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# FORMULATION AND EVALUTION OF POLYHERBAL SHAMPOO

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## Abstract

The study's goal was to create a pure herbal shampoo and test and compare its physicochemical qualities to those of commercially available synthetic and herbal shampoos. Acacia concinna, Sapindus mukorossi, and other botanical extracts were used to create the herbal shampoo. In varying amounts, Phyllanthus emblica, Ziziphus spina-christi, and Citrus aurantifolia were added to a 10% aqueous gelatin solution. As a preservative, a trace of methylparaben was added, and the pH was corrected with citric acid. Several experiments were done to assess the physicochemical features of both produced and marketed shampoos, including visual inspection, pH, wetting time, % of solid contents, foam volume and stability, surface tension, detergency, filth dispersion, and so on. The conditioning effect of the herbal shampoo was further assessed by giving. The herbal shampoo formulation was clear and inviting. After 10 minutes, it demonstrated strong cleaning and detergency, low surface tension, tiny bubble size, and good foam stability. The In terms of % solid components, homemade shampoo, and commercial shampoo had equivalent results. The conditioning performance of the tresses was determined to be 3.0 out of 4, whereas the scores of the marketed synthetic and herbal shampoos were 3.4 and 3.3, respectively. The findings showed that the designed shampoo had outstanding conditioning performance comparable to commercially available shampoo. However, further research and development is needed to increase the product's quality and safety.

## 1. INTRODUCTION

Hair contributes significantly to the overall attractiveness of the human body. There are several hair issues, such as thinning hair, a lack of hair volume, premature greying, conditioning, hair loss, and so on. have been observed by most of the individuals. Shampoo may also be described as a cosmetic preparation used for cleaning the scalp and hair that is packaged in an easy-to-use form<sup>[1]</sup>.

Shampoos are most frequently used as cosmetics and are a viscous solution of detergents with appropriate additives, preservatives, and active substances. It is typically applied to damp hair, rubbed into the hair, and then rinsed with water. The aim of shampoo is to eliminate debris from the hair without removing too much sebum. Many medicated and nonmedicated synthetic shampoos, both medicated and nonmedicated, are available in the market today; however, herbal shampoo has gained popularity owing to its natural nature, which is safer, improves customer demand, and is devoid of side effects<sup>[2-4]</sup>.

Herbal formulations are seen as a feasible alternative to synthetic shampoo; yet, making cosmetics entirely from natural raw ingredients is a difficult task<sup>[5]</sup>. Several medicinal herbs have been believed to have good benefits on hair and are widely utilized in shampoo composition<sup>[6]</sup>. These plant materials can be employed as powders, crude extracts, refined extracts, or derivatives<sup>[7]</sup>.

It is challenging to design a shampoo having only one natural component that is safer and has a gentler impact than synthetic shampoo and also has good foaming, detergency, and solid content as such synthetic shampoo. As a result, we contemplated designing an unadulterated natural cleanser utilizing a traditional approach utilizing commonly used plant material for hair cleaning<sup>[8]</sup>.

It is incredibly difficult to create a herbal shampoo from a single natural substance that is gentler and safer than synthetics while yet competing well in terms of foaming, detergency, and solid content. As a result, we contemplated creating a pure herbal shampoo using traditionally and regularly used plant components for hair cleaning in India. For ages, the pericarp of *Spindus mukorossi*, also known as Soapnut or reetha, fruits of *Phyllanthus emblica*, also known as Amla, and dried pods of *Acacia concinna* (Sheekakai) have been utilised for washing hair in Indian folklore systems<sup>[9]</sup>. Reetha and Sheekakai produce rich lather when shaken with water due to their high content of saponins<sup>[10]</sup>.

The replacement of cells on the scalp happens slowly and is not visible to the naked eye. Every month, the process of transformation is underway. There will be a disturbance on the scalp, which we call dandruff. Herbal shampoos are cosmetic preparations that, like conventional shampoo, are supposed to cleanse the hair and scalp by using traditional Ayurvedic herbs<sup>[11]</sup>.

**Sidr:** It is obtained from leaves of *Ziziphus spina-christi* of the family Rhamnaceae and is used as antibacterial, antifungal, anti-nociceptive, antioxidant, and anti dandruff in cosmetics<sup>[12]</sup>.

**Amla:** It is obtained from the dried fruit of *Phyllanthus emblica* of the family Phyllanthaceae and used as antibacterial, antifungal, anti dandruff and reduce premature pigment loss of hair.

**Sheekakai:** It is obtained from the dried fruit of *Acacia concinna* of the family Mimosaceae and used as :

- Controls hair fall
- Prevents dryness
- Detangles hair
- Cleans the scalp without interfering with its natural pH.
- Slows down premature graying of hair
- Prevents split ends
- Promotes faster hair growth
- Treats dandruff and reduces white flakes

**Reetha:** It is obtained from dried fruit of *Sapindus mukorossi* of the family Sapindaceae and used as foaming agent and cleaning agent.

## 2.AIMS AND OBJECTS

The aim and objects of the study of formulation of poly herbal shampoo in lab and evaluation with various parameter such as physical appearance , pH percentage of solid content, dirt dispersion test, surface tension, foaming ability and foam stability, wetting time and conditioning performance test.

### Applicaton of polyherbal shampoo:

- Antidandruff
- Antibacterial and antifungal
- Promotes hair growth
- Reduce premature hair pigment
- Promotes conditing to hair
- Detangles hair

### Review of literature

- **Khaloud Al Badi, Shah A. Khan:** The study's goal was to create a pure herbal shampoo and compare its physicochemical qualities to those of commercially available synthetic and herbal shampoos. The herbal shampoo was created by combining extracts of *Acacia concinna*, *Sapindus mukorossi*, *Phyllanthus emblica*, *Ziziphus spina-christi*, and *Citrus aurantifolia* in various amounts with a 10% aqueous gelatin solution. As a preservative, a little quantity of methylparaben was added, and the pH was corrected using citric acid. Several experiments were done to establish the physicochemical features of both produced and marketed shampoos, including visual inspection, pH, wetting time, percentage of solid components, foam volume and stability, surface tension, detergency, filth dispersion, and so on. The conditioning efficiency of the prepared herbal shampoo was also examined by giving a blind test to 20 student volunteers. The herbal shampoo formulation was clear and inviting. It displayed powerful cleansing and detergency after 5 minutes, as well as low surface tension, tiny bubble size, and high foam stability.
- **VIJAYALAKSHMI A, SANGEETHA S, RANJITH N:** The purpose of this study is to create and develop a herbal shampoo and evaluate its physiochemical function, with an emphasis on safety, efficacy, and the elimination of dangerous synthetic chemicals in favor of safe natural ones. Shampoo formulated in various amounts using extracts of *Emblca officinalis*, *Hibiscus rosa-sinensis*, *Acacia concinna*, *Sapindus indicia*, *Eclipta prostrate*, *Aloe barbadensis*, and *Cassia auriculata*. Organoleptic, physicochemical, and performance tests were evaluated in terms of visual evaluation, wetting time test, pH, solid content assurance, surface tension, detergency, dirt dispersion, conditioning performance, foam volume, and stability. The cleaner that was made was clear and visually pleasing. It demonstrated excellent foam stability, detergency, cleanliness, small bubble size, low surface strain, and efficient conditioning execution.

- **Ishita Kumari, Ishita Sarkar, Ishika Sanyashi, Sayak Das and Rajat Das:** The shampoo contains amla fruit, which is high in vitamin A and other minerals and helps to reduce hair loss, neem leaf, which helps to seal hair follicles, treat head lice, and condition the scalp, and reetha fruit, an anti-inflammatory herb used to treat dandruff and other scalp infections. The goal of this project is to assess and produce herbal shampoo made entirely of natural ingredients, with a focus on efficacy and safety. *Azadirachta indica* leaves and fruits of *Phyllanthus emblica* and *Sapindus mukorossi* were utilized in the formulation, which was tested for physical qualities and appearance, pH, wetness, skin irritation, form development, and stability.
- **Abdulkarim K. Y. Alzomor Wafa M. Al-Madhagi, Nahlah M. Sallam, Haytham Mojamel, Mostafa M. Alawar, Abdulfattah G. Al-Hetari:** Herbs are frequently employed as therapeutic agents in light of contemporary scientific and technical advancements. This study sought to develop and assess the safety and efficacy of a herbal antidandruff shampoo derived from *Ziziphus spina-christi* (Sidr) leaf extract, which has traditionally been used for a variety of medicinal and aesthetic applications. Sidr leaves were extracted using maceration and ethanol as a solvent. The plant extract's antifungal activity was evaluated against *M. furfur*. The extract was tested in vivo on rats with daily oral dosages (50, 100, and 200 mg/kg) for 28 days, followed by an examination of biochemical and histological markers. Following that, the plant extract was made into a shampoo and evaluated for antidandruff effectiveness on 80 volunteers. Sidr extract shown clear antifungal efficacy against *M. furfur*, with 86% of the tested volunteers significantly improved from dandruff using sidr shampoo formulation. In biochemical investigation, the extract's toxicity yielded no abnormal results when compared to the control group. However, when the extract was administered orally at high dosages of 100 and 200mg/kg, modest histologically detrimental effects on the liver and kidney tissues were seen. Finally, sidr extract has the potential to be utilised topically as an anti-dandruff shampoo composition with great efficacy and safety.

## 2.1 Materials and methods:

Plant *Ziziphus spina-christi* is taken from the locally market or the local jungle area. And other plant dried fruit are taken from the market. Those plant are taken and prepared for extraction and formulation of shampoo began<sup>[13]</sup>.

## 2.2 Extraction process:

**Reetha extraction:** The extraction is done by cold maceration method by using 70% ethanol and take it upto 24 hours and filtered it to get extracted and make a semi-solid by evapouratind the extraction.



Fig : cold maceration method



**Sdir extraction:** 100 g of Ziziphus spina-christi leaves were washed under running water to remove foreign substances, homogenized and boiled in hot water for 4 h reflux method. To get semisolid bulk, the aqueous extract was filtered and concentrated.

**Amla extraction:** Dried fruit powered and taken for aqueous extract similar as above.

**Sheekakai extraction:** Dried fruit powered and taken for aqueous extract similar as above.



**Fig: aqueous extract by reflux method**

### 2.3 Formulation of shampoo:

The 10% of gelatin solution is made and dissolve in water by melting gelatin. The portion of extraction were mixed and 50 ml of gelatin were mixed by shaking upto 20 min. 1g of guar gum also added and stired. Lemon juice(1mL) and methyl paraben were also added with stirring. Finally the pH of the solution was adjusted by adding sufficient quantity of 1% citric acid solution. To add smell, a few drops of rose essential oil were added to the shampoo, and the final volume was raised to 100 mL with gelatin solution.

Material	Quantity
Reetha extrct	5.8g
Sidr extract	2.5g
Sheekakai extract	4gm
Amla extract	3g
Gelatin solution	q.s
Guar gum	1g
Lemon juice	1ml
Methyl paraben	1ml of 0.50% solution
Citric acid	q.s
Essential rose oil	0.5ml

**Table 1: composition for shampoo**

### 3. Evaluation of Shampoo

Several quality control procedures, including visual evaluation, physicochemical controls, and conditioning performance tests, were undertaken to evaluate the quality of commercial and created formulations<sup>[14]</sup>.

#### 3.1 Physical appearance/visual inspection

The clarity, colour, odour, and foam-producing capacity of the created mixture were all tested<sup>[15]</sup>.

#### 3.2 Determination of pH

The pH of 10% v/v shampoo solution in distilled water was measured by using pH meter (Mi 151, Martini instruments) at room temperature<sup>[16]</sup>.

#### 3.3 Determination of % of solid contents

4 g of shampoo was put in a previously clean, dry, and weighed evaporating dish. The dish and shampoo were weighed again to ensure the precise weight of the shampoo. The liquid component of the shampoo was evaporated by placing the evaporating dish on the hot plate. The weight and hence percentage of the solid components of shampoo that remained after full drying was determined.

### 3.4 Dirt dispersion test

In a big test tube, two drops of shampoo were mixed with 10 mL of distilled water. One drop of amarnath dye was added to this solution, and the test tube was sealed and shook ten times. The rubrics None, Light, Moderate, or Heavy denoted the quantity of ink in the foam<sup>[17]</sup>.

### 3.5 Surface tension measurement

The surface tension of 10% w/v shampoo in distilled water was measured using stalagmometer at room temperature<sup>[18]</sup>.

### 3.6 Test to evaluate foaming ability and foam stability

Foaming ability was determined by using cylinder shakemethod. Briefly, 50 mL of the 1% commercial or formulated shampoo solution was placed into a 250 mL graduated cylinder; it was covered with one hand and shaken 10 times. After 1 minute of shaking, the total volume of foam content was measured. The foam stability was assessed by measuring the foam volume after 1 minute and 4 minutes of shaking<sup>[19]</sup>.

### 3.7 Wetting time test

Canvas paper was cut into 1-inch discs with an average weight of 0.44 g. The smooth surface of disc was placed on the surface of 1% v/v shampoo solution and the stopwatch started. The time it took for the disc to begin sinking was recorded as the wetting time<sup>[20]</sup>.

### 3.8 Evaluation of conditioning performance

A neighbourhood salon provided an Asian woman's hair tresses. It was sliced into four swatches of the trees, each around 10 cm long and 5 g in weight. A swatch that had not been washed served as the control. The remaining three tresses were cleansed using the same commercial and designed shampoos. For each cycle, each tree was shaken for 2 minutes in a conical flask with a combination of 10 g of a sample and 15 g of water, then washed with 50 mL water. Following that, each tree was allowed to air dry at room temperature. The trees were washed a total of ten times. The shampoos' conditioning performance, i.e. smoothness and softness, was tested a blind touch test is given to twenty randomly chosen student participants<sup>[21]</sup>.

## 4. Result and Discussion:

### 4.1 Formulation of shampoo:

A pure shampoo is created by combining the aqueous / alcoholic extracts of ziziphus spina-christi, amla, sheekakai, and reetha given in table 1. These plant materials contain phytochemicals such as saponins, which are natural surfactants with strong detergency and foaming qualities. Conditioning agents included amla and sidr extracts. A decent shampoo must have enough viscosity to allow for easy release from the container while also not dripping down from the hair during usage.

A decent shampoo must have enough viscosity to allow for easy release from the container while also not dripping down from the hair during usage. We selected a 10% gelatin solution since it is pseduoplastic and creates transparent solutions. To achieve the appropriate pH level, citric acid was applied. To keep a formulation's acidic pH, 1 mL of lemon juice was added as a natural antioxidant, chelating agent, and antidandruff agent. A little quantity of methylparaben was added to the shampoo to further preserve it. Table 1 shows the finished shampoo recipe.

### 4.2 Evaluation

The efficiency of the designed herbal and commercial shampoos was compared using certain simple physicochemical tests, the findings of which are explained further below.

#### 4.2.1 Physical appearance/visual inspection:

In this colour, odor, texture and state of formulation is checked.

Parameters	Formulation
colour	Brownish black
odor	
Texture	smooth
State	liquid

#### 4.2.2 Determination of pH

In this the 5ml of formulation is dissolve in 50ml and mixed well. Then for determination of pH of shampoo pH meter is used. The pH should be up to 4.5 to 7.

#### 4.2.3 % of solid contents

4.2g of the shampoo is taken in china dish. Than evapourate it in water bath.

$$\begin{aligned}\text{Weight of the china dish} &= 76.37\text{g} \\ \text{Weight of china dish with shampoo} &= 80.57\text{g} \\ \text{Weight of only shampoo} &= 80.57\text{g} - 76.37\text{g} \\ &= 4.2\text{ g}\end{aligned}$$

After evapourating,

$$\begin{aligned}\text{Weight of china dish with solid content} &= 76.84\text{g} \\ \text{Weight of only solid content on china dish} &= 76.84\text{g} - 76.37\text{g} \\ &= 0.47\text{g}\end{aligned}$$

#### 4.2.4 Dirt Dispersion:

The two drop of shampoo is taken in test tube and one drop of amaranth dye was taken in 10 ml of water and shaken up to 10 times and show dirt cleaned in test tube.



**Fig: dirt dispersion**

#### 4.2.5 Surface tension measurement:

The surface is determined by the stalagmometer. The shampoo is taken in 25ml density bottle and weight.



**Fig: surface tension**

Weight of density bottle with shampoo = 47.51

Weight of shampoo only = 47.51g – 11.94g

$$=35.57\text{g}$$

$$\text{Density} = \frac{\text{mass}}{\text{volume}}$$

$$= \frac{35.57}{25}$$

$$=1.4228$$

Weight of only water = 46.31

$$\text{Density} = \frac{46.31}{25}$$

$$=1.8524$$

Surface tension =  $d_1/d_2 \times n_1/n_2$

$$=1.8542/1.4228 \times 76/9$$

$$=10.92$$

#### 4.2.6 Test to evaluate foaming ability and foam stability:

Because foaming or lathering is vital to the customer, it is considered a significant criteria in shampoo assessment. Formulated shampoo is taken in measuring cylinder and shake than observe the form abibility 50ml of formulated shampoo may contain upto 50ml to 74ml in 10 min then, 50ml to 72ml in another 10 min and 50 to 70 ml in last 10 min. Then compare formaluted shampoo with clinic plus marketed shampoo which observation is done upto 50ml to 100ml im 1<sup>st</sup> ten min then,50 ml to 90 ml in 2<sup>nd</sup> ten min and 50ml to 89ml last ten min<sup>[22]</sup>.



**Fig: foaming ability and foam stability**



#### 4.2.7 Wetting time:

The wetting ability of a surfactant is proportional to its concentration and is widely used to assess its efficacy. The canvas disc method is a rapid, efficient, and dependable test assess a shampoo's wetting power<sup>[20]</sup>. The observe time for formulation shampoo is 20min and 12 second. Then compare of marketed shampoo clinic plus is 18min and 13 second.

#### 4.2.8 Evaluation of conditioning performance

Table 3 shows the conditioning effectiveness of three shampoos based on the mean scores of student referees. The majority of pupils thought the trees were cleaned with clinic plus. Offered the best conditioning performance, whereas the control trees (without washing) had the lowest score (1.1). The conditioning performance of the tresses was determined to be 3.0 out of 4 when washed with designed shampoo, which was equivalent to the scores of marketed shampoos. The results showed that the designed shampoo had high levels of conditioning performance.

Score	Formulated shampoo	Clinical shampoo	No washing
1	1	0	18
2	3	1	2
3	11	10	0
4	5	9	0
Average	3	3.4	1.1

Score 4 = excellent; score 3 = good; score 2 = fair and score 1= poor Table 2

#### Conclusion:

The purpose of this research was to develop a completely herbal shampoo that is similar to synthetic shampoo on the market. We created a herbal shampoo by combining plant extracts that are often utilized in traditional medicine and renowned for their hair-cleansing operations across Asia. All of the shampoo components are safer than silicones and polyquaternium synthetic conditioning additives. And can significantly minimize hair or protein loss when combing. We used Shikakai, Amla, Ziziphus, and other plant extracts to condition instead of cationic conditioners.

Several studies were carried out to analyze and compare the physicochemical properties of both produced and commercial shampoos. For quality control tests, our manufactured shampoo performed similarly to marketed shampoo, but more research and development are needed to increase its overall quality.

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