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Formulation, qualitative and quantitative evaluation of hair serum using herbal ingredients

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Abstract



Combining herbs into a single composition enhances their curative and therapeutic effects compared to individual use. Even non-medicinal plants, when processed into appropriate formulations or dried powders using advanced techniques, can offer superior therapeutic benefits. Hair cosmetic formulations, particularly serums, with their high concentration of active ingredients, provide deep skin nutrition and a non-greasy finish. Integrating plants into hair serum formulations maximizes therapeutic benefits and enhances skin absorption. Herbal cosmetics, derived from botanical phytochemicals, are increasingly popular for their aromatic value and skin benefits such as suppleness, collagen protection, UV protection, and wrinkle smoothing. India's cosmetic industry is rapidly growing, with herbal cosmetics contributing significantly to revenues. Hair, being a crucial aspect of one's appearance, faces issues like dandruff, hair loss, and greying. Hair serums, with their intensive nutrition and tailored formulas, cater to diverse skin types. Overall, hair serum stands as an elegant and effective styling product, offering multiple benefits for hair and skin health.

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INTRODUCTION

The global cost of raising living standards has increased consumer demand for cosmetics, which combines the pharmaceutical and cosmetics industries. Cosmetics and pharmaceuticals are

combined in skincare products known as cosmeceuticals, with serum being a high-concentration product with a non-greasy finish and intensive nutrition for the deeper layers of the skin. Bhringraj, also known as false daisy in English and Bhringraj in India, is a wild plant with significant ethno-medicinal value. It is used in traditional medical systems like Ayurveda, Siddha, and Unani. The leaves' fresh juice was used as a hair serum [1]. Natural medicinal substances, such as alkaloids, flavonoids, tannins, and phenolic compounds, have replaced many manufactured medications that could have negative effects. Neem, a natural raw material for mass production of cosmetics, can be used to make herbal cosmetics like hair serum [2]. The root, gum, leaves, flowers, and fruits of this tree, biologically

similar to mahogany, can be used to create herbal cosmetics like hair serum. As well Hibiscus rosa-sinensis Linn (HRS) which is used as a raw material for hair serum for smoothening nourishes and stimulates the hair follicles. The goal of this study was to create an herbal hair serum for improving hair quality using extracts of several herbs [3].

Highlights

Hair serums are fantastic products to have on your cosmetics shelf because of their many benefit. It is simple to use and is normally applied after washing and before styling the hair.

Hair serum is a liquidised product that provide a protective layer over the hair fibre, in assisting a smoothing frizz. This smooth layer in which it reflects in the light, which is how serum gives hair a shiny, not greasy finish [4].

However, hair serum isn't just for frizz control. The proper serum for the right kind of hair can take care of several issues, including detangling, smoothing, and adding shine, as well as healing damage and shielding against pollution [5].

Advantages

Relieves itchy scalp

Intensify hair growth

Avert premature greying of hair

Hair Nourishment

Dandruff control

Improves Hair Texture

Healthy Scalp

Prevent split ends

Makes our hair look shiny,smooth,silky and lustrous

Condition against frizz,dryness,breakage, etc [6].

Disadvantages

Sometimes it gives damp and oily look

Sometimes it causes skin irritation.

Side Effects

Excessive serum use might result in might result in serious hair loss and breakage.

Some of them may cause irritation, inflammation, redness, or itchiness in your mane [7].

Benefits of Using Hair Serum [8]

Hair serum makes your hair brighter and healthier, and it also helps to prevent tangles.

Hair serum makes your hair brighter and healthier, and it also helps to prevent tangles.

Its low ph level reduces swelling and keeps hair strands together, minimizing damage.

Hair serum also shields your hair from the sun, pollutants, other dangerous chemicals, and heat styling tools.

It hydrates dry hair and hair that has been color-treated.

Formulation of Herbal Hair Serum

Step: 1. Sterilize all the glassware and dry them properly as per SOP.

Step: 2. Measure the accurate quantity of powders as per the table and transfer it to the beaker.

Step: 3. Mix the required quantity of Coconut oil and Vitamin E.

Step: 4. Now mix rose water with the above mixture of Coconut oil and Vitamin E

Step: 5. After stirring for a few minutes, heat the prepared solution for a few minutes.

Step: 6. Add a few droplets of almond oil.

Step: 7. After that stir the preparation with the help of a magnetic stirrer

Step: 8. Add the Preservative to the above mixture [9]

Step: 9. Transfer the preparation to the measuring ngcylinder and adjust the final volume to 100ml.

Step: 10. Transfer the final solution into the contain

1. Eclipta alba

It is the most predominant herbal ingredient when comes to hair care. There are a lot of benefits produced, as follows [10]:

- Nourishes the scalp and the follicles to regenerate more hair strands.
- Used to treat alopecia (hair thinning and hair fall).

Table 1 Ingredients used in the preparation of herbal hair serum

S. No	Name of the Ingredient	Part of the plant used	Category	Quantity (%)
1	Eclipta alba	Leaves	Hair Growth Promoter	20 %
2	Hibiscus rosa sinensis	Leaves	Anti-dandruff, Conditioner Hair Growth Promoter	40 %
3	Azadirachta indica	Leaves	Hair Growth Promoter and Anti-Microbial Activity	15 %
4	Coconut Oil	-	Conditioner	8.5 %
5	Almond oil	-	Conditioner	8.5 %
6	Vitamin E	-	For hair growth	5 %
7	Rose water	-	Flavor	Q. S
8	Methyl Paraben	-	Preservative	3 %
9	Distilled Water	-	Vehicle	Q. S

- Hydrates the hair follicles.
- Reduces dandruff, and scaly, itchy, flaky scalp which makes them look weak.
- Proven to be anti-microbial.
- Reverse the greying of hair.
- Strengthens the hair and produces results in a few months.

2. Hibiscus rosa sinensis

One-step herbal solutions for hair concerns which easily available in the market. Oldest ingredients used for hair treatment. In our project, we have used leaf extract which has proven to show more reliable results than flower extract. Some of the benefits are [11]:

- Contains amino acids that stimulate hair follicles.
- Promotes blood circulation.
- Provides smoother and fizz-free hair.
- Prevents split ends.
- Reduce premature greying.
- Adds volume to hair.
- Has positive hair length.

3. Azadirachta indica

Neem is one of the most used herbal solutions for most of the diseases like chicken pox or skin rashes It is also used in ancient medicine systems

in India. Listed below are the effects of Neem related to hair [12]:

- Keep your dry strands hydrated.
- Controls fizzy and makes it manageable.
- Visibly contributes to stunted growth of hair growth.
- Conditions from roots to tips.

4. Coconut oil

It Is one of the household staples in Southern India. Considered to be the safest option used for any hair problems. Best home remedy for cuts, burns, wounds, etc. Here are some of the effects of coconut oil used for hair

- Protects from heat damage
- Prevents dandruff
- Can be used as styling gels if used to a minimum quantity.
- Reduces damage to the hair.
- Emollients the hair from root to tip

5. Almond oil [13]

It is one of the versatile oils. It is also a household staple. Eating raw almonds can help in various bodily functions such as providing energy, building muscles, etc. Here is the enumeration of oil benefits:

- Improves blood flow therefore contributing to hair growth.
- Ensures regrowth of hair.
- Involved in reactivating dormant hair follicles.
- Contains keratin one of the essentials for hair growth, thickening, and conditioning of hair.

6. Vitamin E

It is one of the fat-soluble vitamins available in markets in the form of capsules (evion). It is popular for its anti-aging properties. Hair benefits of vitamin E are:

- Provides elasticity to hair
- Mostly protected from UV radiation.

7. Methylparaben

It is one of the preservatives used. It is also an FDA (Food and Drug Administration) approved preservative. Reasons for usage in this serum:

- Preservation when used as per IP.
- Prevents microbial growth.

8. Rose water [14]

Most used in cosmetic products. Easily available in markets. Most preferred and affordable product to use. Safe to use for all age people. Purpose of using:

- Controls oily scalp.
- Enables minimum hair growth.
- Used predominantly for odor.

EVALUATION OF THE HAIR SERUM

The below-mentioned parameters were used to estimate the prepared hair serum

1. Physical Appearance

The physical appearance, color, and feel of the prepared hair serum were visually tested and results were tabulated [15].

2. pH test

We used pH 4 and pH 7 buffers to calibrate the pH. The hair serum was also applied to the electrode, which was then left until the pH stabilised.

3. Homogeneity test

The hair serum was applied to a dry, clean object glass, and then a cover glass was sealed. The appearance was examined in the presence of a coarse particle or unity. Visual examination was used to assess the hair serum for summations, lumps, as well as flocculates.

4. Viscosity

Using spindle number six, the viscosity dimension was measured using a Brookfield-Viscometer (RVDV-II+PRO). 50ml of hair serum was added to the beaker. Also, the density was measured at 10, 20, 50, and 100 revolutions per minute [16].

5. Spreadability

Spreadability was determined using a similar plate method that is typically used to evaluate and quantify the spreadability of unnecessary medication. Pressed between two 20x20cm horizontal plates, the top one weighing 125g, was one gramme of hair serum. Following the millisecond, the spread periphery was quantified. The following formula was used to determine spreadability [17].

$$S = M.L/T$$

6. Observation of growth of hair

On days 7, 14, and 21, it was accomplished by removing ten arbitrary hair beaches from each box. With the help of tape recording, the hair was pulled out, uncurled, and measured with MITUTOYO DIGIMATIC wireless callipers. To determine whether there was a statistically significant difference between the exploration region along with the control, the average length that was gathered was examined [18].

7. Test the sensitivity of the eye (Draize eye test)

To determine the average sensitivity result, eye sensitivity used three rabbits for testing. As the right eye serves as the control, one drop of hair serum was injected into the left eye of the rabbits in the physiological NaCl. The animals were then monitored for thirty, sixty, one hundred, and forty minutes, as well as one, two, three, and four days. It was established how the cornea, iris, as well as conjunctiva, scored.

8. Microbial contamination

Using the usual cup plate method, the antimicrobial efficacy of hair serum against strains of both aerobic and anaerobic microorganisms was assessed using various solvents. Nutrient agar is the culture media used for several common cup plate types. The pre-sterilized petri plate was used to conduct an antimicrobial test. Pre-sterilizing the petri dish involved incubating it at 37°C for 24 hours and pouring slightly sterile agar culture media on top of it. To solidify the agar medium, it is covered with a second Petri plate as well as refrigerated for a full day after being used. These two plates were subsequently stored at 37°C for a 24-hour incubation period. On the petri plate, the inhibition was set up following the incubation period. The zone of inhibition for hair serum and the pure form of retailed expression is displayed on the Petri plate, and it also appears in the Bacillus [19].

QUALITATIVE ASSESSMENT OF HAIR GROWTH

Fluorescence analysis

To determine whether chromophores were present in the extracts as well as powdered drugs, fluorescence examination was done using a variety of reagents. Luminescence analysis is important because, unlike fluorescence, which is invisible in daylight, UV light reveals the fluorescent nature of the emulsion. As a result, standard operating procedures are followed. Results are noted [20].

RESULTS AND DISCUSSION

Table 2 Data on Parameters

S.No.	Parameters	Results
1.	Physical Appearance	Yellowish Brown
2.	Homogeneity	Good
3.	pH	6.4
4.	Spreadability	Good
5.	Draize Eye Test	Mild Irritation

1. Physical appearance

The manufactured hair serum was visually inspected and evaluated for physical appearance, colour, odour, as well as texture.

2. pH

The hair serum's pH result was 6.4, which was enough and good for the hair, suggesting that it was safe to use.

3. Homogeneity

Following a visual assessment for the appearance and presence of any lumps, flocculates, or summation, the homogeneity of the prepared hair serum was verified. The manufactured serum's homogeneity is suitable for use.

4. Skin irritation test

After we applied on the skin no redness was found.

5. Sensitivity test

When applied on the skin and observed after 10 minutes, any itching or rashes have not occurred.

6. Viscosity

Table 3 Viscosity

SHEAR SPEED	10 RPM	20 RPM	50 RPM	100 RPM
Viscosity (cps)	4110 cps	2933 cps	1645 cps	1010 cps

7. Spreadability

The spreadability study is used to find the measurement of spreadability, the formulation showed a better result.

Table 4 Evaluation Parameters

S.NO	EVALUATION PARAMETER	BEFORE ONE MONTH	AFTER ONE MONTH
1.	Colour	Pale Yellow	No change
2.	Odour	Pleasant	No change
3.	Transparency	Transparent	No change
4.	Viscosity		No change
5.	Spreadability	Good	No change
6.	Homogeneity	Good	No change

8. Observation of hair growth

By contrasting the growth patterns exhibited by the normal control, negative control, as well as positive control, a significant difference was identified. Consequently, it was discovered that, even with a single formula. The hair serum utilised in this experiment showed a 7.98mm more significant hair growth activity.

Table 5 Observation of Hair Growth

S. No.	Hair Length (Mm)	7 th Day	14 th Day	21 st Day
1.	Normal control	1.22	1.54	2.19
2.	Negative Control	1.45	1.67	2.98
3.	Positive Control	3.22	4.01	7.21

9. Draize eye test (test the sensitivity of the eye)

There was no nebulosity picture in the left eye, the conjunctiva was normal, the eyelid was not blown, and the iris image seemed normal. Tears were visible to be produced by the eyes. On day one, the optical discomfort indicator was 2, and on days three, four, and five, it was 0. (optical vexation index at 110 at its maximum). Consequently, the hair serum appears to have a somewhat inflammatory impact.

10. Microbial contamination

Table 6 Microbial Contamination

Product	Zone of Inhibition
Control	0mm
Test formulation	33.1mm
Standard formulation	23.3mm

Qualitative Assessment of the Growth of Hair

Fluorescence analysis

CONCLUSION

All the parameters show they're inside of it limits and since all the ingredients have been added, a lot of advantages, this hair serum is going to help Maintaining good hair growth and turning grey

hair to black, essential nutrients needed to preserve. The correct function of the sebaceous glands and Provide support for the growth of hair from naturally occurring sources. In the personal the use of herbal medicines, hygiene and health care system. There are several folds of change in the cosmetics. Therefore, there is a lot of glamour in genuinely focusing on and paying extra attention to the creation of herbal cosmetics in the herbal cosmeceuticals individual care or personal health care sector. Given the numerous benefits of all the added constituents, this oil will aid in preserving healthy Hair growth and colouring grey hair to prevent dandruff and provide shiny, healthy-looking hair. The findings demonstrated that herbal hair serum offers the different vital elements required to maintain the sebaceous glands' healthy function and promote the growth of natural hair. The usage of herbal cosmetics products has seen several developments in the personal hygiene and healthcare systems. For this reason, herbal cosmetics the need for individual care, or the personal healthcare sector, is rather high. This industry is concentrating and giving greater attention to the creation of cosmetics based on herbs. India's traditional medical system has received recognition for the wide range of herbal remedies it uses to heal and promote hair growth. The finest part is the herbal extracts; they supplement hair with microproteins and supply the proper quantity of nourishment, resulting in hair that is safe and sound. The personal care industry has seen a rise in the use of herbal cosmetics, which are in high demand because they don't include parabens or other common sulphates.

Table 7 Fluorescence Analysis

S. No.	Treatment	BRINGARAJA (<i>eclipta alba hassk</i>)		RED HIBISCUS (<i>hibiscus rosa sinensis</i>)		NEEM (<i>Azadirachta indica</i>)	
		SHORT UV 254nm	LONG UV 365nm	SHORT UV 254nm	LONG UV 365nm	SHORT UV 254nm	LONG UV 365nm
1.	Saturated picric acid	Dark Green	Blackish Brown	Blackish Brown	Light Green	Dark Green	Blackish Brown
2.	Nitric acid	Green	Dark Green	Bright Yellow	Bright Yellow	Light Green	Bright Yellow
3.	Hydrochloric acid	Green	Blackish Brown	Dark Green	Bright Yellow	Blackish Brown	Light Green
4.	Glacial acetic acid	Green	Dark Green	Bright Yellow	Blackish Brown	Dark Green	Light Green

Conflict of Interest

The authors declare no conflict of interest, financial or otherwise.

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