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A REVIEW ON HERBAL HAIR OIL AND ITS BENEFITS IN HAIR CARE

Aniket V. Walunj*[1], Vishal P. Ware[2], Sakshi D Warik[3] Assistant Prof. Vrushali Suryavanshi[4], Dr. Tushar Shelke[6]

[1,2,3]Research Scholar,Genba Sopanrao Moze College of Pharmacy,Wagholi,Pune,India

[4]Assistant Professor, Genba Sopanrao Moze College of Pharmacy,Wagholi,Pune,India.

[5]Principle, Genba Sopanrao Moze College of Pharmacy, Wagholi, Pune, India.

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***Corresponding Author: Aniket V. Walunj**

Research Scholar,Genba Sopanrao Moze College of Pharmacy,Wagholi,Pune,India

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ABSTRACT

A natural hair care product made with medicinal plants and appropriate oil bases is called herbal hair oil. The traditional use of herbs to keep the scalp and hair healthy has attracted a lot of attention. Hair loss, dandruff, dry scalp, early graying, and decreased hair growth are common hair issues. Many studies have been conducted on the potential benefits of herbal ingredients for hair care, including Amla (Phyllanthus emblica), Bhringraj (Eclipta prostrata), Hibiscus (Hibiscus rosa-sinensis), Brahmi (Bacopa monnieri), Fenugreek (Trigonella foenumgraecum), and Curry leaves (Murraya koenigii).

Flavonoids, tannins, alkaloids, vitamins, and antioxidants are among the phytoconstituents found in these herbs that may help protect and nourish the scalp. The organoleptic properties, pH, viscosity, acid value, saponification value, specific gravity, stability, antioxidant activity, and antimicrobial activity of herbal hair oils can be assessed using various extraction techniques. Prior research has shown encouraging outcomes in terms of maintaining the health of hair and promoting hair growth. However, more carefully planned research is needed to confirm their safety and effectiveness in people. The herbal components, formulation techniques, assessment criteria, and possible advantages of herbal hair oil for hair care are highlighted in this review.

KEY POINTS: Introduction to Herbal Hair Oil,Common Hair Problems,Herbal Ingredients Used in Hair Oil, Phytochemical Constituents,Preparation Methods,Mechanism of Action, Evaluation Parameters, Antioxidant and Antimicrobial Activity,Stability and Safety Studies ,Advantages of Herbal Hair Oil,Limitations and Future Scope.

1. INTRODUCTION

Hair has a significant impact on one's appearance and confidence. Hair loss, dryness, dandruff, early graying, and decreased hair growth are common issues with hair. The general look and health of hair may be impacted by these issues. Hair oils are frequently used in hair care to condition hair, keep the scalp healthy, and lessen dryness. Traditional cosmetic preparations known as herbal hair oils are created by mixing extracts from medicinal plants with an appropriate oil base [1,2].

Traditional medical systems, such as Ayurveda, have utilized medicinal plants for a variety of medical and cosmetic uses. Amla (Phyllanthus emblica), Bhringraj (Eclipta alba), Hibiscus (Hibiscus rosa-sinensis), Brahmi (Bacopa monnieri), and Fenugreek (Trigonella foenumgraecum) are common ingredients in herbal hair oil formulations [1-3]

A suitable oil base and appropriate herbal ingredients must be chosen in order to prepare herbal hair oil. The literature describes a variety of preparation methods, such as the cloth pouch method, paste preparation, and direct boiling. Organoleptic properties, pH, viscosity, specific gravity, acid value, saponification value, stability, antioxidant activity, and antimicrobial activity can all be assessed for the prepared formulations [1,2].

Previous research has examined polyherbal hair oils that contain various combinations of medicinal plants, and the results have shown promise. However, a formulation's efficacy is determined by its quality, safety, preparation technique, and ingredients. Clinical efficacy in humans is not always established by conventional use and initial experimental results. Thus, more carefully planned research is needed to verify the effectiveness and safety of herbal hair oil formulations [1,3].

The medicinal plants utilized in herbal hair oil, their possible advantages, preparation techniques, assessment criteria, and the body of research on their use in hair care are the main topics of this review.

2. COMMON HAIR PROBLEMS

Hair-related issues are prevalent and can impact the condition and appearance of hair. Among the principal issues are:

A. Hair Fall: Genetics, nutritional deficiencies, stress, hormonal changes, or specific medical conditions can all contribute to excessive hair loss.

B. Dandruff: Dandruff is a common condition of the scalp that is characterized by flaking and occasionally itching.

C. Dryness and Hair Breakage: Roughness, split ends, and breakage may result from moisture loss and damage to the hair shaft.

D. Premature Graying: A variety of biological, genetic, and other factors can cause hair to turn gray before it should.

E. Decreased Hair Growth: Genetics, nutritional status, and conditions of the scalp or hair can all have an impact on hair growth.

Herbal hair oils have long been used to condition hair and take care of the scalp. However, their efficacy in treating particular hair issues varies depending on the formulation and necessitates scientific assessment.

Table 1: Common Hair Problems and Their Causes.

Sr.no.	Hair Problems	Causes
1	Hair Fall	Stress, nutritional deficiency, hormonal changes and illness.
2	Dandruff	Dry scalp, excess oil production and fungal infection.
3	Split Ends	Excessive heat styling, chemical treatments and lack of hair care.
4	Dry Hair	Lack of moisture, excessive shampooing and environmental factors.
5	Oily Hair	Excessive sebum production by sebaceous glands.

3. Common hair problem

Dandruff: This common scalp ailment is characterized by flaking and occasionally itching. Malassezia yeast-related factors and conditions of the scalp are linked to its development. The potential scalp-care benefits of herbal ingredients are being studied, but appropriate research is needed to determine their efficacy [5]

Dryness and hair damage: Frequent heat styling, exposure to the environment, and grooming habits can all contribute to dryness and breakage of hair. When grooming, the right carrier oils may help condition the hair and lessen friction [5].

Premature graying: Variations in the amount of melanin produced by hair follicles cause premature graying. Reliable clinical evidence that herbal hair oils can stop premature graying is still scarce, despite the fact that many herbs are traditionally used to preserve hair color [4].



Figure 1. Common Hair Problems

4. Herbal Ingredients Used in Hair Oil

Because medicinal plants contain a variety of phytochemicals that may promote scalp conditioning and hair health, they are frequently used in traditional hair care preparations. Herbs are chosen based on their availability, compatibility with the oil base, reported biological activities, and traditional use. Various combinations of medicinal plants in polyherbal hair oil formulations have been studied [6,7].

Table 2: Herbal Ingredients and Their Potential Benefits.

Sr.no.	Herbal Ingredients	Potential Benefits
1	Aloe vera	Provides moisture, soothes the scalp and reduces dryness.
2	Amla	Helps strengthen hair and supports healthy hair growth.
3	Bhringraj	Traditionally used to promote hair growth and reduce hair fall.
4	Neem	Helps control dandruff and has antimicrobial properties.
5	Hibiscus	Conditions hair, improves softness and supports hair growth.
6	Fenugreek (Methi)	Helps condition hair and reduce dryness.
7	Shikakai	Acts as a natural cleanser and helps maintain scalp hygiene.
8	Onion	Contains sulfur compounds and may support hair growth.
9	Rosemary	May improve hair growth and scalp circulation.
10	Coconut	Moisturizes hair and helps reduce protein loss.
11	Brahmi	Traditionally used to nourish the scalp and strengthen hair.
12	Green Tea	Contains antioxidants that help protect hair follicles from oxidative stress.



Figure 2. Medicinal Herbs Used in Herbal Hair Oil

Amla (*Phyllanthus emblica*): Traditionally, amla has been used in hair care products. Polyphenolic compounds and other phytochemicals with documented antioxidant qualities are present in it. Although more research is needed to determine the clinical efficacy of oils containing amla, its potential uses in hair care have been examined [7].

Eclipta alba, or bhringraj, is a common ingredient in traditional Ayurvedic hair care products. It is used in a number of herbal oil preparations and has been studied for possible hairgrowth-promoting qualities [7].

The flowers and leaves of hibiscus (Hibiscus *rosa-sinensis*) are utilized in herbal hair care products. It is a component of polyherbal formulas meant to support and condition hair health [6,7].

The medicinal plant known as Brahmi (*Bacopa monnieri*) has long been utilized in hair oils. It has been added to herbal formulations that have been studied for their possible effects on hair quality and growth [7].

The seeds of fenugreek *(Trigonella foenum-graecum*) are utilized in conventional hair care products. Fenugreek was added to a herbal hair oil formulation by Banerjee et al. along with brahmi, hibiscus, and amla [7].

Curry leaves (*Murraya koenigii*): Curry leaves have been studied as a component in herbal oil formulations and are used in traditional hair-care preparations. Stronger clinical evidence is needed to support their specific effects on hair growth and graying prevention, though [8].

5. Phytochemical Components of Herbal Components

Numerous phytochemicals found in medicinal plants may be involved in their biological

activities. Flavonoids, phenolic compounds, tannins, saponins, alkaloids, and other components derived from plants are common phytochemical groups. Depending on the plant species, plant part, extraction technique, and processing conditions, these compounds may differ in type and quantity [6,7].

The antioxidant qualities of flavonoids and phenolic compounds are the subject of extensive research. Under the right circumstances, antioxidants may aid in neutralizing free radicals.

During the initial phytochemical screening of hair oil formulations, their existence in herbal ingredients can be examined [6,7].

Tannins: Found in a variety of therapeutic plants, tannins are polyphenolic compounds derived from plants. They could influence the biological and chemical properties of herbal extracts. Appropriate phytochemical tests can be used to evaluate their presence [6].

Saponins: Fenugreek and other plants contain saponins, which are naturally occurring substances. They can be identified by initial phytochemical screening and are examined for various biological characteristics [7].

Additional bioactive components: Depending on the species, medicinal plants may also contain vitamins, glycosides, alkaloids, and other substances [6-7].

Table 3: Phytochemicals Constituents of Selected Herbs

Sr.no.	Selected Herbs	Major Phytochemical Constituents
1.	Aloe vera	Aloin, Aloe-emodin, Acemannan, Anthraquinones, Saponins, Flavonoids
2.	Calendula officinalis	Flavonoids, Carotenoids, Triterpenoids, Saponins, Phenolic compounds
3.	Avena sativa (Oat)	Avenanthramides, Beta-glucan, Saponins, Flavonoids, Phenolic acids
4.	Neem (Azadirachta indica)	Nimbin, Nimbolide, Azadirachtin, Quercetin, Tannins
5.	Tulsi (Ocimum sanctum)	Eugenol, Ursolic acid, Rosmarinic acid, Flavonoids
6.	Liquorice (Glycyrrhiza glabra)	Glycyrrhizin, Glabridin, Liquiritin, Flavonoids
7.	Turmeric (Curcuma longa)	Curcumin, Demethoxycurcumin, Bisdemethoxycurcumin, Turmerones

6. Preparation method of Herbal Hair Oil

A suitable carrier oil can be mixed with medicinal plant materials or their extracts to create herbal hair oil. The type of herbs, the plant parts utilized, the intended constituent extraction, and the stability of the finished formulation all influence the preparation method choice. Three techniques for making herbal hair oil were reported by Banerjee et al. [9]:

direct boiling, paste method, and cloth method. Additionally, Kuber et al. documented the

production and assessment of polyherbal hair oil using specific medicinal plants [10].

A. The Method of Direct Boiling

This method involves combining specific herbal ingredients with an appropriate oil base and heating them under carefully monitored conditions. Heating makes it easier to extract some components that are soluble in oil. After cooling, the mixture is filtered to get rid of any solid plant material. Heat-sensitive components may be deteriorated by excessive heating, so it should be avoided [9].

B. Method of Paste

Using the paste method, the chosen herbs are made into a paste and added to the process of making oil. To make it easier for the herbal components to be transferred into the oil, the mixture is processed under the right circumstances. After filtering, a relatively clear formulation is produced [9].

C. Method of Cloth

To help separate the plant material from the oil during preparation, this method involves placing herbal materials in a clean cloth or other appropriate porous material. The exact process is determined by the formulation protocol used in the research. A consistent product requires careful handling and filtration [9].



Figure 3. Flowchart of Herbal Hair Oil Preparation

D. Herbal Hair Oil's Possible Mechanism of Action

Depending on the herbs used, their active ingredients, and the carrier oil, herbal hair oil may promote healthy hair and scalp in a number of ways. Various herbal components may help protect the hair shaft, condition the scalp, and increase antioxidant activity. Nevertheless, these effects differ among formulations, and more research is needed to determine their clinical efficacy [11,12].

A. Conditioning the scalp

Hair care products use carrier oils, like coconut oil, to condition and lubricate the hair. The potential of coconut oil to lessen hair protein loss under specific circumstances has been studied. This characteristic might aid in shielding hair fibers from harm brought on by washing and grooming [13].

B. Antioxidant Function

Phenolic compounds and flavonoids found in some medicinal plants may have antioxidant properties. Laboratory tests like the DPPH radical-scavenging method can be used to study these substances. This method was used by Kuber et al. to assess the antioxidant activity of their polyherbal hair oil [11].

Antioxidant activity in the lab does not, however, prove that a formulation encourages human hair growth.

C. Possible Promotion of Hair Growth

Bhringraj is one of the herbal ingredients that have historically been used in hair-growth preparations and have been the subject of initial research. Herbal hair oil containing amla, hibiscus, brahmi, and fenugreek was assessed by Banerjee et al. for its effects on hair growth [12]. To ascertain the efficacy of individual herbs and combination formulations, more carefully monitored clinical research is required.

D. Protection of the Scalp and Hair

Because herbal oils improve lubrication and reduce friction, they may help keep hair manageable and soft. In lab settings, some formulations have also been assessed for antimicrobial activity [11]. These results should not be taken as evidence that all herbal oils treat scalp infections or prevent dandruff.

E. Herbal Hair Oil Assessment Parameters

Determining the physical attributes, quality, stability, and appropriateness for the intended use of herbal hair oil requires evaluation. Organoleptic, physicochemical, phytochemical, and biological tests have been used in numerous studies to assess herbal hair oil formulations [14,15].

A. Organoleptic Evaluation: The formulation's color, consistency, appearance, and odor are all assessed. These features aid in determining the product's overall acceptability and consistency [14].

B. Physicochemical Evaluation: To describe the formulation, parameters including specific gravity, pH, viscosity, acid value, saponification value, and refractive index are measured. These tests aid in determining the oil's chemical and physical characteristics [14].

C. Phytochemical Screening: To find specific groups of phytoconstituents in the herbal formulation, qualitative chemical tests are carried out. The presence of specific constituents can also be examined using chromatographic techniques [14,15].

D. Stability Studies: Stability studies evaluate how the formulation changes over time. At predetermined intervals, parameters like color, odor, appearance, and other pertinent physicochemical properties may be observed [14].

E. Biological Evaluation: Laboratory tests may include antimicrobial activity using a suitable technique and antioxidant activity using the DPPH assay, depending on the formulation and study goals. A protocol that has been approved by ethics may also be used for skin irritation testing [14]. These tests do not independently determine clinical efficacy; rather, they offer preliminary information.

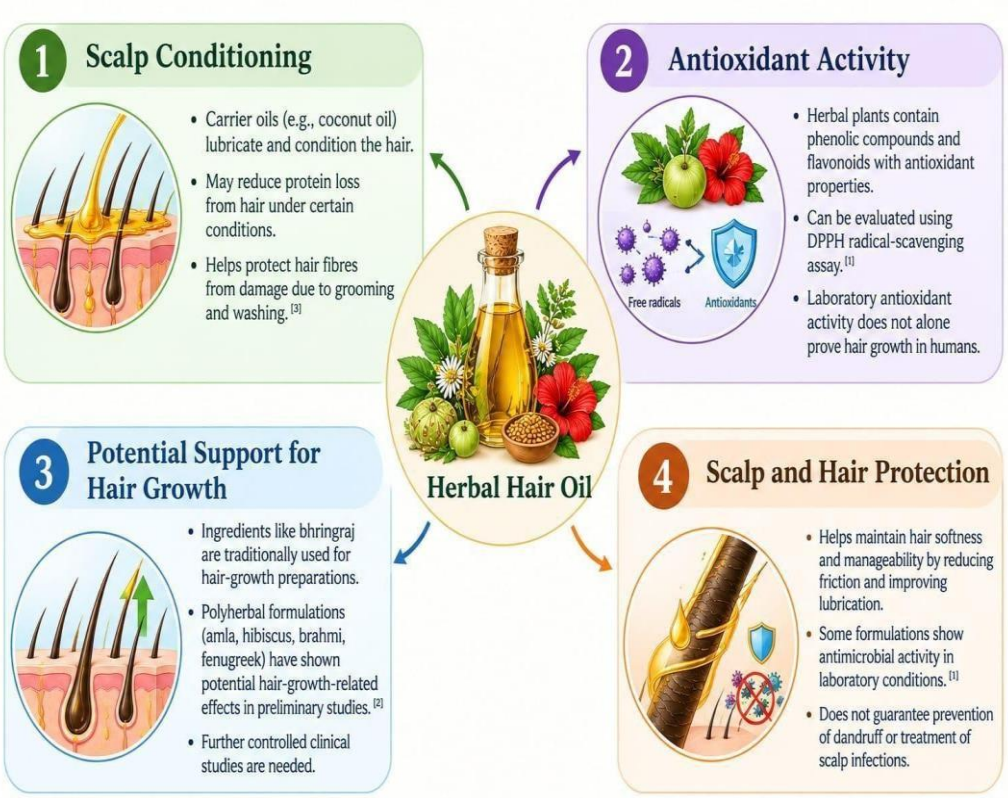


Figure 4. Potential Mechanisms of Action of Herbal Hair Oil

F. Herbal Hair Oil's Antioxidant and Antimicrobial Properties

Plant-based substances with antimicrobial or antioxidant properties may be included in herbal hair oil formulations. To comprehend the formulation's possible biological features, these properties are examined. However, the herbs used, their concentrations, the extraction technique, and the testing protocol all affect the outcomes [16,17].

A. Activity of antioxidants

Phytochemicals like flavonoids and phenolic compounds, which may have antioxidant properties, are found in a number of medicinal plants. Laboratory tests, such as the DPPH (2,2-diphenyl-1-picrylhydrazyl) radical-scavenging method, can be used to assess antioxidant potential. Using the DPPH assay, Kuber et al. assessed polyherbal hair oil formulations and contrasted their activity with that of a conventional antioxidant [16]. These findings show antioxidant potential in the lab but do not directly support human hair growth promotion.

B. Antimicrobial Properties

Under laboratory conditions, antimicrobial testing is used to determine whether a formulation prevents the growth of specific microorganisms. Compounds found in herbal ingredients may be responsible for the observed activity. Kuber et al.'s study of polyherbal hair oil included an antimicrobial assessment [16]. Antimicrobial activity should not be taken as evidence that the oil can treat dandruff or scalp infections because the results are specific to the formulation and test organisms investigated.

C. Biological Evaluation's Significance

Tests for antimicrobials and antioxidants can offer helpful initial information regarding herbal hair oil formulations. However, the findings should be interpreted in conjunction with evaluations of stability, safety, and physicochemical characteristics. To determine whether these laboratory results translate into significant advantages for human hair and scalp health, more controlled research is required [16,17].

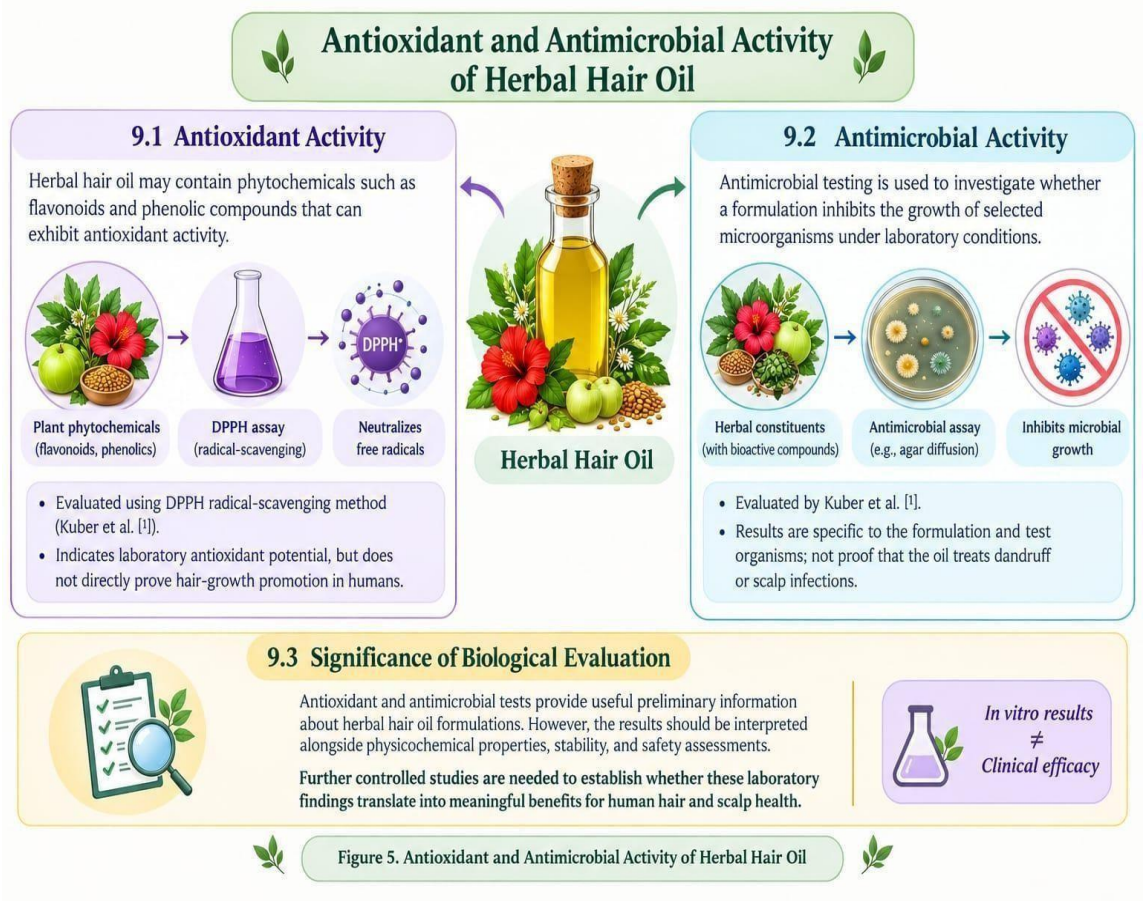


Figure 5. Antioxidant and Antimicrobial Activity of Herbal Hair Oil

G. Safety and Stability Research

For evaluating the quality, shelf life, and appropriateness of herbal hair oil for topical application, stability and safety studies are crucial. Throughout storage, the formulation should retain its color, consistency, odor, and physical appearance. Variations in these characteristics could be a sign of formulation deterioration or instability [18,19].

A. Studies of Stability

To find out if the herbal hair oil maintains its quality under various storage circumstances, stability studies are carried out. Over time, the formulation's color, odor, appearance, viscosity, and other pertinent physicochemical parameters can be assessed [18].

B. Assessment of Safety

Skin irritation and sensitivity testing are part of the safety evaluation process, which determines whether the formulation is suitable for external use. The components,concentrations, preparation technique, and quality of herbal hair oil all affect its safety. Not everyone should automatically believe that natural ingredients are safe. Therefore, before recommending frequent use, appropriate safety testing is required [18,19].

C. Stability and Safety Are Important

Testing for stability and safety contributes to determining the consistency and quality of herbal hair oil. To verify long-term safety and efficacy in humans, more controlled studies might be necessary.

H. Herbal Hair Oil's Benefits and Drawbacks

Because they contain ingredients derived from plants that may help condition the hair and scalp, herbal hair oils are used extensively in hair care. However, the herbs used, their concentration, the preparation technique, and the quality of the finished formulation all affect how effective they are [20,21].

A. Benefit

Natural ingredients: Made with herbal extracts and therapeutic plants.

Hair conditioning: Oil bases can lessen damage to the hair shaft and lubricate hair [22]. Moisturizing the scalp helps make hair easier to handle and less dry.

Several herbal components: Various herbs may offer complementary qualities.

Potential antioxidant activity: In lab experiments, some herbal components may exhibit antioxidant effects [20].

Simple application: Direct application to the scalp and hair is possible.

B. Constraints

Limited clinical evidence: Results from laboratories do not always indicate efficacy in people.

Potential allergic reactions: Sensitivity or irritation may result from specific herbal ingredients.

Formulation variability: The final product may be impacted by variations in the quality and concentration of the ingredients.

Stability issues: Poor storage can change the oil's color, smell, or quality.

Lack of standardization: The composition and production processes of herbal formulations may vary.

Research is needed: To determine efficacy and long-term safety, more controlled clinical trials are needed [20,21].

I. Herbal Hair Oil's Prospects

The field of herbal hair care and cosmetics has a lot of room to grow with the use of herbal hair oil. Future studies can concentrate on enhancing the quality of formulations, standardizing herbal ingredients, and conducting scientific analyzes to assess the efficacy and safety of these products [23,24].

Enhanced stability: Increasing shelf life with appropriate packaging and formulation methods.

Scientific assessment: Performing laboratory research on antioxidants, antimicrobials, and other pertinent topics.

Safety assessment: Assessing sensitivity, skin irritation, and potential side effects.

Clinical studies: Assessing hair conditioning and possible benefits for hair growth through controlled human studies.

Innovative delivery methods: Investigating effective delivery strategies to enhance the distribution of herbal components on the scalp and hair.

Sustainable production: Using ecologically friendly production techniques and medicinal plants that are sourced ethically.

The efficacy, safety, and quality of herbal hair oil formulations may be established with additional study and clinical validation.

J. CONCLUSION

Herbal hair oil is a natural hair care product made from medicinal plants like fenugreek, amla, bhringraj, hibiscus, and brahmi. Numerous phytochemicals found in these herbal compounds may help condition hair, nourish the scalp, and offer antibacterial and antioxidant qualities. A high-quality formulation requires careful selection of herbal constituents, adequate oil bases, and optimal production techniques. Assessing stability, safety, and physicochemical characteristics aids in guaranteeing product quality. However, more investigation and clinical trials are needed to determine its long-term efficacy and safety.

The formulation of herbal hair oil involves selecting suitable herbal ingredients, choosing an appropriate carrier oil, and using proper preparation methods such as direct boiling, paste preparation, and the cloth pouch method. Different evaluation parameters, including organoleptic properties, pH, viscosity, specific gravity, acid value, saponification value, and stability studies, are important for determining the quality and consistency of the final product.

Herbal hair oils may help in conditioning the hair, reducing dryness, improving hair manageability, and providing potential antioxidant and antimicrobial activities. They may also support scalp health and help protect hair from damage. However, their effectiveness depends on the quality, concentration, and combination of herbal ingredients used in the formulation.

Therefore, proper standardization, quality control, safety evaluation, and further clinical research are necessary to establish their effectiveness and long-term safety. Overall, herbal hair oil represents a promising natural alternative in cosmetic hair care and has considerable

scope for future development in the pharmaceutical and cosmetic industries.

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