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Unlocking nature's secrets: Developing and analyzing herbal hair oil formulation

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Abstract

The contemporary preference for natural substances over synthetic cosmetics is driven by the belief in their safety, effectiveness, and environmental friendliness, leading many individuals to opt for herbal alternatives. Herbs offer a myriad of benefits for the skin, including antibacterial, anti-aging, anti-inflammatory, and moisturizing properties, owing to their combination of bioactive and photochemical components. Unlike chemical drugs, herbal medicines can achieve desired outcomes without the risk of adverse side effects. This research study utilized a method involving the weighing, powdering, and boiling of raw herbs in coconut oil to formulate a herbal hair oil product. The prepared oil underwent assessment based on various factors such as viscosity, pH, saponification value, and organoleptic characteristics. The findings indicate that the herbal hair oil demonstrated promising efficacy in addressing hair concerns like dandruff and hair fall, attributed to its provision of saponins, antioxidants, vitamins, and antibacterial activity, which contribute to stronger hair roots and improved blood circulation.

Keywords: Plant herbs; Antidandruff; Antioxidant; Strong hair root; Improve Blood circulation

1. Introduction

Hair serves as a vital biological component of human skin, fulfilling various functions such as defense, temperature regulation, sensory perception, and aesthetic appeal. The hair follicle, a unique mini-organ in mammals, is a distinguishing feature contributing to these functions. Human hair undertakes numerous roles, including the production of pheromones, apocrine sweating, shielding against environmental stressors, and maintaining body temperature equilibrium. Additionally, hair plays significant roles in an individual's sexual and social interactions, further emphasizing its multifaceted importance in human physiology and behavior ^{1,2}. The hair follicle stands out as one of the rare immune-privileged sites within the human body, serving as a reservoir for melanocyte and epithelial stem cells. The intricate interplay between mesenchymal and epithelial cells plays a pivotal role in the development and maintenance of hair follicles. This interaction, along with the hair follicle cycle, is intricately regulated by a multitude of genes, highlighting the complex genetic mechanisms underlying hair follicle biology and function ^{3,4,5}.

The evolving environmental conditions and lifestyle shifts worldwide have led to the emergence of various factors impacting hair health. Among these factors are air pollutants, which can settle on the scalp and contribute to hair fall, as well as dietary imbalances stemming from modern lifestyles, potentially leading to hair thinning. A significant portion of the population grapples with hair-related issues such as alopecia and Seborrheic dermatitis, both of which can profoundly affect individuals' appearance and self-esteem. Alopecia, characterized by varying degrees of hair loss, can manifest as localized or diffuse, reversible or permanent, and may affect either the scalp or the entire body, presenting complex challenges for those affected ^{6,7}. Common types of hair loss encompass a range of conditions, including alopecia areata, traction alopecia, male- and female-pattern hair loss, telogen effluvium, and tinea capitis ^{8,9}.

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Diagnosis of hair loss conditions involves a comprehensive assessment, including a thorough medical history and physical examination. Dermatologists utilize advanced techniques such as dermatoscopy and trichoscopy to identify specific findings ¹⁰. Treatment approaches vary depending on the type of alopecia and the likelihood of hair regrowth. For male- and female-pattern hair loss, treatments may include topical minoxidil and laser light therapy, while telogen effluvium often resolves spontaneously. Seborrheic dermatitis, characterized by inflammatory skin lesions on the scalp, face, and body folds, can occur in both infantile (ISD) and adult (ASD) forms, presenting as papulosquamous morphology. Presently, there's a growing preference for herbal remedies over synthetic drugs, driven by abundant online information highlighting their perceived lower side effects. Herbs like saw palmetto, bhringraj, rosemary oil, pumpkin seed oil, and biotin are gaining popularity for promoting hair growth, offering benefits such as scalp nourishment, strengthening of hair follicles, and improved blood circulation. However, it's important to note that herbal products lack FDA regulation, leading to variations in dosage and potency ¹¹.







The objective of this study is to formulate a herbal hair oil aimed at nourishing and fortifying hair, soothing the scalp, and stimulating hair growth. Following formulation, the herbal hair oil underwent comprehensive evaluation, considering factors including viscosity, pH, saponification value, and organoleptic characteristics. The results revealed promising efficacy in tackling common hair issues such as dandruff and hair fall. This positive outcome was attributed to the presence of beneficial components such as saponins, antioxidants, vitamins, and antibacterial agents, which collectively contribute to reinforcing hair roots and enhancing blood circulation, thereby promoting overall hair health.

2. Material and Method

Initially procured various seeds from a local market (Chandigarh) to prepare herbal oil, including black seeds, fenugreek seeds, sesame seeds and herbs like Shatavari, Shikakai, bhringraj, and coconut oil while hibiscus flowers were collected from locality. Process utilized involves weighing, powdering, and boiling raw materials in coconut oil while stirring and heating continuously until the medication is fully extracted into the oil base for formulation of hair oil product.

Table 1 List of the ingredient used in the formulation

S. No.	Name of Ingredient	Benefits	Image
1.	Fenugreek seeds Scientific name- (<i>Trigonella foenum-graecum</i>)	It is a rich source of vitamins, minerals, and antioxidants essential for healthy hair growth, promoting a healthy scalp environment and stronger hair growth.	
2.	Black seeds Scientific name- (<i>Nigella sativa</i>)	By lowering scalp irritation, encouraging growth, enhancing texture, adding shine, and curing hair loss, black seed oil improves the health of hair.	
3.	Sesame seeds Scientific name- (<i>Sesamum indicum</i>)	It has antioxidants, vitamins, minerals, tocopherols, and lignans like sesamin and sesamolin, they have anti-aging qualities and can delay the onset of grey hair.	

4.	<p>Bhringraj Scientific name- (EcliptaProstrata)</p>	<p>It is rich in iron, calcium, magnesium, vitamin D, and E, is a potent hair tonic and liver cleanser, known as a "Rasayana" in Ayurveda, known for its rejuvenating and anti-aging properties.</p>	
5.	<p>Shikakai Scientific name- Acacia concinna</p>	<p>It has antifungal and antibacterial qualities that prevent dandruff, eczema, and itchy scalp. It reduces any irritation or inflammation on the scalp and soothes the skin.</p>	
6.	<p>Hibiscus Scientific name- Hibiscus</p>	<p>Reduces hair loss, cures dandruff, thickens and volumizes hair, and keeps hair healthy and conditioned.</p>	
7.	<p>Shatavari Scientific name- Asparagus racemosus</p>	<p>Shatavari is a rich source of minerals, vitamins A, B1, B2, C, essential oils, and fatty acids, which aid in the healing of various illnesses and conditions, including those containing essential fatty acids like gamma-linoleic acid.</p>	
8.	<p>Coconut oil (oil base)</p>	<p>Hydrates and minimizes breakage by defending hair from moisture-induced damage and protein loss and also shields hair from pollutants including smoke, wind, and sun.</p>	
9.	<p>Vitamin E (preservative)</p>	<p>It protects preparation from getting oxidized and turning rancid.</p>	

2.1. Preparation of the Hair oil

The preparation of the herbal hair oil began by soaking shikakai in water overnight, followed by grinding shatavari roots into powder form. Sesame seeds, black seeds, fenugreek seeds, hibiscus petals, and dried bhringraj leaves were then pulverized and blended using a mortar and pestle. Subsequently, coconut oil was heated in a beaker for 2-3 minutes on a heating mantle, and the soaked shikakai was added to the oil. After stirring, the pulverized mixture was incorporated and simmered for 15 minutes with constant stirring. Once thoroughly mixed, the oil was allowed to cool for 10-15 minutes before being filtered through cheesecloth into a clean container. To maximize oil extraction, the filtering process was repeated, and vitamin E was added as a preservative. Finally, the oil was left to infuse for a day before being ready for use. Fig.1



Figure 1 Preparation of Herbal hair oil

Table 2 Ingredients with the sufficient quantity

S.no.	Ingredients	Quantity	
		In grams	%
1.	Fenugreek seeds	2	1.2
2.	Hibiscus petals	3	1.7
3.	Black seeds	3	1.6
4.	Sesame seeds	2	1.1
5.	Bhringraj	10	5.5
6.	Shatavari	10	5.5
7.	Shikakai	30	16.6
8.	Coconut oil	120	66.5
9.	Vitamin E	0.6	1

2.2. Evaluation Parameters

2.2.1. Organoleptic properties

- Color: yellowish brown
- Odour: Characteristics

A series of different type of tests were performed to gain information about its physicochemical and organoleptic properties.

Acid value test: A steady stirring was done while dissolving 0.56 g of KOH pellets in 100 mL of distilled water. The 0.1 molar KOH solution that had been made was put into the burette. 10 ml of oil was measured, diluted with 25 ml of ethanol and 25 ml of ether mixture, and then chained. After adding one ml of phenolphthalein solution, 0.1 molar KOH solution was utilized for titration¹².

Saponification value: One millilitre of carefully weighed oil was added to a 250ml conical flask, and then ten millilitres of a combination of ethanol and ether in a 2:1 ratio was added. This flask was filled with 25ml of 0.5 N alcoholic KOH, left to sit at room temperature for 30 minutes. After cooling, the solution was titrated against 0.5 N HCl using

phenolphthalein indicator. For the blank test, no oil was used, just like in the sample titration. The KOH usage calculation was expressed in milligrams¹³.

Viscosity: Fill tube L with the liquid under study until it is just above mark G in the viscometer, which has already been cleaned and dried thoroughly. After positioning the tube vertically in a water bath leave it there for at least thirty minutes to allow the temperature to stabilize. Meniscus falls at mark G. Blow or suction the liquid up to a position that is around 5 mm above the E mark. Measure the amount of time it takes for the meniscus's bottom to descend from the top edge of mark E to the top edge of mark F after the pressure or suction has been released¹⁴.

Specific gravity: Take the pycnometer, rinse it with distilled water, dry it in the oven for about 15 minutes, let it cool, and place a cap on it, and weigh it (w1), then add the distilled water to the pycnometer and weigh it (w2). Now discard the water in pycnometer and dry it using hot air oven and desiccator and then weigh it with sample (w3). Then use the formula for Specific gravity = $w3-w1/w2-w1$ ¹⁵.

Saponin test: Oil and water are mixed in a test tube and is shaken to create stable froth.

pH: Measure the pH of herbal hair oil using a digital pH meter.

Sensitivity: After applying the product, let the skin sit in the sun for approximately 4-5 minutes.

3. Results

The herbal hair oil presents itself as a potent and natural solution for stimulating hair growth and fortifying hair follicles. Rich in essential nutrients, it offers comprehensive nourishment for both the hair and scalp. Formulated from a blend of proven herbs renowned for their beneficial effects on hair health and growth, the herbal hair oil underwent rigorous testing across various quality and efficacy parameters. Assessment of factors such as viscosity, pH, sensitivity, grittiness, saponification value, and acid value revealed that the herbal hair oil met all requisite quality and effectiveness standards, affirming its potential as an effective and reliable option for enhancing hair vitality and overall scalp wellness.

The evaluation of the herbal hair oil revealed favorable results across multiple parameters. With an acid value of 4.48 and a saponification value of 114.34, the oil exhibited acceptable levels within quality standards. Additionally, its viscosity was measured at 0.93, with a specific gravity of 1.089, and a pH of 6.63, indicating suitable consistency and acidity. Sensitivity testing yielded no signs of irritation, affirming its gentle nature on the skin. Furthermore, the presence of foam during the saponin test indicated the presence of beneficial compounds. Organoleptic assessments highlighted a yellowish-brown color, characteristic aroma, smooth texture, and minimal sedimentation, further attesting to its quality. Overall, the herbal hair oil demonstrated efficacy in nourishing and strengthening hair, soothing the scalp, and promoting hair growth, making it a promising solution for hair care needs.

Table 3 Evaluation parameters with observation

S.No.	Evaluation Parameters	Observation
1	Acid value	4.48
2	Saponification value	114.34
3	Viscosity	0.93
4	Specific gravity	1.089
5	pH	6.63
6	Sensitivity test	No irritation
7	Saponin	Foam present

4. Conclusion

In conclusion, the herbal hair oil formulated with ingredients including Shatavari, Bhringraj, hibiscus flower petals, shikakai, black seeds, sesame seeds, and fenugreek seeds has exhibited promising results in addressing common hair

concerns such as dandruff and hair fall. The blend of herbs in the formulation provides essential compounds like saponins, antioxidants, vitamins, and antibacterial agents, which play pivotal roles in strengthening hair roots and enhancing blood circulation. Through a series of rigorous assessment tests measuring parameters such as acid value, saponification value, saponins, and viscosity, the product demonstrated conformity to desired standards of safety and effectiveness. These findings underscore the potential of the herbal hair oil as a viable solution for promoting healthy hair growth and scalp wellness.

Future Scope

The findings of this research offer conclusive insights into the efficacy and safety of the herbs employed in hair care, demonstrating satisfactory performance. These herbs, with a historical precedent in promoting hair health, have proven effective and safe within the formulated product, meeting the requisite parameters for efficacy and safety. Moving forward, the study sets the stage for further exploration and validation of these herbal ingredients in hair care formulations. Future research endeavors could delve deeper into optimizing formulations, exploring additional herbal combinations, and conducting clinical trials to corroborate and expand upon the observed benefits, thus contributing to the growing body of evidence supporting herbal remedies in hair care.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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