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## Formulation and Evaluation of Polyherbal Shampoo



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### ABSTRACT

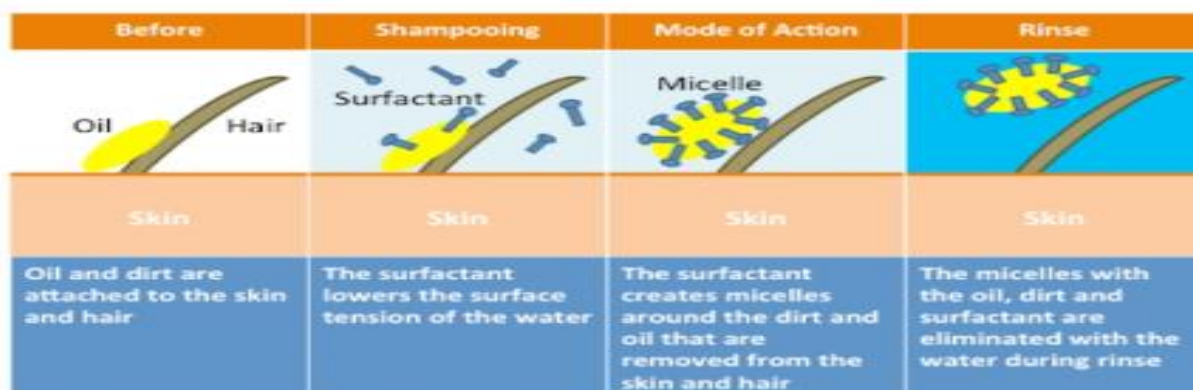
The assurance of therapy with minimal side effects has been proven that ayurvedic formulation is to be promising for cosmetic use too. Maintenance of other factors shall not fulfill the need so extraneous treatment is essential that too which is safe. In case of hair disorders like dandruff problems, proper selection of ayurvedic ingredients with their required amounts, the dosage form can be formulated as powder shampoo to fight against dandruff. A more radical approach in reducing the synthetic ingredient is by incorporating natural extract whose functionality is comparable with their synthetic ingredient. A shampoo is a cleansing aid for the hair and is counted among the foremost beauty products. Several herbs are reported to be effective in controlling such fungi in our laboratory an antidandruff herbal shampoo –Herbello was prepared and characterized. Certain improvements, especially concerning viscosity, conditioning ability, and anti-dandruff activity were needed. Most effective herbs were chosen and used in different combinations for the preparation of shampoo to improve antidandruff activity. This herbal shampoo was formulated using various natural ingredients. Later the formulation was evaluated at a laboratory scale to ensure its safety, stability, and efficacy.

## INTRODUCTION:

The shampoo sector is probably the largest unit sale among the hair care products since shampoos are one of the cosmetic products used in daily life. Synthetic preservatives and detergents have sometimes been the cause of adverse effects among consumers. A more radical approach in reducing the synthetic ingredients is by incorporating natural extracts whose functionality is comparable with their synthetic ingredients. A shampoo is a cleaning aid for the hair and is counted among the foremost beauty products. Today's shampoo formulations are beyond the stage of pure cleaning of the hair. Additional benefits are expected, e.g. conditioning, smoothing of the hair surface, good health of hair, e.g. hair free of dandruff, dirt, grease, and lice, and, above all, its safety benefits are expected. As the scalp is one of the most absorbent parts of the body, products applied to the scalp go directly to the blood, without being filtered in any way.<sup>[1]</sup>

**Shampoo:** Shampoos are most probably used as cosmetics. It is a hair care product that is used for cleaning the 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 built upon the hair without stripping out much of the sebum.<sup>[1,2,3,4,5,6,7,8]</sup>

**How shampoo works:** Shampoo cleans by stripping sebum from the hair. Sebum is an oil secreted by hair follicles that is readily absorbed by the strands of hair and forms a protective layer. Sebum protects the protein structure of the hair from damage, but this protection comes at a cost. It tends to collect dirt, styling products, and scalp flakes. Surfactants strip the sebum from the hair shafts and thereby remove the dirt attached to it. While both soaps and shampoos contain surfactants, soap bonds to oils with such affinity that it removes too much oil if used on hair. Shampoo uses a different class of surfactants balanced to avoid removing too much oil from the hair.



**Figure No. 1: Working of shampoo**

The chemical mechanisms that underlie hair cleansing are similar to that of traditional soap. Undamaged hair has a hydrophobic surface to which skin lipids such as sebum stick, but water is initially repelled. The lipids don't come off easily when the hair is rinsed with plain water. The anionic surfactants substantially reduce the interfacial surface tension and allow for the removal of the sebum from the hair shaft. The non-polar oily materials on the hair shaft are solubilized into the surfactant micelle structures of the shampoo and are removed during rinsing. There is also considerable removal through a surfactant and oil “roll-up” effect.

#### **Ideal characteristics of Shampoo:**

Shampoo formulations seek to maximize the following qualities:

1. Easy rinsing
2. Good finish after washing hair
3. Minimal skin/eye irritation
4. No damage to hair
5. Feels thick and/or creamy
6. Pleasant fragrance
7. Low toxicity
8. Good biodegradability of ingredients

9. Slightly acidic (pH less than 7), since a basic environment weakens the hair by breaking the disulfide bonds in hair keratin. <sup>[9]</sup>

**Plan of work:**

**Ingredients:**

**1. Amla:**

- Synonyms: Indian gooseberry, Emblic myrobalan.
- Biological Source: Amla consists of the fresh or dried fruit of *Emblica officinalis* Gaertn. (syn. *Phyllanthus emblica* Linn)
- Family: *Euphorbiaceae*.
- Uses: used for hair growth, antidandruff, hair darkening, reduce hair loss. <sup>[10,11]</sup>



**Figure No. 2: Amla**

**2. Ashwagandha:**

- Synonyms: Withania root. Ashwagandha, Clustered Winter cherry.
- Biological Source: It consists of the dried roots and stem bases of *Withania somnifera* Dunal,
- Family: *Solanaceae*.
- Uses: Improves circulation. <sup>[10]</sup>



**Figure No. 3: Ashwagandha**

### 3. Cinnamon:

- Synonyms: Cortex cinnamoni, Ceylon cinnamon, Saigon cinnamon, Chinese cassia, Cinnamomum aromaticum, Cinnamomum laurus.
- Biological Source: Cinnamon is the dried inner bark of the coppiced shoots of *Cinnamomum zeylanicum* Nees.,
- Family: *Lauraceae*
- Uses: lice treatment, hair growth promoter, reduce hair loss, antifungal <sup>[10,12]</sup>



**Figure No. 4: Cinnamon**

### 4. Kalonji:

- Synonyms: Small Fennel, Nigella Seed, Black Cumin, Fitch (Biblical), Biological Source: It consists of seeds of *Nigella sativa* Linn
- Family: *Ranunculaceae*.
- Uses: Improves scalp health, reduces dryness, improves blood circulation, promotes hair growth, prevents premature graying, reduces hair fall. <sup>[10,13]</sup>



**Figure No. 5: Kalonji**

#### **5. Neem:**

- Synonym: Neem, Margosa, Azadirachta.
- Biological Source: Neem consists of almost all parts of the plants which are used as a drug. Some important morphological parts are the dried stem bark, root bark, leaves, and fruits of *Azadirachta indica* also, known as *Melia azadirachta*.
- Family: *Meliaceae*
- Uses: Antiseptic, antibacterial.<sup>[10]</sup>



**Figure No. 6: Neem**

#### **6. Methi:**

- Synonyms: Fenugreek, Greek hay.
- Biological Source: It consists of dried seeds of *Trigonella foenum-graecum* Linn.

- Family: *Fabaceae*.
- Uses: Cleaning, softening, and shining of hairs.<sup>[10]</sup>



Figure No. 7: Methi

#### 7. Shikakai:

- Synonyms: Shikakai, sap-pod.
- Biological sources: It consists of dried fruit of *Acacia concinna*.
- Family: *Mimosaceae*.
- Use: Foaming & antidandruff.<sup>[14]</sup>



Figure No. 8: Shikakai

#### 8. Hibiscus:

- Synonyms: red hibiscus.
- Biological sources: It consists of dried flowers of *Rosa sinensis*.
- Family: *Malvaceae*

- Uses: hair conditioning, treat itchy scalp, prevent premature graying.<sup>[15]</sup>



Figure No. 9: Hibiscus

#### 9. Reetha:

- Synonyms: Soapnut, washnut, etc.
- Biological sources: It consists of the dried fruit of *Sapindus mukorossi*.
- Family: *Sapindaceae*
- Use: Foaming and detergent.<sup>[16]</sup>



Figure No. 10: Reetha

#### 10. Rose:

- Synonyms:
- Biological source: It consists of dried petals of *Rosa centifolia*.
- Family: *Rosaceae*.
- Uses: Promot hair growth, Fragrance<sup>[10]</sup>





Figure No. 11: Rose

### MATERIALS AND METHODS:

The Herbal shampoo powder was formulated using the above natural ingredients, selected herbal drugs in dried form were purchased from the authenticated agencies. Herbs along with their part used in shampoo and quantity took are tabulated in Table No. 1. Herbal shampoo was prepared by uniformly powdering and mixing in ascending order by weight with continuous trituration. <sup>[1,3,17]</sup>

Table No. 1: Formulation

Ingredients	Quantity & Use
Shikakai ( <i>Acacia concinna</i> )	10 % (anti-dandruff)
Methi ( <i>Trigonella foenum-graecum</i> )	10 % (cleaning agent)
Hibiscus ( <i>Rosa sinensis</i> )	10 % (conditioning agent)
Neem ( <i>Azadirachta indica</i> )	5 % (anti-bacterial)
Ashwagandha ( <i>Withania somnifera</i> )	5 % (scalp circulation & nourishment)
Reetha ( <i>Sapindus mukorossi</i> )	20 % (foaming)
Amla ( <i>Embllica officinalis</i> )	15 % (hair darkening)
Cinnamon ( <i>Cinnamomum zeylanicum</i> )	8 % (anti-lice agent)
Kalonji ( <i>Nigella sativa</i> )	15 % (hair growth)
Rose ( <i>Rosa centifolia</i> )	2% (fragrance)

### **Procedure for Formulation:**

Formulation of Herbal shampoo powder

**Drying:** All the powders are in dry form and ground.

**Weighing:** All the required herbal powders for shampoo preparation were weighed individually.

**Size reduction:** The crude ingredients were collected and these ingredients were size reduced using a hand-driven mixer individually.

**Mixing:** All these fine ingredients were mixed thoroughly by the mixer to form a homogenous fine powder.

**Sieving:** Then this fine powder was passed through sieve No: 80, to get a sufficient quantity of fine powder.

**Packing and labeling:** Then it was packed and labeled suitably.

Preparation Quantity is taken for 100g of Herbal Powder Shampoo.<sup>[1,18,19,20]</sup>

### **Evaluation:**

The prepared formulation of shampoo was subjected to the following evaluation parameters.

- Organoleptic character
  - Odour
  - Colour
  - Texture
  - Taste
- Angle of repose
- Bulk density
- Tap density
- Moisture content

- Dirt dispersion
- Cleaning action
- pH
- Ash value
  - Total ash value
  - Acid insoluble ash
  - Water-soluble ash
- Washability
- Wetting time
- Water solubility
- Foaming index
- Skin/eye irritation



### 1. Organoleptic character:

Organoleptic evaluation studies were performed by taking the samples randomly for the parameters like color, odor Taste, and texture.

**2. Angle of repose:** Angle of repose affects the flow properties of a powder. It was determined by the fix glass funnel method, a distance of 2 cm is maintained between the graph paper and the bottom of a powder. Flowing was continued till the top of the heap touches the bottom tip of the funnel.

The angle of repose was thus estimated by the following formula. It is expressed in  $g/cm^3$ .

$$\Theta = \tan^{-1}(h/r)$$

Where

h = Height of the pile formed.

r = The radius of the base of the pile.<sup>[1,3,21]</sup>

### 3. Bulk density:

The bulk density of a powder is the ratio of the mass of an untapped powder sample and its volume, including the contribution of the inter particulate void volume. Hence, the bulk density depends on both the density of powder particles and the spatial arrangement of particles in the powder. The bulk density is expressed in  $\text{g/cm}^3$ .

A 50 ml graduated cylinder was taken and the required amount of herbal shampoo powder was added to it. This was transferred to bulk density apparatus and bulk density was calculated. It is an important property for packaging and uniformity in the bulk of the product.<sup>[1,3]</sup>

$$\text{Bulk density} = \text{Mass of powder/Bulk volume of the powder}$$

### 4. Tap density:

The tapped density is an increased bulk density attained after mechanically tapping a container containing the powder sample. After observing the initial powder volume or mass, the measuring cylinder or vessel is mechanically tapped for 1 min and volume or mass readings are taken until little further volume or mass change was observed. It was expressed in grams per cubic centimeter ( $\text{g/cm}^3$ ).<sup>[1,3,21]</sup>

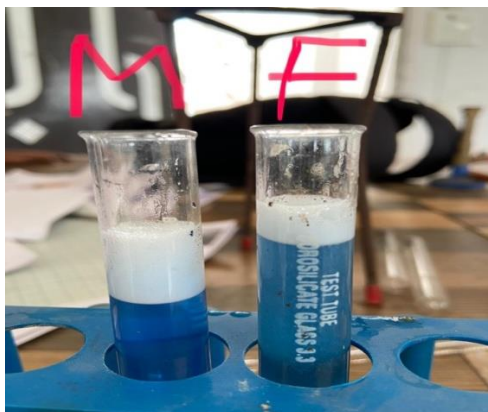
$$\text{Tapped density} = \text{Mass of the powder/tapped volume of the powder}$$

### 5. Moisture content:

Moisture content in the formulation is very important as it contains herbs that are liable to be attacked by weather. 2 gm of powder was taken and kept in an oven and dried up to two constant readings and % moisture content was calculated as w/w.<sup>[1,17,22]</sup>

### 6. Dirt dispersion:

Two drops of herbal shampoo were added to a large test tube containing 10 ml of distilled water. 1 drop of India ink was added; the test tube was stoppered and shaken ten times. The amount of ink in the foam was estimated as Light.<sup>[1,13,16]</sup>



**Figure No. 1: Dirt Dispersion Test**

### **7. Cleaning action:**

5 grams of wool yarn were placed in grease, after that, it was placed in 200 ml. of water containing 1 gram of *herbal shampoo* in a flask. The temperature of the water was maintained at 35°C. The flask was shaken for 4 minutes at the rate of 50 times a minute. The solution was removed and the sample was taken out, dried, and weighed. The amount of grease removed was calculated by using the following equation.

$$DP = 100(1-T/c)$$

In which, DP is the percentage of detergency power, 1g is the weight of sebum in the control sample and the cleansing action *herbal shampoo* is calculated.<sup>[1,23]</sup>

### **8. pH:**

The pH of 10 % shampoo solution in distilled water was determined at room temperature 25°C. The pH was measured by using a digital pH meter. <sup>[1,7,20,22]</sup>

### **9. Ash value:**

#### **a) Total ash:**

Ash value is calculated to determine the inorganic contents which are characteristic of a herb. About 2 g of powder drug was taken in silicon dish previously ignited and weighed. The temperature was increased by gradually increasing the heat not exceeding to red colour. After complete burning, ash is cooled and weighed.

**b) Acid insoluble ash:**

Acid insoluble ash was calculated by boiling above obtained ash with 25 ml diluted HCl for 5 min, insoluble matter was collected in gooch crucible, washed with hot water, ignited, and weighed. [1,17,18]

**10. Washability:**

Formulations were applied on the skin and then ease and extent of washing with water were checked manually.

**11. Wetting time:**

The canvas was cut into 1 inch diameter discs having an average weight of 0.44 g. The disc was floated on the surface of a shampoo solution of 1 % w/v and the stopwatch was started. The time required for the disc to begin to sink was measured acutely and noted as the wetting time.

**12. Water Solubility:**

Solubility is defined as the ability of the substance to be soluble in a solvent. One gram of the powder is weighed accurately and transferred into a beaker containing 100 ml of water. This was shaken well and warmed to increase the solubility. Then cooled and filtered, the residue obtained is weighed and noted.

**13. Foaming index:**

One gram of the powder was weighed accurately and transferred into a 250 ml conical flask containing 100 ml of boiling water. Then it is warmed gently for 30 minutes, cooled and filtered, and the volume was made up to 100 ml in a standard volumetric flask.

This extract is taken in 10 test tubes in a series of successive portions of 1, 2, 3....10 ml, and the remaining volume is made up to 10 ml with water. Then the test tubes were shaken in longwise motion for 15 seconds at speed of 2 frequencies/second. Then the tubes are allowed to stand for 15 minutes. The height of the foam was measured. [1,18]

$$\text{Foaming index} = 1000/a$$

#### 14. Skin/eye irritation:

The eye and skin irritation tests revealed that the herbal *shampoo powder* shows no harmful effect on the skin and eye. This is due to the absence of synthetic surfactants. Most of the synthetic surfactants produce inflammation of the eyelid and corneal irritation. But in this formulation of herbal *shampoo powder*, the uses of all ingredients are obtained naturally. So it does not produce any harmful effects on the skin and eye.<sup>[1,5,17]</sup>

The study represented percentage of mortality 86% adult and 25.7% eggs of head lice of cinnamon leaf, using water as solvent. On the other hand, researchers change the solvent and using ethanol followed by rinse and the results illustrate 100% mortality in both adult and eggs.<sup>[24,25]</sup>

#### RESULTS:

**Table No. 2: Results**

Evaluation parameters	Formulated product	Marketed product
Organoleptic character		
Odour	Slightly pleasant	pleasant
Colour	Light brown (Tortilla)	Dark brown (peanut)
Texture	Smooth	Smooth
Angle of repose	41.18	40.01
Bulk density	0.50	0.38
Tap density	0.6	0.5
Moisture content	3.76 %	3.9 %
Dirt dispersion	Light	Light
Cleaning action	15 %	15 %
pH	6.2	5.5
Ash value		
Total ash	10.5 %	
Acid insoluble ash	2.5 %	
Wetting time	8 sec	5.99 sec
Washability	Easily washable	Easily washable
Water solubility	Soluble (sparingly)	Soluble (sparingly)
Foaming index	Good foaming	Good foaming
Skin/eye irritation	No irritation	No irritation

## CONCLUSION:

The world market is also moving towards herbal medicines for health care, health foods, and cosmetic purposes including hair preparations. India is a rich heritage for the cultivation and production of herbal medicines due to its diversified climatic conditions. The present study is to successfully prepare *herbal shampoo* containing herbal extract which is traditionally used for hair cleansing in India. All the ingredients used for the preparation of *herbal shampoo* are safer than marketed commercial *herbal shampoos*. Formulated herbal shampoo include not only, cleaning but also includes basic scalp treatments eg. Kalonji: improves scalp blood circulation and promote hair growth, Cinnamon: help in prevention from lice and fungus, shikakai: shows antidandruff property and neem: includes the antibacterial and antimicrobial effect.

## DISCUSSION:

Medicinal plants used in the formulation of *herbal shampoo* were found as a rich source of novel drugs. These plants were Reetha, Neem, Amla, Shikakai, Rose, Hibiscus, Ashwagandha, Methi, Cinnamon, Kalonji had been reported for hair growth and conditioning. The various quality control parameters were checked. All parameter gives favourable result. The result obtained in the present study shows that the active ingredients of these drugs when incorporated in shampoo give more stable products with good aesthetic appeal. The pH of the shampoo is important for improving and enhancing the qualities of hair, minimizing the irritation to the eyes, and stabilizing the ecological balance of the scalp. Though the product is in dry form despite has a wonderful wetting capacity and being dry is very good for storage.

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