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# FORMULATION AND EVALUATION OF HERBAL ANTI-DANDRUFF SHAMPOO

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## ABSTRACT

Dandruff is one of the most common scalp disorders affecting individuals of all age groups and is often associated with itching, scalp irritation, and hair fall. The present study was undertaken to formulate and evaluate a herbal anti-dandruff shampoo using natural ingredients such as fenugreek seeds (*Trigonella foenum-graecum*), curry leaves (*Murraya koenigii*), and neem leaves (*Azadirachta indica*), which are traditionally known for their antimicrobial, antifungal, and hair-nourishing properties. Three different shampoo formulations were prepared by incorporating individual herbal extracts into a shampoo base containing sodium lauryl sulfate, acacia, glycerin, gelatin, and lavender oil. The prepared formulations were evaluated for various physicochemical parameters including appearance, pH, foamability, foam stability, dirt dispersion, cleansing action, solid content, microbial examination, skin irritation, and stability studies. The results revealed that all formulations exhibited acceptable physical characteristics with pleasant odor, smooth texture, good foaming ability, and satisfactory cleansing action. The pH values ranged between 5.0 and 5.7, which is suitable for scalp application. Among the formulations, the curry leaf extract shampoo showed superior dirt dispersion and cleansing performance. Stability studies indicated that all formulations remained stable under storage conditions without significant changes in appearance or performance. Skin irritation studies confirmed that the shampoos were non-irritant and safe for topical use. The herbal ingredients contributed significantly to dandruff reduction, scalp nourishment, and improvement of overall hair health. The study concludes that the formulated herbal anti-dandruff shampoo is a safe, effective, and economical alternative to synthetic shampoos. The combination of natural herbal extracts offers promising anti-dandruff activity with minimal side effects and has potential for further development as a commercial herbal hair care product.

**KEYWORDS:** Herbal Shampoo, Anti-Dandruff, Fenugreek Seeds, Curry Leaves, Neem Leaves, Hair Care, Herbal Cosmetics, Scalp Health, Shampoo Evaluation, Natural Products.

## INTRODUCTION

Hair play an important role in enhancing the appearance and personality of an individual. Healthy hair is often associated with good hygiene and overall well-being. However, various scalp disorders such as dandruff, itching, dryness, and hair fall can adversely affect hair health. Among these disorders, dandruff is one of the most common conditions affecting people of all age groups. It is characterized by excessive shedding of dead skin cells from the scalp, often accompanied by itching, irritation, and inflammation. The condition is primarily associated with the proliferation of fungi such as *Malassezia* species and may be aggravated by environmental, hormonal, and lifestyle factors.

Shampoo is the most widely used cosmetic preparation for cleansing the hair and scalp. Conventional anti-dandruff shampoos contain synthetic chemicals such as

zinc pyrithione, selenium sulfide, ketoconazole, and coal tar. Although these agents are effective in controlling dandruff, their prolonged use may lead to undesirable effects such as scalp irritation, dryness, hair damage, and allergic reactions. Therefore, there is an increasing demand for herbal cosmetic products that are safer, eco-friendly, and free from harmful synthetic chemicals.

Herbal shampoos are formulations prepared using natural plant extracts possessing cleansing, conditioning, antimicrobial, and anti-dandruff properties. Herbal ingredients have been traditionally used in Ayurvedic and folk medicine for maintaining healthy hair and scalp. These natural products are generally considered safer and exhibit fewer side effects compared to synthetic preparations.

In the present study, fenugreek seeds (*Trigonella foenum-graecum*), curry leaves (*Murraya koenigii*), and neem leaves (*Azadirachta indica*) were selected as the major herbal ingredients. Fenugreek seeds are rich in proteins, vitamins, and saponins that help strengthen hair follicles, reduce hair fall, and combat dandruff. Curry leaves contain antioxidants, amino acids, and essential nutrients that nourish the scalp and promote healthy hair growth. Neem leaves possess potent antifungal, antibacterial, and anti-inflammatory properties that help control dandruff-causing microorganisms and improve scalp health.

The aim of this project was to formulate and evaluate an herbal anti-dandruff shampoo using these herbal extracts. The prepared formulations were subjected to various physicochemical and performance evaluation tests, including pH determination, foamability, foam stability, cleansing action, dirt dispersion, microbial examination, skin irritation testing, and stability studies. The study was undertaken to develop a safe, effective, and economical herbal shampoo capable of reducing dandruff while maintaining the health and appearance of hair.

The growing preference for herbal products in personal care has encouraged the development of innovative formulations utilizing medicinal plants. Herbal anti-dandruff shampoos not only provide effective cleansing and dandruff control but also contribute to scalp nourishment and hair conditioning. Therefore, the development of a herbal shampoo formulation offers a promising alternative to synthetic anti-dandruff products and supports the use of natural resources in cosmetic preparations.

**HERBAL INGREDIENTS**

**1. Fenugreek seed extract**

**Fig. No. 01 Fenugreek seed extract.**

**a) Biological source:** Methi consists of dried ripe seeds of Trigonella foenum-graecum

**b) Family:** Leguminaceae

**c) Synonyms:** Methi, Methika, Chandrika

**d) Geographical source:** The plant grows wild In Northern India and is cultivated as a crop throughout India. It is also cultivated in Southern and Eastern Europe, Pakistan, France, Morocco and Egypt.

**e) Role in hair care**

- ✓ Fenugreek seed extract promotes hair growth and reduces hair loss.
- ✓ It strengthens hair follicles and prevents breakage.
- ✓ Fenugreek seed extract helps to combat dandruff and soothe the scalp.

It adds shine and luster to the hair.

**2. Curry leaves extract**

**Fig. NO. 02 Curry leaves extract.**

a. **Biological source:** Curry leaves are derived from the curry tree (Murraya koenigii)
b. **Family:** Rutaceae
c. **Synonym:** sweet neem leaves, kadi patta
d. **Geographical source:** Curry leaves are widely cultivated and used in various cuisines throughout the Indian subcontinent, as well as in Southeast Asian countries such as Sri Lanka, Thailand, and Malaysia. They are also grown in other tropical and subtropical regions around the world.

e. **Role in hair care**

- ✓ Curry leaves are believed to help in reducing hair fall and promoting hair growth.
- ✓ They are known for their antioxidant properties, which can help in preventing premature graying of hair.
- ✓ Curry leaves can be used in hair masks or as an ingredient in hair oils to nourish and strengthen the hair follicles.

**2. Neem leaves extract**

**Fig. NO. 03: Neem leaves extract.**

a. **Biological source:** Neem leaves are derived from the neem tree (Azadirachta indica), an evergreen tree native to the Indian subcontinent.
a. **Family:** Meliaceae
b. **Synonym:** "Indian lilac" or "nimba"
c. **Geographical source:** Neem trees are primarily found in India, Pakistan, Bangladesh, and Nepal. However, they are also cultivated in other tropical and subtropical regions worldwide, including parts of Africa, Southeast Asia, and Australia.

d. **Role in hair care**

- ✓ Neem leaves have antifungal and antibacterial properties that can help in treating scalp infections and dandruff.
- ✓ They are known for their ability to nourish and condition the scalp, promoting healthy hair growth.
- ✓ Neem leaves can be used in hair masks or rinses to improve the overall health and luster of the hair.

## MATERIALS AND METHODS

For 15 ml of shampoo

**Table No. 01: Formulation Table Fenugreek seed exctract.**

| SR. NO. | Material | Qunatity |
|---|---|---|
| 1. | Fenugreek seed exctract | 3 ml |
| 2. | Sodium lauryl sulphate (7.5% sol) | 3 ml |
| 3. | Nacl (0.1M) | 3ml |
| 4. | Acacia | 1.5 gm |
| 5. | Glycerin | 0.3 ml |
| 6. | Vit. E capsule | 1 capsule |
| 7. | Gelatin | q.s |
| 8. | Water | 3.3 ml |
| 9. | Lavender oil | q.s |

**Table No. 02: Formulation Table Curry leaves exctract.**

| SR. NO. | Material | Qunatity |
|---|---|---|
| 1. | Curry leaves exctract | 3 ml |
| 2. | Sodium lauryl sulphate (7.5% sol) | 3 ml |
| 3. | Nacl (0.1M) | 3 ml |
| 4. | Acacia | 1.5 gm |
| 5. | Glycerin | 0.3 ml |
| 6. | Vit. E capsule | 1 capsule |
| 7. | Gelatin | q.s |
| 8. | Water | 3.3 ml |
| 9. | Lavender oil | q.s |

**Table No. 03 Formulation Table Neem leaves exctract.**

| SR NO | Material | Qunatity |
|---|---|---|
| 1. | Neem leaves exctract | 3 ml |
| 2. | Sodium lauryl sulphate (7.5% sol) | 3 ml |
| 3. | Nacl (0.1M) | 3 ml |
| 4. | Acacia | 1.5 gm |
| 5. | Glycerin | 0.3 ml |
| 6. | Vit. E capsule | 1 capsule |
| 7. | Gelatin | q.s |
| 8. | Water | 3.3 ml |
| 9. | Lavender oil | q.s |

**Formulation procedure**

1. Make 7.5% SLS in 100 ml water.
2. Add 10 ml of this with 0.1 M NaCl.
3. Add 10 ml herbal extract.
4. Add 5 gm of acacia (slurry).
5. Then in the resultant mixture add 1 ml glycerine.
6. Then add 11 ml water to it.
7. Add 4ml of orange oil into the mixture.
8. 2% of gelatine slurry is added to make 50 ml of volume.
9. Mix it well.
10. Store in air tight suitable container.
11. Note: Add the herbal extract of fenugreek seed, curry leaves and neem leaves in the formulation 1, 2, and 3 respectively.

**Evaluation parameters**

According to the regulatory authorities each batch of shampoos must be evaluated prior to marketing. Evaluation is a measure of activity and safety. It also notifies the toxicity, if nowadays most of the shampoos are prepared, from synthetic detergents, hence evaluation becomes an essential factor. However, there is also a need to evaluate herbal shampoo, since it may contain natural ingredient which are liable to contamination.

Shampoos are evaluated for the following aspects.

- **Physical appearance**: This refers to the visual appearance of the shampoo, including colour, texture, and consistency. A good quality shampoo should have a consistent appearance, with no separation or clumping of ingredients.

- **pH determination:** The pH of the shampoo is important as it can affect the scalp's natural pH balance. The ideal pH range for a shampoo is between 4.5 to 6.5, which is close to the pH of the scalp. A pH outside of this range can cause dryness, irritation, or other scalp issues.

- **Solid content percentage determination:** This test measures the amount of solid ingredients in the shampoo. A good quality shampoo should have a balanced amount of solid ingredients to ensure proper cleaning and conditioning without leaving any residue.

- **Foaming ability and foam stability:** The foaming ability and stability of the shampoo are important for its effectiveness in cleansing the hair and scalp. A good quality shampoo should produce a rich and stable lather that is easy to rinse off.

- **Stability study:** Stability testing involves evaluating the shampoo's stability under different storage conditions, such as temperature, humidity, and light exposure. A good quality shampoo should remain stable over time and not degrade or separate, ensuring consistent performance and safety.

- **Microbial Examination:** Microbial content test of shampoo involves evaluating the presence and levels of microorganisms, such as bacteria, yeast, and mold, to ensure the product's safety and quality.

- **Skin irritation test:** Skin irritation testing of shampoo involves conducting patch tests or similar methods to assess potential adverse reactions or irritations on the skin. This test is important to ensure the safety and compatibility of the shampoo with the skin, minimizing the risk of irritation or allergic reactions.

- **Dirt dispersion:** Dirt dispersion test of shampoo measures its ability to effectively disperse and remove dirt and oil from the hair. This test assesses the shampoo's cleansing performance by evaluating its ability to lift and suspend dirt particles, leaving the hair clean and refreshed.

- **Conditioning attributes:** Conditioning attributes test of shampoo evaluates its ability to provide conditioning benefits to the hair. This test assesses factors like softness, smoothness, manageability, and reduction of frizz, determining the effectiveness of the shampoo's conditioning properties.

- **Cleansing action:** The cleansing action of shampoo refers to its ability to effectively remove dirt, excess oils, product build up, and other impurities from the hair and scalp, leaving them clean, refreshed, and free from debris.

- **Evaluation Test Performed: (Methods)**

To evaluate the prepared formulations, quality control tests including visual assessment and physicochemical controls such as pH, density, viscosity, surface tension, foam volume, foam stability and wetting time were performed using standard protocols.

- **Physical appearance/visual inspection**

The formulation prepared was evaluated for the clarity, color, odor and foam producing ability and fluidity.

- **Determination of pH**

A 10% v/v shampoo solution was constituted in distilled water and the pH of the solution was measured by using a calibrated pH meter.

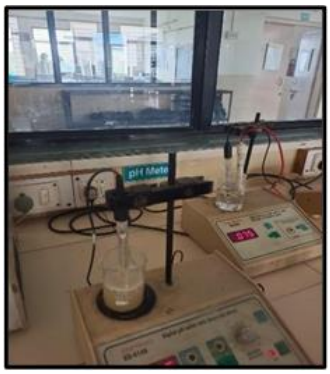

**Fig. NO. 04: Determination of Ph.**

**Determination of solid content percentage**

A clean dry evaporating dish was weighed and 4 grams of shampoo was added to the evaporating dish. The evaporating dish with shampoo was placed on the hot plate until the liquid portion was evaporated. The weight of the solid contents present in the shampoo was calculated after drying.

**Fig. NO. 05: Determination of solid content percentage.**

- **Dirt dispersion**

Two drops of herbal shampoo were added in a wide mouthed falcon tube containing 10ml of distilled water. 1 drop of India ink was added, the falcon tube was covered and shaken for ten times. The amount of ink in the foam was estimated as None, Light, Moderate or Heavy.

- **Cleansing action**

The cleansing property of the herbal shampoo was evaluated by the application of the shampoo on hair that has not been washed for seven days. The shampoo was used to wash the hair of human subject that had applied oil 4-5 hours before washing. The performance of the shampoo was assessed on its ability to remove oily dirt from scalp.

- **Foaming ability & foam stability**

Cylinder shake method was used for determining foaming ability. 50ml of the 1% herbal shampoo solution was put into a 250ml graduated cylinder & the cylinder was covered with hands and shaken for 10 minutes. The total volume of the foam content after 1 minute shaking was recorded. Immediately after shaking the volume of foam at 1 minute intervals for 10 minutes were recorded. The foam volume remains same throughout the period of about 5 min showing that the generated foam by the shampoo has good stability and the prepared shampoo exhibits higher foam property which may be due to the presence of soapnut.


**Fig. NO. 06: Foaming ability & foam stability.**

- **Stability Study**

The stability of the formulation was studied for a period of four weeks by keeping at temperature of 25-30°C.

- **Skin Irritation Test**

Prepared herbal shampoo was applied on skin for 5 minutes after that was washed and tested for irritation or inflammation to the skin.

- **Microbial examination**
- 100 microlitre of shampoo was mixed with melted Mueller Hinton agar and poured to sterile petridishes under asceptic conditions. The plates were rotated to mix thoroughly and then allowed to set. The plates were incubated at 37°C for 24 hours and observed for microbial growth. This test was carried out to determine the susceptibility or resistance of organisms to formulation ingredients according to the method described by Cheesbrough. The Gram positive (Bacillus) and Gram negative (E.coli) test organisms were subcultured on nutrient broth and incubated at 37°C till desired turbidity. The developed culture was streaked on the surface of nutrient agar on which four wells were punched with sterile cork borer. 25, 50, 100 and 150 ul shampoo were filled in these wells in increasing order. The plates were incubated at 37 °C for 24 hrs. and zone of inhibition around the wells were measured using a ruler.

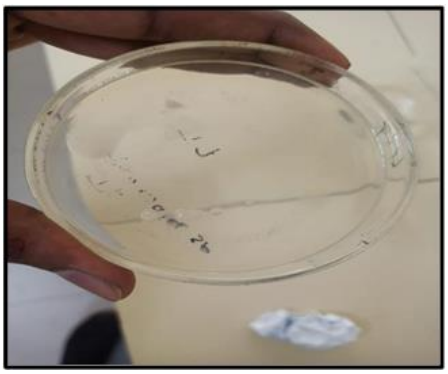

**Fig. No. 07: Microbial examination.**

**Fig. No. 08: Final Product.**

## RESULT

The herbal anti-dandruff shampoo formulations were prepared successfully and evaluated for various quality parameters. All formulations showed good appearance, pleasant fragrance, smooth texture, and satisfactory foam production. The pH was found to be suitable for scalp application. The shampoos exhibited good cleansing ability and effective dirt removal. No signs of skin irritation were observed during testing. Stability studies indicated that the formulations remained stable throughout the study period. Among all formulations, the curry leaf extract shampoo demonstrated comparatively better overall performance. The results suggest that the prepared herbal shampoos are safe, stable, and effective for controlling dandruff and maintaining scalp health.

## CONCLUSION

The present study successfully developed a herbal anti-dandruff shampoo using natural plant extracts. The formulated shampoo showed satisfactory quality, good cleansing ability, suitable pH, and acceptable stability. It was found to be safe for scalp application and demonstrated potential in reducing dandruff while maintaining healthy hair. The results indicate that herbal ingredients can be effectively utilized in shampoo formulations as a natural and economical alternative to conventional products.

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## CONFLICT OF INTEREST

The authors declare that there is no conflict of interest regarding the preparation, evaluation, and submission of this project. The work was carried out solely for academic purposes, and no financial, commercial, or personal relationships influenced the outcomes of the study.

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