



## Formulation and Evaluation of Polyherbal Shampoo to Promote Hair Growth and Provide Antidandruff Action Using Poly Herbal Extract

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### Abstract

The objective of this study is to develop and assess a polyherbal shampoo that is free from synthetic chemicals, utilizing herbal extracts as an alternative to conventional chemical-based shampoos. This approach aims to offer a safer and more effective option for hair care. The proposed shampoo is designed to address multiple hair concerns, including dirt and dandruff removal, hair growth promotion, enhancement of luster, strengthening, and darkening of hair strands. The shampoo formulation incorporates a blend of herbal extracts derived from Hibiscus Flowers, Pomegranate Peels, Neem Leaves, Curry Leaves, Shikakai, and Amla Fruit, each in varying proportions. Subsequently, the formulated shampoo underwent a series of evaluations, including tests for pH levels, visual inspection, % of solids content, viscosity, dirt dispersion, foaming ability, foam stability, surface tension, and other relevant parameters.

**Keywords:** Natural Ingredients, Polyherbal Shampoo, Evaluation of Shampoo, Hair Care.

### Introduction

Shampoos serve primarily as cosmetic products, used for daily hair care routines to cleanse the scalp and hair. Typically, they consist of a viscous solution of detergents with additives, preservatives, and active ingredients. Applied to wet hair, they are massaged in and rinsed off with water. Their primary function is to remove accumulated sebum, scalp debris, and residues from hair grooming products.

Polyherbal shampoos are gaining popularity as they offer superior performance and safety compared to synthetic counterparts. This trend is driven by increasing consumer demand for natural products with minimal side effects. These shampoos, formulated using herbal extracts from plants, are designed for hair and scalp cleansing, akin to traditional shampoos.

The formulation of polyherbal shampoo typically includes ingredients such as Hibiscus Flower (*Hibiscus rosa-sinensis*), Pomegranate Peel (*Punica granatum*), Neem Leaves (*Azadirachta indica*), Curry Leaves (*Murraya koenigii*), Shikakai Fruit (*Acacia concinna*), Amla Fruit (*Emblica officinalis*), Senna extract, Aloe vera, etc. Physicochemical properties of such formulations are evaluated to ensure efficacy.

Shampoos are categorized based on consistency, appearance, and use or function. Herbal and synthetic shampoos are distinguished by their ingredients, while appearance-based classifications include clear liquid, cream, gel, powder, and aerosol types. Shampoos can also be categorized by their function, such as conditioning, antidandruff,

therapeutic, baby, balancing, and clarifying shampoos.

Ideal herbal shampoos should effectively clean hair and scalp, produce satisfactory foam, remove hair products, have suitable consistency, ease hair combing, provide active ingredients, be non-toxic and non-irritating, prevent static charge build-up, impart pleasant fragrance, and be stable over time.

Benefits of herbal shampoos include enhanced shine, reduced hair loss, longer-lasting hair color, stronger and fortified hair, natural ingredients without chemicals, skin-friendly properties, and maintenance of healthy natural oils. Advantages include pure organic ingredients, absence of side effects and surfactants, no synthetic additives or animal testing, and environmental friendliness.

Functionally, herbal shampoos lubricate, condition, promote hair growth, maintain hair color, and medicate the scalp. Desired properties include easy application, efficient debris removal, wet combing, fragrance, low irritation, preservation, and stability.

The mode of action of shampoo molecules involves their hydrophilic and lipophilic ends, attracting water and oil respectively, which facilitates the removal of oils, dirt, and deposits from the hair during rinsing.

**Aim:** Preparation and Evaluation of Polyherbal Shampoo Using Polyherbal Extracts.

### Objectives

#### 1. Formulation of Polyherbal Shampoo:

- Develop a formulation incorporating polyherbal extracts as the main ingredients.
- Utilize flowers, leaves, and fruits in the formulation process.

#### 2. Evaluation of Polyherbal Shampoo:

- Conduct thorough evaluation tests to assess the efficacy and safety of the polyherbal shampoo.

- Test various parameters including cleansing efficiency, safety, texture improvement, and color enhancement.

#### 3. Reduction of Adverse Effects of Chemical Formulation:

- Aim to minimize the negative impacts associated with traditional chemical-based shampoos.
- Prioritize the use of natural ingredients to mitigate adverse effects on hair and scalp.

#### 4. Improvement of Hair Texture:

- Focus on enhancing the overall texture of the hair.
- Incorporate ingredients that promote softness, smoothness, and manageability.

#### 5. Darkening of Hair Color:

- Explore methods to naturally darken hair color.
- Incorporate herbal extracts known for their hair-darkening properties.

#### 6. Imparting Gloss to Hair and Maintaining Manageability:

- Develop a formulation that imparts shine and gloss to the hair.
- Ensure that the shampoo maintains the manageability and oiliness necessary for healthy hair.

#### 7. Formulation of Product with Better Feel and Consistency:

- Strive to create a polyherbal shampoo with a pleasant texture and consistency.
- Optimize the sensory experience during shampoo application and rinsing.

#### 8. Development of Economical and Safe Formulation:

- Design a formulation that is cost-effective without compromising safety.

- Use ingredients that are known for their affordability and safety profile.
9. Formulation of Effective and Well-Tolerated Product:
- Aim to create a polyherbal shampoo that is highly effective in cleansing and nourishing the hair.
  - Ensure that the formulation is well-tolerated by a wide range of users, including those with sensitive scalp or skin.

By addressing these objectives, the aim is to prepare a polyherbal shampoo that not only outperforms synthetic counterparts but also prioritizes consumer safety and satisfaction.

In the formulation of the polyherbal shampoo, various ingredients were carefully selected for their beneficial properties. These ingredients include.

### Materials

Selection of ingredients in polyherbal shampoo.

1. Hibiscus Flower (*Hibiscus rosa-sinensis*): Known for its hair conditioning properties, hibiscus flower extracts nourish the hair, promote growth, and add shine.
2. Pomegranate Peel (*Punica granatum*): Rich in antioxidants, pomegranate peel extracts help to protect the hair from damage caused by free radicals and environmental stressors.
3. Neem Leaves (*Azadirachta indica*): Neem leaves have antibacterial and

antifungal properties, making them effective in treating scalp infections and dandruff.

4. Curry Leaves (*Murraya koenigii*): Curry leaves are rich in vitamins and minerals that help to strengthen hair roots, prevent hair loss, and stimulate hair growth.
5. Shikakai Fruit (*Acacia concinna*): Shikakai is a natural cleanser that gently removes dirt and oil from the scalp without stripping away natural oils, leaving the hair soft and shiny.
6. Amla Fruit (*Emblica officinalis*): Amla is rich in vitamin C and antioxidants, which nourish the hair follicles, promote hair growth, and prevent premature graying.
7. Senna Extract: Senna extract is known for its conditioning properties, which help to soften and moisturize the hair, making it more manageable.
8. Aloe Vera: Aloe vera soothes the scalp, reduces inflammation, and promotes healthy hair growth. It also adds moisture and shine to the hair.

These ingredients work synergistically to provide comprehensive care for the hair and scalp. They nourish the hair from the roots, remove impurities, prevent inflammation, and promote overall hair health. The unique combination of these natural ingredients makes the polyherbal shampoo formulation effective in maintaining healthy, shiny, and soft hair while preventing aging and hair loss.

The Material used for formulation of Polyherbal Shampoo is as follows. Top of Form.

**Table 1: Materials used for formulation collected from.**

| Sr. No. | Material         | Collected From   |
|---------|------------------|------------------|
| 1       | Hibiscus Flower  | Garden           |
| 2       | Pomegranate Peel | Local Market     |
| 3       | Neem Leaves      | Residential area |
| 4       | Curry Leaves     | Residential area |
| 5       | Shikakai Fruit   | Local Market     |
| 6       | Amla Fruit       | Local Market     |

|    |               |                 |
|----|---------------|-----------------|
| 7  | Vit.E         | Local Market    |
| 8  | Lemon Juice   | Patanjali Store |
| 9  | Honey         | Patanjali Store |
| 10 | Gaurgum       | From Laboratory |
| 11 | Rose Oil      | From Laboratory |
| 12 | Senna extract | Local Market    |
| 13 | Aloe vera     | Local Market    |

**Table 2: Description of the ingredients of the polyherbal shampoo.**

| Sr. No | Common         | Picture                                                                             | Botanical Name                          | Family        | Parts used | Category                                                           |
|--------|----------------|-------------------------------------------------------------------------------------|-----------------------------------------|---------------|------------|--------------------------------------------------------------------|
| 1      | Hibiscus       |    | Hibiscus rosa-sinesis                   | Malvaceae     | Flowers    | Conditioning agent                                                 |
| 2      | Pomegrante     |    | Punica graatum                          | Punicaceae    | Peels      | Anti-hairfall agent                                                |
| 3      | Neem           |   | Azadirachta indica                      | Meliaceae     | Leaves     | Anti-bacterial agent                                               |
| 4      | Curry          |  | Murraya koenigii                        | Rutaceae      | Leaves     | Hair follicles strengthening agent                                 |
| 5      | Shikakai       |  | Acacia concinna                         | Leguminosae   | Fruits     | Deteregent/ Foaming agent                                          |
| 6      | Amla           |  | Emblica officinalis                     | Euphorbiaceae | Fruits     | Anti-dandruff agent                                                |
| 7      | Senna extract  |  | Cassia angustifolia Vahl                | Leguminosae   | leaves     | boosts moisture and regenerates <i>hair</i>                        |
| 8      | Aloe vera leaf |  | Dried leaves of Aloe barbadensis miller | Liliaceae     | leaves     | strengthen your <i>hair</i> , Conditioner and moisturizing effect. |

## Methodology

### Collection of plants

The plant parts, including Curry leaves, Aloe vera, Senna, and Neem leaves, were sourced from the local market. Upon acquisition, they underwent a thorough cleaning process under running water to eliminate any contaminants. Subsequently, they were dried in indirect sunlight until they reached a suitable dryness level. Once dried, they were ground into coarse powders and sieved using a 60-mesh sieve to achieve uniform consistency.

The extracts were then prepared using the decoction method, a process involving the extraction of active compounds from plant materials by boiling them in water. After extraction, the resulting extracts were carefully stored in well-sealed containers to preserve their potency and prevent contamination.

### Preparation of polyherbal extract

The extraction process was conducted using the decoction method. Each ingredient, including hibiscus powder, amla powder, Aloe vera, neem leaves, curry leaves, Senna extract, pomegranate powder, and shikakai powder, was weighed separately.

Next, each ingredient was decocted individually by boiling it in water. This process involves simmering the ingredients in water to extract their active compounds. After boiling, the mixture was filtered using muslin cloth to remove any solid particles, and the resulting filtrate was collected.

By decocting each ingredient separately, the desired active compounds were effectively extracted, ensuring the potency and efficacy of the polyherbal shampoo formulation.



**Figure 2: Extraction of each herbal ingredient.**

**Formula used for preparation of polyherbal extract.**

**Table 3: Quantity taken of each herbal ingredient in formulation.**

| Sr. No. | Ingredients             | Quantity(100ml) |      |      |      |
|---------|-------------------------|-----------------|------|------|------|
|         |                         | F1              | F2   | F3   | F4   |
| 1       | Hibiscus Powder         | 3.5g            | 4.0g | 5.1g | 2.1g |
| 2       | Pomegranate Peel Powder | 3.5g            | 4.3g | 3.0g | 3.2g |
| 3       | Neem Leaves Powder      | 3.5g            | 4.5g | 3.2g | 3.2g |
| 4       | Curry Leaves Powder     | 3.5g            | 4.2g | 4.2g | 4.5g |
| 5       | Shikakai Powder         | 3.5g            | 5.0g | 6.0g | 3.0g |

|   |               |      |      |      |      |
|---|---------------|------|------|------|------|
| 6 | Amla Powder   | 3.5g | 3.0g | 1.0g | 5.0g |
| 7 | Senna extract | 3.5g | 3.0g | 1.0g | 5.0g |
| 8 | Aloe vera     | 3.5g | 3.0g | 1.0g | 5.0g |

### Formulation of poly herbal shampoo

The formulation of the polyherbal shampoo was prepared according to the following formula. Ingredients.

1. Decoction of hibiscus powder
2. Decoction of amla powder
3. Aloe vera extract
4. Neem leaves extract
5. Curry leaves extract
6. Senna extract
7. Pomegranate powder
8. Shikakai powder
9. Guar gum (for thickness)
10. Glycerin (for thickness)
11. Honey
12. Lemon juice
13. Vitamin E
14. Rose oil
15. Water

### Procedure

1. Combine the decoctions of hibiscus powder, amla powder, Aloe vera extract,

neem leaves extract, curry leaves extract, Senna extract, pomegranate powder, and shikakai powder in a suitable container.

2. Add guar gum and glycerin to increase the thickness of the formulation. Stir continuously to ensure uniform mixing.
3. Incorporate honey and 2-3 ml of lemon juice into the mixture while stirring continuously.
4. Introduce vitamin E for its conditioning effect.
5. Enhance the aroma of the formulation by adding a sufficient quantity of rose oil.
6. Adjust the final volume to 100 ml by adding a sufficient quantity of water.
7. Stir the mixture thoroughly to ensure all ingredients are well combined.
8. By following this formulation and procedure, a polyherbal shampoo with desired thickness, conditioning properties, pleasant aroma, and effective herbal extracts is prepared.

### Composition of polyherbal shampoo-

**Table No. 4: Formulation table.**

| Sr. No. | Ingredients        | Quantity(100ml) |           |           |           |
|---------|--------------------|-----------------|-----------|-----------|-----------|
|         |                    | F1              | F2        | F3        | F4        |
| 1       | Polyherbal extract | 25.0ml          | 25.0ml    | 25.0ml    | 25.0ml    |
| 2       | Gaurgum            | 20.0ml          | 20.0ml    | 15.0ml    | 10.0ml    |
| 3       | Glycerin           | 15.0ml          | 10.0ml    | 10.0ml    | 15.0ml    |
| 4       | Honey              | 5.0ml           | 10.0ml    | 5.0ml     | 10.0ml    |
| 5       | Vit.E              | 10.0ml          | 10.0ml    | 10.0ml    | 10.0ml    |
| 6       | Lemon Juice        | -               | 3.0ml     | 3.0ml     | -         |
| 7       | RoseOil            | 2-5drops        | 2-5drops  | 2-5drops  | 2-5drops  |
| 8       | Distilled water    | q.s.100ml       | q.s.100ml | q.s.100ml | q.s.100ml |

### Evaluation of Polyherbal Shampoo

To evaluate the prepared formulations, several quality control tests were conducted, including.

1. Physical Appearance/Visual Inspection.
  - Clarity, color, odor, foam-producing ability, and fluidity of the formulation were assessed.

## 2. Determination of pH.

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

## 3. Determination of Solid Content Percentage.

- Four grams of shampoo were added to a clean, dry evaporating dish and placed on a hotplate until the liquid portion evaporated. The weight of the remaining solid contents was calculated after drying.

## 4. Wetting Time.

- Wetting time was measured by noting the time required for a canvas paper disc to sink completely into a 1% v/v shampoo solution.

## 5. Viscosity Test.

- Viscosity was evaluated using a Brookfield viscometer with an LV-62 spindle. The rotation rate was set to 10 rpm, and the viscosity reading in cps was recorded.

## 6. Dirt Dispersion.

- Two drops of polyherbal shampoo were added to a test tube containing 10 ml of distilled water. One drop of ink was added, and the test tube was shaken. The amount of ink dispersed in the foam was visually estimated as none, light, moderate, or heavy.

## 7. Anti-Microbial Activity.

- The susceptibility or resistance of organisms to formulation ingredients was determined using the method described by Cheesbrough. Gram-negative (*E.coli*) test organisms were subcultured on nutrient broth, streaked on Mueller Hinton agar plates, and incubated. Zone of inhibition around wells filled with the sample was

measured.

## 8. Surface Tension Measurement.

- Surface tension was measured using a stalagometer. The weight of drops of polyherbal shampoo falling from a capillary glass tube was measured to calculate surface tension.

These tests provide valuable information about the physical and chemical properties, antimicrobial efficacy, and overall quality of the polyherbal shampoo formulation.

## 9. Foaming Ability & Foam Stability.

- The cylinder shake method was employed to determine foaming ability. 50ml of the 1% polyherbal shampoo solution was poured into a 250ml graduated cylinder, which was then covered and shaken for 10 minutes. The volume of foam content after 1 minute of shaking was recorded, and subsequent volumes of foam were recorded at 1-minute intervals for 10 minutes. The foam volume remained consistent for about 5 minutes, indicating good stability. The higher foam property observed may be attributed to the presence of Shikakai.

## 10. Stability Study.

- The stability of the formulation was assessed over a four-week period by storing it at a temperature of 25-30°C. This study aimed to evaluate the formulation's ability to maintain its physical and chemical properties over time.

## 11. Skin Irritation Test.

- A skin irritation test was conducted by applying the prepared polyherbal shampoo on the skin for 5 minutes. Subsequently, the shampoo was washed off, and the skin was examined for signs of irritation or inflammation. This test helps assess the product's safety for use on the skin

## a. Results and Discussion

## Results

Table 5: Evaluation test result of formulated shampoo.

| Sr. No. | Evaluation Test                                                                    | Formulated shampoo(F2)                |
|---------|------------------------------------------------------------------------------------|---------------------------------------|
| 1       | Colour                                                                             | Yellow Brown                          |
| 2       | Transparency                                                                       | Clear transparent                     |
| 3       | Odour                                                                              | Very Good                             |
| 4       | pH of 10% solution                                                                 | 6.31                                  |
| 5       | Solid contents (%)                                                                 | 3.2                                   |
| 6       | Wetting time(sec.)                                                                 | 8                                     |
| 7       | Viscosity                                                                          | %torque                               |
|         |                                                                                    | Cp value                              |
|         |                                                                                    | Spindle no.                           |
| 8       | Dirt dispersion                                                                    | Light                                 |
| 9       | Anti-microbial activity<br>[Zone of inhibition against Gram negative bacteria(cm)] | 0.2                                   |
| 11      | Surface tension(dynes/cm)                                                          | 58.20                                 |
| 12      | Foam volume(per100ml)                                                              | 25ml after 1min & 19ml<br>After 10min |
| 13      | Foam type                                                                          | Dense & Small                         |
| 14      | Stability                                                                          | Stable                                |
| 15      | Skin irritation                                                                    | Nil                                   |

The evaluation of the four formulations of polyherbal shampoo highlighted that formulation F2 exhibited the best overall performance, boasting optimum stability, a pleasant fragrance, appealing appearance, and appropriateness for consumer use. Let's delve deeper into the discussion of the findings.

## 1. Physical Appearance/Visual Inspection.

- Formulation F2 appeared as a brown, shiny solution with a pleasing odor, indicating an aesthetically pleasing product.

## 2. pH.

- The pH of formulation F2 was measured at 6.3, falling within the ideal range for shampoos. This near-neutral pH is crucial for enhancing hair quality, minimizing irritation, and maintaining the scalp's ecological balance.

## 3. Percentage of Solid Content.

- Formulation F2 exhibited a solid content percentage of 3.3%, suggesting

easy washability without causing buildup or difficulty in application.

## 4. Wetting Time.

- The wetting time of formulation F2 was determined to be 9 seconds, indicating efficient surfactant concentration and efficacy in wetting the hair for effective cleansing.

## 5. Viscosity.

- With a viscosity of 24.8, formulation F2 demonstrated an optimal consistency for shelf-life stability, ease of application, and product uniformity.

## 6. Dirt Dispersion.

- Formulation F2 showed satisfactory dirt dispersion, as indicated by the light amount of ink in the foam, ensuring thorough rinsing and cleansing.

## 7. Anti-Microbial Activity.

- The anti-microbial activity test revealed that formulation F2 was effective against Gram-negative



bacteria, albeit with less inhibition. Incorporating Neem leaves extract could further enhance its inhibitory activity.

#### 8. Surface Tension.

- Formulation F2 exhibited a surface tension value of 58.30 dyne/cm, indicating effective detergent action essential for thorough cleansing.

#### 9. Foaming Ability and Foam Stability.

- Formulation F2 produced stable foams with minimal volume changes, contributing to consumer satisfaction despite its limited impact on cleansing ability.

#### 10. Stability Study.

- The stability study conducted over four weeks confirmed that formulation F2 remained chemically and physically stable at standard room temperature, ensuring product integrity and quality.

In summary, formulation F2 emerged as the most promising option among the evaluated formulations, showcasing optimal stability, desirable characteristics, and adherence to quality standards, making it suitable for further development and potential consumer use.

### Conclusions

The preparation of herbal shampoo in this study was guided by traditional knowledge, with a focus on formulating a stable and functionally effective product. The detrimental effects of UV radiation and harsh chemical products on hair were considered, motivating the development of an herbal shampoo that not only offers hair protection but also provides conditioning, shine, and manageability.

This study explored the potential of herbal extracts for cosmetic purposes, leveraging the properties of herbs such as hibiscus, curry, pomegranate, neem, shikakai, amla, and honey. These herbs, known for their effectiveness on hair, were combined to create a synergistic polyherbal formulation. The utilization of these herbs, which are rich in

phytoconstituents, aimed to maximize their role in the shampoo formulation.

There is a growing awareness and demand for herbal cosmetics, driven by the belief that such products are safe and free from side effects. The formulated shampoo in this study is free from chemicals, addressing concerns such as hair fall, strengthening hair growth, and reducing premature greying. Additionally, it imparts shine, smoothness, softness, and bounce to the hair, fulfilling consumer expectations.

Importantly, the formulation is deemed harmless and cost-effective, making it accessible to a wide range of consumers. Overall, this study underscores the potential of herbal ingredients in developing effective and safe hair care products that cater to the evolving preferences of consumers for natural and sustainable solutions.

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