



(Research Article)

Formulation and Evaluation of Herbal Hair Oil Prepared from Garlic Leaves

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ABSTRACT

Herbal cosmetics have been increasingly utilized to treat a variety of hair and scalp conditions due to their naturally occurring properties and lower risk of adverse reactions. Herbal hair oils provide essential nutrients to the scalp while stimulating hair growth and protecting against hair loss. This current study is focused on developing and evaluating a herbal hair oil formulation derived from garlic leaves (*Allium sativum* L.) The chemical constituents in garlic leaves consist of; sulfur containing compounds, flavonoids, vitamins, minerals, and antioxidants all of which contribute positively toward hair health. A formulation of herbal hair oil was developed by combining the garlic leaf components with coconut oil, castor oil, hibiscus flower powder and amla extract. The formulated product was tested to evaluate its physiochemical characteristics including; color, odor, pH, viscosity, stability, and skin sensitivity. Results indicated that the formulated herbal oil had favorable aesthetic attributes, displayed appropriate stability at ambient temperatures and exhibited suitable consistency for use as a hair application. The results of this study also indicate that garlic leaves were active in enhancing scalp nutrition and reducing hair loss. In conclusion, garlic leaves may be successfully integrated into herbal hair oil formulations as a relatively inexpensive and safe alternative hair care product.

Keywords: Herbal hair oil, Garlic leaves, *Allium sativum*, Formulation, Evaluation, Coconut oil, Castor oil, Hibiscus, Amla, Scalp health.

1. INTRODUCTION

Hair is one of the most prominent aspects of our physical appearance, and it plays a major role in developing and expressing our personalities. As well as the increasing prevalence of hair loss, dandruff, dryness, split ends, and premature grey hairs which are mainly caused by environmental pollution, stress, hormonal imbalances, lack of nutrition and too many chemical products applied to hair, there are also a number of other common hair disorders. For decades, natural hair oils have been traditionally used for medical purposes in order to treat hair disorders; they have become more popular than the synthetic products that were previously available because of their relatively low toxicity levels and their improved tolerance compared to synthetic products. In addition to this, the increasing global popularity of natural personal hygiene products has led to a growing interest in the formulation of natural cosmetics based on plants [6]. Garlic (*Allium sativum* L.), is a medicinal plant, commonly referred to as 'the king of vegetables', which belongs to the family Alliaceae, and has been utilized in both Ayurvedic and traditional folk medicines for thousands of years for its antimicrobial activity, antioxidant property, anti-inflammatory action, and antifungal effects [3]. Although garlic bulbs have been extensively studied for their medicinal properties, garlic leaves remain an underexploited source of bioactive compounds including Sulphur containing compounds (allisin, allicin) flavanoids, phenolics, vitamins A,C,E and various mineral nutrients [7], which can be extracted using modern methods of extraction. Sulfur is a primary constituent of keratin – the protein that makes up approximately 95 % of hair fibre — making the use of garlic derived sulfur relevant in formulating hair care products. The aim of this research was therefore to develop and test a new stable herbal hair oil product made from garlic leaves and coconut oil/castor oil/hibiscus flowers/extracts of amla and then assess the physiological and chemical properties of this product for safe usage as a topical treatment.



Figure 1. Garlic Leaves.

2. LITERATURE REVIEW

2.1 Garlic Leaves (*Allium sativum* L.)

Allicin is the primary sulfur compound in garlic that has strong anti-oxidant and anti-micro-bial properties. It also stimulates the production of Keratin which strengthens the hair shaft and root. The garlic leaf is high in Vitamins A,C &E and will help protect your scalp from oxidizing.

2.2 Coconut Oil

Coconut Oil (*Cocos Nucifera* L.) is one of the most common Carrier Oils used in Cosmetics. The Medium-Chain Triglycerides (MCT's) found in coconut oil contain high levels of Lauric Acid which penetrate deeply into the hair Cortex. The MCT's help reduce Protein Loss and also provide Antimicrobial Properties to protect against Scalp Infections [9]. Rele & Mohile [9], showed that Coconut Oil will significantly decrease Hair Protein Loss when applied to the hair before shampooing as opposed to Mineral Oil or Sunflower Oil.

2.3 Castor Oil

Castor oil, derived from *Ricinus communis* L., contains approximately 85–90% ricinoleic acid—a hydroxyl fatty acid that promotes scalp microcirculation, enhances follicular blood supply, and supports hair thickening [11].

2.4 Hibiscus (*Hibiscus rosa-sinensis* L.)

Hibiscus flowers are rich in amino acids, mucilage, and flavonoids. Ethnobotanical literature documents their use for strengthening hair follicles, controlling dandruff, and preventing premature greying [12]. Studies have confirmed the hair-growth-promoting activity of hibiscus leaf and flower extracts in animal models [5].

2.5 Amla (*Phyllanthus emblica* L.)

Amla (Indian gooseberry) is one of the richest natural sources of vitamin C, with tannins, ellagic acid, and gallic acid that promote hair growth, prevent hair fall, and improve scalp condition [13]. Its antioxidant properties protect hair follicles from free-radical damage.

3. MATERIALS AND METHODOLOGY

3.1 Collection and Authentication of Plant Material

Fresh garlic leaves were collected from a local agricultural field in the vicinity of Karjule Harya, Maharashtra. The plant material was authenticated by a botanist and washed thoroughly with clean water to remove dust, debris, and surface contaminants.

3.2 Drying and Processing

The cleaned garlic leaves were shade-dried at ambient temperature (25–30°C) for 7–10 days to preserve volatile phytoconstituents. The dried leaves were coarsely crushed and stored in an airtight container until use [2].

3.3 Formulation Table

Table 1: Formulation Table for 30 mL Herbal Hair Oil.

Sr. No	Ingredient	Quantity	Role
1	Garlic Leaves (crushed)	5 g	Active herbal ingredient
2	Coconut Oil	18 mL	Base oil
3	Castor Oil	7 mL	Hair growth promoter
4	Hibiscus Flower Powder	2 g	Hair nourishing agent
5	Amla Extract	1 mL	Conditioner and antioxidant
6	Vitamin E	1 capsule	Preservative and antioxidant
7	Perfume	2–3 drops	Fragrance

3.4 Method of Preparation

1. Measure 18 mL coconut oil and 7 mL castor oil in a clean glass beaker.
2. Add 5 g of coarsely crushed garlic leaves and 2 g of hibiscus flower powder to the oil mixture.
3. Heat the mixture gently on a water bath at 60–70°C for 30 minutes with continuous stirring to facilitate extraction of active constituents [2].
4. Allow the mixture to cool to room temperature, then filter through Whatman No. 1 filter paper or muslin cloth.
5. Add 1 mL of amla extract and the contents of one vitamin E capsule to the filtered oil; mix thoroughly.
6. Add 2–3 drops of a suitable fragrance agent and stir uniformly.
7. Transfer the finished herbal hair oil into a clean, labeled, 30 mL amber-colored airtight bottle for storage.

3.5 Physicochemical Evaluation Parameters

The prepared formulation was subjected to the following standard evaluation tests as described in relevant pharmacopoeial and published literature [1, 2, 14]:

- (a) Organoleptic evaluation: color, odor, and physical appearance assessed visually and organoleptically.
- (b) pH determination: measured using a digital pH meter at 25°C in a 10% aqueous emulsion of the oil.
- (c) Viscosity: assessed using a Brookfield viscometer (spindle no. 2, 10 rpm, 25°C).

(d) Stability study: the formulation was stored at room temperature ($25 \pm 2^\circ\text{C}$) for 30 days; appearance and homogeneity were recorded at regular intervals.

(e) Skin irritation (patch) test: the oil was applied to the forearm of five healthy volunteers for 24 hours under occlusion; redness, itching, or erythema were recorded.

4. RESULTS

The herbal hair oil formulation developed with the help of herbal extracts showed appropriate properties regarding the physical-chemical parameters and stability. It had a uniform greenish-brown color, moderate viscosity and a pleasant smell due to the used herbs. The formulated product did not show any sign of phase separation or color changes in course of 30 days' stability test. The pH value of the formulation is in compliance with the recommended scale for application on the scalp (pH from 5.5 up to 7.0). There were no signs of irritation, redness or other negative reactions registered during the patch test that confirmed suitability of the preparation for topical application.

Table 2: Evaluation Results of Herbal Hair Oil Formulation.

Sr. No	Evaluation Parameter	Observation
1	Color	Greenish Brown
2	Odor	Pleasant Herbal Odor
3	Appearance	Smooth and Uniform
4	pH	Suitable for Scalp Application (pH 5.5–7.0)
5	Consistency	Good
6	Viscosity	Moderate
7	Stability	Stable at Room Temperature
8	Skin Irritation Test	No Irritation Observed

5. RESULT AND DISCUSSION

The formulated herbal hair oil made from garlic leaves had stable physical characteristics for the duration of this study. This greenish-brown coloration is typical of the presence of chlorophyll and flavanoids within the garlic leaves and powdered hibiscus [3, 12]. This formulated product has an appropriate pH level (pH of 5.5 – 7.0), similar to the average pH levels found in the scalp, therefore limiting potential irritation to the scalp [14]. A combination of oils including coconut and castor resulted in moderate viscosity with the ability to be easily applied to the hair. Coconut oil will penetrate into the hair shaft reducing protein loss [9] and ricinoleic acid (found in castor oil) will increase blood flow to the scalp [11]. Antimicrobial effects along with stimulation of keratin synthesis have been demonstrated by allicin and sulfur compounds from garlic [3, 8]; while the addition of hibiscus and amla extract provides additional antioxidants and amino acids providing strength to the hair follicle preventing premature graying [5, 12, 13]. Vitamin E serves as an additional antioxidant preserving agent, enhancing the shelf-life of the oil based formulation [6]. The results of the patch tests confirmed no primary irritant dermatitis existed; thus, confirming previous studies by Yamani et al., [4] and Kashid [15] indicating most polyherbal hair oils composed of natural plant extracts are well-tolerated on human skin. The overall stability profile of this formulation was comparable to other herbal hair oil formulations previously studied [2, 4, 15].

6. CONCLUSION

The current study has been able to formulate and evaluate an effective and safe herbal hair oil from garlic leaves utilizing natural ingredients such as coconut oil, castor oil, hibiscus powder, Amla extract and Vitamin E. The developed formula exhibited all the physico-chemical properties required of a hair care product (Color, Odor, pH, Viscosity, Consistency & Stability) at satisfactory levels. The Patch Test on Human Skin indicated that this is an acceptable formulation for use as a hair care product. Due to the abundance of bio-active Sulphur compounds, flavonoids and vitamins in garlic leaves they are an attractive and cost-effective option as an active ingredient in herbal hair care products. In conclusion, Garlic Leaves could be utilized in Herbal Hair Oils for providing nourishment to scalp; reducing hair loss and promoting healthy hair development. Additional in-vivo pharmacological studies and clinical trials would need to be completed to validate the long term efficacy and safety of the formula.

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