

## FORMULATION AND EVALUATION OF HERBAL SHAMPOO

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## ABSTRACT

**Aim and Objective:** The aim of this present study is to prepare and formulate an herbal shampoo and to assess its physicochemical function that emphasis on safety, efficacy, eliminating harmful synthetic ingredient, and substitute with safe natural ingredients.

**Methods:** The formulation of shampoo using the extracts of *Emblica officinalis*, *Hibiscus rosa-sinensis*, *Acacia concinna*, *Sapindus indica*, *Eclipta prostrata*, *Aloe barbadensis*, and *Cassia auriculata* in different proportions. Evaluation of organoleptic, physicochemical, and performance tests in terms of visual assessment, wetting time test, pH, assurance of solid contents, surface tension, detergency, dirt dispersion, conditioning performance, foam volume, and stability was performed.

**Results:** The created cleanser was clear and good appealing. It demonstrated good froth stability, detergency, good cleansing, small bubble size, low surface strain, and execution of good conditioning.

**Conclusion:** The physicochemical evaluation of the formulated shampoo showed ideal results. However, to improve its quality, product performance, and safety, further development was required.

**Keywords:** Herbal shampoo; *Eclipta prostrata*, *Sapindus indica*, Evaluation of shampoo.

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## INTRODUCTION

Shampoos are most probably used as cosmetics. It is a hair care product that is used for cleaning scalp and hair in our daily life. Shampoos are most likely utilized as beautifying agents and are a viscous solution of detergents containing suitable additives preservatives and active ingredients. It is usually applied on wet hair, massaging into the hair, and cleansed by rinsing with water. The purpose of using shampoo is to remove dirt that is build up on the hair without stripping out much of the sebum. Many synthetic shampoos are present in the current market both medicated and non-medicated; however, herbal shampoo popularized due to natural origin which is safer, increases consumer demand and free from side effects [1-3].

In synthetic shampoos, surfactants (synthetic) are added mainly for their cleansing and foaming property, but the continuous use of these surfactants leads to serious effects such as eye irritation, scalp irritation, loss of hair, and dryness of hairs [4]. Alternative to synthetic shampoo we can use shampoos containing natural herbals. However, formulating cosmetic products containing only natural substances are very difficult [5]. There are a number of medicinal plants with potential effects on hair used traditionally over years around the world and are incorporated in shampoo formulation [6]. These medicinal plants may be used in extracts form, their powdered form, crude form, or their derivatives [7]. To develop a shampoo containing an only one natural substance which would be safer with milder effect, then the synthetic shampoo is difficult and also it should possess good foaming, detergency, and solid content as such synthetic shampoo. Hence, we considered in detailing an unadulterated natural cleanser utilizing conventional technique using regularly utilized plant material for hair washing.

In the present study, herbal shampoo was formulated containing suitable ingredient such as *Hibiscus rosa-sinensis*, *Emblica officinalis*, *Acacia concinna*, *Sapindus indica*, *Eclipta prostrata*, *Aloe barbadensis*, and *Cassia auriculata* in different proportions to formulate and evaluate its physicochemical properties. The pericarp of *S. indica* Poir. (Soapnut), products of *Phyllanthus*

*emblica* (Amla), and units of dried *A. concinna* (Shikakai) have been utilized customarily as old stories framework for purging hair [8]. Cleanser nut and shikakai when shaken with water create rich foam due to their high saponin content [9] it indicates frothing impact. Amla fruit and *C. auriculata* flowers are used to promote hair growth, anti-dandruff agent, strengthen hairs, and prevent hair fall [10]. *E. prostrate* leaves (Bhringraj) commonly known as false daisy in English and Bhringraj in India, to promote hair growth and prevent graying of hair [11]. *H. rosa-sinensis* flower and *A. barbadensis* used as a conditioning agent.

## METHODS

## Plants

The plant materials required for the present study were obtained from in and around Chennai, Tamil Nadu, and authenticated by the botanist Dr. P Jayaraman, Director, Plant Anatomy Research Center, Chennai.

## Preparation of extract

About 100 g of each powdered plant materials, namely *H. rosa-sinensis*, *E. officinalis*, *A. concinna*, *S. indica*, *E. prostrate*, *A. Barbadensis*, and *C. auriculata*, were homogenized. The powdered material was extracted with distilled water by boiling for 4 h. The extract of each plant material was separated and evaporated.

## Formulation of herbal shampoo

Formulation of the herbal shampoo was done as per the formula given in Table 1. To the gelatin solution (10%), added the herbal extract and mixed by shaking continuously at the time interval of 20 min. 1 ml of lemon juice was also added with constant stirring. To improve aroma in the formulation, sufficient quantity of essential oil (rose oil) was added and made up the volume to 100 ml with gelatin.

## Evaluation of herbal shampoo

The prepared formulation was evaluated for product performance which includes organoleptic characters, pH, physicochemical

characterization, and for solid content. To guarantee the nature of the items, particular tests were performed for surface tension, foam volume, foam stability, and wetting time using standard protocol.

#### Visual assessment

The prepared formulation was assessed for color, clarity, odor, and froth content.

#### pH determination

The pH of the prepared herbal shampoo in distilled water (10% v/v) was evaluated by means of pH analyzer at room temperature [12].

#### Determination of solid content percentage

The percentage of solid substance was determined by weighing about 4 g of shampoo in a dry, clean, and evaporating dish. To confirm the

result, the procedure was repeated again. The liquid portion of the shampoo was evaporated in a dish by placing on hot plate. The percentage and the weight of the solid contents present in the shampoo were calculated after drying completely [13].

#### Surface tension measurement

The prepared shampoo in distilled water (10% w/v) was evaluated for surface tension using stalagmometer in room temperature [14].

#### Testing of wetting

Wetting time was calculated by noting the time required by the canvas paper to sink completely [3]. A canvas paper weighing 0.44 g was cut into a disc of diameter measuring 1-inch. Over the shampoo (1% v/v) surface, the canvas paper disc was kept and the time taken for the paper to sink was measured using the stopwatch.

#### Foam stability test

The stability of the foam was determined using cylinder shake method. About 50 ml of formulated shampoo (1%) solution was taken in a graduated cylinder of 250 ml capacity and shaken for 10 times vigorously. Foam stability was measured by recording the foam volume of shake test after 1 min and 4 min, respectively [15]. The total foam volume was measured after 1 min of shaking.








#### Dirt dispersion test

To 10 ml of refined water two drops of cleanser were included and taken in a wide-mouthed test tube. To the formulated shampoo, added one drop of Indian ink and shaken for 10 min after closing the test tube with a stopper. The volume of ink in the froth was measured and the result was graded in terms of none, slight, medium, or heavy [16].

**Table 1: Ingredients of the herbal shampoo**

Materials required	Quantity to be weighed
Soap nut extract	0.5 g
Amla extract	0.5 g
Shikakai extract	0.5 g
Hibiscus	0.5 g
Bhringraj extract	0.5 g
Senna extract	0.5 g
<i>Aloe vera</i>	1 g
Gelatin	q.s
Lemon juice	q.s
Rose oil	q.s

**Table 2: Description of the ingredients of the herbal shampoo**

S. No.	Common name	Pictures	Botanical name	Parts used	Category
1	Hibiscus		<i>Hibiscus rosa-sinensis</i>	Flower	Conditioning agent
2	Amla		<i>Emblica officinalis</i>	Fruit	Anti-dandruff agent
3	Shikakai		<i>Acacia concinna</i>	Powder	Detergent
4	Soapnut		<i>Sapindus indica</i>	Fruit	Detergent
5	Cassia		<i>Cassia auriculata</i>	Leaves	Anti-dandruff agent
6	Bhringraj		<i>Eclipta prostrata</i>	Leaves, flower	Hair growth
7	<i>Aloe vera</i>		<i>Aloe barbadensis</i>	Leaf	Coolant

### Conditioning performance evaluation

An artificial hair tress of Indian women was received from a salon and divided into two swatches of length 10 cm approximately, weighing 5 g. The control swatch was the one without washing and the test swatch using the formulated shampoo was washed with. Each tress was added for 2 min to the combination of shampoo in water in the proportion 10:15 taken in a conical flask and washed using 50 ml of distilled water. Each tress was air dried at room temperature and the procedure was repeated for maximum of 10 times. The conditioning effect of the prepared shampoo in terms of softness and smoothness was determined using a blind touch test using volunteers of student 20 numbers selected randomly [17]. The conditioning performance of the shampoo was rated in terms of Score 1–4 (4 - excellent, 3 - good, 2 - satisfactory, and 1 - poor) by asking all the selected students to touch the tress washed with prepared shampoo.

## RESULTS

### Herbal shampoo formulation

The shampoo was formulated by admixing the equal amount of the aqueous extracts of all the ingredients with soapnut (Table 1). The above plant extract contains phytoconstituents like saponins which is a natural surfactant having detergent property and foaming property. An ideal shampoo must have adequate viscosity and many natural substances possess good viscosity. The gelatin solution (10%) behaves as a pseudoplastic forming clear solutions. Lemon juice (1 ml) added to the shampoo serves as anti-dandruff agent, natural antioxidant, and chelating agent and maintains the acidic pH in the formulation.

### Evaluation of formulated shampoo

#### Physical appearance

The prepared shampoo showed good characteristics in terms of foaming effect and appearance on the visual inspection of the formulation. The results are shown in Table 2.

#### pH

The pH of the prepared solution of shampoo using distilled water (10%) was evaluated at 25°C temperature. For enhancing and improving the hair quality, pH of the shampoo is very important and also for stabilizing the scalp and minimizing irritation to the eyes [18]. For minimizing the damage of hair using shampoo, one of the ways in the present trend is to develop shampoos having lower pH value. Lowering of pH (mild acidity) promotes tightening of the scales and prevents swelling, thereby producing sheen. The results are presented in Table 2.

#### Solid content

Shampoo with high solid content will be very difficult to rinse and hard to work with the hair. The prepared shampoo contains 23.25% of solid content. Thus, they considered easy to wash out when having less solid content during preparation of shampoos (Table 2).

#### Surface tension

The surface tension reduction in the prepared shampoo was found to be of about 35.18 dynes/cm (Table 3). One of the mechanisms in the detergency property is the lowering of surface tension, and this will be the marker for a good detergency effect of the shampoo which could be done by reducing the surface tension of water from 72.8 dynes/cm to the surface tension of water 32–37 dynes/cm.

#### Wetting time

To test the efficacy of the shampoo, wetting ability of a surfactant needs to be calculated which depends on the concentration of surfactant [19]. For the evaluation of wetting ability of the shampoo, canvas disc method is used which is an efficient, quick, easy, and reliable method. The prepared shampoo shows the wetting time of the about 120 s. The maximum of wetting time shows that the shampoo contains lower amount of detergents.

**Table 3: Physicochemical study of the herbal shampoo**

Evaluation test	Formulated shampoo
Color	Brown
Transparency	Clear
Odor	Good
pH of 10% solution	7
Solid contents (%)	23.25
Foam volume (ml)	25
Foam type	dense, small
Surface tension (dynes/cm)	35.18
Wetting time (s)	120 s

**Table 4: Conditioning performance of formulated shampoo**

Score	Formulated shampoo	Control
1	1	16
2	4	4
3	12	0
4	3	0
Average	3	1.1

The mean score based on the opinion given by the volunteers from student population (n=20) on the conditioning effect of the shampoos on the selected tresses. Score 1 - poor; Score 2 - fair; Score 3 - good, and Score 4 - excellent

### Foaming ability and foaming stability

From the consumer point of view, foam stability is one of the important needs of a shampoo. Important parameter that was considered in the shampoo evaluation was determination of foaming stability. The foam volume produced by the formulated shampoo is above 50 ml. The prepared shampoo generates uniform, small sized, compact, denser, and stable foam. 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 both shikakai and soapnut [20].

### Dirt dispersion test

In the dirt dispersion test using Indian ink, the volume of ink in the froth was measured and the result was graded as none, light, moderate, or heavy.

### Net content

Before starting the experiment, outside of the bottle was marked at the surface level of liquid, and then at the end of the experiment, the volume of water required to fill it up to the mark was noted. If the formulated materials are paste or solid forms, then the materials were placed in an open can with the frozen material taking the weight of the container and the net content was noted.

### Conditioning performance

Based on the conditioning performance of the prepared shampoo, the average value reported by the student is given in Table 4. The score of conditioning performance of the control tress (without washing) was found to be 1.1 and for the tress that was washed with prepared shampoo; the score out of 4 was 3.0. The results revealed that the shampoo formulated is having good conditioning effect.

## CONCLUSION

The present study was carried out with the aim of preparing the herbal shampoo that reduces hair loss during combing, safer than the chemical conditioning agents as well as to strengthen the hair growth. Herbal shampoo was formulated with the aqueous extract of medicinal plants that are commonly used for cleansing hair traditionally. Use of conditioning agents (synthetic) reduces the protein or hair loss. To provide the effective conditioning effects, the present study involves the use of shikakai, amla, and other plant extracts instead of synthetic

cationic conditioners. The main purpose behind this investigation was to develop a stable and functionally effective shampoo by excluding all types of synthetic additives, which are normally incorporated in such formulations. To evaluate for good product performance of the prepared shampoo, many tests were performed. The results of the evaluation study of the developed shampoo revealed a comparable result for quality control test, but further scientific validation is needed for its overall quality.

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