until a smooth, uniform gel base is formed.

Allow the gel to hydrate and stabilize for 25–30 minutes [2].

C. Final Formulation:

After the gel base is completely hydrated, slowly incorporate the prepared herbal extracts (Amla, Bhringraj, and Hibiscus). Add 10 mL of each extract into the beaker, making a total of 30 mL, while stirring continuously to ensure homogenous blending of aqueous and gel phases [35].

Continue gentle stirring for 5–7 minutes to avoid air entrapment and to allow proper dispersion of the phytoconstituents throughout the gel matrix [36].

Add 6 mL of Argan oil dropwise to prevent separation and ensure uniform emulsification. Maintain slow stirring to allow the oil phase to incorporate smoothly into the gel-extract mixture. Argan oil enhances

nourishment and provides smoothness to the serum base.

Add 5–6 drops of Rosemary essential oil, functioning as a hair growth stimulant. Essential oils must be added in minimal quantities due to their high potency; hence slow stirring ensures even distribution within the formulation [2].

Cut open 2 Vitamin E capsules (approx. 2 mL) and squeeze the contents into the formulation. Vitamin E acts as an antioxidant and stabilizer, protecting the serum from oxidative degradation. Mix thoroughly to ensure uniform dispersion [36].

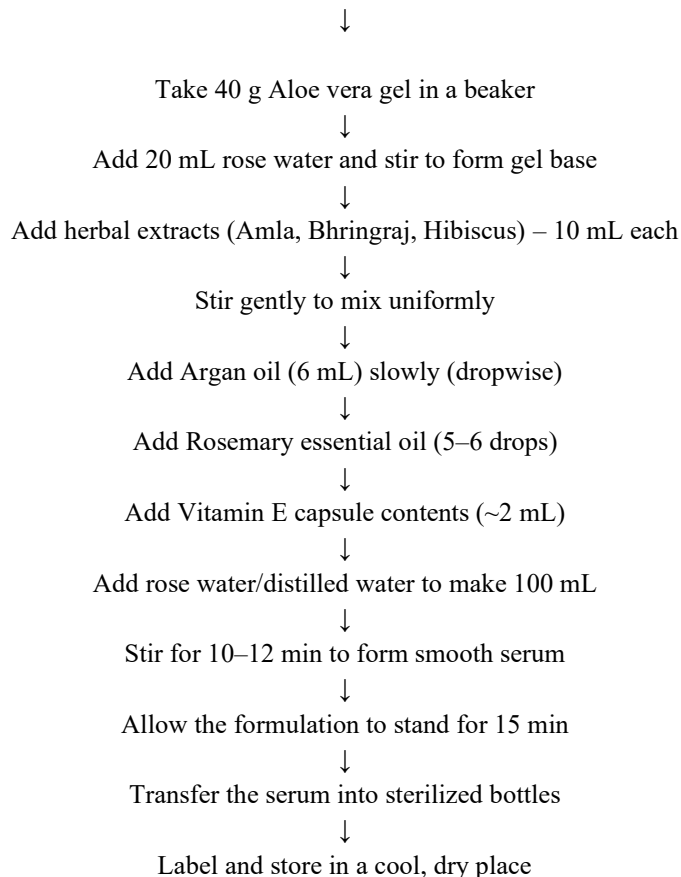
Add rose water or distilled water q.s. to adjust the final volume up to 100 mL. This step helps achieve the desired consistency, spreadability, and fluidity suitable for topical application.

Continue stirring the mixture for 10–12 minutes until the serum achieves a uniform, translucent, stable appearance without phase separation or clumping [36]. Allow the formulation to stand for 15 minutes to remove any entrapped air bubbles and ensure complete stabilization before packaging [37].

Formulation Table:

Sr. no	Ingredients	Required Quantity	Role of Ingredients
1	Amla extract	10 mL	Promotes hair growth, strengthens roots
2	Bhringraj extract	10 mL	Reduces hair fall, enhances follicular activity
3	Hibiscus extract	10 mL	Conditions scalp and improves shine
4	Aloe vera gel	40 g	Acts as a natural gelling and hydrating base
5	Argan oil	6 mL	Nourishes hair, reduces breakage and frizz
6	Rosemary oil	5-6 drops	Stimulates circulation and supports regrowth
7	Vitamin E capsule	~2 mL	Protects hair from oxidative damage
8	Rose water	q.s.	Provides soothing, cooling effect
9	Distilled water	q.s.	Adjusts final volume and consistency

Table – B Quantity and role of Ingredient

**D. Packaging**

Transfer the prepared serum into sterilized amber-colored glass or PET bottles.

Label the bottles with batch number, manufacturing date, ingredients, and storage instructions.

Store in a cool, dry place, away from direct sunlight to maintain potency [37].

VI. PHYSICOCHEMICAL EVALUATION**1. pH Measurement:**

Objective: To determine the pH of the herbal hair serum to ensure it is mildly acidic and scalp-friendly [2].

Materials Required:

- Digital pH Meter
- Buffer solutions (4.0, 7.0, 10.0)
- Serum sample
- Distilled water
- Beaker

Procedure:

1. Calibrate the pH meter using standard buffers [2].
2. Take 10 mL serum sample in a beaker.

3. Immerse the electrode and stir gently.
4. Allow stabilization (30–60 sec) and record the reading [40].

5. Rinse and dry the electrode.

2. Viscosity Test:

Objective: To determine the viscosity of the serum using standard viscometric methods [38].

Materials Required:

- Brookfield Viscometer
- Spindles
- Serum sample

Procedure:

1. Take 20 mL serum in beaker.
2. Select spindle (no. 64) [38].
3. Set 10–20 rpm.
4. Immerse spindle completely.
5. Record viscosity once reading stabilizes [5].

3. Spreadability Test:

Objective: To evaluate the ease of spreading of serum over the scalp [36].

Materials Required:

- Two glass slides
- 500 g weight
- Serum sample

Procedure:

1. Place serum between two slides.
2. Apply 500 g weight for 1 min.
3. Measure spread diameter in cm [36].
4. Color Test:

Objective: To visually assess color, uniformity, and physical stability [40].

Physicochemical Evaluation Table:

Sr. No	Parameter	Test Method	Observation	Inference
1	pH Measurement	pH	4.5-6.5	5.0
2	Viscosity	Brookfield Viscometer	100-500 Cp	438.5
3	Spreadability	Glass slide method	>5cm diameter	Good spreadability
4	Color	Visual	Uniform herbal colour	Muddy green
5	Odour	Organolaptic	Pleasant herbal	Minty
6	Clarity	Visual under light	Transparent	Opaque
7	Consistency	Touch + visual	Smooth, non greasy	Smooth, slightly viscous
8	Phase Inversion	Stability	No separation	No phase inversion

Table - C Evaluation test table

2) Skin Irritation Test:

Objective: To check safety and absence of irritation upon topical application [39].

Procedure:

Procedure:

1. Place serum sample on white background.
2. Observe color and uniformity under natural light [40].

5. Odour Test:

Objective:

To evaluate fragrance type and acceptability [5].

Procedure:

1. Smell serum directly after opening container.
2. Compare with expected herbal aroma [5].

6. Clarity Test:

Objective: To check transparency and presence of suspended particles [40].

Procedure:

1. Hold serum against bright light.
2. Note whether transparent, hazy, or opaque [40].

7. Consistency Test:

Objective: To evaluate smoothness, viscosity, and greasiness [38].

Procedure:

1. Take a drop on fingertip.
2. Rub to assess smoothness and flow [5].

8. Phase Inversion Test:

Objective: To assess physical stability and absence of phase separation [6].

Procedure:

1. Keep serum in sealed vial for 24–48 hours
2. Observe for oil separation or phase inversion [6].

Skin Irritation Table:

Sr.No.	Observation	Grade	Reaction	Observation
--------	-------------	-------	----------	-------------

1	No change	0	No irritation	Yes
2	Slight redness	1	Mild irritation	No
3	Redness + itching	2	Moderate irritation	No
4	Redness + sweating	3	Severe irritation	No

Table – D Skin Irritation

3) Efficacy Tests:

i) Foam Test:

Objective: To evaluate mild foam formation due to saponins or surfactants [36].

Procedure:

1. Add 5 mL serum to test tube.
2. Shake for 15 sec.
3. Observe foam formation and stability [36].

ii) Hair Smoothness Test:

Objective: To check softening and detangling property after application [36].

Procedure:

1. Apply serum to cleaned hair strands.
2. Comb and evaluate smoothness [5].

iii) Shine Test:

Objective: To check shine enhancement due to oils and plant extracts [5].

Procedure:

1. Observe hair under light after serum application [5].

iv) Absorption Rate Test:

Objective: To measure how fast serum absorbs without greasiness [38].

Procedure:

1. Apply 1 drop on skin.
2. Measure time until fully absorbed [38].

Efficacy Test Table:

Sr.No.	Test Method	Obsevation
1	Foam Test	Mild, stable foam
2	Hair Smoothness	Soft detangled
3	Shine Test	Glossy appearance
4	Absorption Rate	45-48 sec (non-greasy)

Table – E Efficacy test

VII. DISCUSSION

The prepared herbal hair growth and anti-hair fall serum shows good potential due to the combined action of its natural ingredients. Each component contributes an important role in improving scalp health and strengthening hair roots. Aloe vera and Argan oil provide hydration and smoothness, while Amla, Hibiscus, and Bhringraj supply antioxidants and

nutrients that support healthy hair growth. Rosemary oil helps stimulate blood circulation, promoting better follicle activity.

The results of physicochemical evaluation indicate that the serum has an acceptable pH, smooth consistency, good spreadability, and stable appearance, making it suitable for daily use. Skin irritation tests showed that the formulation is safe and non-irritant. Performance tests further confirmed that the serum improves shine, softness, and absorption without leaving a greasy feel.

Overall, the discussion suggests that the combination of herbal extracts and natural oils works synergistically to reduce hair fall and promote healthy hair growth, making the formulation effective, safe, and user-friendly.

VIII. CONCLUSION

In this review, the herbal hair growth and anti-hair fall serum was found to be a safe and effective formulation made from natural ingredients like Aloe vera, Amla, Bhringraj, Hibiscus, Rosemary oil, Argan oil, and Vitamin E. These herbs provide important nutrients that help nourish the scalp, improve blood circulation, and strengthen hair roots. The physicochemical evaluation showed that the serum has an ideal pH, good viscosity, smooth spreadability, and stable consistency, which makes it suitable for regular use. The tests also confirmed that the serum is non-irritant, easily absorbed, and able to improve hair shine, softness, and texture. Overall, the combination of these herbal ingredients supports healthy hair growth and helps reduce hair fall in a natural way. Therefore, this herbal serum can be considered a good alternative to chemical products for maintaining strong, shiny, and healthy hair.

REFERENCES

- [1] Ashwini S. Pundekar, prachi, M, murkute snehal wani, mohini tathe. A Review herbal therapy used

- in Hair loss pharmaceutical Resonance 2020 vol.3- Issue 1
- [2] Kokate C.K., Purohit A.P., Gokhale S.B. Pharmacognosy. Nirali Prakashan.
 - [3] Khandelwal K.R. Practical Pharmacognosy Techniques and Experiments. Nirali Prakashan.
 - [4] Agrawal S.S., Paridhavi M. Herbal Drug Technology. Universities Press.
 - [5] Sharma P.P. Cosmetics: Formulation, Manufacturing and Quality Control, Vandana Publications – (Hair physiology, growth cycle relevance to cosmetic formulations).
 - [6] Kalia A.N. Textbook of Industrial Pharmacognosy, CBS Publishers. (Scalp types, porosity, herbal relevance)
 - [7] Trease & Evans. Pharmacognosy, 16th Edition.
 - [8] Sharma P.V. Dravyaguna Vigyan, Vol. 2.
 - [9] Sharma, A., & Jaiswal, P. Herbal Formulations for Hair Growth: A Review. Journal of Pharmacognosy and Phytochemistry, 2017.
 - [10] Kapoor, V.P. Herbal Hair Cosmetics: An Overview. Natural Product Radiance, 2005.
 - [11] Datta, H.S., & Paramesh, R. Trichology and Hair Care – Indian Perspective. Journal of Ayurveda & Integrative Medicine, 2009.
 - [12] Smith, J., & Rao, P. (2021). Herbal Approaches for Scalp and Hair Care. Journal of Cosmetic Dermatology, 18(3), 215–223.
 - [13] Kaur, S., & Banerjee, R. (2020). Topical Delivery Systems for Hair Growth Enhancement. International Journal of Trichology, 12(2), 45–52.
 - [14] Gupta, A., & Sharma, M. (2019). Role of Plant-Based Serums in Hair Follicle Stimulation. Herbal Therapeutics Review, 7(1), 33–40.
 - [15] World Health Organization (WHO). WHO Monographs on Selected Medicinal Plants, Vol. 1–3. World Health Organization, Geneva.
 - [16] Nadkarni KM. Indian Materia Medica. Mumbai: Popular Prakashan; Reprinted Edition.
 - [17] Khare, C.P. (2007). Indian Medicinal Plants: An Illustrated Dictionary. Springer.
 - [18] Bedi, M.K., & Shenefelt, P.D. (2002). Herbal therapy in dermatology. Archives of Dermatology, 138(2), 232–242.
 - [19] Dias, M. F. R. G. (2015). Hair Cosmetics: An Overview. International Journal of Trichology, 7(1), 2–15.
 - [20] Anusha, R., & Rathi, V. (2023). Formulation and Evaluation of Herbal Hair Serum – A Review. International Journal of Basic & Clinical Pharmacology, 12(4), 312–318.
 - [21] Surjushe, A., Vasani, R., & Saple, D. G. Aloe vera: A short review. Indian Journal of Dermatology, 2008, 53(4), 163–166.
 - [22] Eshun, K., & He, Q. Aloe vera: A valuable ingredient for the food, pharmaceutical and cosmetic industries—A review. Critical Reviews in Food Science and Nutrition, 2004, 44(2), 91–96.
 - [23] Baliga, M. S., & Dsouza, J. J. Amla (*Embllica officinalis* Gaertn), a wonder berry in the treatment and prevention of cancer. European Journal of Cancer Prevention, 2011, 20(3), 225–239.
 - [24] Scartezzini, P., & Speroni, E. Review on some plants of Indian traditional medicine with antioxidant activity. Journal of Ethnopharmacology, 2000, 71(1–2), 23–43.
 - [25] Singh, B., & Sharma, R. A. Plant Profile, Phytochemistry and Pharmacology of *Eclipta alba*. Journal of Pharmacognosy and Phytochemistry, 2015, 4(3), 123–130.
 - [26] Pandey, G., & Sharma, M. Pharmacological activities of *Eclipta alba* (L.) Hassk.: A review. International Journal of Pharmaceutical Sciences Review and Research, 2010, 4(2), 67–72.
 - [27] Bozin, B., Mimica-Dukic, N., Simin, N., & Anackov, G. Characterization of the volatile composition of essential oils of some Lamiaceae spices and investigation of their antioxidant, antimicrobial and antimutagenic activities. Food Chemistry, 2006, 105(3), 1161–1169.
 - [28] Pereira, R., & Valentão, P. *Rosmarinus officinalis* L. (rosemary) as a functional herb: phytochemistry, biological activity, and medicinal applications. Food Research International, 2011, 44(9), 2077–2085.
 - [29] Burkill, I. H. The Useful Plants of West Tropical Africa, Vol. 3. Royal Botanic Gardens, Kew, 1985, pp. 182–185.
 - [30] Kirtikar, K. R., & Basu, B. D. Indian Medicinal Plants, 2nd edition, Vol. 2, Lalit Mohan Basu, 1935, pp. 1023–1027.
 - [31] Traber, M. G., & Atkinson, J. Vitamin E, antioxidant and nothing more. Free Radical Biology and Medicine, 2007, 43(1), 4–15.
 - [32] Niki, E. Role of vitamin E as a lipid-soluble peroxy radical scavenger: In vitro and in vivo

- evidence. *Free Radical Biology and Medicine*, 2014, 66, 3–12.
- [33] Charrouf, Z., & Guillaume, D. Argan oil: Occurrence, composition and impact on human health. *European Journal of Lipid Science and Technology*, 2008, 110(7), 628–635.
- [34] El Hadrami, A., & Charrouf, Z. Argan oil and the argan tree: Phytochemistry, pharmacology and potential applications. *Food and Chemical Toxicology*, 2010, 48(5), 1496–1506.
- [35] Khare CP. *Indian Medicinal Plants: An Illustrated Dictionary* Springer 2007
- [36] Jahan S, et al. “Formulation and Evaluation of Herbal Hair Serum.” *International Journal of Pharmacy and Pharmaceutical Sciences*. 2017.
- [37] *Ayurvedic Pharmacopoeia of India*. Govt. of India, Ministry of AYUSH; 2016.
- [38] Lachman L, Lieberman HA. *The Theory and Practice of Industrial Pharmacy*. 2009.
- [39] WHO. *Guidelines for Skin Irritation and Patch Testing*. 2011.
- [40] WHO. *Quality Control Methods for Herbal Materials*. 2011.