

REVIEW ON FORMULATION, DEVELOPMENT AND EVALUATION OF HERBAL HAIR SERUM

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ABSTRACT

Herbal hair serums have grown in popularity as natural alternatives to conventional hair care products because of their claims of nourishing qualities, enhanced scalp health, and hair growth stimulation. This abstract provides an overview of herbal hair serums, paying special emphasis to their composition, efficacy, safety, and potential benefits for hair health, including the claims of decreased hair loss and enhanced hair growth. Alopecia is a prevalent problem among city people who deal with stress, environmental problems, and other problems. This review article leads us to the conclusion that alopecia can be successfully treated with a variety of herbal medicines without experiencing any negative side effects. Hair loss can be treated with a variety of allopathic drug types, but each one has numerous side effects. Hair loss can be treated with a variety of allopathic drug types, but each one has numerous side effects. The collecting of herbs is the cornerstone of any medical study. Since herbal remedies had more beneficial results than animal systems and fewer side effects, around 80% of residents recommended utilizing them. According to our post, herbal hair serum has several essential components that are required to keep things functioning properly and for self-defence. It provides outstanding defence against intense heat as well. The significant hair loss problems that the younger generations are currently facing are the result of numerous reasons. In general, hair loss is not temporary. The hair follicle, widely regarded as the most important organ in the mammalian system, serves a number of purposes, including self-defence, protection from high temperatures, and gender differentiation and beauty. A number of lifestyle changes, such as worry, fatigue, and overindulgence in junk food, hair colouring, and styling products, are contributing to the significant hair loss problems that younger generations are experience. The result is alopecia. Many people who are experiencing hair loss are looking for various treatments since hair roots need to be activated in order to promote the growth of new hair and prevent hair loss. Citrus sinensis's anti-dandruff and hair-care qualities are used.

KEYWORDS: Herbal hair serum, Hair disease, Evaluation of herbal hair serum, Trigonella foenum-graecum, Zingiber officinale, Flaxseeds, Citrus Sinensis, Castor oil formulation.

INTRODUCTION

Healthy" head of hair is defined as having nice luster, being silky, long, and bouncy, and having volume, and without any signs of hair loss.^[1]

Dermal papilla cells, which make up the hair, extend all the way to the dermis' Top.^[2]

Hair enhances a person's personality, defends the body from the elements, and gives the body a refined appearance. Hair issues like split ends, dandruff, dry hair, gray hair, and hair loss can be brought on by environmental causes, stress, hormone imbalances, and changing lifestyles. Researchers are creating herbal Nano-formulations to treat hair issues. Among the hair products designed to address hair issues are oils, serums, conditioners, hair Colour, shampoos, gels, and wax. Worldwide, millions of herbal remedies and phytoconstituents are utilized to cure hair Issues.^[3]

Many counties like Europe, North America, Asia-Pacific, and South America demand natural hair care products, By 2022, the hair market is expected to generate \$2875.9 million in revenue, based on the compound annual growth rate (CAGR). The hair market is expected to grow by \$4.9 billion between 2020 and 2024. Baldness and the COVID-19 infection are related. According to the literature, telogen effluvium (9.8% female, 9.3% male) and alopecia areata (7.0%, 40% male) were the most common types of hair loss, followed by androgenic alopecia (30.7% female, 86.4% male). Androgenetic alopecia may occur before COVID-19 symptoms appear. Thus, 95% of people with previous conditions are more likely to develop alopecia aerate, and COVID-19 is frequently to blame (93.6%) for the onset of new telogen effluvium.^[4,5]

People have used natural resources and extracts for beauty and health care reasons since prehistoric times. As a result, today's consumers want natural chemicals and components. The use of natural ingredients instead of synthetic ones, which may have detrimental impacts on human health and the environment, is particularly prevalent in cosmetic items. Thus, in an effort to fulfill these specifications, in addition to the pressing need to decrease the usage of microplastics, marketing Trends are shifting in favor of natural ingredient-based cosmetics, which are typically linked to a healthy way of living in the areas of food and cosmetics.^[6,7] People wish to maintain their youth and beauty. Cosmetics refers to how the cosmetics industry has merged with the pharmaceutical sector and cosmetics manufacturers manufacture pharmaceuticals and cosmetics medications. Cosmeceuticals are products for skincare that mix medications with cosmetics. One type of cosmetic product that has a very high concentration of active ingredients in its formula is a serum, which gives the deeper layers of the skin intense nutrition and a skin-friendly, non-greasy.^[8]

BACKGROUND OF HAIR SERUM

Hair serum originated from the use of plant extracts and natural oils by ancient cultures to nourish and improve hair. However, the contemporary idea of hair serum as a distinct hair care product emerged in the late 20th century as a result of advances in cosmetic science and customer desire for more specialized hair care products.^[9]

DEVELOPMENT OF THE HAIR SERUM

In the middle of the 20th century, the beauty industry witnessed enormous advancements in cosmetic science, leading to the development of shampoos, conditioners, and style products tailored to certain hair types and problems.

However, a many of these products contained harsh chemicals that, by eliminating the hair's natural oils, might cause damage over time.^[10]

TYPES OF HAIR SERUM

Herbal hair serums come in a wide variety, each of which is a blood supply to the scalp and is made to address certain hair problems and preferences. Typical types of herbal hair serums include of the following.

1) Moisturizing serum

The purpose of these serums is to moisturize brittle, dry hair. The nutrients included in herbal ingredients, such as coconut oil, shea butter, argan oil, and aloe vera, help to hydrate and nourish the hair strands, making them feel smooth, silky, and easier to manage.^[11]

2) Growth-promoting serum

The two primary objectives of these serums' compositions are to promote hair growth and density. Biotin is one ingredient that encourages hair development. They may contain ginseng and fenugreek extracts, which are believed to stimulate follicles.^[12]

3) Strengthening serum

Strengthening serums are designed to fortify weak, damaged hair in order to stop breakage and promote healthier-looking hair. They frequently contain vitamins, minerals, and antioxidant-rich herbs like horsetail extract, nettle leaf extract, and rosemary oil that support the strength and resilience of hair.^[13]

4) Anti-dandruff serum

Anti-dandruff serums are made to treat issues with the scalp, such as dandruff, flakiness, and itching. They usually include herbal substances with antibacterial and anti-inflammatory properties, such as peppermint oil, neem oil, and tea tree oil. These components decrease the microorganisms that cause dandruff and soothe the scalp.^[14]

5) Colour-protecting serum

Colour-protecting serums are designed to preserve the vibrancy and resilience of colour-treated hair. They typically contain herbal ingredients that help protect hair colour from UV rays and environmental damage, such as sunflower seed oil, grapeseed oil, and green tea extract.^[15]

6) Soothing serum

Soothing serums are meant to calm and soothe the scalp, which reduces irritation and inflammation. They may contain herbal substances like calendula extract, lavender oil, and chamomile extract that have relaxing and anti-inflammatory properties to assist ease and lessen scalp irritation.^[16]

7) Shine serum

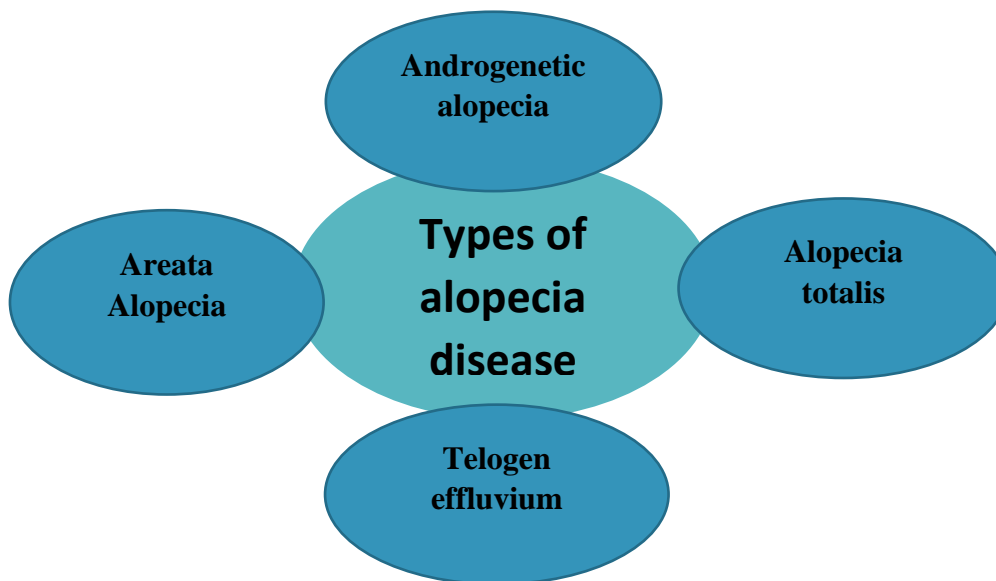
Hine serums are intended to provide brightness and shine to lifeless hair. Usually, they contain light-reflecting particles or oils like coconut or jojoba oil to add shine without making the hair feel heavy.^[17]

8) Heat protectant serum

These serums serve as a barrier to prevent blow dryers, flat irons, and curling irons—three safe hair styling tools—from producing heat. Often, they utilize silicones or other heat-protective materials to lessen the damage brought on by heat style.^[19]

HAIR DISEASE

2000 years, alopecia has been acknowledged as a dermatological for over condition. It is another name for baldness and refers to the lack or thinning of hair, particularly in the head.^[20]



It is thought to impact 0.2% to 2% of the global population and is widespread around the world. Alopecia has also been noted as a significant side impact of immune suppressants, anticancer medications, and several further medication therapies. Focus, emotional pressure, and mental shock infection, refractive errors, endocrine disruption, neuro Additionally, genetic predisposition and circulation instability are the recognized alopecia causes.^[21]

In addition to creating items primarily for skin care, a number of cosmetic firms are concentrating on hair care as well. They are producing eco-friendly packaging and safety products while also taking action. In fact, for instance, in contemporary writing, the ethnicity seems to be a crucial element that should be considered in the clinical monitoring, treatment, and therapy for conditions affecting the skin and hair.^[22,23]

The demand for cosmetics has increased as a result of rising living standards worldwide. Cosmetics have become more significant as many people wish to maintain their youth and beauty. Cosmetics refers to how the cosmetics industry has merged with the pharmaceutical sector and cosmetics manufacturers manufacture pharmaceuticals and cosmetics. medications. Cosmeceuticals are products for skincare that mix medications with cosmetics.

One type of cosmetic product that has a very high concentration of active ingredients in its formula is a serum, which gives the deeper layers of the skin intense nutrition and a skin-friendly, non-greasy finish.^[24]

ADVANTAGES

Hair serum's strong hydrating qualities give hair a natural luster while shielding it from environmental or heat-related harm. We all know that hair can turn becoming. It is less brittle and healthier after being locked and moisturized. Serums make it feel smoother and add moisture and appear healthier.^[25]

The anti-frizz qualities of hair serum also contribute to its increased smoothness.^[26]

The using hair serum consistently can damage hair making it dry, unhealthy and flat.

DISADVANTAGES

Excessive application and frequent use can harm hair; after a few days of regular use, this build-up and weighting causes hair to appear extremely flat and lifeless.^[25]

AIM AND OBJECTIVES

1. Hair can be successfully softened, smoothed, and made silky using herbal hair serum.
2. Serums are a great way to protect hair from pollutants, dust, heat, and sun damage.
3. They make hair shiny, keep it from breaking, are ideal for dry hair, nourish it, and make it easier to handle.
4. To offer a substitute for artificial hair serum.
5. The process of making herbal hair serum.
6. To enhance the texture and condition of hair.
7. To conduct an assessment of herbal hair serum.^[27]

MATERIAL AND METHODS

1) Ginger (*Zingiber officinale*)

Ginger, the root of the plant *Zingiber officinale* (L.) Roscoe., is one of the most widely used spices worldwide. Among the many active components are bisabolene, zingerone, shogaol, and gingerol.^[28] Utilised as folk remedy for variety of illnesses including rheumatoid arthritis, neurodegenerative diseases, inflammation and asthma.^[29] In addition to strong antioxidant activity and a reduction in numerous pro-inflammatory biomarkers, many of its active ingredients include anti-diabetic, anti-cancer, and anti-inflammatory properties.^[30,31] Ginger may be useful in AA treatment. In the meantime, these ingredients are convenient and harmless, and they can help AA patients comply better with therapy.^[32]

2) Orange (*Citrus sinensis*)

Citrus peel is a rich source of vitamin C, carotene, and protein. Orange peel can improve the toughness of hair, refine damaged hair, and increase blood circulation in the skin. It can also stimulate metabolism, nourish the scalp, and promote hair growth in a healthy environment. *Citrus sinensis* contains a lot of secondary metabolites, which are thought to be responsible for the plant's medicinal qualities. Plants' antimicrobial potency is thought to be attributed to tannins, saponins, phenolic compounds, essential oils, and flavonoids.^[33,34]

3) Flaxseeds (*Linum usitatissimum*)

Flaxseed, sometimes referred to as linseed, is rapidly emerging as a crucial component of functional foods because of its high levels of lignans, fiber, and linoleic acid (ALA, an omega-3 fatty acid).^[34] One possible health benefit of flaxseed oil, fibers, and lignans is a decrease in cardiovascular disease, atherosclerosis, diabetes, cancer, arthritis, osteoporosis, autoimmune, and neurological disorders. Furthermore, flaxseed is a great source of fatty acids and antioxidants, which aid in clearing the scalp of pollutants and dead skin cells. Using flax seed gel as a moisturizer on the scalp and hair helps strengthen existing hair and encourage new growth.^[35] The skin is hydrated and kept supple with flaxseed extract. All skin types—normal, dry, and oily—can use it. Flax seed oil provides limp, lifeless hair volume, calms sensitive scalps, and hydrates damaged hair.^[36]

4) Black seed (*Nigella sativa*)

Nigella sativa L. is a member of the Ranunculaceae family, which includes buttercups. According to the plant parts used, it is categorized as a mild spice. The common term for *Nigella sativa* is "black seed." Since ancient times, N.

sativa seeds and oil have been used extensively to cure a variety of illnesses worldwide. They are also crucial to Indian traditional medical systems like Unani and Ayurveda.^[37] Among its many bioactive components are thymol, carvacrol, nigellimine, nigellisin, alphaahederin, thymoquinone, thymohydroquinone, and dithymoquinone. Pharmacological and cosmetic qualities such as antioxidant, antibacterial, anti-inflammatory, astringent, stimulant, diuretic, and others are provided by *Nigella sativa*.^[38]

5) Fenugreek (*Trigonella foenum-graceum*)

Fenugreek seed extract is a nutritional supplement that also contains micronutrients like B-vitamins, antioxidants, and trace elements found in hair. *Trigonella foenum-graceum* L. (fenugreek) is a leguminous herb. Fenugreek is indigenous to Southern Europe, Western Asia, and the Mediterranean. Saponins, including diosgenin, yamogenin, and gitogenin derivatives, trigonelline alkaloids, flavonoids, galactomannan vitamins, and fibre, among other active components, are found in fenugreek seeds.^[39] The seeds taste tangy and have a nice scent. Although the precise process is unknown, fenugreek is known to support the growth of healthy hair. It has been proposed that fenugreek increases blood flow to steroid saponins and hair follicles, which physiologically interact with the production of DHT (dihydrotestosterone). The impact of DHT on genetically predisposed hair follicles is one potential reason for hair loss in both male and female variants. DHT binding to the hair follicle results in the hair becoming smaller and eventually falling off.^[40,41]

6) Coconut oil (*Cocos nucifera*): Quite efficient at preventing protein loss, which can cause your hair to grow in various unsightly or unhealthy ways. In the Indian subcontinent, coconut oil is widely used for hair treatment. After taking a shower or bath, the majority of individuals in those nations apply coconut oil to their hair every day. It is a great conditioner and aids in the process of damaged hair growing back. Additionally, it offers the crucial proteins needed for nourishing and repairing harmed hair. According to studies, coconut oil offers hair stronger defence against fatigue-related hair damage. Coconut oil massages on a regular basis can help.^[42]

7) Almond oil (*Prunus dulcis*)

Applying almond oil deeply hydrates the scalp and fortifies the hair follicles, resulting in thick, lustrous, and beautiful hair. Almond oil might assist you in getting rid of dandruff. It has anti-bacterial characteristics that heal dry skin and exfoliate the scalp of dead skin cells. It is a vitamin B derivative that is recommended to persons who have issues like hair thinning. Almond oil includes biotin, so massaging your hair with it is a good way to give it a healthy dose of the vitamin to encourage hair development and stop hair thinning. According to studies, using almond oil topically can help prevent sun-induced skin damage and reduce the ageing process. Almond oil can assist with cellular protection by reducing DNA damage from UV rays and prevent the chemical and structural changes they can make.^[43]

8. Vitamin E (Tocopherol)

By repairing the protective layer, an oil high in vitamin E can aid in restoring shine. Oil generally aids in retaining moisture, reducing breakage, and shielding the hair from damage. Because vitamin E includes natural antioxidants that may promote hair growth, it may help maintain a healthy crown and hair. Antioxidants and vitamins can lessen the amount of free radicals and oxidative stress that cause the hair follicle cells in one's crown to deteriorate.^[44]

FORMULATION

Formulation 1

A unique count and distribution of all fresh sauces, including citrus sinensis peel, Zingiber officinale roots, Linum usitatissimum seeds, Nigella sativa seeds, and Trigonella foenum graceum seeds, were made in 50 millilitres of water. For fifteen minutes, the ingredients that make reference to more are boiled. After 15 minutes of boiling, let them cool before filtering. The filter was supplemented with vitamin E, coconut oil, and almond oil. The serum set was then kept in a nebulizer for storage.^[45]

Formulation 2

The usual procedure for making serum is followed when making medicinal plant serum for hair. The aqueous extracts of Nigella sativa seeds, Trigonella foenum graceum seeds, Linum usitatissimum seeds, and Zingiber officinale roots were carefully weighed and put into a glass for this mixture. When the peel of orange sinensis and the extract mentioned above were well combined. In a porcelain dish, the necessary quantity of coconut oil with the above extraction was taken and thoroughly mixed to create a paste. Three drops of essential oils, including vitamin E capsules, coconut oil, and almond oil, were added and combined. While continuously stirring, the porcelain mixture was added to the extract. Distilled water is added to the serum until it reaches 50 ml. Extract from rosemary is added as a means of preservation. After that, the prepared serum was kept in an amber dropper container.^[46]

Formulation 3

The glassware should be completely cleaned and dried in accordance with SOP. Calculate the exact amount of extracts from the seeds of Nigella sativa, Zingiber officinale, Linum usitatissimum, and Trigonella foenum graceum. Transfer it to a glass. Apply the required amount of vitamin E to the citrus sinensis peel. Now blend the coconut and almond oils with the previously described citrus sinensis peel and vitamin E mixture. After a few minutes of stirring, heat the prepared solution for a few minutes. Next, mix the preparation with a magnetic stirrer. 50 ml should be the ultimate volume after the serum has been transferred to a measuring cylinder. Transfer the completed blend into a container.^[47]

EVALUATION TEST OF HERBAL HAIR SERUM

1) Physical Characteristics

Visual testing is done on the set herbal hair serum's look, colour, and texture.

2) Homogeneity

A cover glass was bonded over a dry, clean object glass after the hair serum had been applied. The appearance was examined in the presence of specific coarse particles or homogeneity. Visual inspection was used to check the homogeneity of the herbal hair serum and look for any lumps, flocculates, or aggregates.

3) pH test

Buffer pH 4 and pH 7 data were used to calibrate the pH cadence. Additionally, after many twinkles, the electrode was soaked in the hair serum and allowed to stabilize the pH.

4) Skin care test

Applying serum to the skin's surface and checking for redness or irritation two hours later is how it is done.

5) Sensitivity test

It involves applying a serum to the skin's surface and then monitoring it for redness or irritation two hours later.

6) Viscosity

Viscosity was measured using spindle number 6 on a Brookfield viscometer (RVDV-II+PRO). The 50 ml of hair serum's viscosity was measured in the beaker at 50 rpm.

7) Spread ability

A parallel plate method, which is commonly used to evaluate and quantify the spread ability of liquid preparations, was utilized to measure spread ability. Two horizontal plates, each 20 x 20 cm and weighing 125 g, were used to compress one gram of hair serum. After one minute, the spread diameter was measured.

The following formula was used to quantify spread ability:

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

Where, S = Spread ability, M = Weight in the pan (attached to the higher slide), L = Length moved by the glass slide, and T = Time (sec) required to fully separate the slides.

8) Diffusion Study in Vitro

A 250 ml beaker was filled with 100 ml of a pH 7.4 buffer solution. Five millilitres of hair serum were placed inside the dialysis membrane and suspended within the buffer solution-filled beaker. Using a magnetic bead at 37°C, the contents of the beaker were rotated at 300 rpm. At certain intervals, 1 ml of the sample was taken out and replaced with the same volume of buffer solution. The drug's concentration was determined using spectrophotometry at 265 nm.

9) Stability

For three months, the herbal hair serum was stored at two different temperatures of 4 ± 2 °C and 30 ± 2 °C with 65 RH. The pH and density of the herbal hair serum were then measured three months later and compared to the initial values.

APPLICATION OF HAIR SERUM

- 1) They moisturize and nourish the hair
- 2) They help keep the hair strong, silky, and shiny; and
- 3) They protect the hair from damage caused by free radicals.
- 4) They prevent infections of the scalp and hair loss.
- 5) Therapeutic serums have antibacterial properties.
- 6) They reduce hair loss and stimulate hair growth.^[48]

CONCLUSION

This hair serum encourages natural hair growth and preserves sebaceous glands. Significant changes have occurred in the personal hygiene and health care systems as well as in the use of herbal cosmetics. In addition to offering the sebaceous glands the essential nutrition they need to survive and produce healthy hair, all of the other ingredients have several benefits and all metrics show that they are within acceptable limits, functioning as intended. According to our research, herbal hair serum has several essential components that are required to keep it functioning properly. Thus, there is a lot of agitation in the herbal cosmeceutical or personal health care sector, which is focusing on and paying

particular attention to the production of cosmetics made from herbs. As it stands, it will keep expanding swiftly and have a significant influence in the upcoming years.

FUTURE SCOPE

The formulation and evaluation of herbal hair serums involve developing products that can promote healthy hair growth, nourishment, and overall hair health. The future goals for this field can include:

Innovation in Ingredients

1. Incorporating Advanced Natural Actives: Research into newer herbal extracts, essential oils, and botanicals that offer targeted benefits for hair health, such as enhanced growth, reduced hair fall, and improved scalp health.
2. Standardization of Herbal Ingredients: Ensuring consistent quality, potency, and purity of herbal ingredients used in hair serum formulations.

Personalized Hair Care

1. Customized Formulations: Using AI and data analysis to create hair serums tailored to individual hair types, concerns (e.g., dryness, thinning), and conditions (e.g., scalp inflammation).
2. DNA-Based Products: Exploring the potential of genetics in formulating hair products that align with individual genetic predispositions for hair growth and scalp health.

Sustainability and Eco-friendly Packaging

1. Sustainable Sourcing: Using organic, ethically sourced herbs and botanicals, minimizing the environmental footprint of production
2. Eco-Friendly Packaging: Transitioning to biodegradable or recyclable packaging to reduce waste and contribute to a circular economy.

Clinical and Dermatological Evaluation

1. Clinical Trials: Conducting more extensive clinical studies to back the efficacy and safety of herbal ingredients in hair serums
2. Dermatological Testing: Ensuring products are hypoallergenic, dermatologically tested, and safe for all skin types, including sensitive scalps.

Advanced Delivery Systems: Nanotechnology

1. Utilizing nanotechnology to improve the penetration and efficacy of herbal ingredients deep into the scalp and hair follicles.
2. Microencapsulation: Encapsulating active ingredients for prolonged release, ensuring sustained benefits over time.

Holistic Hair Health

1. Synergistic Formulations: Combining herbal hair serums with oral supplements or other topical treatments for a holistic approach to hair care.
2. Integrating with Scalp Care: Focusing on not just hair nourishment but also addressing scalp health, such as managing dandruff, oil production, and overall scalp microbiome balance.

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