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RESEARCH ARTICLE

Formulation and Evaluation of Herbal Hair Growth Oil Using Flower Extract of *Lantana camara* Linn

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ABSTRACT

The present study was designed to formulate and evaluate a herbal hair growth oil incorporating the flower extract of *Lantana camara* Linn., a plant traditionally known for its diverse pharmacological activities. Fresh flowers were collected, identified, and authenticated, followed by extraction using ethanol–water (1:1) through maceration. The obtained extract was subjected to preliminary phytochemical screening, which confirmed the presence of alkaloids, glycosides, flavonoids, phenols, saponins, tannins, steroids, and triterpenoid compounds known to exert antioxidant, anti-inflammatory, and hair growth-promoting effects. The herbal hair oil was formulated by incorporating the extract with supportive herbal ingredients such as *Hibiscus* flowers, curry leaves, almond oil, coconut oil, rose oil, and vitamin E, thereby enhancing both therapeutic and cosmetic value. The prepared oil was evaluated for organoleptic and physicochemical parameters including pH, viscosity, acid value, refractive index, specific gravity, and irritation potential. The results indicated that the oil possessed a greenish-brown color, characteristic odor, a pH of 6.5, acceptable viscosity, specific gravity of 0.97 g/cm^3, and an acid value within permissible limits. No irritation was observed upon topical application, confirming its safety. The observed phytochemical constituents were considered responsible for the potential hair growth activity. The overall evaluation demonstrated that the herbal hair oil formulation was stable, safe, and effective, suggesting its potential as a natural alternative to synthetic hair growth products. This work highlights the significance of integrating traditional herbal knowledge with scientific validation to develop efficacious hair care formulations.

Keywords: Formulation and evaluation, hair growth, herbal hair oil, *Lantana camara* Linn., phytochemical screening

INTRODUCTION

The pursuit of healthy hair growth has been a long-standing concern in both traditional and modern medicine, as hair is considered a vital component of human identity, self-esteem, and social acceptance. Hair disorders, including alopecia and excessive hair fall, are prevalent across populations and have prompted the exploration of natural remedies in addition to synthetic agents. Although several allopathic treatments such as minoxidil and finasteride are clinically available, they often present limitations including high cost, side effects, and unsatisfactory long-term outcomes, thereby fueling the demand for plant-derived alternatives with proven efficacy and safety profiles.[1]

Herbal formulations have gained significant attention in the cosmetic and pharmaceutical industries due to their multi-component nature, holistic action, and reduced side effects compared to synthetic drugs. Among the vast array of medicinal plants, *Lantana camara* Linn., commonly known as wild sage or red sage, stands out for its wide distribution and ethnopharmacological relevance.

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Conventionally, the plant has been used in the treatment of skin ailments, wounds, and microbial infections, highlighting its potential for dermatological applications.[2] The flower extract of *L. camara* is particularly rich in bioactive constituents such as triterpenoids, flavonoids, and phenolic compounds, which exhibit antioxidant, anti-inflammatory, and antimicrobial properties, making it a promising candidate for hair growth formulations.[3]

The role of oxidative stress in hair follicle damage has been widely documented, with reactive oxygen species leading to the disruption of follicular microenvironments and acceleration of hair loss. Antioxidants derived from plant sources can counteract such oxidative damage, restoring follicular health and promoting regeneration. *L. camara* flowers are reported to contain high levels of flavonoids and phenolics, both of which are potent antioxidants that may contribute to the strengthening of hair follicles and stimulation of hair growth.[4] This scientific rationale has laid the foundation for exploring its flower extract in hair oil formulations.

The use of herbal hair oils as a delivery system is deeply rooted in traditional medicine. Oils act as carriers, ensuring the penetration of active compounds into the scalp and hair follicles. Moreover, the massage associated with oil application enhances blood circulation, thereby improving nutrient supply to hair roots and facilitating growth. Several oils, such as coconut, sesame, and castor oil, have historically been used as bases for herbal hair preparations due to their emollient, moisturizing, and antimicrobial activities.[5] Combining the base oil with plant extracts like *L. camara* flower offers the dual advantage of traditional efficacy and scientifically validated therapeutic potential.

Several studies have reported the pharmacological potential of *L. camara*, particularly in relation to wound healing and antimicrobial properties, which indirectly support its role in hair care. Microbial infections of the scalp, such as dandruff caused by *Malassezia* species, often contribute to hair loss. The antimicrobial activity of *L. camara* flower extract could therefore play a crucial role in maintaining scalp health, reducing microbial colonization, and preventing infection-induced alopecia.[6] In addition, triterpenoids present in the extract may enhance keratinocyte proliferation and differentiation, which are essential for hair follicle cycling and regeneration.[7]

Another dimension of interest is the anti-inflammatory potential of *L. camara* constituents. Chronic scalp inflammation has been implicated in conditions such as seborrheic dermatitis and cicatricial alopecia, where the inflammatory response damages the follicular structure. By modulating inflammatory pathways, flavonoid-rich extracts of *L. camara* may help restore the scalp's physiological environment and prevent premature follicular regression.[8]

While synthetic hair growth formulations are primarily single-target oriented, herbal oils provide a multi-targeted approach. The bioactive compounds in *L. camara* flowers not only address hair growth promotion but also improve overall scalp health by reducing inflammation, combating microbial infections, and supplying antioxidants. This multifaceted action enhances the therapeutic value of herbal oils in managing hair loss disorders.[9]

Therefore, systematic formulation and evaluation of herbal hair oil using *L. camara* flower extract not only addresses the growing consumer demand for natural hair care solutions but also contributes to the scientific validation of ethnomedicinal knowledge.

MATERIALS AND METHODS

Collection of Plant

The flowering twigs of *Lantana* plants were collected in Shri Sahaj Institute of Pharmacy, Khargone, and the plant was collected from the village Nandgaon Bagud, District Khargone state, Madhya Pradesh (India) [Figure 1] and sent as a herbarium form to the Botanical department of P.G. College, Khargone (M.P).

Identification and Authentication of *L. camara* Linn

The identification and authentication are done by Mr. C.L Ningwal sir assistant professor of Botany

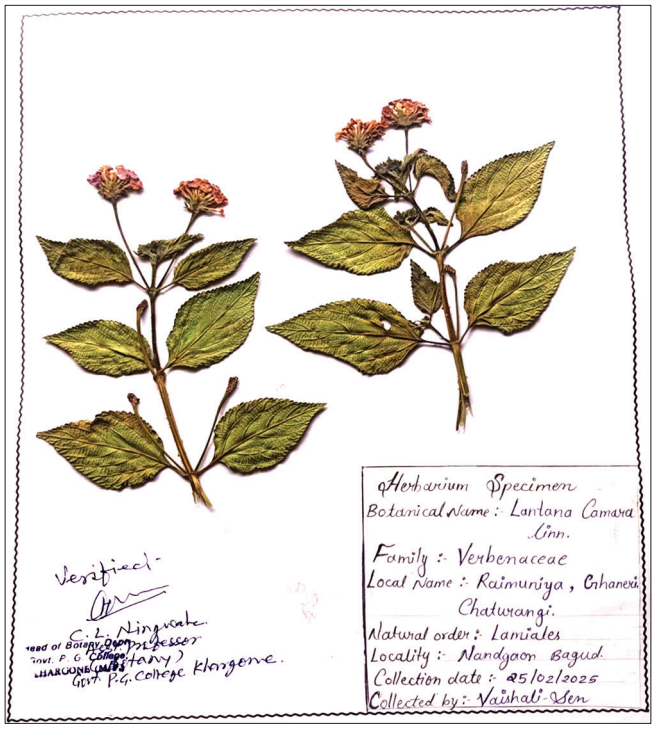

Figure 1: Identification and authentication of a plant

at the government P. G. College, Khargone. Herbarium of *L. camara* Linn. was verified.

Preparation of the Extract

The plucked flowers were subjected to pharmacognostical study by following the standard pharmacognostical protocols. Fresh flowering petals were macerated using mortar and pestle in the presence of ethanol and water (at 1:1 ratio) and were left for 24 h, after which the extract was filtered. The filtrate was dried under reduced pressure and re-dissolved in the solvent (ethanol) and was centrifuged. The supernatant was decanted and the collected floral extract was allowed to dry for a period of 48 h. The dried floral extract was analyzed for the presence of alkaloids, glycosides, terpenes, phenols, flavonoids, and saponins.

Phytochemical Screening of Plant

The concentrated extract of selected plant was subjected to different chemical tests for the detection of different phytoconstituents using standard methods.

Test for glycosides

5 mL of 1% picric acid is added with 5 mL of 10% NaOH known as Baljet's reagent. Add Baljet's reagent to the sample containing the suspected glycoside. A positive test is indicated by the development of an orange to reddish-brown color.

Test for alkaloids

Add a few drops of sodium nitroprusside solution to the test sample then add few drops of sodium hydroxide to the sample. A red or deep red coloration indicates the presence of alkaloids.

Test for flavonoids

Take a small amount of plant extract in a test tube. Add a few magnesium turnings then add concentrated hydrochloric acid dropwise. Red, pink, or orange coloration confirms the presence of flavonoids.

Test for phenols

Phenols form colored coordination complexes with Fe3+ ions from ferric chloride. The color depends on the type of phenol present. Dissolve a small amount of the test sample in distilled water or ethanol. Add a few drops of freshly prepared FeCl3 solution. The appearance of violet, blue, green, or red color indicates the presence of phenols.

Test for saponins

A small amount of plant extract is mixed with 5 mL distilled water in test tube then it is shaken briskly. The formation of stable foam indicates the presence of saponins.

Test for steroids

The crude extract of selected plant was dissolved in 0.5 mL dichloromethane to prepare a dilute solution, and then, 0.5 mL of acetic anhydride was added, followed by four drops of concentrated sulfuric acid. A blue-green color indicates the presence of steroids.

Test for tannins

Crude extract of plant was mixed with small amount of water and heated in water bath. The mixture was

filtered and ferric chloride was added drop by drop to the filtrate. A dark green appearance indicates the presence of tannins.

Test for triterpenoids

Add a few drops of concentrated sulfuric acid to the sample extract. A reddish brown or golden-yellow color at the interface indicates the presence of triterpenoids.

Hair Oil

Hair oil is an oil-based cosmetic product used to improve hair's condition; often to address dryness, damage, or frizz; and enhance shine and manageability. Hair oil is hair care product. Hair care merchandise is defined as the formulations which might be used for the reason of cleaning, editing the hair texture, providing nourishment to the hair, and retaining the healthy appearance of hair. Hair oil is a hair care component implemented to the hair for the treatment of hair disorder which include baldness, graying of hair, hair fall, and dry hair and also allows for providing nourishment to hair. Herbal cosmetics are excessive in demand because of the increasing hobby of mankind closer to them. In addition, natural cosmetics are more effective with negligible facet consequences. Table 1 summarizes the list of ingredients.

Preparation of hair oil

- Curry (leaves) and *Hibiscus* (flower) are dried in sunlight and converted into coarse powders
- The extracts were prepared by the maceration method and the prepared extracts were stored in well-closed containers
- Precisely, all the dried and fresh herbs, *Hibiscus*, and curry leaves were weighed and triturated in the mortar and pestle and mixed with Almond oil
- The above content was boiled for 15 min and filtered through a muslin cloth. To the filtrate, coconut oil was added to the makeup volume
- Finally, a small amount of rose oil was added to the oil for fragrance, and Vitamin E was used as a preservative, then store the oil in a close container.

Table 1: List of ingredient

Ingredients	Quantity
Hibiscus (flower)	2 g
Curry leaves	2 g
Almond oil	10 mL
Rose oil	0.5 mL
Flower extract	2 g
Coconut oil	Up to 60 mL

Evaluation Parameter of Hair Oil

The formulated herbal oil was evaluated for parameters such as pH, acid value, saponification value, refractive index, viscosity, and organoleptic parameters.

Acid value

10 mL of oil was added to 25 mL of ethanol and 25 mL of ether. Phenolphthalein was added as an indicator and titrated with 0.1M potassium hydroxide solution,

pH measurement

pH of the herbal oil was detected using pH meter which involves dipping electrodes into the oil sample and reading the pH values.

Viscosity

Viscosity was determined using a Brookfield viscometer and rotated the oil was rotated at 60 rpm. Note down the reading. The viscosity was obtained by dial reading the X factor given in the Brookfield viscometer catalogues.

Specific gravity

Specific gravity of the prepared oil was determined using a pycnometer or specific gravity bottle.

Organoleptic property

Color, odor, and skin irritation were determined manually. Oil was applied to the hand and exposed to sunlight for 5 min to check for any irritation of the skin.

Table 2: Evaluation of herbal hair oil

S. No.	Parameters	Observation
1	Color	Greenish brown
2	Odor	Characteristics
3	Specific gravity	0.97 g/cm^3
4	Viscosity	0.0782 poise
5	pH	6.5
6	Acid value	5.94
7	Irritation test	No irritation

Table 3: Phytochemical screening of *L. camara* flower extract

Phytoconstituents	Result
Glycosides	
Cardiac glycoside	+
Anthraquinone glycoside	–
Alkaloids	
Mayer's test	+
Dragendroff's test	+
Flavonoids	
Shinoda test	+
Ferric chloride test	+
Phenols	
Ferric chloride test	+
Saponins	
Foam of froth test	+
Hemolytic test	+
Steroids	
Salkowski test	+
Keller-Kiliani test	+
Liebermann–Burchard test	+
Tannins	
Ferric chloride test	+
Lead acetate test	+
Triterpenoids	
Salkowski test	+
Liebermann–Burchard test	+
Tannins	
Ferric chloride test	+
Lead acetate test	+
Triterpenoids	
Salkowski test	+
Liebermann–Burchard test	+
Tannins	
Ferric chloride test	+
Lead acetate test	+
Triterpenoids	
Salkowski test	+
Liebermann–Burchard test	+

RESULTS AND DISCUSSION

The hair growth activity of *L. camara* Linn. may be due to chemical such as alkaloids, tannins, steroids, flavonoids, saponins are present. These compounds are responsible of hair growth activity of *L. camara* Linn. the effective topical dose of *L. camara* Linn. 2 g/60 mL. Table 2 represents the evaluation result of herbal hair oil.

Preliminary Phytochemical Analysis of *L. camara* Flower Extract

Table 3 represents the preliminary phytochemical analysis of *L. camara* flower extract.

CONCLUSION

This research provides guidelines on the use of herbal ingredients in the preparation of herbal hair oil having minimal or no side effects. All the parameters showed that they are within the limits, and since all the ingredients added have many advantages, this oil will help in maintaining the good growth of hair. One of the most well-known hair treatments is herbal hair oil. Herbal hair oil not only hydrates the scalp but also helps to heal dry scalp and hair. It contains various vital nutrients that support regular sebaceous gland activity and encourage natural hair growth. The results showed that herbal hair oil exhibited good pH, acceptable viscosity and was stable at room temperature. As a result, it is clear that the herbal plant may be a preferable option for future formulation.

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