



Formulation and Evaluation of Herbal Hair Serum

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Abstract:

Herbal cosmetics are widely used due to their safety, effectiveness, and minimal side effects compared to synthetic products. Hair problems such as hair fall, dandruff, dryness, and slow hair growth are commonly caused by pollution, stress, and excessive use of chemical-based hair products. The present research work focuses on the formulation and evaluation of a polyherbal hair serum using Aloe vera gel, Amla extract, Bhringraj extract, Hibiscus extract, Rosemary oil, Argan oil, and Vitamin E. The herbal extracts were prepared by boiling and filtration methods and incorporated into the aloe vera gel base with continuous stirring. Rosemary oil and argan oil were added to improve nourishment and scalp conditioning, while Vitamin E acted as an antioxidant. The prepared formulation was evaluated for parameters such as appearance, homogeneity, pH, consistency, spreadability, and stability. The serum showed good homogeneity, smooth texture, acceptable pH, and satisfactory stability. The herbal ingredients possess antioxidant, moisturizing, and hair growth-promoting properties which help in reducing hair fall and improving scalp health. The study concluded that the formulated polyherbal hair serum can serve as a safe, effective, and natural alternative to synthetic hair care products.

Keywords: Herbal Hair Serum, Aloe vera gel, Amla extract, Bhringraj extract, Hibiscus extract, Rosemary oil, Argan oil, Polyherbal formulation.

INTRODUCTION:

Anatomy Of Hair:

1. Structure of Hair

a) Hair Shaft

The visible part of the hair above the scalp.

Made up of three layers:

Cuticle:

Outermost protective layer of keratin cells.

Maintains shine and prevents damage.

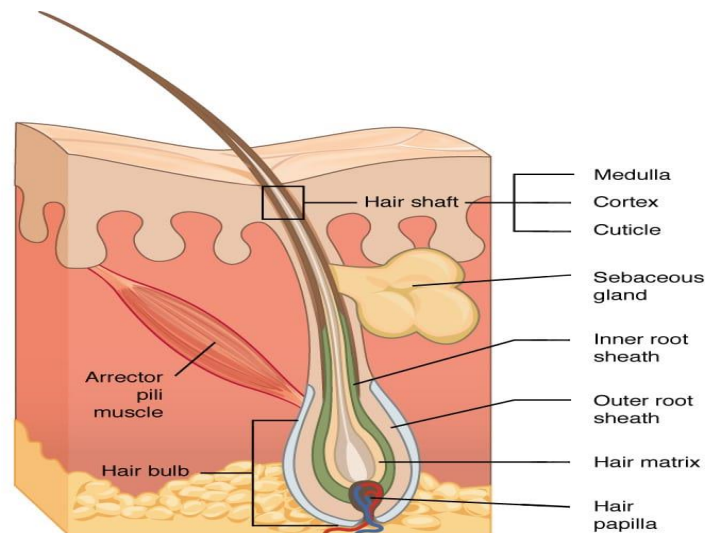


Fig.01 Anatomy of hair

Cortex:

Middle, thickest layer.

Contains melanin (pigment) and structural proteins.

Responsible for strength, elasticity, and texture.

Medulla:

Central core of the hair.

Present mainly in thick or coarse hair.

Key Point: Hair serums mainly act on the cuticle and cortex, improving smoothness and strength.

b) Hair Follicle

A tubular structure located in the dermis.

Consists of:

Hair bulb:

Base of the follicle where active cell division occurs.

Dermal papilla:

Rich in blood vessels.

Supplies nutrients, oxygen, and growth signals to the hair.

Sebaceous gland:

Produces sebum, the natural oil that lubricates hair and scalp.

Key Point: Healthy follicles maintain strong roots and reduce hair fall.

c) Scalp Structure

The scalp contains:

Numerous hair follicles

Sebaceous glands for oil secretion

Blood vessels that nourish follicles

Nerve endings that provide sensitivity [4]

Key Point: Good scalp health supports overall hair quality and shine.

2. Scalp Types

a) Normal Scalp

Balanced sebum production.

Hair appears healthy and smooth.

b) Dry Scalp

Low sebum levels and Shows dryness, flakiness, and rough texture.

c) Oily Scalp

Excess oil secretion.

Leads to greasy appearance and clogged pores.

d) Sensitive Scalp

Easily irritated.

Shows redness, itching, or burning with products.[4]

Hair Growth Cycle :

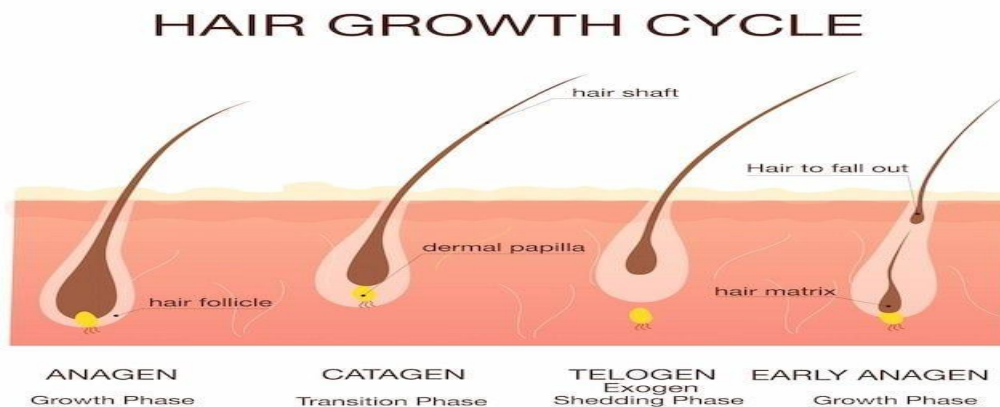


Fig.02 Hair Growth Cycle

The hair growth cycle has four major phases:

1. Anagen Phase (Growth Phase):

The longest and most active phase of hair growth.

Hair follicles continuously produce new cells, causing the hair shaft to grow in length.

Duration: 2 to 7 years, depending on genetics and health.

Around 85–90% of scalp hair is in this phase at any given time.

Longer anagen phase = longer hair growth.

2. Catagen Phase (Transition Phase):

A short and transitional phase between growth and rest.

Duration: 2–3 weeks.

The hair follicle shrinks and detaches from the dermal papilla (blood supply).

Hair growth completely stops during this stage.

Only 1–2% of hair is in the catagen phase.

3. Telogen Phase (Resting Phase)

A resting and inactive stage where the hair follicle is dormant.

Duration: about 3 months.

Hair remains in the follicle but does not grow.

New hair begins to form beneath the old hair, preparing for the next cycle.
 Around 10–15% of scalp hair lies in this phase.

4. Exogen Phase (Shedding Phase)

Considered an extension of the telogen phase.

The old, resting hair is shed from the scalp.

Natural hair fall: 50–100 hairs per day.

New anagen hair pushes the old hair out, allowing the cycle to restart.[5][6]

Why Hair Cycle is Important For Herbal Hair Serum Formulation:

It helps select herbs that boost growth.

It reduces hair fall by targeting the shedding phase.

It makes the serum work effectively at each stage

Types of Hair :

Hair varies due to genetics, hormones, nutrition, and environment. Understanding hair type helps choose suitable herbal ingredients like Aloe vera, Amla, Bhringraj, Hibiscus, Argan oil, and Vitamin E.[2][8]



Fig.03 Hair Types

1. By Hair Shape / Curl Pattern

Straight (Type 1): Round follicles, shiny, gets greasy fast. Needs lightweight serums.

Wavy (Type 2): “S”-shaped, frizz-prone. Needs hydration. Aloe vera & hibiscus help.

Curly (Type 3): Loose curls, dry, tangles easily. Bhringraj & argan oil for elasticity.

Coily/Kinky (Type 4): Tight curls, fragile. Requires heavy moisturizing oils/butters.[2]

2. By Hair Thickness (Strand Diameter)

Fine: Thin, weak, heavy oils weigh down. Lightweight serums best.

Medium: Balanced, retains moisture. Works with most herbal serums.

Coarse: Thick, rough, needs rich oils (argan, vitamin E).[8]

3. By Hair Porosity (Moisture Absorption)

Low: Cuticles tight, products sit on surface. Use water-based serums.

Medium: Absorbs & retains moisture well. Most serums effective.



High: Damaged cuticles, loses moisture quickly. Use humectants + sealing oils.

4. By Hair Density (Number of Strands)

Low: Sparse, scalp visible. Lightweight serums prevent flat look.

Medium: Normal fullness. Most products suitable.

High: Thick, voluminous. Needs detangling agents.

5. By Scalp Type

Oily: Excess sebum, greasiness. Non-comedogenic serums.

Dry: Low oil, itchy. Hydrating, emollient serums.

Normal: Balanced oil. Most serums work.

Sensitive: Easily irritated. Mild herbal serums.[2]

6. By Hair Condition / Damage

Chemically Treated: Dyed/bleached, damaged cuticles. Protein-rich serums.

Heat-Damaged: Straighteners/curlers weaken hair. Vitamin E & argan oil help.

Pollution-Exposed: Dust/pollutants damage keratin. Protective serums recommended.

Types of Herbal Hair Serum :

1. Based on Formulation Base

i) **Water-Based:** Light, non-sticky, quick absorption. Best for oily/sensitive scalp.

ii) **Oil-Based:** Nourishing, reduces dryness. Best for dry/frizzy hair.

iii) **Emulsion-Based:** Balanced hydration and nourishment. Best for normal/combination scalp.

2. Based on Therapeutic Action

i) **Hair Growth Serum:** Stimulates follicles, promotes new growth.

ii) **Anti-Hair Fall Serum:** Strengthens roots, reduces shedding.

iii) **Scalp-Nourishing Serum:** Reduces dryness, itchiness, and inflammation.

iv) **Split-End Repair Serum:** Smoothens cuticles, prevents split ends.

v) **Heat Protection Serum:** Protects hair from heat, UV, and pollution.

vi) **Frizz-Control Serum:** Smoothens hair, reduces frizz.[10]

Role of Herbal Hair Serum:

A.Regulates Hair Growth Cycle: Supports follicles to remain active in the anagen (growth) phase.

B.Strengthens Hair Shaft: Reinforces keratin structure to resist breakage.

C.Balances Scalp Environment: Maintains sebum and moisture levels to prevent dryness or greasiness.

D.Protective Barrier Formation: Creates a thin layer over hair to shield from heat, dust, and UV damage.

E.Improves Hair Follicle Nutrition: Enhances delivery of nutrients to roots for healthier hair production.

F.Supports Natural Hair Function: Maintains elasticity, shine, and resilience without chemical interference.[11]

Benefits of Hebal Hair Serum :

- Reduces Hair Fall – Strengthens roots and minimizes shedding.
- Promotes Hair Growth – Stimulates follicles for healthier, new hair.
- Nourishes Scalp – Improves scalp health, reducing dryness and itchiness.
- Smoothens Frizz – Makes hair soft, manageable, and frizz-free.
- Repairs Split Ends – Prevents breakage and improves hair texture.
- Protects from Damage – Shields hair from heat, UV, and pollution.
- Adds Shine & Softness – Makes hair look healthy, glossy, and hydrated.[12]

Advantages:

- 1.Natural and chemical-free, safer for hair and scalp.
- 2.Lightweight and non-sticky for easy application.
- 3.Can be used on all hair types.
- 4.Long-lasting effect with regular use.
- 5.Combines multiple herbal actions in one product.
- 6.Improves hair manageability and styling.
- 7.Eco-friendly and sustainable compared to chemical serums.[13]

Disadvantages:

- 1.Requires consistent, long-term use for visible results.
- 2.Slower action compared to chemical or synthetic serums.
- 3.May not work equally for all hair types.
- 4.Can be costlier than regular chemical hair oils/serums.
- 5.Some people may have mild allergic reactions to certain herbs.
- 6.Limited shelf life due to natural ingredients.[14]

LITERATURE REVIEW:

- 1) Sharma P., Mehta R. (2017) – This review highlighted the traditional use of Amla, Bhringraj and Hibiscus in improving hair texture and reducing hair fall. The study concluded that these herbs, rich in antioxidants and vitamin C, help in strengthening hair roots and preventing oxidative damage to scalp tissues.
- 2) Kulkarni S., Patil A. (2019) – This article focused on the phytochemical composition of Hibiscus rosa-sinensis, reporting that anthocyanins and mucilage promote hair conditioning, reduce dryness, and support hair follicle activity. The authors recommended Hibiscus extract as a key ingredient in herbal hair care formulations.
- 3) Rao G., Bhandari T. (2020) – Research on Aloe vera gel demonstrated its strong moisturizing, anti-inflammatory, and healing properties. The study concluded that Aloe vera serves as an excellent natural base for herbal hair serums due to its ability to hydrate the scalp and enhance absorption of active herbal components.
- 4) Sushmita L., Chatterjee A. (2018) – This review explained the Ayurvedic view of hair care, especially the role of herbs like Amla and Bhringraj in balancing pitta dosha and promoting healthy hair growth. The article supported their use in modern polyherbal formulations.

5) Waghmare D., Jain S. (2021) – A comparative evaluation of market herbal hair serums showed that formulations containing Amla, Hibiscus and Aloe vera exhibited ideal pH, viscosity, and spreadability. Regular use improved hair smoothness and reduced breakage.

6) Pawar R., Chaudhari P. (2016) – This study reviewed the pharmacological activity of Bhringraj (Eclipta alba) and reported its effectiveness in prolonging the anagen phase, stimulating new hair follicle growth, and preventing premature hair fall.

7) Joseph A., Rajput A. (2020) – This article examined various evaluation parameters for hair serums such as pH, stability, irritancy, and viscosity. It concluded that herbal serums show better skin compatibility and fewer side effects compared to synthetic serums.

8) Fatima S., Ansari F. (2022) – Review on the mechanism of herbal hair serum explained that natural antioxidants, vitamins, and plant proteins reduce free radical damage, nourish hair shafts, improve microcirculation, and support long-term scalp health.

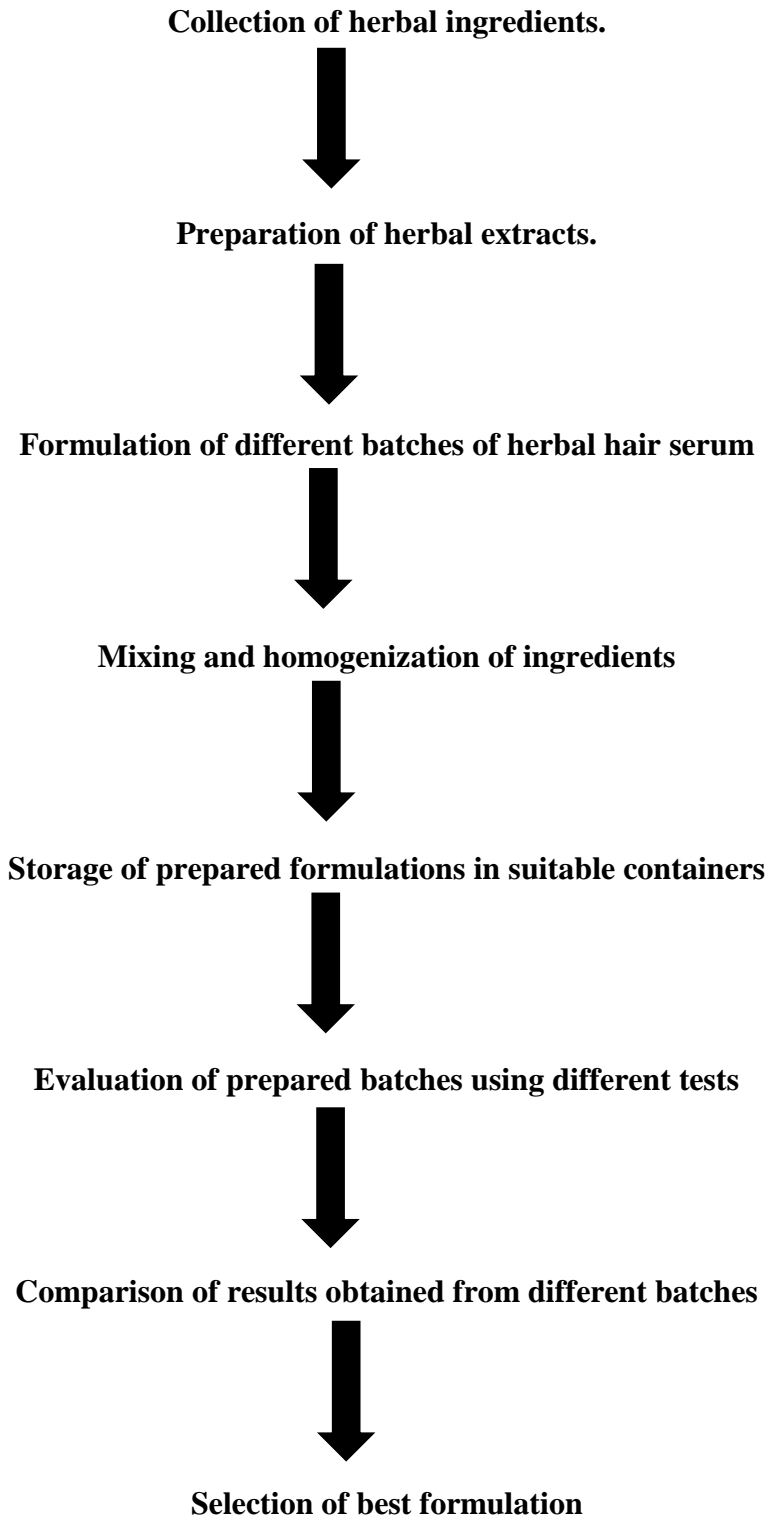
Aim:

To formulate and evaluate a natural herbal hair serum containing plant-based ingredients for promoting healthy hair growth, reducing hair fall, nourishing the scalp, and improving the overall strength, texture, and appearance of hair with better safety, stability, and effectiveness.

Objectives:

1. To develop a scientifically designed polyherbal hair serum using natural ingredients such as Aloe vera, Amla, Bhringraj, Hibiscus, Rosemary oil, Argan oil, and Vitamin E known for their beneficial effects on hair and scalp health.
2. To prepare and optimize different batches of herbal hair serum by varying the concentration of ingredients in order to obtain the most stable, effective, and aesthetically acceptable formulation.
3. To evaluate the prepared formulations for various physicochemical parameters including color, appearance, odor, pH, homogeneity, viscosity, spreadability, washability, and stability.
4. To study the effectiveness of herbal ingredients in stimulating hair growth, strengthening hair roots, reducing hair fall, and preventing hair thinning and breakage.
5. To formulate a lightweight, non-sticky, smooth, and easy-to-apply serum that provides proper nourishment and hydration to the scalp and hair follicles.[15]
6. To improve scalp health by maintaining moisture balance, reducing dryness, and creating a healthy environment for stronger and healthier hair growth.

Plan of Work :



MATERIALS AND METHODS :**1. Materials**

Sr.No	Common Name	Botanical Name	Form Used	Role in Serum
1	Aloe Vera	Aloe barbadensis Miller	Gel	Base, moisturizer
2	Amla	Emblica officinalis	Powder Extract	Hair Strengthening
3	Bhringraj	Eclipta alba	Powder Extract	Hair growth promoter
4	Hibiscus	Hibiscus rosa-sinensis	Powder Extract	Conditioner
5	Rosemary Oil	Rosarinus officinalis	Oil	Hair growth activator
6	Argan Oil	Argania spinosa	Oil	Smoothing agent
7	Vitamin E	Tocopherol	Capsule	Antioxidant

Other Materials :

- i) Distilled water
- ii) Muslin cloth
- iii) Beakers, glass rod
- iv) Glass bottles for storage
- v) Measuring cylinder

2. Methods**Step A: Collection of Raw Materials**

All herbal powder ingredients (aloe vera gel, amla powder, bhringraj powder, and hibiscus powder) were procured from authenticated herbal suppliers and stored in airtight containers to avoid moisture contamination. Rosemary oil, argan oil, and Vitamin E capsules were obtained from cosmetic-grade suppliers.[16]

Step B: Preparation of Herbal Extracts

The herbal extracts were prepared using powdered crude drugs.

Hibiscus Powder: Extracted by decoction method using distilled water with continuous heating.

Amla Powder: Extracted by maceration in distilled water for 35 to 45 minutes .

Bhringraj Powder: Extracted by hot infusion method using warm distilled water.

All prepared extracts were filtered through muslin cloth to obtain clear filtrate.[17]

Step C: Preparation of Gel Base

A measured quantity of aloe vera gel was taken as the base and stirred gently to obtain a smooth and uniform consistency.

Step D: Mixing

The prepared herbal extracts were added gradually into the aloe vera gel base with continuous stirring to ensure uniform mixing and proper incorporation.

Step E: Addition of Oils

Rosemary oil, argan oil, and Vitamin E were added slowly into the formulation to enhance hair nourishment, smoothness, and antioxidant stability.

Step F: Homogenization

The complete formulation was homogenized properly to obtain a smooth, lump-free, and uniform herbal hair serum.[18]

Step G: Packaging

The prepared herbal hair serum was transferred into clean amber-colored glass bottles, labeled properly, and stored in a cool and dry place for further evaluation studies.

ACTIVE HERBAL INGREDIENTS: -

1)ALOEVERA:



Fig.04 Aloe vera gel

1	Common name	Aloe vera
2	Biological name	Aloe barbadensis Miller
3	Kingdom	Plantae
4	Class	Liliopsida
5	Order	Asparagales
6	Family	Asphodelaceae

Uses:

- Acts as a natural moisturizer for scalp and hair
- Possesses anti-inflammatory and soothing properties
- Strengthens hair follicles and reduces hair fall
- Helps treat dandruff and dry scalp

- Promotes smooth, shiny, conditioned hair

Category:

Hydration support, scalp-soothing, hair strengthening

2)AMALA : (Amala extract)



Fig.05 Amala

1	Common name	Amla / Indian Gooseberry
2	Biological name	Phyllanthus emblica
3	Kingdom	Plantae
4	Class	Magnoliopsida
5	Order	Malpighiales
6	Family	Phyllanthaceae

Uses:

- Rich source of Vitamin C; strengthens hair follicles
- Promotes hair growth and reduces hair fall
- Prevents premature greying
- Improves scalp health due to antioxidant properties
- Adds shine and thickness to hair

Category:

Hair growth stimulant, anti-greying, scalp nourishment

3)BHRINGRAJ : (Bhringraj extract)



Fig.06 Bhringraj

1	Common name	Bhringraj
2	Biological name	Eclipta prostrata
3	Kingdom	Plantae
4	Class	Magnoliopsida
5	Order	Asterales
6	Family	Asteraceae

Uses:

- Promotes hair growth and reduces hair fall
- Strengthens hair roots and prevents thinning
- Known for preventing premature greying
- Soothes scalp and reduces dandruff
- Improves overall hair texture and shine

Category:

Hair growth promoter, anti-hair fall, anti-greying herb

4)ROSEMERY : (Rosemary oil)



Fig.07 Rosemary

1	Common name	Rosemary
2	Biological name	<i>Rosmarinus officinalis</i>
3	Kingdom	Plantae
4	Class	Magnoliopsida
5	Order	Lamiales
6	Family	Lamiaceae

Uses:

- Stimulates blood circulation to the scalp
- Promotes hair growth and reduces hair thinning
- Helps control dandruff and scalp infections
- Strengthens hair follicles and improves density
- Acts as an antioxidant and reduces scalp inflammation

Category:

Hair growth stimulant, anti-hair fall, anti-dandruff herb

5)Hibiscus : (Hibiscus extract)



Fig.08 Hibiscus

1	Common name	Hibiscus
2	Biological name	Hibiscus rosa-sinensis
3	Kingdom	Plantae
4	Class	Magnoliopsida
5	Order	Malvales
6	Family	Malvaceae

Uses:

- Strengthens hair roots and reduces hair fall
- Acts as a natural conditioner for smooth, soft hair
- Promotes hair growth and increases hair volume
- Helps reduce dandruff and scalp dryness
- Prevents premature greying and adds natural shine

Category:

Hair growth booster, natural conditioner, anti-dandruff and anti-greying herb

6)Vitamin E : (Vitamin E Capsule)



Fig.09 Vitamin E (Capsule)

1	Common name	Vitamin E Capsule
2	Chemical name	Tocopherol / α -Tocopherol
3	Kingdom	(Synthetic/Nutrient, not from plant kingdom)
4	Class	Fat-soluble vitamin
5	Category	Antioxidant

Uses:

- Acts as a powerful antioxidant and prevents hair follicle damage
- Improves scalp circulation and supports healthy hair growth
- Reduces dryness and nourishes hair shafts
- Adds natural shine and smoothness to hair
- Helps protect hair from oxidative stress and environmental damage

Category:

Hair nourishing agent, antioxidant, shine enhance

7)Argan : (Argan oil)



Fig.10 Argan oil

1	Common name	Argan
2	Biological name	Argania spinosa
3	Kingdom	Plantae
4	Class	Magnoliopsida
5	Order	Sapindales
6	Family	Sapotaceae

Uses:

- Deeply nourishes and conditions hair
- Reduces frizz and adds shine
- Strengthens hair strands and prevents breakage
- Protects hair from heat and UV damage
- Helps improve overall hair smoothness and softness

Category: Hair conditioner, anti-frizz agent, hair strengthener

Procedure of Herbal Hair Serum :

Formulation Table :

Sr.No.	Ingredient	F1	F2	F3	F4	F5
1.	Aloe Vera Gel	15 ml	21ml	9 ml	12ml	13.5ml
2.	Amla Extract	3ml	1.5 ml	3 ml	45 ml	3ml
3.	Bhringraj Extract	3ml	1.5 ml	3 ml	4.5 ml	3 ml

4.	Hibiscus Extract	3 ml	1.5 Drops	3 ml	6 ml	3 ml
5.	Rosemary Oil	30 Drops	30 Drops	90 Drps	30Drops	60 Drops
6.	Argan Oil	60 Drops	30 Drops	120 Drop	15 Drops	60 Drops
7	Vitamin E Capsule	3 capsules (approx.2-5 mL)	3 Capsules	3 Capsules	1.5 Capsules	3 Capsules
Total		30ml	30 ml	30ml	30 ml	30 ml

Procedure for Preparation of Herbal Hair Serum (30 mL)

Step 1: Preparation of Herbal Extracts

A. Preparation of Amla Extract (Maceration Method)

About 3 g of amla powder was taken in a separate beaker containing 30 mL distilled water. The mixture was stirred properly and allowed to stand for about 30–45 minutes with intermittent shaking to facilitate extraction. The extract was then filtered using muslin cloth/filter paper to obtain a clear filtrate. Approximately 3 mL of amla extract was collected.[19]

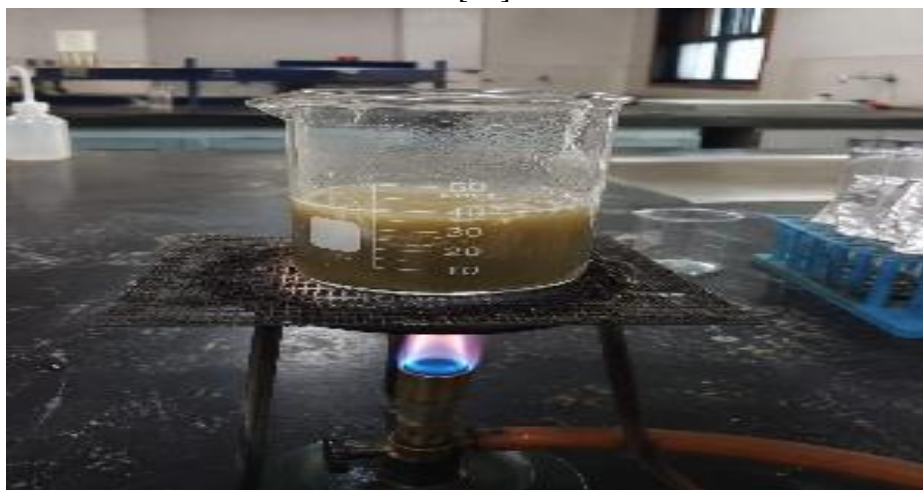


Fig.11 Amala Extraction

B. Preparation of Bhringraj Extract (Hot Infusion Method)

Approximately 3 g of bhringraj powder was weighed and mixed with 30 mL of hot distilled water. The mixture was covered and allowed to stand for about 1 hour for efficient extraction of active constituents. After cooling, the extract was filtered carefully to remove residue. Approximately 3 mL of bhringraj extract was obtained.

C. Preparation of Hibiscus Extract (Decoction Method)

Accurately weighed 3 g of dried hibiscus powder and transferred it into a clean 100 mL beaker. About 30 mL of distilled water was added to the beaker. The mixture was heated on a hot plate and boiled gently for 10–15 minutes with occasional stirring to ensure proper extraction of phytoconstituents. After boiling, the extract was allowed to cool to room temperature and then filtered through muslin cloth/filter paper to remove insoluble particles. Approximately 3 mL of concentrated hibiscus extract was collected and stored for further formulation.[20]

Step 2: Preparation of Gel Base

In a clean dry beaker, 12 mL of aloe vera gel was taken as the base material for serum preparation. The gel was stirred gently using a glass rod until a smooth and uniform consistency was obtained.



Fig. 12 Base Moisturizer

Step 3: Addition of Distilled water

About 3 mL of Distilled was added slowly into the aloe vera gel base with continuous gentle stirring. Distilled water was incorporated to improve hydration, and consistency of the formulation.

Step 4: Incorporation of Herbal Extracts

The prepared herbal extracts were added one by one into the gel base with continuous mixing to ensure uniform distribution.

3 mL amla extract was added first.

Followed by 3 mL bhringraj extract.

Finally, 3 mL hibiscus extract was incorporated.

The mixture was stirred thoroughly after each addition to obtain a homogeneous serum.



Fig. 13 Addition of extracts

Step 5: Addition of Oils and Vitamin E

To the above mixture:

1.5 mL rosemary oil

1.5 mL argan oil

Contents of 1 vitamin E capsule (approximately 0.5–1 mL)

were added slowly with gentle stirring. These ingredients were incorporated to enhance hair nourishment, scalp conditioning, and antioxidant activity.

Extraction of Hibiscus, Amla & Bhringraj.



Fig. 14 Addition Of Oils



Fig. 15 Additional Of Vitamin E Capsule

Step 6: Homogenization

The complete formulation was mixed thoroughly using a glass rod until a smooth, lump-free, and uniform serum was obtained. Proper homogenization was carried out to ensure even distribution of all ingredients throughout the formulation.[21]

Step 7: Packaging

The prepared herbal hair serum was carefully transferred into clean and dry storage bottles/dropper bottles and The bottles were sealed tightly after filling.

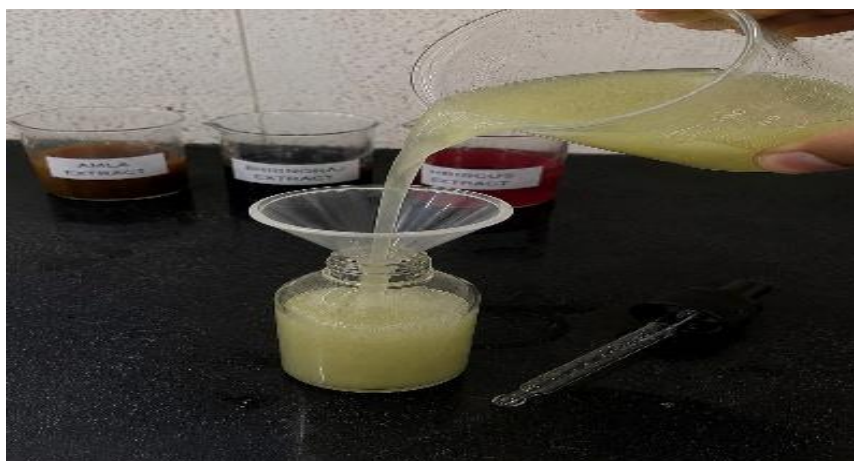


Fig. 16 Packaging of serum

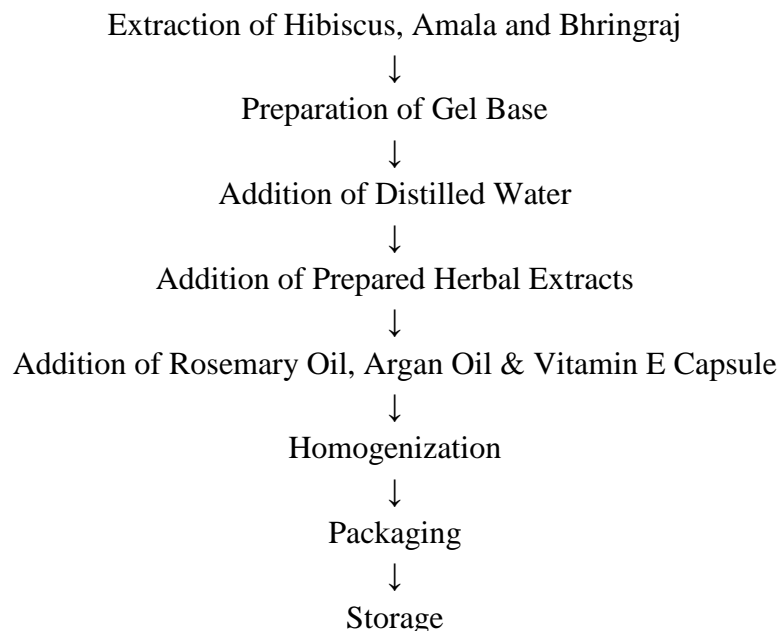
Step 8: Storage

The formulated herbal hair serum was stored in a cool, dry, and dark place away from direct sunlight to maintain stability and effectiveness of the formulation.



Fig. 17 Storage of serum

Methodology for Preparation:



PHYSICOCHEMICAL EVALUATION :

1) Organoleptic Evaluation

Aim: To evaluate the physical appearance and sensory characteristics of the herbal hair serum.

Procedure:

1. Take a small quantity of serum in a transparent beaker or glass container.
2. Observe the colour against a white background.
3. Smell the formulation to check the odour.
4. Hold the container against light to observe clarity.
5. Rub a small amount between fingers to evaluate texture and appearance.[25]

Parameters Evaluated:

Colour
Odour
Clarity

Appearance
Texture

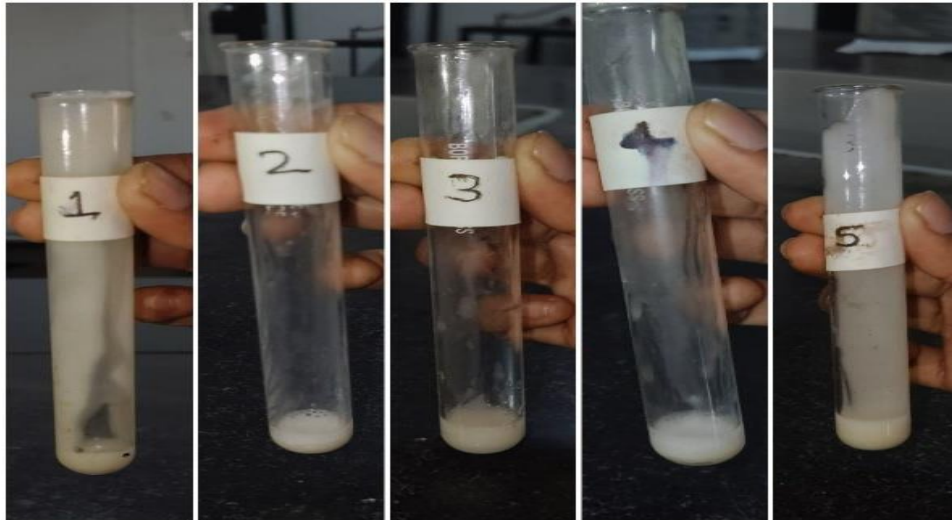


Fig.18 Appearance of serum

2) pH Determination

Aim: To determine the pH of Herbal Serum using digital pH meter.

Procedure

1. Switch on the pH meter.
2. Take Serum sample in test tube.
3. Dip electrode in sample.
4. Wait for stable reading.
5. Note the pH value.
6. Wash electrode with distilled water after use.[26]

Observation

The pH of Herbal Serum was found to be within acceptable range.



Fig. 19 PH Determination

3) Spreadability Test

Aim: To determine the spreadability of the serum.

Procedure:

1. Place one drop of serum on a clean glass slide.
2. Place another glass slide over it carefully.
3. Apply slight pressure.
4. Observe how easily the serum spreads between the slides.[27]

Observation:

- Easy spreading indicates good spreadability.
- Thick spreading indicates poor spreadability.



Fig. 20 Spreadability of serum

4) Homogeneity Test

Aim: To evaluate the uniformity of the formulation.

Procedure:

1. Take a small quantity of serum in a transparent container.
2. Observe visually for lumps, particles, or phase separation.
3. Rub a small quantity between fingers to check smoothness.[28]

Observation:

- Uniform appearance
- No lumps
- No phase separation



Fig. 21 Uniform appearance

5) Washability Test

Aim:To evaluate the ease of washing of the serum.

Procedure:

1. Apply a small amount of serum on the hand.
Leave it for 2–3 minutes.
2. Wash with normal water.
3. Observe whether the serum is easily removed or leaves residue.[29]

Observation:

- Easily washable
- Slight residue
- Difficult to wash



Fig. 22 Washability of serum

6) Non-Greasy Test

Aim:To determine the greasy nature of the serum.

Procedure:

1. Apply a small amount of serum on skin or hair strand.
2. Leave for 5–10 minutes.
3. Touch the applied area and observe oiliness or stickiness.[30]

Observation:

- Non-greasy Slightly greasy Highly greasy



Fig. 23 Application on hairs

7) Patch Test

Aim: To evaluate skin irritation caused by the serum.

Procedure:

1. Apply a small amount of serum on the inner wrist or behind the ear.
2. Leave for 15–20 minutes.
3. Observe for redness, itching, irritation, or swelling.[31]

Observation:

- No irritation
- Mild irritation
- Severe irritation



Fig. 24 Patch test

RESULT:

Evaluation Result of Herbal Hair Serum

1. Organoleptic Test Result

Batch	Colour	Odour	Clarity	Apperance	Texture	Result
F1	Milky White	Pleasant Herbal	Cloudy	Smooth	Slightly thick	Good
F2	Creamy White	Mild herbal	Slightly cloudy	Smooth	Slightly light and soft	Moderate
F3	Greenish White	Oily odour	Less cloudy	Oily	Thin and oily	Average
F4	Off White	Herbal	Slightly cloudy	Thick	Sticky	Average
F5	Uniform Off White	Pleasant and mild	Homogeneous and clear	Smooth and Thick	Non-sticky and smooth	Excellent

2. PH Determination Result

Batch	Observed pH	Interpretation.
F1	5.17	Suitable for scalp
F2	5.93	Suitable
F3	4.86	Slightly acidic but acceptable
F4	7.43	Suitable
F5	7.00	Application

3. Spreadability Test Result

Batch	Observation	Result
F1	Spread properly with slight thickness	Good
F2	Spread smoothly and evenly	Moderat
F3	Excess oil reduced spreadability	Average
F4	Slight uneven spreading observed	Average
F5	Spread uniformly with smooth application	Excellent

4. Homogeneity Test Result

Batch	Observation	Result
F1	Uniform mixture	Good
F2	Smooth and homogeneous	Good
F3	Slight oil separation	Moderate
F4	Slight non uniformity	Average
F5	Completely uniform and homogeneous	Excellent

5. Washability Test Result

Batch	Observation	Result
F1	Easily washable	Good
F2	Washed of easily without residue	Good

F3	Require more washing due to oiliness	Average
F4	Moderate washability	Moderate
F5	Easily removed without oily residue	Excellent

6. Non – Greasy Test Result

Batch	Observation	Result
F1	Slight Oily appearance	Good
F2	Medium oily feel	Moderate
F3	Highly greasy and oily	Poor
F4	Slight residue and heaviness	Average
F5	Non- greasy light and smooth feel	Excellent

7. Patch Test Result

Batch	Observation after application	Result
F1	No irritation or redness	Safe
F2	No irritation observed	Safe
F3	Mild heaviness due to oil content	Safe
F4	No redness or itching	Safe
F5	No irritation ,itching or redness	Excellent and Safe

Conclusion :

The present research work successfully developed and evaluated a herbal hair serum using natural ingredients such as Aloe vera, Amla, Bhringraj, Hibiscus, Rosemary oil, Argan oil, and Vitamin E. The formulation demonstrated good physicochemical properties, excellent stability, and satisfactory performance during evaluation studies. The serum was found to be safe, non-irritant, easy to apply, and effective in improving hair texture, softness, shine, and overall hair health.

The combination of herbal extracts and oils provided proper nourishment to the scalp, strengthened hair roots, and helped in reducing hair fall naturally without the harmful effects associated with synthetic

products. Among all the prepared batches, Batch F5 showed the best evaluation results and was selected as the optimized formulation.

Overall, the developed herbal hair serum can be considered an effective, economical, and natural alternative for maintaining healthy, strong, and nourished hair, with potential for future commercial and cosmetic applications.

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