



## FORMULATION AND EVALUATION OF HERBAL POWDER SHAMPOO

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### ABSTRACT

The present study was aimed to formulate an herbal shampoo powder. It is safe as compared to synthetic marketed products. Herbal shampoo powders were accurately weighed and passed through sieve no.100. It is prepared by mixing in their ascending order of quantities with continuous trituration. Later on, it was stored in air tight containers and used for further studies. All four formulations (F1-F4) were subjected to organoleptic studies, general powder characteristics, physicochemical evaluation, ash and alcohol soluble extractives, moisture content determination, pH determination, cleaning action, foaming capacities, dirt dispersion, wetting time and studies on nature of hair after wash. All four formulations (F1-F4) offered a suitable practical approach and achieved a better usage. General powder characteristics showed results in specified limits. Physicochemical evaluations, pH determination, ability to remove grease, foaming capacity, dirt dispersion, wetting time and nature of their hair wash were found to yield satisfactory results for F2 formulation. The present work confirmed the successful preparation of herbal shampoo powders by mixing method. Among all the four formulations (F1-F4) F2 yield satisfactory results.

**KEYWORDS:** Herbal, Herbal shampoo powder, crude drugs, Cosmeceuticals.

### INTRODUCTION

Cosmeceuticals have become the fastest growing segment of the personal care industry. About 25 years ago, Dr. Albert Kligman of the University of Pennsylvania originally coined the term "cosmeceutical," describing a hybrid category of products found on the spectrum between drugs and cosmetics that exert a pharmaceutical therapeutic benefit but not necessarily a biological therapeutic benefit. There are approximately 400 cosmeceutical manufacturers including companies that supply the cosmeceutical chemicals and/or manufacture the products in the U. S. market. The largest companies in the industry for finished products are Procter and Gamble, Johnson and Johnson, L'oreal, Estee Lauder, Avon and Allergan, which together represent nearly one half of the U. S. market. Domestication of plants by man started since the dawn of civilization to meet his basic needs of food, shelter and clothing. Besides, these requirements nature has provided plants for health care, healing and other comforts. An estimate suggests that about 13,000 plant species worldwide are known to have use as drugs. Nowadays, herbal extracts and herbal powders are used in the preparations to enhance beauty and increase the attractiveness of the person. These herbal preparations are used as sunburn, complexion brighter, and hair growing.<sup>[1,2,3,4]</sup>

Cosmetics that include herbs can be classified on the behalf of dosage form such as powder, cream, soaps, and solutions and according to organ or part of the body to be applied for such as cosmetics for skin, hair, teeth and mouth. The hair follicle is one of the characteristic features of mammals serves as a unique miniorgan. In humans, hair has various functions such as protection, and thermo-regulation. The hair also plays important roles for the individual's social and sexual interaction. The hair follicle serves as a reservoir for epithelial and melanocyte stem cells and it is capable of being one of the interactions between epithelial and mesenchymal cells.<sup>[5]</sup>

The approximate growth of hair is 10cm per year. Hair follicle undergoes three phases of growth in a cyclic manner.

**Anagen** is growth phase which may vary from 2 to 8 years and determines the length of the hair.

**Catagen** is transitional or regression phase which lasts about 10 days. At the end of growth phase, the hair enters into this phase. The hair follicle shrinks and detaches from the dermal papilla.

**Telogen** is known as resting phase, which lasts about 5-6

weeks. This phase comes after the transitional phase. The hair follicles along with the dermal papilla remain in the resting phase. Both of them join and new hair growth begins at the end of this stage. This new hair pushes the old one out and hair follicle enters in the growth phase again.<sup>[6,7,8,9,10]</sup>

Hair care products may be defined as the preparation which are meant for cleansing, modifying the texture, changing the color, giving life to the stressed hair, providing nourishment to the hair and giving the healthy look to the hair. The English word shampoo is derived from Hindi word "champo", which means head massage with some form of hair oil. The main aim is shampoo is to remove dirt, oil, skin particles, dandruff, environmental pollutants and other contaminant particles from hair without adversely affecting the users. Shampoos are most likely utilized as beautifying agents and are powder preparation of detergent containing various additive, preservative and active ingredients. It is usually applied on the wet hairs, massaging into the hair, and cleansed by rinsing with water. Alternative to synthetic shampoo we can use shampoo containing natural herbals.<sup>[4,5]</sup>

However, formulating cosmetic products containing only natural substance are very difficult. There are number of medicinal plants with potential effect on hair used traditionally over years around the world and are incorporated in shampoo powder preparation. These medicinal plants used in powder form, crude form.

Hair is one of the external barometer of internal body conditions. It is an important part of human body. Various synthetic compounds, chemicals, dyes and their derivative have been proved to cause harmful effect. Now days, people are having an awareness of their effect on hairs, skin and eyes. Due to this reasons community is getting attracted towards herbal products dye to their inexpensive nature and negligible side effects.<sup>[11]</sup> Hence this product having great demand in market.

A shampoo powder is said to be ideal when it

- (1) Effectively and completely remove dust particles and excessive sebum from the scalp and hair,
- (2) Easily remove when rinsed with water
- (3) Leave the hair non-dry, soft and manageable
- (4) Impart a pleasant fragrance to the hair
- (5) Cause no side effect or irritation to the skin or hairs.

Now-a-days natural products dominate over synthetic since it has no side effects. This is one reason that the herbal products are among the consumers. Synthetic hair products have chemicals which may give short term growth and shine to hair, but definitely when used for long term damages the hair which may even lead to baldness, premature hair graying and hair loss. Some of the chemicals buses in synthetic shampoo includes sodium directly sulphate, N-nitrosodiethanolamine,

EDTA, disodium EDTA, formaldehyde etc. Hence chances of hair damage are more as compare to herbal powder shampoo.<sup>[12]</sup>

Based upon the past history Indian women use herbals such as Shikakai, reetha and soil that are natural cleansing agents without harmful effects.

A shampoo is a preparation of surfactant in a suitable liquid, solid or powder which when used under the specific conditions will remove surface grease, dirt and skin debris from the hair shaft without adversely affecting the user's hairs. Herbal shampoos are the cosmetic preparations that with the use of traditional ayurvedic herbs are meant for cleansing the hair and scalp just like the regular shampoo. They are used for removal of oils, dandruff, dirt, environmental pollutions etc.<sup>[13]</sup>

The advantages of this herbal formulation are, it is pure and organic ingredients. Free from side-effects, no surfactants. E.g. SLS, no synthetic additives, good stability. They are less harmful as compared to commercial shampoos.

In the present study, herbal shampoo was formulated containing various types of herbs and suitable ingredients, such as- *Emblica officinalis*, *Acacia concinna*, *Lowsonia inermis*, Green tea, Coffee, *Aloe barbadensis*, Brahmi, Shikakai, Reetha, Methi powder, *Ocimum sanctum*, *Azadiracta indica* etc.

Herbal products are affordable and they are having very little negative effects. They are used not just cleaning of hair but for lightening and keeping hair under control.<sup>[14]</sup>

#### **MATERIALS AND METHODS OF PREPARATION OF HERBAL SHAMPOO**

Different parts of plants were selected to study hair care property. The plants are Amla (Fruits), Fenugreek (Leaves), Shikakai (Fruits), Brahmi (Root), Hibiscus (Leaf and Flower), Green Tea (Leaves), and Aritha (Fruit). All the required powders of these crude drugs were collected from the local herbal drug store market. These powders were accurately weighed, passed through sieve no. 100 and then mixed in their ascending order of quantities with continuous trituration and stored in airtight containers until it was used for further studies.<sup>[15,16]</sup> The preparation formulas are given in table 1.

## FORMULATION

**Table 1: Formulation of Herbal Powder Shampoo.**

Constituents	F1	F2	F3	F4
Amla	20	15	18	23
Fenugreek	10	08	09	10
Green Tea	08	07	10	09
Brahmi	10	06	09	08
Hibiscus	08	09	06	07
Shikakai	15	20	20	15
Aritha	10	09	12	10

## EVALUATION OF HERBAL POWDER SHAMPOO

**1. Organoleptic studies:** Organoleptic evaluation studies were performed by taking the samples randomly for the parameters like color, taste and texture.<sup>[17,18]</sup>

**2. General Powder Characteristics:** General powder characteristics included particle size, angle of repose, bulk density and tapped density, which in turn affects properties like flow property. Hence they are evaluated.<sup>[19,20,21]</sup>

**Particle Size:** The particle size of herbal shampoo powder was determined by using microscope method. Place the stage micrometer on the microscope and initially focus on lower power by positioning the object to the center of the object. Focus the object, measure the size of each particle in terms of eyepiece division. Select two points one on left side other on right side. Calculation can be done by using calibration factor.<sup>[15,22]</sup>

Calibration factor = Number of stage divisions/ Number of eye piece divisions \*10

**Angle of Repose:** A glass funnel was held in place with a clamp on ring support over a glass plate. The glass plate was placed on a micro lab jack. Approximately, 10gm of the powder was transferred into the funnel keeping the orifice of funnel blocked by the thumb. As the thumb was removed, the lab jack was adjusted so as to lower the plate and maintain about 2cm gap between the bottom of the funnel stem and the top of the powder pile. When the powder was emptied from the funnel, the angle of the heap to the horizontal plane was measured with a protractor. The height and radius were measured using a ruler. The angle of repose was thus estimated by the following formula. It is expressed in g/cm<sup>3</sup>.<sup>[15,23]</sup>

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

Where,

$\alpha$  = Angle of repose

h = Height of the pile formed

r = Radius of the base of pile.

**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 powdered. The bulk density is expressed in g/cm<sup>3</sup>. A volume of 100 ml graduated cylinder in was taken and required amount of herbal shampoo powders (F1-F4) was added to the graduated cylinder. 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>[24]</sup>

Bulk Density = Mass of powder/ Bulk volume of the powder.

**Tapped Density:** Required amount of herbal shampoo powders (F1-F4) was taken and placed in 100 ml graduated cylinder and tapped for 2 minutes until little change in volume was observed.<sup>[15,25,26]</sup>

It is expressed in g/cm<sup>3</sup>. The tapped density is calculated by using the following formula:

Tapped density = Mass of the powder/ Tapped volume of the powder.

## 3. Physicochemical evaluation

### Extractive values

#### Determination of water soluble extractive

4g each of the dried herbal shampoo powder was weighed and macerated with 100ml of chloroform in a 250 ml conical flask for 24hrs shaking frequently during 6 hrs of shaking and allowed to stand for 18 hrs. Filter into a 50 ml cylinder. When sufficient filtrate has collected; transfer 25ml of the filtrate to a weighed, thin porcelain dish, as used for the ash values determinations. Evaporate to dryness on the water bath and complete the drying in an oven at 105<sup>0</sup> C for 6hrs. Cool in desiccators for 30 minutes and weigh immediately.<sup>[16,17]</sup> Calculate the percentage w/w of extractive with reference to air-dried shampoo powders (F1-F4).

Water soluble extractive value of the sample = 80\*%

### Ash value

This value is used to determine quality and purity of herbal shampoo powder and to establish the identity of it.

#### Determination of total ash

A flat, thin, porcelain dish or a tarred silica crucible was weighed and ignited. About 2g of herbal shampoo powder formulation (F1-F4) were weighed and taken into a dish. Support the dish on pipe-clay triangle placed on a ring of retort stand. Heat the dish about 7cm above

the flame, with the help of a burner, using a flame about 2cm high, heat till vapors almost cease to be evolved, then lower the dish and calculate the percentage of total ash with reference to air dried shampoo powders.<sup>[16,28]</sup>

#### Determination of acid insoluble ash

After determining total ash value using 25ml of dilute hydrochloric acid, wash the ash from the dish used for total ash into 100ml beaker. Place mere gauze over a Bunsen burner and boil for 5 minutes. Filter through an ash-less filter paper; wash the residue twice with hot water. Ignite a crucible in the flame, cool and weigh. Put the filter paper and residue together into crucible, heat gently until vapors cease to be evolved and then more strongly until all carbon has been removed. Cool using desiccators.<sup>[16,29]</sup> Weigh the residue and calculate acid insoluble ash with reference to the air dried herbal shampoo powders (F1-F4).

#### Moisture content determination

10g of herbal shampoo powder formulations (F1-F4) was placed in a tarred evaporating dish and kept in hot air oven for 105<sup>0</sup> C. The weight loss was observed at an interval of 15 minutes until constant weight was obtained.<sup>[30,31]</sup>

#### pH

1g each of herbal shampoo powder formulations (F1-F4) was taken and dissolved in 10ml of water. Their pH was checked with the help of pH paper.<sup>[32]</sup>

#### Skin/eye irritation test

The eye and skin irritation tests revealed that the herbal shampoo powder shows no harmful effect on 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 were obtained naturally. So it does not produce any harmful effect on skin and eye.<sup>[33]</sup>

#### Cleaning action

2g of wool was taken and placed in grease; the same was then placed in 200 ml of water containing 1g of each herbal shampoo powder formulations (F1-F4) in a flask and was shaken for 4 minutes. The solution was removed and sample was taken out, dried and weighed. The amount of grease removed was calculated.<sup>[34]</sup>

#### Foaming capacity

2g of each herbal shampoo powder formulations (F1-F4) were taken in 250ml graduated cylinder, 50ml of water was added and shaken for 5-10 times. The foaming capacities of all the four formulations (F1-F4) after 1 minute shaking and % foaming capacities of all the four formulations (F1-F4) for a time period of 60 minutes were performed.<sup>[35]</sup>

#### Dirt dispersion

Two drops of each 1% herbal shampoo powder formulations (F1-F4) were added in a large test tube containing 10ml of distilled water. A drop of Indian ink was added; the test tubes were stoppered and shaken. The amount of ink in the foam was estimated as none, moderate, heavy.<sup>[36]</sup>

#### Wetting time

A canvas was taken and cut into 1 inch diameter discs. The discs were floated on the surface of each formulation (F1-F4) of 1% herbal shampoo powder solution and time was noted. The time required for the disc to begin sink was measured accurately and noted as wetting time.<sup>[37]</sup>

## RESULTS

### Organoleptic properties

The results of visual inspection for all herbal shampoo powders were observed and evaluated for color, odor, taste and in terms of their appearance, flow property and texture. They somewhat shows distinct change in color. The results were reported in Table 2.

**Table 2: The Evaluation Parameters Of Organoleptic Studies.**

Evaluation parameters	F1	F2	F3	F4
Color	Faint Brownish	Faint Brownish	Faint Brownish	Faint brownish
Odor	Characteristic	Characteristic	Characteristic	Characteristic
Texture	Fine and smooth	Fine and smooth	Fine and smooth	Fine and smooth

### General powder characteristics

The particle size, angle of repose, bulk density and tapped density results were determined. All the herbal

shampoo powder shows the results in the specific limits for the respective evaluation parameters. The results were reported in Table 3.

**Table 3: The General Powder Characteristics.**

Evaluation parameters	F1	F2	F3	F4
Particle size	1-10 $\mu$ m	1-10 $\mu$ m	1-10 $\mu$ m	1-10 $\mu$ m
Angle of repose	41.98 <sup>0</sup>	41.02 <sup>0</sup>	39.35 <sup>0</sup>	39.69 <sup>0</sup>
Bulk density	0.39g/cm <sup>3</sup>	0.36g/cm <sup>3</sup>	0.40g/cm <sup>3</sup>	0.39g/cm <sup>3</sup>
Tapped density	0.49g/cm <sup>3</sup>	0.55g/cm <sup>3</sup>	0.53g/cm <sup>3</sup>	0.54g/cm <sup>3</sup>

**Physicochemical evaluation**

The results of extractive values, ash values and moisture content were reported in Table 4.

slightly acidic pH which may not cause damage to hairs. The results were reported in Table 4.

**Determination of pH**

All the formulations (F1-F4) of herbal shampoo powders were acid balanced and were 4. All formulations showed

**Table 4: The Physicochemical Evaluation Studies.**

Evaluation Parameters	F1	F2	F3	F4
<b>Extractive values:</b> Water soluble	20.2% w/w	32% w/w	22% w/w	18.8% w/w
<b>Ash value:</b> Total ash	17.8% w/w	17.2% w/w	16.8% w/w	19.8% w/w
Acid insoluble ash	5.4% w/w	4.2% w/w	4.6% w/w	7% w/w
<b>Moisture content:</b>	91.65w/w	89% w/w	89.85w/w	89.4% w/w
<b>pH</b>	4	4	4	4

**Cleaning action**

As cleaning is the primary action of a shampoo powder, cleaning action was tested on wool in grease. As seen from the results there is a significant difference in the amount of grease removed by all the five batches of

formulated herbal shampoo powders. The cleaning action of F1, F2, F3 and F4 formulations were observed. F2 formulations portrayed good ability in the removal of grease compare to other four formulations. These were reported in Table 5.

**Table 5: The Cleaning Activity Evaluation Parameters.**

Evaluation parameter	F1	F2	F3	F4
Cleaning action	86.67%	98%	90%	85.71%

**Foaming capacity**

All the four formulations of herbal shampoo powders have comparable foaming characteristics in distilled water. The total foam volume of herbal shampoo powders after 1 minute shaking ranged from mild to

good was recorded. The average percentage foaming capacities for F1, F2, F3, F4 and F5 formulations for a time period of 60 minutes were observed and were reported in Tables 6 and 7.

**Table 6: The Foaming Capacities Of All Formulations.**

Evaluation parameter	F1	F2	F3	F4
<b>Foaming capacity</b>	Good foam	Good foam	Mild foam	Good foam

**Table 7: The % Foaming Capacity Of Herbal Shampoo Powders.**

Time (Minutes)	Foaming Capacity			
	F1	F2	F3	F4
<b>0</b>	122	126	114	120
<b>5</b>	120	122	110	118
<b>30</b>	112	119	104	112
<b>60</b>	110	118	104	112
<b>Average foaming capacity</b>	116	121.25	108	115.5

**Dirt dispersion**

Shampoo powders that cause the ink to concentrate in the foam are considered as poor quality, the dirt should stay in water. Dirt that stays in the foam will be difficult to rinse away and will be re-deposited on the hair. The amount of ink in the foam of F1, F2, F3 and F4

formulations of herbal shampoo powders were evaluated and were ranged from moderate to light respectively. F1 and F2 formulations showed less dirt dispersion compared with others and the results were reported in Table 8.

**Table 8: The Dirt Dispersion Parameters Of All The Four Formulations.**

Evaluation parameter	F1	F2	F3	F4
<b>Dirt dispersion</b>	Light	Light	Moderate	Moderate

**Wetting time**

Wetting time of a substance is a function of its concentration. The wetting time of the F1, F2, F3 and F4

formulations were observed. F2 formulation showed less wetting time when compared to other three formulations. The results were reported in Table 9.

**Table 9: The Evaluation Parameters Of Wetting Time Of All The Four Formulations.**

Evaluation parameter	F1	F2	F3	F4
Wetting time	3 minutes 20 seconds	2 minutes 30 seconds	2 minutes 50 seconds	3 minutes 25 seconds

**Nature of hair after wash**

Nature of hair after wash was carried out with the help of application of herbal shampoo Powder formulations (F1-

F4) to volunteers observed the hairs as soft and manageable. The results were reported in Table 10.

**Table 10: The Evaluation Parameters Of Nature Of Hair After Wash.**

Evaluation parameters	F1	F2	F3	F4
Nature of hair after wash	Soft manageable	Soft manageable	Soft manageable	Soft manageable

**DISCUSSION**

The herbal shampoo powders were prepared by mixing in ascending order with continuous trituration F2 formulation exhibited satisfactory results with the evaluation parameters. It showed an increase in percentage foaming capacity in 1hr amongst other formulations. An increase of about 98% in cleaning action and 118% in 60 minutes for percentage foaming capacity was noted. Quick action on wetting time of 2 minutes and 30 seconds was reported. The similarity factor was noticed in the foaming capacity and nature of hair after wash for all the four formulations (F1-F4) of herbal shampoo powder.

**CONCLUSION**

F2 formulation of herbal shampoo powder was found to be in compliance with all the properties of powders and exhibited satisfactory results. The evaluation studies showed good cleaning action, better foaming capacity, and quick wetting time than other formulation batches. From the given study, it can be concluded that all the four formulations (F1-F4) of herbal shampoo powders prepared were good and had all the properties. Formulation F2 exhibited satisfactory results.

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