

Formulation and Evaluation of Flaxseed Hair Serum

Yash Ravindra Jichkar¹, Harshal Ashok Sultane², Jayesh Raju Warghat³, Prof. Diksha C. Ogale⁴
Vardhaman College of Pharmacy, Koli, Karanja (Lad)

Abstract: *The present study aimed to formulate and evaluate a herbal hair serum containing flaxseed as the main active ingredient for improving hair health and appearance. Flaxseed is rich in omega-3 fatty acids, proteins, antioxidants, and vitamins that help nourish the scalp, reduce hair fall, and promote healthy hair growth. The herbal hair serum was prepared using flaxseed gel along with suitable natural ingredients and evaluated for various physicochemical parameters.*

The formulated serum was evaluated for physical appearance, colour, odour, homogeneity, pH, viscosity, spreadability, and stability. The preparation showed good homogeneity, smooth texture, acceptable pH suitable for scalp application, and good spreadability. Stability studies indicated that the formulation remained stable without phase separation or significant changes in its properties during storage. The serum was found to be safe, effective, and suitable for improving hair conditioning and overall hair health naturally.

Keywords: Flaxseed, Herbal Hair Serum, Hair Growth, Herbal Cosmetics, Hair Care, Physicochemical Evaluation, Stability Study.

I. INTRODUCTION

Cosmetics, means any article intended to be rubbed, poured, sprinkled or sprayed on or introduced into or otherwise applied to human body or any part thereof for cleansing, beautifying, promoting attractiveness or altering appearance and includes any article intended for use as a component of cosmetic. "Cosmeceuticals" can be referred to as topical cosmetic pharmaceutical hybrids intended to enhance beauty through ingredients that provide additional health related functions or benefits. Herbal cosmetics are preferred over chemically synthesized products because they typically have fewer or no harmful side effects, are considered safe for use, and are compatible with most hair types.

Nowadays, cosmetics are becoming more high demand in daily life and it was used frequently by many of people as per year. Mankind uses various products to enhance beauty and elegance to look young and charming. Cosmetics thus play a vital role in human life. Now days, herbal cosmetic are widely used because of the belief that they have fewer side effects and better safety. Hair is one of the primary parts of the body which acts as a protective appendage. The main objective of the present work is to develop an herbal hair serum for general purpose (daily) using various herbs with this evaluate the characteristics of cosmetic serum and to identify the best formulation of cosmetic serum.

Herbal hair serum is more preferred and it is used for healthy hair They promotes hair growth which also hydrates and moisturizes dry and damage hair. Reduce frizz and split ends and also protect against environment damage. It also reduce hair fall scalp irritation and other problem related to hair.[1]

The present work was aimed to prepare and evaluate a herbal hair serum containing herbs used like flaxseed, orange peel, fenugreek. Aloe vera, castor oil, vitamin E. which have been used for centuries for their therapeutic properties. These ingredients are believed to nourish and revitalize the scalp, strengthen hair follicles, and promote healthier, shinier hair. Furthermore, Herbal formulations are often perceived as safer and gentler compared to their synthetic counterparts, making them an attractive choice for people with sensitive scalps or those concerned with the long-term effects of chemical hair treatments.



Hair plays vital role in human body. As hairs are considered to be one of the essential parts that complement the beauty of a person, it is important to take right care of the hairs. Human hair is considered as one of the symbol of beauty in humans and the scalp is an important element for hair growth. It's a cyclical medium involving hair shaft conflation, extension, and eventually shedding. Human hair generally comprises follicle of anagen and telogen phases.

Herbal hair serum is one of the ornamental products with veritably high attention of active component in their formula for furnishing ferocious nutrition to the deeper skin subcaste and non-greasy finish product which suitable for skin. Containing slightly thicker thickness the water. Hair serums are the liquid medication Hair serums adds natural shine while shielding hair from environmental or heat related damage with its rich moisturizing characteristics. Hair serum blocks the humidity and makes the hair healthier.

Hair serum is a liquid-based treatment usually formulated using provide a protective layer over the hair fiber, assisting in smoothing frizz. This smooth layer then reflects the light, which is how seram gives you get heat.

Hatvan he defined as a slender, thread-like outgrowth from a follicle in the skin of of mammals Composed mainly of keratin, it has three morphological regions the cuticle, medulla, and cortex.

The hair is made op of 95% Keratin, a Vibrous, helcoida protein (shaped like a helix) that forms part of the skin and all its appendages (body hair, nails, etc.) Keratin synthesized by Keratinocytes and is insoluble in water, thus ensuring impermeability and protection for the hair, Some 18 amino acids can be found in the hait threonine, leucine and arginine Keratin is particularly ich in cysteine (a type of sulfirated amino acid), which forms disulfide bond between molecule, adding rigidity and resistance to entire structure.

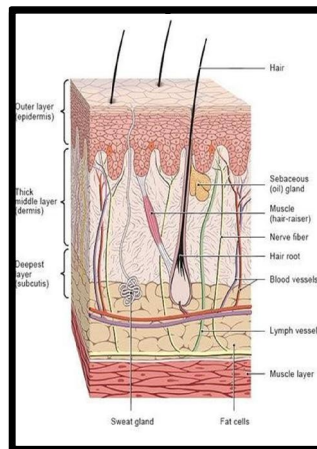


Fig. no. 1.1 Anatomy of Hair Scalp

- The hair structure can be divided into 3 distinct parts:

Medulla: Innermost layer of the hair shaft composed of an amorphous soft oily substance.

Cuticle: Thin protective outer layer that contains the nourishing portion essential to the hair growth it is highly keratanised composed cell shape like scales that are layered one over the other measuring about 60 micro meters long about 6 microns.

Cortex: Main component of the hair, containing long keratin chain that add elasticity, suppleness and resistance to the hair. The cells of the cortex are joined together by an intracellular cement eric him lipids and proteins each cell is composed of bundles that lie in the direction of The hair length: these are macro fibrils which are made up of microfibrils, which in turn contain protofibrils[4]



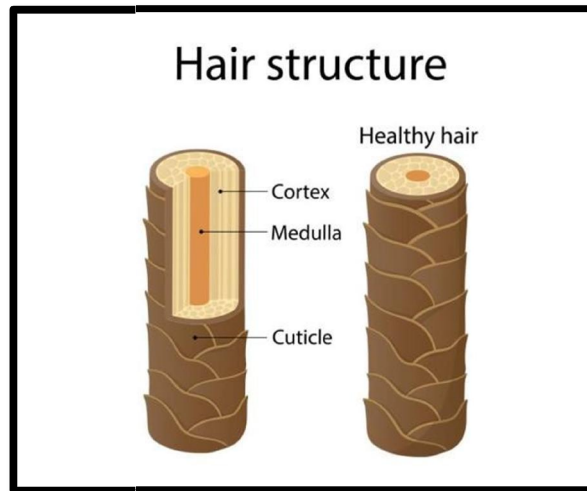


Fig. no. 1.2 Hair Structure

1.1 Benefits of hair serum:

- Protect hair:** Acts against the heat, sun damage. Dirt, dust, pollution when hair serum applied on hair it forms the thin layer on hair. It protect the hair from the hair damage. [5].
- Gives shine to the hair:** Hair serum from the thin layer which reflects the light. The serum provides the shiny appearance to the hair. Hair serum contained the amino acids which protect coloured and chemically treated hair.
- Multi purpose:** Hair serum are used to treat the various hair related problems. Few drops of hair serum make your hair shiny and silky it turns your bad day into the good day. It is one remedy to multi hair issue[5].
- Nourished hairs:** Hair serum fill the follicular cracks and act on damaged hairs. Hair serum make hair manageable which make them lustrous and easy to carry[3].
- Best for hair dry:** Most commonly hair serums are used for the damaged, dry, and frizz hairs Hair serum lock and provide the moisture to the hair and make them smooth and shuny[5]
- Prevent hair fall from breakage:** When our hair becomes frizz, damaged, messy, tangled intether condition we loss lot of hair follicles Hair serums act as the lubricant in such cases and eule them detangled casily. It may cause the stop the hair fall problems[3]

1.2 Problems of hair: Hair is an important part of human body. The problem associated with it includes hatt loss, lack of hair volume conditioning, immature greying, dandruff thinning of har dullness cle Hairs can in shape, length, diameter, texture and colour All mammals have hair

Its main purpose is to regulate body temperature. It also wants to Accrease Intion to guard against sunlight. For the scalp, hairs were known as protective awening in ancient times[4]

A. Dandruff:

Dandruff is little white pieces of dead skin in someone's hair, or fallen someone's hat It's apparently caused by a fungus called Malassezia restricta and Globose, formerly called Prosperum may be a yeast causing infection of skin and scalp It's caused by not brushing hair, allergy, not showering enough etc[2]



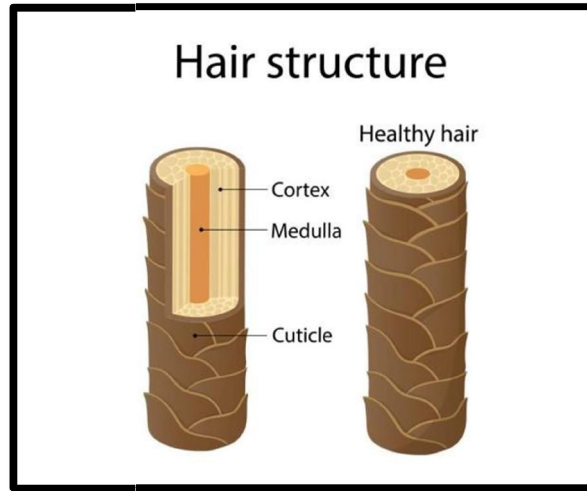


Fig. no. 1.3. Dandruff

B. Hair loss:

- Although historically as a haul among men, hair loss is additionally common among women.
- Female hair loss is typically caused by stress, medication, changing hormones and even menopause. Many hair styling product can contribute to hair loss.

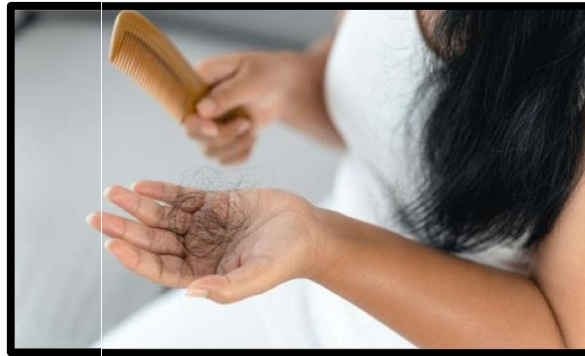


Fig No. 1.4 Hair loss

C. hair: Shampooing too often cause dry haus. Although squeaky clean hau may be evol dine, mam overdo it by washing once, sometimes twice or per day which strip away all of the hair's natural oilos.

D. Split ends: Over brushing hatit, excessive perming, too much heat and lack of a good conditioner cause split ends. Exposure to extreme weather conditions, and hair care techniques such as blow drying, straightening, and curling may cause split ends.



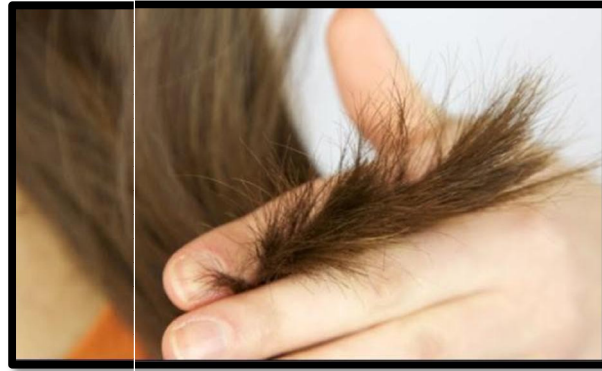


Fig. no. 1.5 Split ends

E. Grey hair: To many, grey hair is a badge of honour. But others would prefer to get rid of it because grey hair can be brittle and more unruly than other strands,

F. Dull hair: There are many causes of dull looking hair chemical or heat styling damage and environmental soil.

G. Oily/greasy hair: Oily hair is caused scalp produces an excessive amount of natural oil called sebum. Sebum is produced by sebaceous glands, which leading to excessive amounts of oil.

H. Heat damaged hair: Heat damaged hair occurs when you blow dry, flat iron, or curl your hair at the highest temperature settings over an extended period of time. [4]

1.3 How to Apply Hair Serum:-

Step 1: Shampoo your hairs

the shampoo to wash the oil from your hair. When you rinse without shampooing, it'll leave your hair oily. Shampoo your hair just once, and apply it to your scalp in the same way you would the oil. Start at the front of your head, work your way towards your crown.

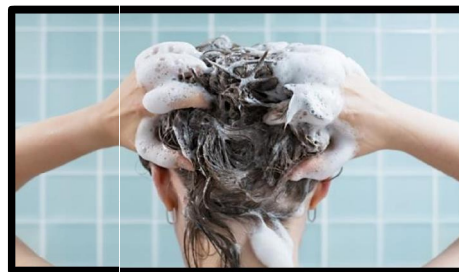


Fig. no. 1.6 Shampoo your hair Step 2: Apply On Damp Hair:

The best time to apply a serum is after you have washed your hair. When your hair is a bit damp post-washing, apply a few drops of the product to detangle your mane.



Step 3: Rub a few drops of Serum into your palms:

Just take 4-5 drops of the serum in your palms and rub it before applying it evenly to your strands. The quantity of the product you take totally depends on the length of your hair. Just make sure not to go overboard as it might make your hair look greasy.



Fig.No. 1.7 Few drop of serum

Step 4: Applying the serum:

Apply the serum to the back of your hair first. Don't start with the front of the top of your hair and in your style with too much serum. Instead, use your hands to gently blot the serum into the midsection and tips of your hair starting at the back and moving forward to the front of your hair. This way, if you apply too much to your hair to start, it won't be noticeable

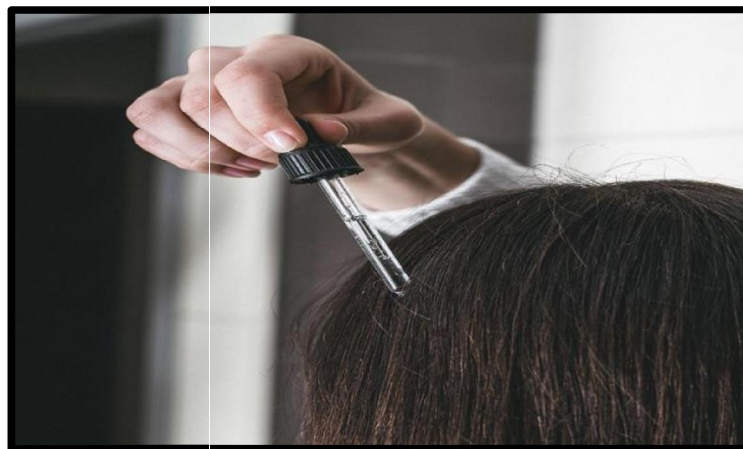


Fig. no. 1.8 Applying the serum

Step 5: Comb your hair:

Comb your dry hair until it's tangle-free. Start at the ends of your hair and work your way up to prevent painful snagging and breakage.

Step 6: Run your fingers through your hair:

Start at the ends of your hair and then slowly work up into the strands, stopping at least 5 inches. (12.7cm) from the scalp. Coating the ends of your hair with Serum will tame flyway's and frizz and give your hair a sleeker look. Don't apply it too close to your roots, or your hair will look oily.



Step 7: Repeat once a week for best results:

Doing regular Serum treatments will help foster new hair growth over time. It will also make your hair strong, smooth and soft by sealing in moisture.[2]

II. PLANT PROFILE

A. Flaxseed



Fig. no. 2.1 Flaxseed

- **Botanical name:** *Linum usitatissimum*
- **Family:** Linaceae
- **Synonym:** Linseed, flaxseed
- **Biological source:** It consists of the dried fully ripe seeds of *Linum usitatissimum* Linn.
- **Chemical constituents:** Alpha-linoleic acid (ALA), Omega-3 fatty acid, lignans, etc
- **Uses:** Anti-inflammatory, anti-oxidants, hair growth[5].

B. Aloe vera



Fig. no. 2.2 Aloe vera

- **Botanical name:** *Aloe barbadensis* miller
- **Family:** Liliaceae
- **Synonym:** Aloe vera, aloe, burn plant, lily.
- **Biological Source:** It is the leaves of various species of aloe-vera- aloe beardedensis' aloe perryi, aloe spicata, aloe African.
- **Chemical constituents:** Aloe vera are measure source of anthraquinone glycoside. Aloe vera contain aloin, barbaloin, aloe emodin.



- **Uses:** To make stronger hair, It provides antioxidant properties and also act an emollient Improve texture of hair, repair dead skin on the scalp.
- Aloe vera gel is slightly viscous & clear liquid having good moisturizing properties[6].

C. Orange Peel

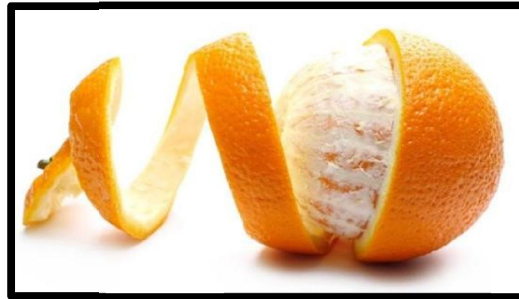


Fig. no. 2.3 Orange peel

- **Botanical name:** Citrus sinensis
- **Family:** Rutaceae
- **Synonym:** Orange or sweet orange
- **Biological source:** It is obtained from the orange peel which is dried or fresh outer part of the pericarp of ripe or nearly ripe fruits of citrus sinensis.
- **Chemical constituents:** limonene, (S)-linalool, pectin, octanal, decanal, essential alcohols, etc.
- **Uses:** Anti-oxidant, anti-inflammatory, Orange oil as perfuming agent, help to relief from itchy[5].

D. Fenugreek



Fig. no. 2.4 Fenugreek

- **Botanical name:** Trigonella foenum-graceum
- **Family:** Leguminosae
- **Synonym:** Methi, Methika, Alholva, Chandrika.
- **Biological Source:** It is obtained from the dried seeds to Trigonella foenum-graecum
- **Chemical Constituents:** Vitamin B, alkaloids, flavonoids, saponins, etc
- **Uses:** Hair growth stimulant, antibacterial, Increases blood flow to the scalp[6]



E. Hibiscus



Fig. no. 2.5 Hibiscus

- **Botanical name:** Hibiscus Rosa sinensis
- **Family:** Malvaceae
- **Synonym:** Hibiscus, Hibiscus mutabilis, Roselle.
- **Biological source :** It is obtained from the petals of flower of Hibiscus Rosa sinensis.
- **Chemical constituents:** Vit. A, C, amino acids, alpha hydroxyl acids, (AHA) etc.
- **Uses:** Hair growth stimulator, anti-dandruff, colouring agent, add volume to hairs and thicken them, treat the problem related to dandruff[9].

F. Castor Oil



Fig. no. 2.6 Castor Oil

- **Botanical name:** Ricinus communis
- **Family:** Euphorbiaceae
- **Synonym:** Ricinus oil.
- **Biological source:** Castor oil is the fixed oil obtained by the cold expression of the seeds of Ricinus communis.
- **Chemical constituents :** 80% riconeleic acid, fatty acids such as isoricinoleic, linoleic, stearic and isosteric acids.
- **Uses:** Hair growth stimulator, anti-dandruff, anti-inflammatory, provides required nourishment to hair root.[8]



Other ingredients use are:

G. vitamin E

Tocopherol- A vitamin E-rich oil can help to restore shine by rebuilding the protective layer. In general, oil helps to seal in moisture, minimise breakage, and protect the hair from harm. Vitamin E may help support a healthy crown and hair since it contains natural antioxidants that may aid in hair growth. Vitamins and antioxidants can reduce the quantity of oxidative stress and free radicals that lead to the deterioration of the hair follicle cells in one's crown.

H. Triethanolamine: use as preservative

I. Rice water

J. Orange Essential oil: Perfuming agent[5].

III. MATERIAL AND METHOD

3.1 Material

The material used in the preparation of flaxseed herbal serum are flaxseed extract, Alon era, orange peel powder, fenugreek seed powder, hibiscus powder, castor oil, vitamin E, Triethanolamine (TEA), Rice Water.

Table 1. Formulation table for 25g of flaxseed hair serum

Sr.No	Ingredients	Quantity Taken			Property
		F1	F2	F3	
1.	Aloe Vera	q.s	q.s	q.s	Conditioner
2.	Flaxseed	8.75g	8.80g	8.75g	Gelling agent
3.	Orange peel powder	1.5g	1.5g	1.5g	Anti oxidant
4.	Fenugreek seed	8.75g	8.70g	8.75g	Hair growth stimulant
5.	Hibiscus powder	2.5g	2.5g	2.5g	Colouring agent
6.	Castor oil	0.5ml	0.5ml	0.5ml	Hair growth
7.	Vitamin E	1ml	1ml	1ml	Antioxidant
8.	Triethanolamine	1ml	1ml	1ml	Preservative
9.	Orange Essential Oil	1ml	1ml	1ml	Perfuming Agent
10.	Water	q.s	q.s	q.s	Vehicle

Equipment: Laboratory equipment and apparatus were used for preparation.

3.2 Methods

Procedure for Herbal serum:

Procedure for preparation of 25ml of Herbal hair serum is divided into four parts:

Solution 1

1. In a beaker, add flaxseeds in distilled water and apply heat.
2. Continue heating until clear, slight viscous gel is formed.
3. Filter the gel using muslin cloth.
4. To the obtained gel, add 1 capsule of Vitamin E and 1ml of cold pressed castor oil.
5. Mix the solution using magnetic stirrer for 30 minutes.
6. After, add Aloe vera extract homogeneous solution is obtained. Drop wise until.



Solution 2

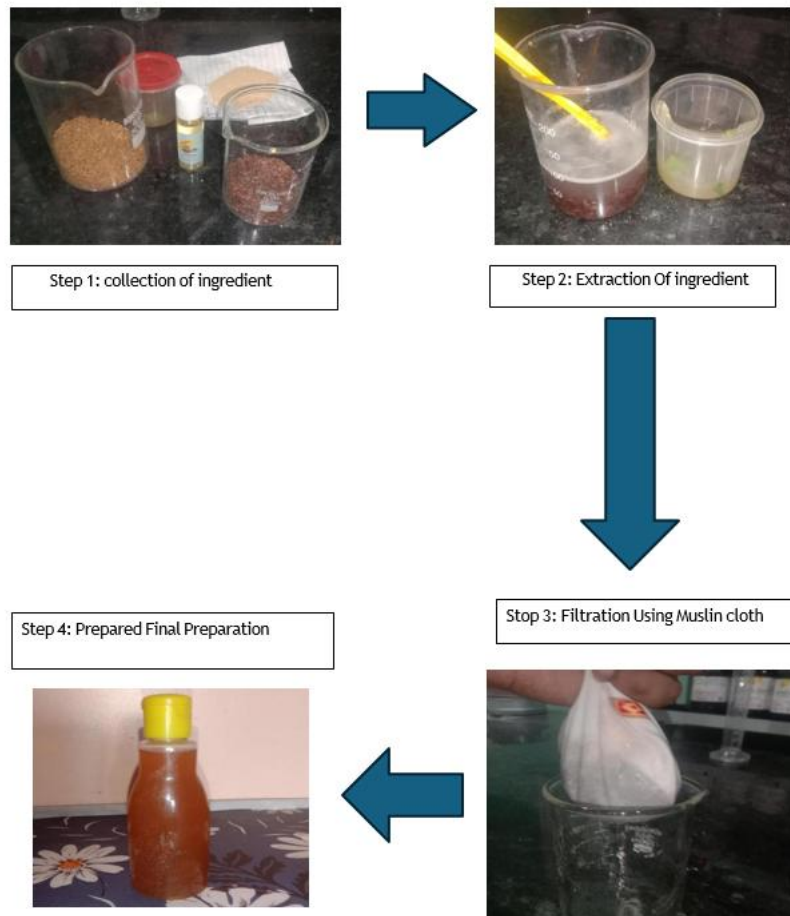
1. In a beaker, add 1 dried fenugreek seeds in distilled water and boil the solution for 5 minutes.
2. Filter the solution and of orange peel powder and keep the mixture at room temperature.
3. Additionally, add rice water to the solution in order to make a solution free from any lumps.

Solution 3

1. In a beaker, add Hibiscus powder in water.
2. Heat the solution until requisite colour is obtained.
3. Filter the solution and store.

Solution 4

1. In a beaker, add solution I and solution 2 with continuous stirring with a stirrer.
2. Then, add solution 3 drop wise until suitable colour is obtained and continue stirring with a glass rod[10].
3. To this solution, add about 1ml of triethanolamine that acts as a preservative and 1-2 drops of orange oil which acts as perfuming agent.
4. Mix the solution using magnetic stirrer for 15 minutes.
5. Store serum in well closed container[5].



IV. EVALUATION OF FLAXSEED HAIR SERUM:

1. **Physical appearance** -The Physical appearance, colour and fool of the prepared bat serum wore visually tested[5].
2. **Homogeneity Test** - The clean atul dried glass slide was smeared with the herford serum and covered using plans cover. The appearance investigated under light. The senen was aler visually tested for homogeneity, aggregates of Hocculent 51.
3. **PH-pli** was determined by using plf paper. The pH of herbal hair serum olmerved to be 4.5 to 5. That are suitable for formulation[8]
4. **Viscosity** - The viscosity of prepared formulation was determined by using Oswald viscometer(8)
5. **Skin Irritation test** - It is carried out by applying the seru redness or iching. Aller 2 hoans. It was observed that there is no redness or itching on the part of skin where the serum was applied. It is suggested that the hair serum was safe for une.[24]

V. RESULT AND DISCUSSION:

- a. **Physical Appearance** : The formulated serum showed a smooth and clear appearance with a light brown to reddish colour. No foreign particles or phase separation were observed. The serum spread easily on hair and provided a non-sticky feel after application.
- b. **Homogeneity** : The serum formulation was found to be homogeneous without the presence of lumps, aggregates, or coarse particles. This indicates proper mixing of all ingredients and good formulation stability.
- c. **PH Determination** : The pH of the prepared serum was found in the range of 5.2–5.5, which is suitable for scalp and hair application. The pH range helps maintain scalp health and reduces the chances of irritation.
- d. **Viscosity** : The viscosity of the serum was observed to be appropriate for easy application on hair. The formulation showed good consistency and smooth flow properties, making it convenient to spread uniformly.
- e. **Microbial Activity** : The prepared herbal serum showed good antimicrobial activity against microorganisms. The inhibition zone observed during microbial testing confirmed the antimicrobial potential of the herbal ingredients used in the formulation.
- f. **Skin Irritation Test** : The serum was applied on the skin to check for irritation or allergic reaction. No redness, itching, or inflammation was observed after application, indicating that the formulation is safe for topical use.

Parameters	Result		
	F1	F2	F3
Color	Brownish - red	Brownish - red	Brownish - red
Odor	Citrus type	Citrus type	Citrus type
Appearance	Good	Good	Good
Homogeneity	Good	Good	Good
PH	5.5	5.2	5.5
Skin irritation	No	No	No

Table No.2 Evaluation Parameter

VI. CONCLUSION

The herbal hair serum was successfully formulated and evaluated by using herbal ingredients. The produced herbal hair serum offers a variety of critical nutrients that are crucial for keeping healthy hair and scalp conditions, according to the research study and outcomes shown. It contains natural components that assist hair maintenance and development.



Herbal hair serums have been shown to be a highly effective and natural way to promote hair growth, improve hair texture, and address various hair-related issues. The unique blend of herbs and natural ingredients in these scrums provides nourishment, moisturization, and protection to the hair, leading to healthier, stronger.

The anti-oxidant properties of herbal components including orange peel powder, hibiscus powder, and vitamin E primarily function by halting the premature greying of hair. Castor oil, fenugreek, and flaxseeds are effective stimulators of hair growth. Hibiscus powder can be also employed as a colour agent in this case. When compared to synthetic chemicals, the components are not dangerous. People now days are really interested in the herbal sector. Due to its strength, effectiveness, and growing use in cosmetics, the herbal business has a promising future.

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