

Recent Advances in the Development of Herbal Hair Serum

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Abstract: Herbal hair serums have garnered significant interest as safer, natural alternatives to synthetic products aimed at enhancing hair health. This research centers on the creation, formulation, and assessment of an herbal hair serum that includes ingredients such as aloe vera, hibiscus, rose extract, ginger, amla, argan oil, and vitamin E. These botanical components offer numerous advantages, including antioxidant, anti-inflammatory, moisturizing, anti-dandruff, and hair growth-promoting properties. The formulated serum was assessed for its physical appearance, homogeneity, pH level, spreadability, sensitivity, and stability. The findings suggest that the formulation is safe, non-irritating, and effective in increasing shine, minimizing frizz, fortifying hair, and enhancing overall hair manageability. This study reinforces the potential of herbal serums as a viable, eco-friendly solution for hair care.

Keywords: Cosmetic, Anatomy and Physiology, Hair growth, Hair Serums, Hair Care, Natural formulation.

Introduction

Hair:- The Rise In Global Living Standards Has Led To An Increased Demand For Cosmetic Products. The significance of cosmetics has grown as numerous individuals aspire to maintain a Youthful and attractive appearance. Cosmeceuticals represent the fusion of the cosmetics and Pharmaceutical industries. While cosmetics companies focus on producing beauty products, Pharmaceutical companies are dedicated to manufacturing medicines. Cosmeceuticals are skincare Items that merge the properties of cosmetics with medicinal benefits. Serums are among the Cosmetic products that contain a very high concentration of active ingredients in their formulations, Designed to deliver intensive nourishment to the deeper layers of the skin while providing a non-greasy finish that is suitable for all skin types.[1] The health and vitality of hair are crucial elements Of physical appearance and overall well-being, impacting self-esteem and confidence. Nevertheless, the widespread occurrence of hair loss and other hair-related issues continues to be A major concern globally. Although many commercial products provide solutions to these Challenges, a significant number of individuals are looking for natural alternatives that utilize the Benefits of botanicals and essential oils. This research initiative is motivated by the deep-rooted Tradition of herbal medicine and the increasing interest in natural remedies for hair care.[2] Hair serum is a leave-in treatment specifically created to care for and safeguard hair. The Primary aim of the hair and scalp serum is to improve the hair's look, increase shine, minimize Frizz, avert damage, and promote hair growth. Herbal hair serums, owing to their diverse herbal Components, can offer significant advantages for both hair and scalp. These herbal mixtures are Crafted using plant extracts. Plant extracts contribute various benefits, including antioxidant, anti- Inflammatory, antiseptic, and antimicrobial

properties.[3] The rise in global living standards has Led to an increased demand for cosmetic products. The significance of cosmetics has grown as numerous Individuals aspire to maintain a Youthful and attractive appearance. Cosmeceuticals denote the fusion of the cosmetics sector with The pharmaceutical sector. While cosmetics companies manufacture beauty products, Pharmaceutical companies focus on producing medications. Cosmeceuticals are skincare items That integrate both cosmetics and medicinal properties. Serum is a notable cosmetic product Characterized by a high concentration of active ingredients in its formulation, designed to deliver Intensive nourishment to the deeper layers of the skin while providing a non-greasy finish that is Suitable for the skin.[4] The increase in the cost-of-living standards globally has led to a heightened Demand for cosmetic products. The significance of cosmetics has grown as numerous individuals Aspire to maintain a youthful and attractive appearance. Various types of hair serums are available To cater to different hair objectives. Depending on the formulation of the product. A hair serum May help reduce frizz, enhance shine, or straighten hair, serving as a cutaneous derivative that Plays a crucial role in improving the overall appeal of the body. However, individuals often face Issues such as hair loss, flakiness, head lice, split ends, and graying hair. A single hair strand Comprises a follicle, a shaft, and an apex.[5]

Objective

To provide an alternative to synthetic hair serum. To develop a formulation for herbal hair serum.

To improve the shine of dull hair, reduce frizz, and protect against heat damage. To elevate the quality and texture of hair.

To conduct an evaluation of herbal hair serum.

Anatomy And Physiology Of Hair

Structure Of Hair:-

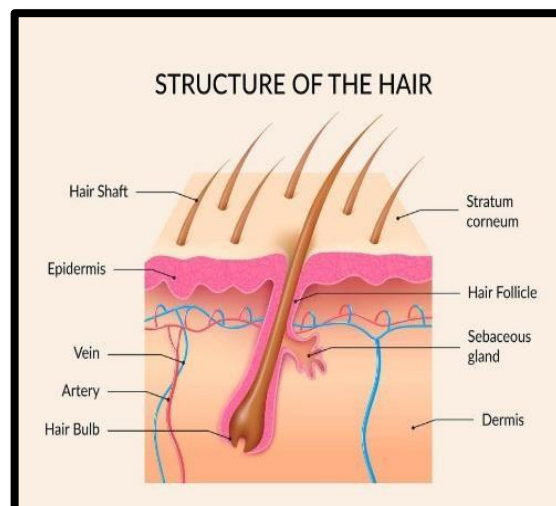


Fig 1: Structure Of Hair.

Parts Of Hair:-

1. Dermal Papillae:-

The dermal papilla is essential for the regulation of the hair cycle and growth, as it contains androgen receptors that react to DHT.

2. Matrix:

The matrix surrounds the dermal papillae and includes all vital components necessary for hair growth and the development of specific hair sections, such as the outer root sheath, inner root sheath, and the hair shaft. Together, the matrix and dermal papillae form the structure of the hair.

3. Bulb, Outermost Sheath:-

The outermost part of the hair, referred to as the outer root sheath (ORS), is distinguished by its keratinized nature. In contrast, the inner root sheath (IRS) is made up of three separate layers: the Henley layer, the Huxley layer, and the Cuticle [6].

Anatomy Of Hair: -

Hair follicles, situated within the adipose layer of the scalp, produce hair in groups of 1-4 strands known as “follicular units”. The hair growth process takes place at the hair bulb, located at the base of each follicle. These follicles receive nourishment from blood vessels in the dermis, enabling the cells to divide and mature into the hair shaft. While the hair is developing beneath the epidermis, it remains soft; however, once it emerges, the outer layer hardens into keratin. Terminal hairs are mainly found on the scalp, eyebrows, and eyelashes, while vellus hairs are distributed across the body. At birth, vellus hairs are present on the scalp and eyebrows, whereas terminal hair appears in other regions of the body. During puberty, certain terminal hairs (such as those on the beard, chest, armpits, and pubic area) are influenced by androgens.

Terminal hair is long (> 2 cm), thick (~60 μm), and pigmented. Furthermore, terminal hairs are medullated and have a bulb at the base. In contrast, vellus hair is thin (< 30 μm), very short (< 2 mm), and primarily non-medullated. Vellus hair is categorized into three main ethnic groups: Asian, African, and European. A recent study has further refined this classification to Eight primary subgroups are identified by assessing three parameters: hair diameter, hair curliness, and the number of waves [6].

Physiology of Hair:

The physiology of hair encompasses three distinct phases: Anagen, Catagen, and Telogen. The Anagen phase represents the main growth stage, which can persist for several years for each individual hair. The Catagen phase is a brief stabilization period, lasting a few weeks, during which the hair follicle contracts and the activity of the cuticle diminishes. Telogen is the resting phase in which old hair is shed, and new hair starts to grow. This phase consists of dead, hardened cells that safeguard the old hair as it is gradually expelled from the follicle over several months. The Anagen phase, which signifies the hair growth stage, comprises three components: the Henley layer, the Huxley layer, and a distinct phase. At any given time, the majority of hair is in the Anagen phase. The Henley and Huxley layers are capsular structures that intertwine to ensure the stability of the hair. This phase endures for several years. During the Catagen phase, which lasts for a few weeks, hair growth decelerates, and the hair follicle, particularly the cuticle nearest to the hair shaft, undergoes a contraction process. Telogen, the resting phase, can extend for several months. During this interval, hair growth halts, and the old hair separates from the hair follicle. Subsequently, a new hair initiates its growth phase, displacing the old hair. The cuticle, made up of dead hardened cells, offers additional protection to the hair shaft. Along with the capsular layers of the Henley and Huxley layers, it guarantees the hair's protection and facilitates its growth [7].

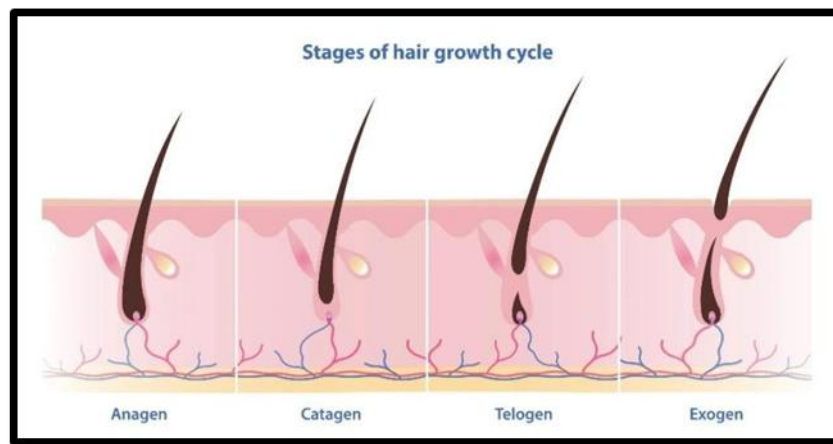


Fig 2: Different Phases of Hair Cycle.

Hair Serum

Hair serum is a treatment that is typically made with silicones and comes in a liquid form. It is designed to create a protective barrier on the hair strands, helping to reduce frizz. This protective layer also has the ability to reflect light, resulting in a shiny appearance without any greasiness. By using hair serum, some individuals may find that they no longer need to use straighteners to achieve smooth hair, which can significantly reduce styling time and prevent heat damage to the hair. Hair serum serves a variety of purposes beyond just controlling frizz. Depending on your hair type, the appropriate serum can help with smoothing, adding shine, detangling, repairing damage, and protecting against pollution. Additionally, using hair serum can effectively conceal split ends until your next appointment with the hairdresser [8].



Fig 3: Hair Serum.

Provides Shine And Smoothness To Hair

- Hair serum is a hair styling product that forms a protective coating on the surface of the Hair.
- It is essentially a liquid hair care product with a consistency that is denser than water.
- This styling product is formulated with silicone to create a protective layer on the hair's Surface, enhancing shine, smoothness, and hydration. It also provides defense against Humidity and pollution.
- Designed for use on damp hair [9].

Type Of Hair For Using Hair Serum

1. Straight
2. Wavy
3. Curly

Advantages Of Hair Serum

1. The hair is protected from environmental factors.
2. Functions as both a pre-styling treatment and a finishing product.
3. It can be used before or after applying heat styling.
4. It protects the hair from outside elements that may lead to damage.
5. Improves the smoothness of the hair strands [10].

Disadvantages Of Hair Serum

1. Consistent use of hair serum can compromise the health of the hair.
2. The act of applying serum directly on the scalp has the potential to trigger inflammation.
3. It is advisable to refrain from applying serum on the scalp to prevent potential issues Such as oiliness or irritation [11].

Benefits Of Herbal Hair Serum

Before choosing a product, it is crucial to comprehend the advantages of hair serum. The primary benefits of a hair serum can be summarized as follows.

Versatile

A hair serum tackles multiple hair-related issues instead of focusing on just one. It is regarded as a comprehensive solution for all your hair requirements. By applying a hair serum, you can transform a bad hair day into a good one. With merely a few drops, your hair will exhibit a noticeable enhancement in both texture and appearance.

Enhances Shine

Hair serum forms a protective layer that amplifies shine by reflecting light, resulting in a sleek and glossy look. The amino acids present in hair serums provide protection for chemically treated and color-treated hair.

Beneficial For Dry Hair

Hair serums are especially beneficial for individuals with dry and unruly hair. These serums effectively retain moisture, leading to hair that is not only smooth but also radiant.[12]

Protects Hair

Hair serum clings to the hair strands, forming a protective barrier against heat, sun exposure, dirt, pollen, and pollution. This helps maintain the health and integrity of your hair. It is advisable to apply a heat protectant cream prior to using any heat styling tools.

Minimizes Hair Loss From Breakage

When our hair becomes tangled, we often face significant hair loss due to the strain and effort required to detangle it. Hair serum serves as a lubricant for knotted hair, easing the detangling process and resulting in reduced hair fall.

Ideal For Dry Hair

Hair serums are particularly beneficial for those with dry and frizzy hair, as they help retain moisture and promote smooth, shiny hair.

Nourishes Hair And Improves Manageability

Hair serums penetrate the hair follicles, repairing damage and restoring strength to delicate hair. By enhancing hair manageability, hair serum simplifies the styling process, saving time, energy, and patience.[13]

Ingredients Of Hair Serum

Aloe Vera:

In the realm of hair and skin care, aloe vera gel is truly a blessing. Maintaining a healthy and balanced pH is crucial for optimal hair growth. This is where aloe vera gel proves beneficial. Additionally, it serves as a natural conditioner and helps to prevent hair loss. Just apply it to your scalp and hair, allowing the gel to perform its wonders for comprehensive nourishment [14].



Fig 4: Aloe Vera.

Ginger:

The use of ginger juice for hair offers significant advantages in the prevention of seborrhoeic dermatitis, commonly referred to as dandruff. Dandruff arises from a yeast infection known as malassezia, which leads to itchy flakes and redness on the scalp. Conversely, antifungal agents can assist in limiting its proliferation. Research indicates that ginger possesses a strong antifungal effect on hair, which can aid in diminishing dandruff. The active compound gingerol, which is the most prevalent in the ginger rhizome, is responsible for its antimicrobial characteristics[15].



Fig 5: Ginger.

Lavender:

One of the most well-known herbs for combating baldness and encouraging hair growth is lavender. The oil extracted from *Lavandula angustifolia* has antibacterial, antimicrobial, and anti-inflammatory characteristics. Lavender oil promotes the growth of new hair, improves blood circulation in the scalp, and helps to balance the scalp's natural oil production. Additionally,

lavender oil is effective against disease-carrying parasites like fleas, ticks, mosquitoes, and head lice, functioning as a natural insect repellent[16].



Fig 6: Lavender Oil.

Vitamin E:

Oils enriched with Vitamin E have the capacity to revitalize and protect your hair. These oils can serve as an effective replacement for the protective layer, helping to restore your hair's natural shine. Furthermore, they play a crucial role in retaining moisture, reducing the likelihood of breakage, and shielding your hair from various forms of damage. Popular choices of oils include argan, jojoba, and coconut. However, it is essential to apply them in moderation and choose the type of oil that best suits your specific hair type to avoid excessive greasiness [17].



Fig 7: Vitamin E.

Rosemary:

For centuries, rosemary has been employed to help with hair loss. It is especially effective for thinning hair and baldness. Its effectiveness in stimulating hair growth is improved when paired with olive oil. To utilize, combine rosemary oil with a small quantity of olive oil and apply it directly to the scalp. This not only promotes hair growth but also helps in preventing premature greying. Furthermore, it offers vital nourishment to hair follicles [18].



Fig 8: Rosemary.

Rose Water:

Rose water acts as a mild astringent that can help reduce oiliness and dandruff.

Its anti-inflammatory properties may make it beneficial for certain scalp conditions, including psoriasis and eczema.

Many women with curly hair attest to the effectiveness of rose water in controlling frizz and improving shine.

Additionally, rose water positively impacts the overall health of the scalp; it helps establish a strong foundation for hair growth and aids in preventing hair loss.

Rose petals are abundant in vitamins A, B3, C, and E, which nourish the scalp and stimulate hair follicles, thus encouraging hair growth, according to Chen [15].



Fig 9: Rose Water.

Hibiscus:

Hibiscus serves as a potent herbal treatment for hair care. It is abundant in vitamins A, C, and E, along with amino acids, antioxidants, and flavonoids, which nourish the scalp and encourage hair growth. It enhances collagen production, aiding in the regeneration of hair follicles. Additionally, it minimizes hair breakage and split ends by providing deep conditioning to the hair strands. The presence of amino acids nourishes the hair follicles. Furthermore, hibiscus functions as a natural hair dye, restoring hair color and preventing premature greying.



Fig 10:- Hibiscus.

Amla:

Amla serves as a rich source of nutrients that enhance hair growth and promote overall scalp health. It is abundant in Vitamin C, antioxidants, and essential fatty acids, rendering it extremely advantageous for hair. It encourages hair growth, fortifies hair follicles, nourishes the roots, and stimulates hair development. Additionally, it helps prevent hair loss and strengthens hair. Amla is high in Vitamin C and iron, which contribute to minimizing hair thinning.



Fig 11:- Amla.







Description Of Hair Serum

All fresh herbs, aloe vera powder, rose petal extract, and black pepper were precisely measured and allocated in 100 ml of water.

The measurement pertained to those that were boiled for 15 minutes. After 15 seconds of boiling, they were permitted to cool and then filtered. Argon and vitamin E were incorporated into the filtrate.

The resulting serum was stored in a spray container[19].

Key Ingredients For Hair Care**1. Herbal:****TABLE NO 1**

Sr. No	INGREDIENTS	CHEMICAL CONSTITUENTS	USES
1.	Aloe Vera Powder 	Polysaccharides. Vitamins. Minerals. Saponins. Sterols.	Soothe the scalp. reduce dandruff. moisturize hair. strengthens hair. scalp health.
2.	Black Pepper 	Alkaloids. Phenolic compound. Carbohydrates.	Treating dandruff. reducing hair fall. premature greying. strengthening hair.
3.	Rose Petal Extract 	Flavonoids. Anthocyanins. Organic acids.	Moisturizes and hydrates. prevents split ends. reduces frizz. enhances shine.
4.	Vitamin E 	Antioxidant components. Tocopherol.	Prevents hair loss. moisturizing a dry scalp. leave-in treatment. hair masks.
5.	Argan oil 	Fatty acids. Triterpene alcohols. Squalene. Polyphenols.	Reduces frizz and flyaways. enhances curls and texture. corrects damaged hair.
6.	Almond oil 	Phytosteroids. Antioxidant.	Moisturize. smooth. soften hair. nourishes the scalp.

2. Synthetic :**TABLE NO 2**

SR. NO	INGREDIENTS	USES
1.	Dimethicone	Provides smoothness, reduces frizz, adds shine, forms protective layer.
2.	Cyclopentasiloxane	Lightweight silicon for easy spreadability, detangles hair, adds slip.
3.	Phenyl Trimethicone	Enhances gloss protects from heat damage, improves shine
4.	Propylene glycol	Acts as humectant, maintains moisture, prevents dryness

Investigation Study Of Hair Serum**1. Physical Appearance**

The herbal hair serum is assessed visually for its appearance, color, and texture.

2. Homogeneity Test

The hair serum was applied to a clean, dry glass object, followed by the placement of a cover glass over it. The appearance was examined for the presence of coarse particles or homogeneity. The herbal hair serum was visually inspected for homogeneity and the presence of lumps, flocculates, or aggregates.

3. pH Test Viscosity

Using data from pH 4 and pH 7 buffers, the pH cadence was calibrated. Furthermore, the electrode was submerged in the hair serum and allowed to sit for a period until the pH returned to normal.

4. Skin Irritation Test

After the serum was applied to the skin, it was monitored for any signs of redness or itching after two hours.

5. Sensitivity Test

This procedure involves applying the serum to the skin, exposing it to sunlight for 10 minutes, and then checking for any rashes or itching.

6. Spreadability

A similar plate method commonly used to evaluate and measure the spreadability of semisolid medications will be utilized to assess spreadability. One gram of hair serum will be compressed between two vertical plates measuring 20 x 20 cm, with the upper plate weighing 125 g. After one minute, the spread perimeter will be measured. Spreadability will be calculated using the following formula:

$$S = M \times L / T$$

Where, S = Spreadability.

M = Weight on the upper slide.

L = Length of the glass slide changed. T = Time (in seconds) taken.

7. Stability

The herbal hair serum was stored for three months at two different temperatures of 42 °C and 30 °C, with 65% relative humidity. After three months, the pH and density of the herbal hair serum were measured and compared to their initial values.

Methods To Prepare Hair Serum

1. Aqueous Extraction Method (Herbal Hair Serum)

Used for: Aloe vera, rose extract, hibiscus, amla, neem, etc.

Steps: Measure the necessary herbs and incorporate them into distilled water. Heat the mixture (60–80°C) for 10–15 minutes. Allow it to cool and filter to eliminate solid particles. Add oils (argan, jojoba), vitamins (Vitamin E), preservatives, and fragrance. Mix thoroughly and store in a spray or serum bottle.

2. Oil Infusion Method

Used for: Dry herbs and oil-soluble actives.

Steps: Take carrier oils (coconut, jojoba, olive, almond). Add dried herbs (rosemary, lavender, hibiscus). Heat on low flame for 10–15 minutes (or cold infuse for 1–2 weeks). Filter the infused oil. Add Vitamin E or essential oils. Store in a glass bottle.

3. Emulsion Method (Creamy Or Smooth Serum)

Used for: Professional-grade serums.

Steps: Heat the oil phase (silicones, carrier oils, emulsifiers). Heat the water phase (distilled water, extracts, humectants). Combine both phases while mixing at high speed. Cool to room temperature. Add heat-sensitive actives (vitamins, proteins, fragrance). Package in a pump bottle.

4. Silicone-based Method (Shine & Smoothing Serum)

Used for: Synthetic commercial serums. Ingredients: Dimethicone, Cyclomethicone, Phenyl Trimethicone

Steps: Blend silicones in a clean beaker. Add fragrance, vitamins, and preservatives. Mix until uniform. Transfer to a dropper or pump bottle.

5. Gel-based Method (Lightweight Herbal Serum)

Used for: Aloe vera gels, hyaluronic acid serums. Steps: Prepare gel base (aloe gel or carbopol gel). Add extracts (green tea, rose, amla). Add humectants (glycerin, panthenol). Stir thoroughly. Adjust viscosity if necessary. Pour into a bottle.

6. Cold-mixing Method (No Heating)

Used for: Heat-sensitive actives. Steps: Add water-soluble phase (water, hydrosols). Add glycerin, D-panthenol, proteins. Gradually add oils while mixing. Mix until uniform. Incorporate natural preservatives and fragrance.

7. Maceration Method (Traditional Herbal Serum)

Steps: Soak herbs in oils/water/alcohol for 24–48 hours. Filter the excess.

Future Scope

The development and assessment of herbal hair serums focus on creating products that foster healthy hair growth, nourishment, and overall hair wellness. The future objectives for this domain may encompass:

Innovation In Ingredients

Incorporating Advanced Natural Actives: Investigating newer herbal extracts, essential oils, and botanicals that provide specific advantages for hair health, such as promoting growth, minimizing hair loss, and enhancing scalp condition.

Standardization of Herbal Ingredients: Guaranteeing consistent quality, potency, and purity of herbal components utilized in hair serum formulations.

Personalized Hair Care

Customized Formulations: Employing AI and data analysis to develop hair serums specifically designed

for individual hair types, issues (e.g., dryness, thinning), and conditions (e.g., scalp inflammation).

Dna-based Products: Investigating the potential of genetics in creating hair products that correspond with individual genetic tendencies for hair growth and scalp health.

Sustainability And Eco-friendly Packaging

Sustainable Sourcing: Utilizing organic, ethically sourced herbs and botanicals, thereby reducing the environmental impact of production.

Eco-Friendly Packaging: Shifting towards biodegradable or recyclable packaging to minimize waste and support a circular economy.

Clinical And Dermatological Evaluation

Clinical Trials: Implementing more comprehensive clinical studies to substantiate the effectiveness and safety of herbal ingredients in hair serums.

Dermatological Testing: Confirming that products are hypoallergenic, dermatologically tested, and safe for all skin types, including sensitive scalps.

Advanced Delivery Systems: Nanotechnology

Utilizing nanotechnology to enhance the absorption and effectiveness of herbal ingredients deep within the scalp and hair follicles.

Microencapsulation: Encapsulating active ingredients for extended release, ensuring lasting benefits over time.

Holistic Hair Health

Synergistic Formulations: Merging herbal hair serums with oral supplements to promote comprehensive hair health.

Conclusion

Herbal hair serum presents a secure, efficient, and natural substitute for synthetic products, delivering vital nourishment, minimizing frizz, boosting shine, and safeguarding hair against environmental harm. The blend of botanical extracts and natural oils fortifies hair, encourages growth, and enhances overall manageability without adverse side effects. The research indicates that herbal formulations can provide remarkable cosmetic and therapeutic advantages, establishing them as a promising option for healthy and sustainable hair care.

References

1. Miss. Shreya Santosh Khatal, Asst. Prof. Ghodke Pratiksha, Dr. Udupurkar Prachi, Herbal Hair Serum, International Journal of Creative Research Thoughts (IJCRT), Volume 11, Issue 5 May 2023 | ISSN: 2320-2882
2. Adhirajan N, Kumar T R, Shanmugasundaram N et al, 2003. In vivo and in vitro Evaluation of hair growth Potential of Hibiscus rosa-sinensis Linn. Journal of Ethnopharmacology. 88(2-3), Pages 235-239. Doi:10.1016/s0378-8741(03)00231-9.
3. Ravi Sankar Prasad P S, Adithya Unni P, Amal Fathima A S, Anjana A S Pradeepam et.al, formulation and evaluation of herbal hair serum using eclipta Alba, International journal of novel research and development (ijnrd) IJNRD.ORG, Volume 10, Issue 3 March 2025 | ISSN: 2456-4184 IJNRD.ORG
4. S. Budiasih, I. Masyitah, K. Jiyauddin, M. Kaleemullah, A. D. Samer, A. Mohd Fadli And Eddy Y., Formulation and Characterization of Cosmetic Serum Containing Argan Oil As Moisturizing Agent, Science and Technology Publications,2018;297304.
5. Andhale Sham Raosaheb, Katkar Vaishnavi, Garje Sanjay, Sayyed Gaffar et.al, A Comprehensive review on herbal hair serum, International journal of progressive research In engineering

- management and science (IJPREMS), Vol. 04, Issue 04, April 2024, pp: 347-351 e-ISSN :2583-1062
6. Janrao Kaveri, Gaikwad Vishal Shivaji review for herbal shampoo, international journal of creative research thoughts, volume-10 issue 10 October 2022
 7. Mrs. Sravanthi, N. Kavitha, K. Sowmya, S. Naazneen, et.al., CH. Anil St. Pauls college of pharmacy, Turkayamjal, 501510, volume 6[issue-3 may-June 2021]
 8. Shruti Shivaji Ippalwad,Pooja Dharmadhikari, Atul Dilip Patil and Ashwini Sanjay Pawar, et.al, Formulation and evaluation of herbal hair and serum,World Journal of Pharmaceutical Research, Volume 12, Issue 13, 1033-1041., ISSN 2277–7105
 9. Shirivas SR, Hingane LD. Preparation and evaluation of hair serum. Int J Adv Eng Manag. 2022 Jun;4(6):2389–93.
 10. Larsson SC, Bergkvist L, Naslund I, Rutegard J, Wolk Vitamin A, retinol and carotenoids and the risk of Gastric cancer: a prospective cohort study. Am J Clin Nutr. 2007;85(2):497- 503.
 11. Aruna V, Amruthavalli GV, Gayathri R. Hair Root activation by anagen grow- a herbal hair Growth serum. Dermatol & Cosmet 2019; 1(3): 56-9.
 12. Rohan R. Vakhariya, Srushti A. Oza, Chaitanya S. Bhingardeva, Smita J. Patil, Safiya F. Mujawar, Dr. K.S. Mohite, Formulation, Development and Evaluation of Herbal Hair Serum, International Journal of Pharmaceutical Science Review and Research, Page: 100- 103, September- October 2022.
 13. Haripriya, V. Prasath,G.Praveen Kumar,G. Priyadarshini, T.Priyadharshini and S. Priyanka,A review of natural ingredients in herbal hair serums, World Journal of Pharmaceutical Research, Volume 4, Issue 3, 2025,ISSN: 2583-6579
 14. Kazi SM, Aiwale PD. International Journal of Pharmacy and Herbal Technology- ISSN NO: 2583-8962 (Online) A REVIEW ON: HERBAL ALOE VERA SHEET MASK, 2023; 1(3): 12431.
 15. Grzanna R, Lindmark L, Frondoza CG. Ginger--an Herbal medicinal product with broad Anti-inflammatory actions. J Med Food.2005;8:125-32.
 16. Sabara D, Kunicka-Styczynska A. Lavender oil – flavouring or active cosmetic ingredient? Sci Bull Tech Univ Lodz. 2009;73:1058. Review: Professor Zofia Akowska, Ph.D., D.Sc.
 17. Ms.Komal Ganesh Kalgunde , Mrs.Sujata Ujakant Veer , Dr.Amol Navnath Khedkar, Ms.Sonali Khandu Jathar et.al, Review on development and evaluation of herbal hair serum, International Journal of Novel Research and Development (www.ijnrd.org),Volume 8, Issue 11 November 2023 ISSN: 2456-4184
 18. Trusha V. Patel,Mitali M. Oza,Mrs.MonaA. Gupta, Dr. Nisha Patel, Ms. Sandhya Bodhe et.al, A comprehensive review article for poly herbal hair serum is MagicalRemedies for hair growth, International Journal of Pharmaceutical Research and Applications,Volume 10, Issue 1 Jan – Feb 2025, pp: 984-991
 19. Manjula D, Josephine JLJ, Kumari P, Banu S (2018) Formulation and evaluation of flaxseed hair gel: A natural hair Tamer. Int J Res Pharm Chem 8: 487-491.