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# Development and Evaluation of Polyherbal Formulation for Effective Hair Regrowth

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**ABSTRACT**

Hair loss is a common concern affecting individuals due to various factors including stress, hormonal imbalance, nutritional deficiencies and environmental conditions.Herbal ingredients have gained importance in hair care preparations because of their traditional use and potential therapeutic properties. The present study aims to formulate and evaluate a polyherbal hair oil containing Bhringraj, Jatamansi, Rosemary, Neem, Camphor, Garlic and Turmeric using Coconut oil as the base. The selected herbal ingredients are subject to TLC identification to confirm the major chemical constituents and incorporated to develop a natural hair oil with potential hair growth promoting, hair-srrengthening and scalp-protective properties. The prepared formulation will be evaluated for various physiochemical parameters including colour, odour , PH, viscosity, skin irritation test and stability studies. The study focuses on developing an economical and stable Polyherbal formulation that may help to maintain the scalp health, reduce hair fall and support hair growth.

## 1. INTRODUCTION

Ayurveda literally means “science of life”, and is considered to be the traditional medicine of India. In Ayurvedic medicine, herbs are used as an integral part of health care system. The synthetic chemical compounds have replaced many Ayurvedic plant products, the safety and efficacy of the natural products could not find suitable match. Herbal drugs obtained from plants are believed to be much safer in the treatment of various disease.

### 1.1 Hair:

Hair is an important appendage of the human body and contributes significantly to physical appearance, personality, beauty, and confidence. It is an epidermal protein filament that develops from specialized structures present within the skin. A typical hair consists of three major parts: the bulb, root, and shaft. The bulb is the enlarged portion present at the base of the hair follicle, where active growth of hair takes place. The root is the portion of the hair located below the skin surface, while the shaft is the visible portion extending above the skin. Healthy hair depends on the proper functioning of the hair follicle, adequate nutrition, and maintenance of scalp health.

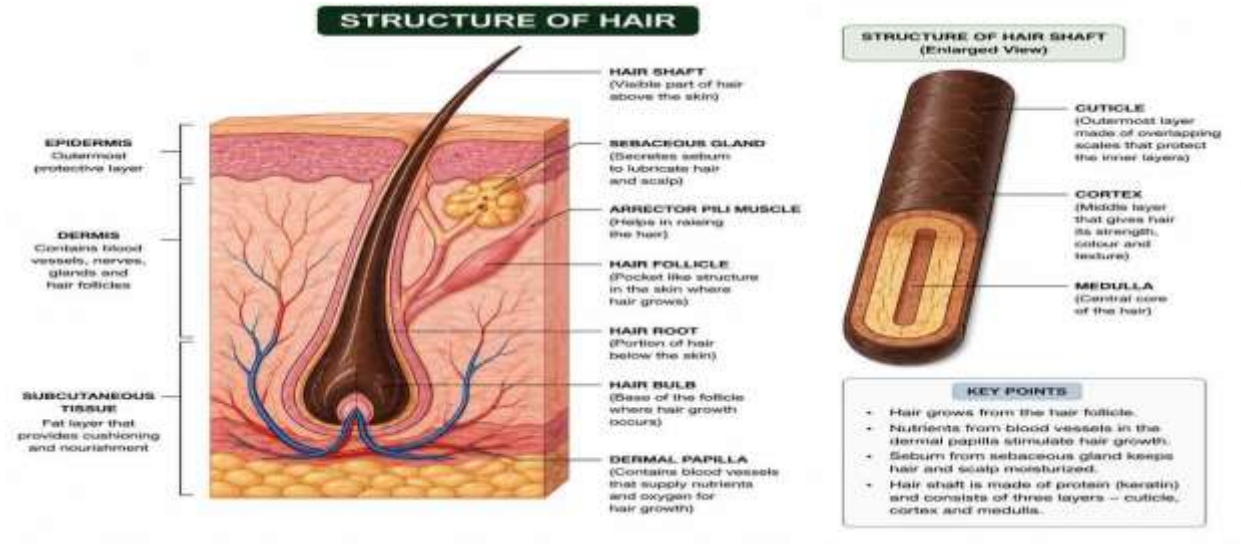



**Figure No :1 Structure of Hair**

### 1.2 Importance of Hair:

Hair is one of the most important and noticeable structures of the human body. It is mainly present on the scalp, face, arms, legs and other parts of the body. Scalp hair has an important role in human appearance and contributes significantly to an individual's physical identity and self-confidence. Apart from its cosmetic importance, hair also performs several biological functions, including protection of the scalp from ultraviolet radiation, regulation of temperature and reduction of minor physical injuries to the scalp.

Hair is a specialized structure that develops from the epidermis of the skin. The visible part of the hair is known as the hair shaft, while the portion present within the skin is called the hair root. The hair root is enclosed by a follicular structure known as the hair follicle. At the base of the follicle, the hair bulb contains actively dividing cells that contribute to the formation and growth of the hair shaft. The dermal papilla present within the bulb provides important nutrients and regulatory signals required for normal hair growth.

The major component of hair is a fibrous protein called keratin. Keratin provides strength, elasticity and structural stability to the hair. The hair shaft consists mainly of three layers: the cuticle, cortex and medulla. The cuticle is the outermost protective layer, the cortex forms the major portion of the hair and provides strength and colour, while the medulla is the innermost layer and may be absent in fine hair.

Healthy hair growth depends on the proper functioning of hair follicles and adequate supply of nutrients and biological factors. Various factors such as age, genetic characteristics, hormonal changes, nutritional status, stress, diseases, environmental conditions and inappropriate hair care practices can influence the growth and quality of hair.

Hair therefore has both physiological and psychological importance. Excessive hair loss can affect physical appearance and may lead to reduced self-confidence, emotional stress and social discomfort. Because of these reasons, maintaining healthy hair growth has become an important area of interest in dermatology, cosmetology and pharmaceutical research.

### 1.3 HAIR GROWTH STAGES:

The hairfall of mammalian skin regularly cycles between involution and regeneration throughout postnatal life.

There are four main phases of the HF cycle:

1. Anagen (Growth)
2. Catagen (Regeneration)
3. Telogen (Rest)
4. Exogen (Shedding)

**1.3.1 Anagen (Growth Stages):**Active growth phase early anagen: Hair matrix forms a new hair Nourishment of HF (Hair Follicle) from blood supply enables hair growth lasts 2-6 years & causing the hair to lengthen. Scalp hair follicles typically remain in the anagen phase for 2to 6 years. Around 85% to 90% of hair follicles are in the anagen phase at any given time.

**1.3.2 Catagen (Transition Stage):** It is an Intermediate "transition" phase. During this phase, hair growth slows down and hair follicle starts to shrink and detach from the body supply.

**1.3.3 Telogen (Resting Stage):** The hair follicles are inactive, papillary cells completely separate from HF last 5-6 weeks.

**1.3.4 Exogen (Shedding Stage):** This is the final phase where the hair falls out, and a new hair begins to grow from the follicles.

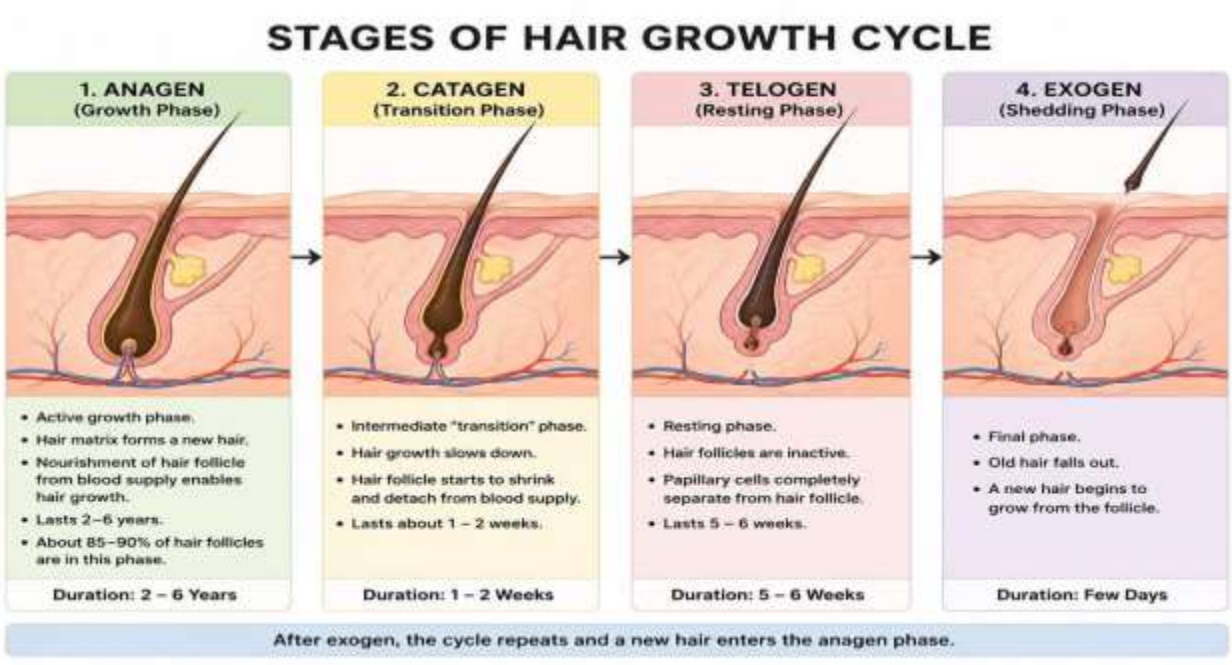



**Figure No 2: Stages of hair growth**

**1.4 TYPES OF HAIR LOSS:**

Hair loss, or alopecia, can occur due to various underlying causes. Understanding the type of hair loss is essential for selecting appropriate treatment strategies:

**1.4.1 Androgenic Alopecia:** Also known as male or female pattern baldness. It is a genetic condition caused by the effect of androgens on hair follicles, leading to progressive thinning of hair.

**1.4.2 Telogen Effluvium:** A temporary form of hair loss caused by emotional stress, illness, surgery, or hormonal imbalance that pushes a large number of hair follicles into the resting phase.

**1.4.3 Alopecia Areata:** An autoimmune disorder where the immune system attacks hair follicles, leading to patchy baldness on the scalp and other areas of the body.

**1.4.4 Traction Alopecia:** Hair loss caused by constant pulling of the hair due to tight hairstyles like

braids, ponytails, or buns over prolonged periods.

**1.4.5 Anagen Effluvium:** Rapid hair loss during the growth phase due to exposure to toxic chemicals, especially during chemotherapy or radiation therapy.

**1.4.6 Cicatricial Alopecia:** Also known as scarring alopecia, it results from inflammation that permanently destroys hair follicles and replaces them with scar tissue.

**1.4.7 Tinea Capitis:** A fungal infection of the scalp that causes round patches of hair loss, mostly seen in children. It is contagious and causes redness, scaling, and itching.




**FIGURE No 3: Pattern of hair loss**

### 1.5 Causes of Hair Problem

It is a disputable issue as there is no broad understanding of what are the fundamental factors that cause loss of hair. It is a general issue having influenced both genders of all races to the various degree for whatever length of time that mankind has existed 10. Different components adding to balding incorporates hereditary inclination, hormonal elements, and illness states, for example, typhoid, jungle fever, jaundice and utilization of chemotherapeutic specialists. It is a dermatologic issue, and the flood for finding characteristics items with hair development advancing potent is ceaseless.

#### 1.5.1 Impact of Hair Loss on Individuals

Hair loss can have a profound psychological and emotional impact. It can affect

- Self-esteem and confidence
- Social interactions and professional life
- Mental health, leading to anxiety or depression
- Body image, especially among women and young adults

**1.6 Treatments and Their Limitations**

The current pharmaceutical and cosmetic market offers various treatments for hair loss, such as:

- Topical applications: Minoxidil, ketoconazole-based shampoos, corticosteroids
- Oral medications: Finasteride, hormonal treatments, nutritional supplements
- Surgical methods: Hair transplant, scalp reduction, platelet-rich plasma (PRP) therapy While effective to some extent, these treatments often come with limitations:
- Side effects: Skin irritation, hormonal imbalance, sexual dysfunction High cost and maintenance
- Lack of long-term efficacy for all users
- Chemical dependency: Cessation of treatment may result in accelerated hair fall

**1.6.1 Method for preventing hair loss**

- Fruit and vegetables should be taken in abundance to facilitate the supply of essential vitamins and minerals.
- Endocrine abnormalities like hyperthyroidism, disorders that result in an excess formation of male hormones, an autoimmune disease like SLE etc., should be properly managed by treatment.
- Don't go for a crash diet to lose your weight as it causes damage to your health and will affect your hairs also. Return to proper nutrition that provides you sufficient protein and required calories, to recover normal hair growth.
- Avoid tension, stress, worries, anger, etc., as far as possible. e. Avoid inflicting mechanical tension to the hair by pulling, crimping etc. Certain beauty practices like trimming, using strong hair colour etc., impart sufficient damage to the hair.
-

**1.7 Hair oil**

Herbal formulations have lesser or no side effects than synthetic formulation, that's why they are more in demand in the market. Poly herbal hair oil is one of those. Natural elements are found in these hair oil which has number of beneficial effects. we have formulated poly herbal hair oil by using various plants like Bhringraj, Jatamansi, Rosemary, Garlic and different oils like coconut oil. Bhringraj is used for promoting hair growth and Anti-inflammatory action, Jatamansi are used for their anti-microbial activity, Rosemary is use for improving hair growth and stimulates hair follicles, Garlic is use for controlling scalp infection, improving circulation to the root. Coconut oil use for their protection against damage, giving smooth hair follicle and easily absorb in to the scalp.

**1.7.1 Requirements of herbal hair oil**

It must be fluently removed on irrigating with water.

It needs to go away the hair-dry, tender, and lustrous with precise manageability and minimum fly down. It must impart a pleasant smell to the hair.

It should not beget any side effects to the skin or eye.

**1.7.2 Why Polyherbal Hair Oil is required**

Polyherbal formulations combine the therapeutic potentials of multiple herbs, each offering unique properties that contribute synergistically to overall scalp and hair health. This integrated approach addresses not just the symptoms (e.g., hair fall or dandruff), but also the root causes, such as poor circulation, microbial infection, and follicular damage.

### 1.8 MARKETED PREPARATIONS

Several polyherbal hair oils are available in the Indian and global markets, reflecting a growing trend toward herbal cosmetics. Some widely used commercial products include:

Indulekha Bringha Hair Oil – A well-known Ayurvedic formulation containing bringharaj, amla, neem, and other herbs that promote hair growth and reduce hair fall.

Kesh King Ayurvedic Hair Oil – Contains a blend of 21 herbs including bhringraj, amla, brahmi, and jatamansi; marketed for hair fall control and rejuvenation.

Dabur Vatika Enriched Coconut Hair Oil – Enriched with herbal extracts like henna, lemon, amla, and others; helps in hair strengthening and dandruff control.

Trichup Herbal Hair Oil – Contains neem, bhringraj, and amla; known for reducing scalp infections and supporting healthy hair.

Himalaya Herbals Anti-Hair Fall Oil – Combines bhringaraj, amla, and fenugreek; commonly used for reducing hair fall and maintaining scalp health.

These products, while effective, may still include fragrances or preservatives. The proposed formulation aims to provide a completely natural, chemical-free alternative using potent herbs like Bhallataka and Ginger, which are less commonly included in marketed oils.

### 1.9 BENEFITS OF POLYHERBAL HAIR OIL

Using polyherbal hair oil offers numerous benefits due to the combined therapeutic properties of the herbs involved:

- Promotes natural hair growth by stimulating blood flow to the scalp.
- Strengthens hair from the root and reduces hair fall significantly.
- Prevents dandruff and dry scalp due to the antifungal and antibacterial activity of herbs like neem and eucalyptus.
- Nourishes the scalp and provides essential nutrients to the hair follicles.
- Prevents premature greying of hair by preserving the natural melanin content.
- Provides a soothing and cooling effect, relieving stress and scalp irritation.
- Enhances the natural shine, volume, and smoothness of the hair.
- Prevents breakage, split ends, and hair thinning.
- Acts as a natural conditioner, improving the texture and manageability of hair.
- 100% free from harmful chemicals, thus reducing risks of allergic reactions or long-term damage.

## 2. REVIEW OF LITERATURE

Literature review for undertaking the study was done by referring articles published in various national and international journals, official standard books and referring various websites on the internet.

1. **Kashyap Rakesh et al.,(2016)**The formulations were evaluated for skin irritation and for qualitative and quantitative growth of hair. the f1 formulation was found to be better. it showed promising results in hair growth, mean hair length and quantitative evaluation. the optimization of formulation showed that

semi carpus anacardium had more potential for hair growth and reduction in hair loss. from the results it can be concluded that semi carpus anacardium showed promising effects in qualitative, quantitative and mean hair length studies over standard oil and found to be effective remedy for hair growth and hair loss treatment.[3]

2. **Pk Jain et al.,(2012)**Drug that causes hair loss and promotes hair growth, international journal of research in pharmaceutical and biomedical sciences dec (2012). Hair loss is a common dermatological problem that can occur due to hereditary, hormonal, nutritional, medical, psychological, mechanical, and drug-related factors. Proper identification of the underlying cause is important for effective management of hair loss. The article highlights that maintaining proper nutrition, reducing stress, avoiding excessive heat, harsh chemicals, and tight hairstyles can help prevent hair damage and hair loss. Both synthetic drugs and herbal medicines have been explored for promoting hair growth. Several herbal plants such as Eclipta alba, Hibiscus rosa-sinensis, Phyllanthus emblica, Rosmarinus officinalis and Allium cepa have been reported to possess potential hair-growth-promoting activity. Therefore, herbal ingredients may provide useful alternatives or supportive approaches for managing hair loss and promoting healthy hair growth.[18]

3. **Lipi Purwal et al.,(2008)** Development and Evaluation of herbal formulations for hair growth, the results of general characteristics, physical and chemical evaluation are summarized, primary skin irritation test was conducted on intact skin of rabbits. all of the prepared formulations were not Showed any erythema and/or edema; this indicates that the prepared formulations were non-irritant on skin of rabbits. in hair growth initiation test the activity of various concentration of hair oil were recorded in terms of qualitative changes various biological parameters formed during treatment of oil with respect to normal untreated animals. this parameter is recorded for finding minimum effective concentration of drug. a7 & a8 (7% & 8% of amla powder) showed a significant increase of hair follicles with in 15d. both of this concentration showed growth initiation for hair follicle within 9 and 8. similarly b7 & b8 (7% & 8% of Brahmi powder) showed a significant increase in number of hair follicles up to 12 within 6d. along with this f7 &f8 (7% & 8% concentration of fenugreek) showed a significant increase in hair follicle 8 and 9 respectively in 9d. the oil containing m7 &m8 (7% & 8% concentration of Meetha neem) showed early irritation of hair growth follicle in 6d with 11 numbers.[1]

4. **Mahavir Chhajed et al.,(2020)**formulation development and evaluation of herbal hair oil for hair growth stimulating activity. international journal of pharmacy & life sciences (2020) from the present investigation it was found that the formulated herbal hair oil has optimum standards and further standardization and biological screening establishes the efficacy of formulated herbal hair oil.[5]

5. **Jain pk et al.,(2015)**Evaluating hair growth potential of some traditional herbs. Asian journal of pharmaceutical and clinical research (2015) in hair growth activity, the hair length of all groups. in group-1, group-2, group-3 and group-4, group-5, group-6 and the hair length was found to be 2.24,5.55,3.93 mm and 3.89,4.92,4.33 mm respectively. in this group-4 shows a very significant hair growth length wise as compared to control. the hair density of all groups in group-1, group-2, group-3 and group-4, group-5 and group-6, hair density was found to be 1195,2529,1887,1676,2657 and 1737 per cm2, respectively (group-4 have significant hair density as compared to control).[2]

6. **Pooja s. Banerjee et al.,(2009)**Preparation, evaluation and hair growth stimulating activity of herbal hair oil. journal of chemical and pharmaceutical research (2009) the hair growth studies that formulation OD3 has excellent potential to be developed as herbal alternative to minoxidil. The various constituents of the herbal extracts such as minerals and amino acids may be the cause for the significant hair growth

activity. All these drugs not only show remarkabla activity but are also devoid of potential side effects as compared to synthetic drugs.[6]

**7. Namrata Omhare et al.,(2019)**Evaluation of hair growth promoting activity of petroleum ether extracts of Hemidesmus indicus Linn. (seed) on wistar albino rats. Journal of drug delivery and therapeutics (2019) The plant Hemisdesmus indicus belonging to the family Apocyanacea were studied for its Pharmacognostical, physicochemical, phytochemical studies and hair growth promoting activity. Pharmacognostical studies of plant namely: macroscopy, microscopy is valuable source of information and provides suitable standards for the authentication of this plant material for future investigation. Determination of ash value is for detecting adulterated or lowgrade products, exhausted drugs and excess of earthy and sandy matter.The physicochemical parameter like ash value such as total ash was found to be w/w, acid insoluble ash was found to be w/w and water soluble ash was found to be %w/w. The total ash usually consists of carbonates, phosphates, silicates and silica which include both physiological ash (which is derived from the plant tissue itself) and non-physiological ash (which is residue of some adhering material to the plant surface, e.g., sand and soil). Acid insoluble ash gives the evidence of the presence of silica, especially sand and siliceous earth. Water soluble ash detects the presence of material that has been exhausted with water. The extractive value such as water soluble. extractive value was found to be %w/w and alcohol soluble extractive value was found to be %w/w. The extractive value determines the amount of active constituents in a given amount of medicinal plant material extracted with solvent. The moisture content was found to be %w/w. An excess of water in medicinal plant materials will lead to microbial growth, the presence of fungi or insect deterioration and following hydrolysis. Therefore, limits for the amount of water should be set for every given plant material. The extracts obtained by solvent extraction extraction were subjected to preliminary phytochemical analysis, which revealed the presence of beta sitosterol in seeds & root part of plant species.[17]

**8. Pranav D. Endait et al.,(2024)**Development and evaluation of poly-herbal hair serum. International journal of novel research and development (IJNRD) 5 may 2024. In conclusion, the formulation, development, and evaluation of the poly-herbal hair serum containing Grapeseed, Sweet Almond, and Argan oils, combined with Ylang-Ylang and Vitamin E oils, represent a significant advancement in natural hair care product innovation. Results have shown that herbal hair serum provides various essential nutrients needed to preserve the proper function of the sebaceous glands and support the growth of natural hair. Through comprehensive experimentation and analysis, we have Demonstrates the efficacy and potential of this poly-herbal serum in addressing diverse hair care needs. The serum exhibited favourable physicochemical properties, ensuring case of application diverse absorption without leaving a greasy residue. Moreover, its stability under various storage conditions underscores its suitability for practical use. Our evaluation revealed the serum's profound moisturizing effect on hair, impairing softness, smoothness, and improved manage ability. Without leaving a greasy residue. Moreover, its stability under various storage conditions underscores its suitability for practical use. Our evaluation revealed the serum's profound moisturizing effect on hair, impairing softness, smoothness, and improved manage ability. Additionally, the incorporation of Ylang-Ylang oil contributed to scalp health by regulating sebum production and promoting a balanced environment conductive to hair growth. Further more, the anti-oxidant properties of Vitamin E oil enhanced the serum's ability to protect hair from environment aggressors and oxidative stress, thereby promoting overall hair health and vitality. The positive user feedback and acceptability observed in our study underscore the promising

consumer appeal of this poly-herbal hair serum. Its natural composition, coupled with tangible benefits for hair and scalp health, positions it is a compelling option in the realm of botanical-based hair care products. Moving forward, further research endeavors could explore additional aspects such as long-term efficacy, compatibility with different hair types, and potential synergistic effects with other botanical extracts. Nonetheless, the findings of this study hold considerable promise for advancing the formulation of botanical-based hair care products, offering consumers effective, safe, and sustainable solutions for achieving healthy, beautiful hair.[16]

**9. Manu Bharti et al.,(2020)**A Review on hair growth regulator. Journal of drug delivery and therapeutics 2020. In the current article, an endaevour has been made to natural alternative for the treatment of male pattern baldness. Male pattern baldness is a typical and consistently expanding issue in beauty care products just as essential social insurance practice. Male pattern baldness happens because of different explanation referenced right now. Many will take a stab at everything without exception to bring back their looks. Male pattern baldness sufferes bum though billion of dollor every year on cures running from drugs, nutrients to unique tonics and shampoos. Minoxidil and Finasteride are the main two medication affirmed by the FDA for hair development for n men. Minoxidil is the main medication accessible for ladies with androgenetic alopecia. Other than having hair development advancement impact, treatment with the manufactured medication has gotten flawed because of their intermittent absence of viability, security and latent capacity symptom. This has prompted increment enthusiasm for elective cures, for example, homegrown medication. Natural medications give another upheaval to hair development. Right now, condensed a portion of the herbs that are accepted to diminish the pace of male pattern baldness and simultaneously invigorate new hair development, and went along the disengaged phytoconstituents for example Piperine, 3,4-dihydroxy benzaldehyde, polyporusterone, acetosyringe, capsaicin, epigallocathechin-3-gallate, procyanidin B-2, B-3, proanthocyanidins, soyasaponin, kaikasaponin, norgalanthamine, senegin, jatmansic corrosive, ginsenosides Ro, hinokitiol from different plants remove that are additionally accepted to diminish the pace of male pattern baldness. This article additionally spread the component like inhibition of 5 reductase type II protein, DHT receptor blockage, diminished degree Od DHT, supply supplements, expanded blood supply, follicular expansion and prolongation of anagen stage, and fragrant, healing by which a few plants extract and phytoconstituents hinder the male pattern baldness or advance hair development. Finally, it is inferred that a lion's share of hair development, advancement examines was performed with planta and their concentrates in the creature's models. In any case, there has been a hole between these exploration and clinical preliminaries, progressively logical confirmations and documentation are attractive for the advancement of natural treatment to male pattern baldness which must be proved by dependable clinical preliminaries with institutionalized material and definition. The audit may encourage the case reason for normal solutions for the troubling and upsetting issue of balding to world network.[15]

**10. Sneha Gupta et al.,(2025)** Formulation and evaluation of poly-herbal oil for hair growth. Journal of pharmacognosy and phytochemistry 2025. The plants Murray koenigii, Allium sativum, Emblica oficinalis, Trigonella foenum graecum with stands a number of tests of evaluation regarding their preparation. In this research all the parameter shows that they are present within limit of standard value. This research shows minimal or no side effects. Small group of volunteers has used this poly herbal hair oil and found out found out that no irritation shows to the scalp or skin. Neem is added which is act as preservative and antidandruff. Curry leaves having antioxidant property, strengthening the hair. Amla stimulates hair growth. Coconut oil moisturizes dry hair, for its cooling activities it can be used in

headache. Since all the ingredients have beneficial effect so it assure its efficacy as well as advantages like promote hair growth, provide strength to the scalp, remove dandruff, moisturize hair etc. Both organoleptic and c Both organoleptic and physico chemical assessment done in order to find out is it close to standard or not. Ph of poly herbal hair oil should be between 4-6, mean while Ph was checked and found to be 4.00. Acid value measured at 1.96mg/KOH, which is under mg/KOH, however our value was found to be 197.56. Specific gravity was found to be 0.932 which is under standard scale. Irritation test also done in short group of valunteers and revealing no significant irritant effect. [14]

**11. Miss. Tisha Patel et al.,(2025)** Formulation & evaluation of poly herbal scalp hair growth serum. International journal of novel trends and innovation Volume 3 issue 4-4-2025. Herbal scalp hair growth serum, formulated with Hibiscus, Aloe vera and Flaxseeds extracts, offers a natural and effective solution for promoting healthier, stronger hair, strengthen the hair follicles and improve overall hair health. The formulation ensures that the serum is free from harsh chemicals, making it suitable for all hair types, including sensitive scalp. Evaluation of the formulated scalp hair serum were performed and it was found that the formulation was prepared successfully. On the basis of tests, it was concluded that the optimum storage condition is at room temperature. From the all three batches. Regular use of these herbal hair serum helps to reduce hair fall and shinier hair, and maintain scalp hydration. With its nutrient-rich composition, it supports long term hair growth while protecting against environmental damage. This hair serum is an excellent addition to a hair care routine for those seeking a natural and sustainable solution for stronger and healthier hair.[13]

**12. Dhanashree V Darade et al.,(2023)**A review on formulation and evaluation of herbal hair oil. GSC Biological and Pharmaceutical sciences. Universal, Herbal oil that are formulated offers numerous essential nutrients required to keep everyday feature of sebaceous glands and promotes natural hair growth. Hair values including vitamins, minerals and important oils finished products are inside the limits. Some ingredients are commonly used in formulation ofherbal hair oil like Coconut oil, Till oil, Almond oil, Hibiscus, Jasmine, etc.The natural extract and ingredients chosen for the method of hair oil had been suggested to have hair thickening and hair fall manipulate homes which while used together licited a synergistic effect in selling healthy and vivid hair increase. The usage of one of a kind herbal substance that is having one-of-kind blessings. The method become demonstrated to be secure for human use, formula turned into done and evaluated with the aid various parameter like Ph, organoleptic properties (colour, odour, sensitivity, sedimentation, and cost, precise gravity and balance take a look at. At closing it could be concluded that the natural hair oil formulations have sizeable first-class.[9]

**13. Mr Amley S ingole et al.,(2025)** Formulation and evaluation of Polyherbal hair oil. International journal of engineering development and research. Volume 13 issue May 2025. The formulated polyherbal hair oil successfully combined the beneficial properties of traditional herbs known for hair nourishment and scalp health. The product demonstrated desirable physicochemical characteristics and microbial safety, indicating its potential as a natural alternative to synthetics hair oils. This herbal hair oil van be recommended for promoting hair growth, reducing hair fall, controlling dandruff, and maintaining overall scalp health. Further clinical studies and long-term stability testing are necessary to validate is therapeutic efficacy and shelf-life. Overall, the polyherbal hair oil presents a promising, effective, and consumer-friendly formulation for natural hair care, aligning well with the increasing demand for herbal and safe cosmetic product.[12]

**14. Lavanya Ch et al.,(2019)**Conducted a study entitled “Preparation and Evaluation of Poly Herbal Hair Oil”, published in the Journal of Drug Delivery and Therapeutics, 2019; 9(1):68–73. The article was

available online on 15 January 2019.In general, the herbal formulation provides good blend of vitamins, antioxidants, terpenoids, and essential oils. All the values in the evaluation of finished product showed that they are within the acceptable limits. Hence, it is concluded that the oil is beneficial in maintaining good growth of hairs, turning grey hairs to black, providing protection from dandruff and results in lustrous looking hairs.[4]

**15. Hossain et al.,(2024)** Conducted a study entitled "Design and Evaluation of Hair Growth–Hair Fall Oil Formulation from Botanicals," published in the Bangladesh Pharmaceutical Journal, volume 27, issue 1, pages 9–18, in January 2024. The Essential oils have gained significant interest and popularity among the increasing demand for herbal cosmetics in the market as they offer a range of potential benefits for the skin and hair. As hair fall is very common in Bangladesh, the project intended to find a fairly sustainable solution causing minimal side effects. The present study showed that the formulated HG-HF oil containing castor oil, black seed oil, sunflower oil, jojoba oil, olive oil, pumpkin seed oil as key ingredients provided numerous nourishing benefits to the hair and could be a safe alternative to improve hair growth and mitigate hair fall. As there were no adverse events associated with the study, it can be assumed that the test product is safe to apply topically.[10]

**16. Jadhav A.K et al., (2019)** conducted a study entitled "Formulation and Evaluation of Polyherbal Hair Oil." The study was published in the International Journal of Science and Research (IJSR), Volume 8, Issue 10, October 2019.The main aim was to formulated polyherbal hair oil will improve and strengthen the hair by proper nourishment and other problems like dryness. It was concluded that the herbal hair oil containing ingredients such as Triphala, Licorice, Aloe vera, Shankpushpi, Ashwagandha, Bhringaraj, Jatamansi, Nirgundi, Shatavari, Lavender and Pudina etc. This polyherbal hair oil was prepared by grinded in the mixture and mixed in 63% of til oil. The above content was boiled for 15 min. and was filtered through muslin cloth. Aloe vera gives reducing dandruff. The prepared herbal hair oil was evaluated by using evaluation test which shows satisfactory results. It was concluded that formulated Polyherbal Hair Oil having good hair nourishing property.[8]

**17. Gajula Meghamala et al.,(2024)** Conducted a study entitled "Formulation Development and Evaluation Natural Hair Oil." The study was published in the World Journal of Pharmacy and Pharmaceutical Sciences, Volume 13, Issue 7, 2024, pages 1006–1016. The article was received on 16 May 2024, revised on 06 June 2024 and accepted on 26 June 2024.Overall, the herbal oil has several benefits for hair nutrition, including vitamins, minerals, and essential oils. Finally Natural oil helps to protect hair against pollution and dull hair related damage and loss.[11]

**18. X. Fatima Grace et al.,(2014)**Conducted a study entitled "Preparation and Evaluation of Polyherbal Hair Oil", published in the International Journal of Pharmaceutical Chemistry and Analysis, Vol. 1, No. 1, October 2014.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 good growth of hair, turning grey hair to black, protects from dandruff and results in lustrous looking hair.[7]

## 3. AIM AND OBJECTIVES

### AIM

To develop and evaluate a polyherbal hair oil formulation using selected herbal ingredients for effective hair regrowth and improvement of overall hair health.

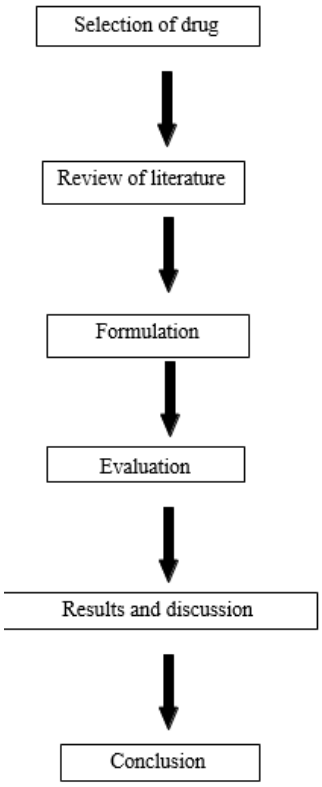
### OBJECTIVES

- To develop a natural polyherbal hair oil formulation using selected medicinal plant extracts known

for their hair health benefits.

- To extract active phytoconstituents from each herb through suitable methods to ensure maximum therapeutic efficacy.
- To evaluate the physicochemical characteristics of the formulated hair oil such as PH, viscosity, refractive index, and stability.
- To assess the efficacy of the hair oil through parameters like reduction in hair fall, dandruff control, and improvement in hair texture.
- To conduct organoleptic and stability studies to ensure the quality and shelf-life of the prepared formulation.
- To compare the developed polyherbal hair oil with commercially available marketed preparations in terms of composition and possible effectiveness.
- To provide a safe, cost-effective, and eco-friendly alternative to chemically synthesized hair care products.

## 4. PLAN OF WORK




## 5. MATERIALS AND METHODS

### 5.1 Collection of Plant Materials

collection of material is the first step in the preparation of herbal hair oil.it involves selecting good quality, fresh and authentic plant material such as

5.1.1 Bhringraj (Eclipta alba)

5.1.2 Jatamansi (Nardostachy's Jatamansi)

5.1.3 Rosemary (Rosmarinus officinalis )

5.1.4 Neem (Azadirachta indica)
5.1.5 Turmeric (Curcuma longa)
5.1.6 Camphor (Cinnamomum camphora)
5.1.7 Garlic (Allium sativum)
5.1.8 Coconut oil (Cocus nucifera)

These selected ingredients are not only locally available and economically viable but also have scientifically proven properties in promoting hair growth and treating scalp issues.

These various ingredients were purchased from wellknown supplier from local tumkur market indore.the collected crude seeds were identified and authenticated on the basis of macroscopic and microscopic characters at the department of Botony, Government agriculture college,indore; vocher specimens scope pharmacognosy 344 have seen deposited at the herbarium of the department of pharmacognosy of the college for further reference.

The materials should be collected at the proper stage of growth to ensure maximum active constituents. After collection, The material are cleaned to remove dust and impurities then dried under shade to prevent microbial growth, proper collection ensures purity, quality and effectiveness of the final hair oil preparation.

### 1.1.1 Bhringraj

**Synonym:** *False Daisy, Bhangra, Kesharaja.*

**Botanical Name:** *Eclipta alba.*

**Family:** *Asteraceae.*

**Active constituents:** mainly coumestans like Wedelolactone and Demethyl wedelolactone triterpenenoid saponins like Eclipta alba saponins Flavanoids like luteolin and apigenin, Alkoloids like ecliptine and verazine and sterols stighmasterol.

**Pharmacological actions:**Hair growth promoting action Anti-alopecia action and Anti-inflammatory action

**Role in formulation:**

- Stimulates hair growth
- Nourishes the scalp
- Prevents hair fall



**Figure No 4: Bhringraj**

### 1.1.2 Jatamansi

**Synonym:** *Indian Spikenard, Muskroot.*

**Botanical Name:** *Nardostachys Jatamansi.*

**Family:** *Caprifoliaceae.*

**Active constituents:** Volatile oil, sesquiterpenes, coumarins, alkaloids and flavonoids mainly

jatamansone, valeranoned nardostachone, jatamansic acid , nardol, nardal, patchouli alcohol calarene.
**Pharmacological action:** Hair growth promoting action Anti-inflammatory action Anti-microbial action
**Role in formulations:**
Promotes hair growth
Prevents hair fall



**Figure No 5: Jatamansi**

### 1.1.3 Rosemary

**Synonym:** *Rusmari, Rosmarin.*
**Botanical Name:** *Salvia Rosmarinus.*
**Family:** *Lamiaceae.*
**Active ingredients:** phenolic acid and diterpenes, volatile oil and flavonoids mainly Rosmarinic acid,carnosic acid, carnosol, ursolic and betulinic acid, cineole, camphor, alpha abd beta pinene Luteolin and apigenin.
**Pharmacological action:** Hair growth stimulant Anti-oxidant,Antimicrobial.
**Role in formulation:**
Stimulate hair follicles
Improves hair growth
Prevents hair thinning



**Figure No 6: Rosemary**

### 1.1.4 Turmeric

**Synonym:***Turmeric, Haldi*
**Botanical Name:***Curcuma Longa L*
**Family:***Zingiberaceae (Ginger Family)*

**Active constituents:** Volatile oil, Proteins, carbohydrates, polyphenols and minerals, sterols, triterpenoids, and alkaloids
Curcumin I,II and III, desmethoxycurcumin, curcuminoids Sesquiterpenes like alpha and beta turmerone
**Pharmacological action:**
Anti-inflammatory, Antimicrobial and antioxidant
**Role in formulation:**
1. Reduce scalp inflammation
2. Treats dandruff
3. Improve scalp health



**Figure No 7:Turmeric**

### 1.1.5 Camphor

**Synonyms:** *Karpura*
**Botanical name:***Laurus camphora L*
**Family:** *Lauraceae*
**Active constituents:** bicyclic monoterpene ketone Trimethyl bicycloheptan-2-one
**Pharmacological action**
Anti-microbial, Anti-inflammatory and Cooling agent
**Role in formulation:**
1. Improves blood circulation in scalp
2. Reduces dandruff
3. Relieves scalp irritation



**Figure No 8:Camphor**

### 1.1.6 Garlic

**Synonyms**: *Lashuna, Rasona, Mugdhagandha***, Botanical name:***Allium controversum* Schrad. **Family**: *Amaryllidaceae*

**Active constituents:** proteins and amino acids, carbohydrates, water, fiber and organosulphur compounds like Allicin, alliin, sulphide and poly sulphides.Italso contains steroidal saponins , flavonoids, Vitamins polysaccharides and minerals.

**Pharmacological action:**

Anti-microbial, Anti-oxidant, Anti- inflammatory

**Role in formulation:**

- Promotes hair growth
- Strengthens hair roots



**Figure No 9:Garlic**

### 1.1.7 Coconut oil Synonyms:*Narikela, Narikelah.* Botanical name: *Cocos nucifera* L Family: *Aceraceae*

**Active constituents:** Triglycerides esters of saturated and unsaturated fatty acids mainly Lauric acid, capric acid, caprylic acid, oleic acid, stearic acid, caproic acid, linoleic acid and palmitic acid.

**Pharmacological action:**

Moisturizing, Anti-oxidant, Anti-microbial

**Role in formulation:**

- Nourishes hair
- Strengthens hair roots
- prevents hair breakage



**Figure No 10: Coconut oil**

### 1.1.8 Neem

**Synonyms:** *Melia azadirachta* L., *Antelaea azadirachta* (L.)

**Botanical name** *Azadirachta indica*.

**Family:** *Meliaceae*

**Active constituents:** Triterpenoids like Azadirachtin Nimbin, Nimbidin and salanin It also contains quercetin and beta sitosterol Margolone and margolonone.

**Pharmacological action:**

Anti-fungal, Antibacterial, Anti-inflammatory

**Role in formulation:**

1. Helps treat dandruff
2. Reduces scalp infections
3. Relieves itching and promote healthy hair growth



**Figure No 11: Neem**

### 5.2 METHOD OF PREPARATION

**Table No 1: Formulation table**

| Sl no | Ingredients | Quantity | Functions |
|---|---|---|---|
| 1 | Bhringraj leaves | 7.25g | Stimulates hair follicle |
| 2 | Jatamansi | 4g | Improve blood circulation to scalp |
| 3 | Rosemary leaves | 2.6g | Support hair regrowth |
| 4 | Neem | 2g | Reduce scalp infections |
| 5 | Turmeric | 2g | Maintain healthy scalp |
| 6 | Camphor | 2g | Providing cooling effect to scalp |
| 7 | Garlic | 3g | Strengthens hair roots |
| 8 | Coconut oil | 250ml | Hair growth |

### 5.3 Extraction procedure for herbal drugs

#### 5.3.1 Rosemary Leaves (Using Soxhlet apparatus)

Dry and crush rosemary leaves into a fine powder

⬇

mixed with ethanol as a solvent Reflux for 2 hours in Soxhlet

⬇

Pass the mixture through a filter to remove solid plant debris evaporated to remove the solvent

Dry the rosemary extract

Dried powdered form of extract is then mixed with the formulation




**Figure No 12: Extraction of rosemary**

### 5.3.2 Bhringraj (Using Soxhlet apparatus)

Dry the bhringraj powder for about 2hrs

Dried bhringraj powder is subjected to soxhlet apparatus and reflux for 3 hours using 200ml of methanol

The methanolic extract is evaporated to dryness

And the dried powdered extract of bhringraj is mixed with the formulation



**Figure No 13: Extraction of Bhringaraj**

### 5.3.3 Jatamansi (Using Soxhlet apparatus)

Dry and crush the jatamansi root into a conical flask Mixed with ethanol as a solvent

cover the flask tightly and allow it for 24hrs

Shaking periodically to maximize compound | Filter the mixture with whatman no.1

Liquid extract was separated from solid powder residue

Evaporate using rotary evaporator under controlled pressure

⬇

Concentrated crude extract is obtained

⬇

Dry the concentrated extract in vaccum dryer and resin is obtained



**Figure No 14: Extraction of Jatamansi**

**5.4**

**5.5 Procedure for polyherbal hair oil**

The different dried powdered form of herbal plant extracts which are obtained through Soxhlet extraction and maceration methods were mixed individually in coconut oil with constant stirring in hot condition. Then remaining herbs including neem, turmeric, garlic, camphor in their crude form also added in the hot oil with constant stirring for 15 minutes.

Then cool the mixture and filter, and the filtrate will be subjected to evaluation.



**Figure No 15: Prepared polyherbal hair oil**

**5.6 Detection of herbal drugs by TLC**

**5.6.1 Detection of Rosmarinic acid by TLC**

**Mobile Phase**: Ethyl acetate: Formic acid: Acetic acid: Water

**Ratio:** 10:11: 11 : 27

**Detecting reagent:** Poly ethylene glycol reagent

**Detection:** Yellowish brown was observed

**Rf value:**

Rf=Distance travelled by solute/Distance travelled by solvent Rf value of rosmerinic acid

= 4.9/5.7

=0.85



**Figure No 16: TLC of rosemary**

**5.6.2 Detection of Bhringraj extract by TLC**

**Mobile Phase**: Toluene: Ethyl acetate : Acetone: Formic acid

**Ratio:** 6:2 : 1 :1

**Detecting reagent:** Vanillin-Sulphuric acid reagent

**Detection:** Purple color bands was observed

**Rf Value:**

Rf=3.3/4.7=0.70

=2.8/4.7=0.59 (major)

=1.4/4.7=0.29

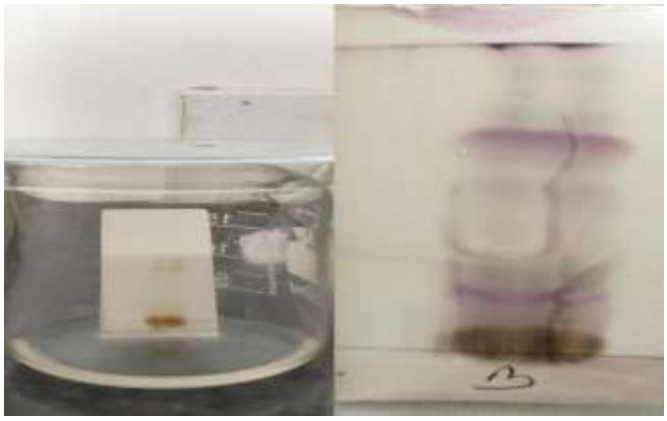


**Figure No 17: TLC of Bhringaraj**

**5.6.3 Detection of Jatamansi extract by TLC Mobile Phase**: Toluene: Ethyl acetate: Acetic acid

**Ratio:** 9 :1 :2

**Detecting reagent:** Vanillin-Sulphuric acid reagent

**Detection:** Purple color bands was observed

**Rf value:**

Rf=4.3/4.5=0.95

=1.9/4.5=0.42 (major)

=0.3/4.5=0.06



**Figure No 18: TLC of jatamansi**

### 5.7 Evaluation Parameters of Prepared Herbal Hair Oil

The prepared formulation were evaluated for Organoleptic evaluation, pH determination, Viscosity, Acid base titration, Stability Study, Skin irritation test.

- Organoleptic evaluation
- pH determination
- Viscosity
- Acid base titration
- Stability Study
- Skin irritation test

#### 5.7.1 Organoleptic evaluation

The prepared poly herbal hair oil was evaluated for organoleptic characteristics including colour, odour, appearance, texture and viscosity.

A small amount of the formulation was taken in a clean glass container and observed visually under normal light to note the colour and appearance.

The odour was evaluated by gentle smelling of the sample.

The texture and viscosity were assessed by rubbing a small quantity of oil between the fingers to check smoothness and flow behaviour.

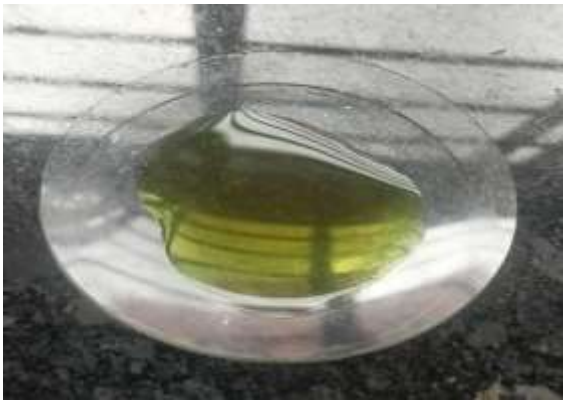


**Figure No 19: Organoleptic evaluation**

#### 5.7.2 PH determination

Take a small quantity of the prepared polyherbal hair oil in a clean beaker. Dip the pH paper directly into the hair oil.

Observe any colour change on the pH paper.

Compare the colour with the standard pH colour chart and record the observation.

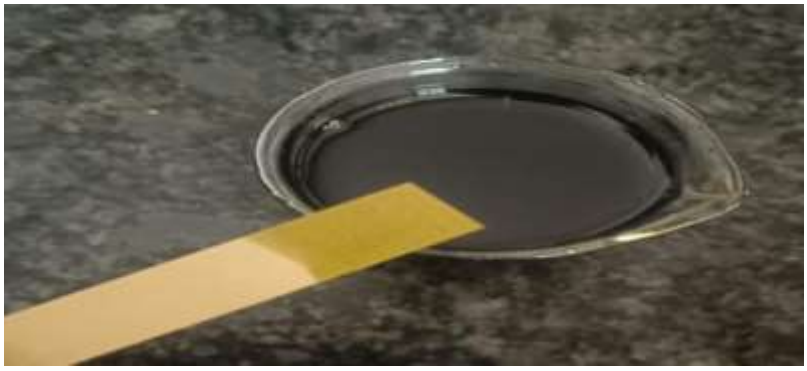


**Figure No 20: pH determination**

### 5.7.3 Viscosity

The sample was allowed to flow between the two marked points of the viscometer.
The time taken for the oil to flow between the two marks was recorded using a stopwatch.
The procedure was repeated to obtain accurate and consistent readings.
The viscosity was calculated by comparing the flow time of the sample with that of distilled water at the same temperature.

1. Measured using viscometer
2. Ensures proper consistency and easy application.



**Figure No 21: Viscosity**

### 5.7.4 Acid Value Determination

A known quantity of the oil sample was accurately weighed and taken in a conical flask.
The sample was dissolved in a suitable solvent mixture (ethanol and ether in equal ratio).
A few drops of phenolphthalein indicator were added to the solution.
The mixture was titrated against standard alkali solution (0.1 N KOH) with constant shaking.
The end point was observed as a persistent pale pink colour.



**Figure No 22: Acid Value Determination**

### 5.7.5 Stability Study

The prepared polyherbal hair oil was stored in clean, airtight containers.
The samples were kept under different storage conditions (room temperature and elevated temperature).
The formulation was observed at regular time intervals.
Physical parameters such as colour, odour, appearance, and consistency were checked.
The sample was examined for any signs of phase separation, precipitation, or turbidity.
The stability of the formulation was assessed based on the absence of significant physical changes during the study period.



**Figure No 23: Stability study**

### 5.7.6 Skin Irritation Test

Apply small amount on skin
Observe for irritation, redness, or itching No irritation indicates safe for use



**Figure No 24: Skin irritation test**

## 6. RESULTS AND DISCUSSION

The present study was carried out to develop and evaluate a polyherbal hair oil using selected herbal ingredients such as Bhringraj, Jatamansi, Rosemary, Turmeric, Camphor, Garlic and Coconut oil. These ingredients were selected based on their reported hair growth promoting, antioxidant, antimicrobial, anti-inflammatory and nourishing properties. The formulation was prepared using suitable extraction methods followed by incorporation of the extracts into coconut oil. The prepared polyherbal hair oil was evaluated for various quality parameters including organoleptic properties, pH, viscosity, specific gravity, acid value, saponification value, phytochemical screening by TLC, stability and skin irritation test. These parameters are important for assessing the quality, consistency, safety and suitability of the prepared formulation.

The phytochemical screening of selected extracts was performed by Thin Layer Chromatography (TLC). Ethanolic extracts of Jatamansi, Rosemary and Bhringraj were subjected to TLC for preliminary identification of phytoconstituents. Different spots were observed and Rf values were calculated, indicating the presence of different constituents in the respective extracts.The stability study was carried out by storing the prepared hair oil under different conditions and observing the formulation at regular intervals. Colour, odour, appearance, consistency, phase separation, precipitation and turbidity were monitored. The absence of significant physical changes indicates satisfactory physical stability of the formulation during the study period.

The skin irritation test was performed by applying a small amount of the formulation on the skin and observing for redness, itching or irritation. The absence of irritation indicates that the prepared formulation was well tolerated under the conditions of the test.Overall, the findings of the evaluation suggest that the developed polyherbal hair oil possesses acceptable physical characteristics, preliminary phytochemical constituents, satisfactory stability and good skin compatibility. The combined properties of the selected herbal ingredients may provide beneficial effects for maintaining scalp health and supporting healthy hair growth.

**Organoleptic evaluation**

The prepared polyhedral hair oil was evaluated for organoleptic characteristics including colour, odour, appearance, texture and viscosity.

**Table No 2: Organoleptic evaluation**

| Sl No | Organoleptic evaluation | Formulation |
|---|---|---|
| 1 | Colour | Light greenish |
| 2 | Odour | Pleasant |

| | | |
|---|---|---|
| 3 | Appearance | Clear |
| 4 | Texture | Smooth |

**pH Determination:**

One millilitre of the oil sample was dissolved in 10 mL of distilled water and the pH was measured using a calibrated digital pH meter.

**Table No 3: pH Determination**

| Sl No | pH Determination | Formulation |
|---|---|---|
| 1 | pH | 6.2 |

**Viscosity Determination:**

The viscosity of the formulation was determined using an Ostwald viscometer by measuring the flow time of the oil sample.

**Table No 4: Viscosity Determination**

| Sl No | Viscosity Determination | Formulation |
|---|---|---|
| 1 | Viscosity | Moderate |

**Acid Value Determination:**

The oil sample was titrated against 0.1 N potassium hydroxide (KOH) solution using phenolphthalein as an indicator until a pale pink endpoint was obtained.

**Table No 5: Acid Value Determination**

| Sl No | Acid Value Determination | Formulation |
|---|---|---|
| 1 | Acid value | 1.5 |

**Stability Study**

The optimized formulation (F2) was subjected to stability studies for a period of one month. The formulation was evaluated for various parameters such as colour, odour, appearance, pH and viscosity before and after the storage period.

No significant changes were observed in any of the evaluated parameters.

**Table No 6: Stability Study**

| Time point | Parameter | Observation |
|---|---|---|
| Initial | Colour | Light greenish |
| | Odour | Pleasant |
| | Appearance | Clear |
| | pH | 6.2 |
| | Viscosity | Moderate |

| | | |
|---|---|---|
| **After 48hours** | Colour | No significant change |
| | Odour | No significant change |
| | Appearance | No significant change |
| | pH | No significant change |
| | Viscosity | No significant change |




**Figure No 25: Prepared and Labelled polyherbal hair oil**

## 7. CONCLUSION

The present study successfully focused on the development and evaluation of a polyherbal hair oil containing Bhringraj, Jatamansi, Rosemary, Turmeric, Camphor, Garlic and Coconut oil. The selected herbal ingredients possess various beneficial properties such as hair growth promoting, antioxidant, antimicrobial, anti-inflammatory and nourishing activities.

The prepared formulation was evaluated using different parameters including organoleptic properties, physicochemical parameters, viscosity, specific gravity, acid value, saponification value, TLC, stability study and skin irritation test. These evaluations helped to assess the quality, consistency, stability and safety of the prepared polyherbal hair oil.

The TLC study provided preliminary evidence for the presence of phytoconstituents in Jatamansi, Rosemary and Bhringraj extracts. The stability study showed that the formulation could maintain its physical characteristics under the tested storage conditions. The skin irritation test indicated good skin compatibility under the test conditions.

Thus, the developed polyherbal hair oil can be considered a promising herbal formulation for maintaining scalp health and supporting healthy hair growth. However, further studies such as detailed phytochemical analysis, biological studies, long-term stability studies and clinical evaluation are required to establish its hair regrowth efficacy and safety conclusively.

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