ORIGINAL RESEARCH PAPER

PREPARATION & EVALUATION OF ANTIDANDRUFF POLYHERBAL POWDER SHAMPOO

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ABSTRACT

Day by day, dependency of people is rising on herbal or ayurvedic formulation not only for chronic ailments but also for number of acute problems. The assurance of therapy with minimal side effects has proven ayurvedic formulation to be promising for cosmetic use too. In the scenario of changing food habits, stress level and dependent environment conditions, number of skin and hair disorders are encountered. Maintenance of other factor shall not fulfill the need so extraneous treatment is essential that to which is safe. In case of hair disorders like dandruff problem, proper selection of ayurvedic ingredient with their required amounts, dosage form can be formulated as powder shampoo to fight against dandruff .This herbal shampoo was formulated using natural ingredient like fenugreek (methi), Azadirachta indica (neem), Acacia concinna (shikakai), Sapindus mukorossi (reetha), Ocimum sanctum (tulsi) with proven efficacy of hair care preparation is prepared. The combination of several such ingredient of herbal origin has made it possible to secure highly effective dry powder shampoo. The formulation at laboratory scale was done and evaluated for number of parameters to ensure its safety and efficacy.

Keywords: Malassezia (Pityrosporum), Herbal Powder shampoo, Antidandruff, Foaming index.

INTRODUCTION

Hair-care products may be defined as the preparation which are meant for cleansing, modifying the texture, changing of the color, giving life to the stressed hair, providing nourishment to the hair and giving the healthy look to the hair. There are various types of hair: normal hair, Oily hair, dry hair, varies from one human to other human. In today fast life peoples dont have time to look on there physique also. The problems of hair : Hair falling, White hair, Dandruff, and Split end hair etc. The reasons of hair problem are tension, scalp infection, hormones disturbances, lower vitamin, food, minerals, and large chemical shampoo use. To overcome all this problem was the main intention of our project. So we prepared polyherbal antidandruff powder, which is an multipurpose powder for hair treatment. Cleanliness of hair and scalp are among the most important personal life consideration today.¹ Dandruff is a clinical condition caused by Malassezia (Pityrosporum) species is of great cosmetic concern all over the world. Pityrosporum ovale is strongly suspected to play a role in the manifestation of the seborrheic dermatitis.² Dandruff is known to be controlled by fungistatic ingredients in Anti-dandruff shampoos. herbal formulation have growing demand in the world market.³ The natural remedies are more acceptable in market because its safe and fewer side effect antidandruff

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shampoo and nutritional shampoo containing vitamin, aminoacids proteins hydrolysate. Currently available treatment of dandruff include therapeutic use of zinc pyrithione, salicylic acid, imidazolederivatives, glycolic acid, steroids, and sulphur and coal tar derivatives. However, these agents show certain limitations, either due to poor clinical efficacy or due to the compliance issues. Further more, these drugs are unable to prevent recurrence. The herbal shampoo powder was formulated using natural ingredients with *Acacia concinna* (shikakai), *Lawsonia inermis* (henna), *Aloe vera* (aloe), *Ocimum sanctum* (Tulsi), *Azadiracta indica* (Neem), and *Fenugreek* (methi). Both are having antidandruff action. The synthetic shampoo contain cationic, anionic and non anionic surfacant mix in this surfactant having good foming charcter but its toxic and caused irritation of eye. Hard water the surfactants leave a deposit of sodium, calcium and magnesium salts on the hair shaft. So these synthetic shampoos are found to have side effects like drying effect on the hair. These shampoos leave the hair too dry to handle (or) comb. To avoid these problems, herbal shampoos will be useful, dandruff is commonly aggrarated by changes in humidity, truma (scratching ), sesonal and emotional stresses, dandruff may improve in summer (as UV rays from sunlight counteract p.ovale) and it may worse in winter pityrosporum organism are linked toT-cell depression and they inhibit celll division & thus reduce sealing by decrease in epidermal turnover. Dandruff may caused varius symptome seborrhoic dermatitis,psoriasis fungal infection,or scalp & somness, itching infestation of head lice.

**MATERIALS AND METHODS**

**Procurement of Material**
The different parts of the plants were selected for the study having hair care property. The plants are methi powder, Hibiscus Leaf (*Hibiscus rosea*), Neem leaf (*Azadirachta indica*), Shikakai fruit (*Acacia concinna*), Aloe leaf (*Aloe barbadensis*), Henna Leaf (*Lawsonia inermis*), Brahmi root (*Centella asiatica*), Rithafruit (*Sapindus mukorossi*), Amla fruit (*Embelica officinalis*), Nagarmotha (*Cyperus rotundus*) Rusmari and Tulsi. The powder of methi, Amla fruit, Hibiscus Leaf, Neem leaf, Shikakai fruit, Aloe leaf, Henna Leaf, Ritha fruit were collected from the local market. The raw materials collected were given with their respective biological source and uses in table no. 1 ingredients in the hair care; even they are responsible to provide the nutrition to the body. Herbs have long been associated with hair care and are often ingredients of conditioners, shampoos and rinses. The selection of active ingredients for hair care powder is often based on the ability of the ingredient to prevent damage to the skin as well as to improve the quality of the skin by way of cleansing, nourishing and protecting the skin. In the paper, we reported the development and evaluation of herbal hair care powder.

**Preparation of the Herbal Shampoo Powder**

**Drying**
All the powder are in dry form and grinded.

**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 hand driven mixer individually.

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

**Sieving**
Then this fine powder was passed through sieve no.:120 , to get the sufficient quantity of fine powder.

**Evaluation of Herbal Powder Shampoo**
Prepared formulations of shampoos were subjected to following evaluation parameters.

**Organoleptic evaluation/visual appearance**
Organoleptic evaluation for parameters like colour, odour, taste and texture was carried out. Colour and texture was evaluated by vision and touch sensation respectively. For taste and odour evaluation a team of five taste and odour sensitive persons were selected.

**General powder characteristics**
General powder characteristics includes evaluation of those parameters which are going to affect the external properties (like flow properties, appearance, packaging criteria etc.) of the preparation. Characteristics evaluated under this section are particle size, angle of repose, bulk density and tapped density. All the three shampoo powders were taken at three different level i.e. from top, middle and lower level for the evaluation.

**Particle size**

Particle size is a parameter, which affect various properties like spreadability, grittiness etc., particle size was determined by sieving method by using I.P. Standard sieves by mechanical shaking for 10 min.

**Angle of repose**

It is defined as the maximum angle possible in between the surface of pile of powder to the horizontal flow.

**Funnel method**

Required quality of dried powder is taken in a funnel placed at a height of 6 cm from a horizontal base. The powder was allowed to flow to form a heap over the paper on the horizontal plane. The height and radius of the powder was noted and recorded. The angle of repose ($\theta$) can be calculated by using the formula.

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

Where,

- $\theta$ – Angle of repose
- $h$ – Height of the heap
- $r$ – Radius of the base of the heap

**Bulk density**

Bulk Density is the ratio between the given mass of a powder and its bulk volume. Required amount of the powder is dried and filled in a 50 ml measuring cylinder up to 50 ml mark. Then the cylinder is dropped onto a hard wood surface from a height of 1 inch at 2 second intervals. The volume of the powder is measured. Then the powder is weighed. This is repeated to get average values. The Bulk Density is calculated by using the below given formula.

$$\text{Bulk Density} = \frac{\text{Mass of the herbal powder shampoo}}{\text{Volume of the herbal powder shampoo}}$$

**Tapped 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 (g/cm$^3$).

**Physicochemical evaluation**

**pH**

The pH of 10% shampoo solution in distilled water was determined at room temperature 25°C. The pH was measured by using digital pH Meter.

**Washability**

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

**Solubility**

Solubility is defined as the ability of the substance to 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 filter it, the residue obtained is weighed and noted.

**Loss on drying**

Loss on drying is the loss of mass expressed in percent m/m. Two gram of the powder was weighed accurately and transferred into a dry Petri dish. The Petri dish is placed in a dessicator for 2 days over calcium chloride crystals. Then the powder was taken and weighed accurately to find out the weight loss during drying.

**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 are obtained naturally. So it does not produce any harmful effect on skin and eye.

**Extractive values**

**Determination of alcohol soluble extractive**
5 g of each air dried herbal shampoo powder was weighed and macerated with 100 ml of Alcohol of the specified strength in a closed flask for twenty-four hours, shaken frequently during six hours and allowed to stand for eighteen hours. Filtered, by taking precautions against loss of solvent, 25 ml of the filtrate was evaporated to dryness in a tare flat bottomed shallow dish, and dry at 105°C, to constant weight and weighed. The percentage of alcohol-soluble extractive with reference to the air-dried drug was calculated.

**Determination of water soluble extractive**
Proceeded as directed for the determination of alcohol-soluble extractive, using chloroform water instead of ethanol. The percentage of water-soluble extractive was calculated for each sample.

**Ash value**

**Total ash content**
Ash value is calculated to determine the inorganic contents which is characteristic fora herb. About 2 Gm of powder drug was taken in silicon dish previously ignited and weighed. Temperature was increased by gradually increasing the heat not exceeding to red colour. After complete burning, ash is cooled and weighed.

**Acid insoluble ash**
Acid insoluble ash was calculated by boiling above obtained ash with 25 ml dil. HCl for 5 min, insoluble matter was collected in gooch crucible, washed with hot water, ignited and weighed.

**Dirt dispersion**
Two drops of 1% each shampoo powders were added in a large test tube contain 10 ml of distilled water. 1 drop of India ink was added; the test tube was stoppered and shaken for 10 times. The amount of ink in the foam of was estimated as None, Light, Moderate, or Heavy.

**Moisture content determination**
10 g of each herbal shampoo powder was weighed in a tare evaporating dish and kept in hot air oven at 105°C. Repeated the drying until the constant weight loss was observed after the interval of 30 minutes. The moisture content was calculated for each sample.

**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 shampoo solution of 1% w/v and the stopwatch started. The time required for the disc to begin to sink was measured acutely and noted as the wetting time.

**Stability Study**
Stability and acceptability of organoleptic properties (odor and color) of formulations during the storage period indicated that they are chemically and physically stable.

**Nature of hair after washes**
Nature of hair after wash can be done by collecting the responses of volunteers.

**Foaming index**
One gram of the powder was weighed accurately and transferred into 250 ml conical flask containing 100 ml of boiling water. Then it is warmed gently for 30 minutes, cooled and filtered and make up the volume to 100 ml in standard volumetric flask. This extract is taken in 10 test tubes in a series of successive portion of 1, 2, 3….10 ml and remaining volume is made up with water to 10 ml. 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.

Foaming index = 1000/a

**RESULT**

**Evaluation of Polyherbal Shampoo Powder**

Table 2
- Particle size:
  The average particle size of herbal powder was resulted 20-25um from microscopical studies.
- Angle of Repose:
Table 3
- Bulk density
The results which are fetched out of number of physical and chemical tests and properties of the polyherbal dry powder antidandruff shampoo are highly satisfactory. The said are up to the mark of utility of the product with safety and promising results. Such results are estimated out of a formulation to establish strong results for the usage and good results of the product. Though the product is in dry form inspite has wonderful wetting capacity and being dry is very good for the storage. Proper drying and milling of the herbs ensure amorphous nature which is not at all abrasive to scalp and moreover can be stored for longer period of time without deterioration. More specific study on the fungus need to be further evaluated to assure the antidandruff effect on the causative factor of dandruff.

CONCLUSION
This study presents a number of plant drugs with proven efficacy as in hair care preparations. Present investigations was carried out to formulate the herbal shampoo powder preparations based upon traditional knowledge and to develop few parameters for quality and purity of herbal powder shampoo. The stability at room temperature has assured the shelf life and every ingredient thus implicates its efficacy and safety. Investigation of antifungal activity of Pityrosporum is necessary as well.

### Table 1: Herbs used in the preparation herbal shampoo powder

<table>
<thead>
<tr>
<th>Sr.</th>
<th>Ingredient</th>
<th>Biological name</th>
<th>Use of ingredient</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Methi powder</td>
<td>Dried seeds of <em>Trigonella foenum-graecum</em> (Leguminosae)</td>
<td>Conditioning and nourishment of hair.</td>
</tr>
<tr>
<td>2</td>
<td>Hibiscus Leaves</td>
<td>Dried leaves of <em>Hibiscus roseus</em> (Malvaceae)</td>
<td>Prevents hair loss and hair growth promoter.</td>
</tr>
<tr>
<td>3</td>
<td>Neem Leaves</td>
<td>Dried leaves of <em>Azadirachta indica</em> (Meliaceae)</td>
<td>Fight scalp infection, prevent the dryness and flaking of hairs, lice, dandruff and itching.</td>
</tr>
<tr>
<td>4</td>
<td>Shikakai fruit</td>
<td>Dried pods of <em>Acacia concinna</em> (Mimosaceae)</td>
<td>Foam base and anti-dandruff, to improve hair and skin and it clears dandruff and the dirt accrued on the scalp.</td>
</tr>
<tr>
<td>5</td>
<td>Aloe vera leaf</td>
<td>Dried leaves of <em>Aloe barbadensis</em> miller (Asphodelaceae)</td>
<td>Condition and moisturizing effect .</td>
</tr>
<tr>
<td>6</td>
<td>Henna Leaves</td>
<td>Dried leaves of <em>Lawsonia inermis</em> (Lythraceae)</td>
<td>Growth of hair, Conditioner .</td>
</tr>
<tr>
<td>7</td>
<td>Brahmi root</td>
<td>Dried roots of <em>Centella asiatica</em> (Apiaceae)</td>
<td>Support to growth of Hairs .</td>
</tr>
</tbody>
</table>
Reetha fruit
Dried fruits of *Sapindus mukorossi* (*Sapindaceae*)
Reetha is a foaming agent.

Amla fruit
Dried ripe fruits of *Emblica officinalis* (*Euphorbiaceae*)
Darkening of hairs and Hair growth promoter.

Nagarmotha
Dried ripe fruits of *Cyperus rotundus* (*Cyperaceae*)
Scalp disorder

Tulsi
Dried leaves of *Ocimum sanctum* (*Lamiaceae*)
Antibacterial

**Table 2:** Organoleptic and general powder characters evaluation

<table>
<thead>
<tr>
<th>Sr.No</th>
<th>Organoleptic Evaluation</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Colour</td>
<td>Faint brownish</td>
</tr>
<tr>
<td>2</td>
<td>Odour</td>
<td>Characteristic</td>
</tr>
<tr>
<td>3</td>
<td>Taste</td>
<td>Slight</td>
</tr>
<tr>
<td>4</td>
<td>Texture</td>
<td>Fine and smooth</td>
</tr>
</tbody>
</table>

*General powder Characters*

<table>
<thead>
<tr>
<th>Sr.No</th>
<th>Characteristic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Particle size</td>
<td>20-25um</td>
</tr>
<tr>
<td>2</td>
<td>Angle of repose</td>
<td>a) 34°5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b) 33°8</td>
</tr>
<tr>
<td>3</td>
<td>Bulk density</td>
<td>0.38</td>
</tr>
<tr>
<td>4</td>
<td>Tapped density</td>
<td>0.34</td>
</tr>
</tbody>
</table>

*a: Funnel Method;  
b: Open ended cylinder method*

**Table 3:** Angle of Repose calculation of herbal powder

<table>
<thead>
<tr>
<th>Sr.No</th>
<th>Method</th>
<th>Height of the cone (h in cm)</th>
<th>Radius of the cone (r in cm)</th>
<th>( \tan \theta = (h/r) )</th>
<th>Average ( \theta ) (h / r)</th>
<th>Flow property</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Funnel Method</td>
<td>2.5</td>
<td>3.4</td>
<td>0.7352</td>
<td>0.6892</td>
<td>34°5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.4</td>
<td>3.3</td>
<td>0.7272</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.3</td>
<td>3.8</td>
<td>0.6052</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Open ended cylinder Method</td>
<td>2.5</td>
<td>3.8</td>
<td>0.6578</td>
<td>0.6712</td>
<td>33°8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.9</td>
<td>4.1</td>
<td>0.7073</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.4</td>
<td>3.7</td>
<td>0.6486</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table 4:** Bulk density calculation of herbal powder

<table>
<thead>
<tr>
<th>Sr.No</th>
<th>Bulk Volume (ml)</th>
<th>Mass of the powder (gm)</th>
<th>Bulk Density (gm / ml)</th>
<th>Average Bulk Density (gm / ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>45</td>
<td>16.9</td>
<td>0.3755</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>46</td>
<td>16.9</td>
<td>0.3673</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>44</td>
<td>16.9</td>
<td>0.3840</td>
<td>0.3756</td>
</tr>
</tbody>
</table>
Table 5: Tapped density calculation of herbal powder

<table>
<thead>
<tr>
<th>Sr.No</th>
<th>Tapped volume</th>
<th>Mass of the powder</th>
<th>Tapped density (gm/ml)</th>
<th>Average tapped density (gm/ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50</td>
<td>16.9</td>
<td>0.339</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>50</td>
<td>16.9</td>
<td>0.334</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>50</td>
<td>16.9</td>
<td>0.332</td>
<td>0.336</td>
</tr>
</tbody>
</table>

Table 6: Physicochemical Property

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Physicochemical evaluation</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>pH</td>
<td>5.46</td>
</tr>
<tr>
<td>2</td>
<td>Washability</td>
<td>Easily washable</td>
</tr>
<tr>
<td>3</td>
<td>Solubility</td>
<td>Soluble</td>
</tr>
<tr>
<td>5</td>
<td>Skin /eye irritation</td>
<td>No harmful effect on skin and eye</td>
</tr>
<tr>
<td>6</td>
<td>Foaming capacity</td>
<td>Good foaming</td>
</tr>
<tr>
<td>7</td>
<td>Extractive values</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Alcohol soluble</td>
<td>16.03%w/w</td>
</tr>
<tr>
<td>8</td>
<td>Water solubility</td>
<td>11.69%w/w</td>
</tr>
<tr>
<td>9</td>
<td>Total ash content</td>
<td>3.69%w/w</td>
</tr>
<tr>
<td></td>
<td>Acid insoluble ash</td>
<td>1.36%w/w</td>
</tr>
<tr>
<td>10</td>
<td>Moisture content determination</td>
<td>2.91%</td>
</tr>
<tr>
<td>11</td>
<td>Wetting time</td>
<td>149 ± 0.04</td>
</tr>
<tr>
<td>12</td>
<td>Stability</td>
<td>Stable</td>
</tr>
<tr>
<td>13</td>
<td>Nature of hair after washes</td>
<td>Soft manageable</td>
</tr>
</tbody>
</table>

Table 7: Foaming index calculation for herbal powder

<table>
<thead>
<tr>
<th>T1</th>
<th>T2</th>
<th>T3</th>
<th>T4</th>
<th>T5</th>
<th>T6</th>
<th>T7</th>
<th>T8</th>
<th>T9</th>
<th>T10</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.8</td>
<td>0.7</td>
<td>0.7</td>
<td>0.9</td>
<td>0.5</td>
<td>0.6</td>
<td>0.9</td>
<td>0.8</td>
<td>1</td>
<td>0.8</td>
</tr>
</tbody>
</table>

Note: T1 - T10 Test tube numbers 1 to 10
Foaming index = \frac{1000}{a} = \frac{1000}{9} = 111.1%

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REFERENCE

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