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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 sanctu* (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 intension

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 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

shampoo and nutritional shampoo containing vitamin, aminoacids proteins hydrolysate.⁴ Currently available treatment of dandruff include therapeutic use of zinc pyrithione, salicylic acid, imidazole derivatives, glycolic acid, steroids, and sulphur and coal tar derivatives.⁵ 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), *Azadirachta indica* (Neem), and *Fenugreek* (methi). Both are having antidandruff action. The synthetic shampoo contain cationic, anionic and non anionic surfactant mix in this surfactant having good foaming character but its toxic and caused irritation of eye.⁶ 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,⁷ dandruff is commonly aggravated by changes in humidity, trauma (scratching), seasonal and emotional stresses, dandruff may improve in summer (as UV rays from sunlight counteract p.o.vale) and it may worsen in winter pityrosporum organism are linked to T-cell depression and they inhibit cell division & thus reduce sebum production by decrease in epidermal turnover. Dandruff may cause various symptoms seborrheic dermatitis, psoriasis fungal infection, or scalp & soreness, itching infestation of head lice.⁸

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*), Ritha fruit (*Sapindus mukorossi*), Amla fruit (*Embelica officinalis*), Nagarmotha (*Cyperus rotundus*) Rusmari and

Tulsi.⁹⁻¹² 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.¹¹ 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^{11,13-17}

Prepared formulations of shampoos were subjected to following evaluation parameters.

Organoleptic evaluation/visual appearance^{11,13}

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 characteristics¹⁰⁻¹²

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 size¹⁴

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 repose¹⁵

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 (θ) can be calculated by using the formula.

Open - ended cylinder method

Required amount of dried powder is placed in a cylindrical tube open at both ends is placed on a horizontal surface. Then the funnel should be raised to form a heap. The height and radius of the heap is noted and recorded. For the above two methods, the angle of repose (θ) can be calculated by using the formula.

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

Where,

θ – Angle of repose, h – Height of the heap, r – Radius of the base of th

Bulk density^{14,15}

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^{16,17}

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/cm³).

Physicochemical evaluation

pH¹³

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.

Washability¹³

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

Solubility¹¹

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.¹¹

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 values¹¹

Determination of alcohol soluble extractive

5 g of the 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^{11,13}

Total ash content

Ash value is calculated to determine the inorganic contents which is characteristic for a 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 ash¹³

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 dispersion¹¹

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 determination¹³

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 time¹³

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 Study¹¹

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^{11,13}

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 20-25µm from microscopical studies.

- Angle of Repose :

Table 3

- Bulk density

Table 4

- Tapped density

Table 5

- Physicochemical Property:

Table 6

- Foming index:

Table 7

DISCUSSION

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 upto 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

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

8	Reetha fruit	Dried fruits of <i>Sapindus mukorossi</i> (<i>Sapindaceae</i>)	Reetha is a foaming agent.
9	Amla fruit	Dried ripe fruits of <i>Embllica officinalis</i> (<i>Euphorbiaceae</i>)	Darkening of hairs and Hair growth promoter .
10	Nagarmotha	Dried ripe fruits of <i>Cyperus rotundus</i> (<i>Cyperaceae</i>)	Scalp disorder
11	Tulsi	Dried leaves of <i>Ocimum sanctum</i> (<i>Lamiaceae</i>)	Antibacterial

Table 2 : Organoleptic and general powder characters evaluation

Sr.No	Organoleptic Evaluation	Result
1	Colour	Faint brownish
2	Odour	Characteristic
3	Taste	Slight
4	Texture	Fine and smooth
General powder Characters		
1	Particle size	20-25um
2	Angle of repose	a) 34°5 b) 33°8
3	Bulk density	0.38
4	Tapped density	0.34

a: Funnel Method; b: Open ended cylinder method

Table 3 : Angle of Repose calculation of herbal powder

Sr.No	Method	Height of the cone (h in cm)	Radius of the cone (r in cm)	$\tan \theta = (h/r)$	Average $\tan \theta$	$\theta = \tan^{-1} (h/r)$	Flow property
1	Funnel Method	2.5	3.4	0.7352	0.6892	34°5	Good flow property
		2.4	3.3	0.7272			
		2.3	3.8	0.6052			
2	Open ended cylinder Method	2.5	3.8	0.6578	0.6712	33°8	good flow
		2.9	4.1	0.7073			
		2.4	3.7	0.6486			

Table 4 : Bulk density calculation of herbal powder.

Sr.No	Bulk Volume (ml)	Mass of the powder (gm)	Bulk Density (gm / ml)	Average Bulk Density (gm / ml)
1	45	16.9	0.3755	0.3756
2	46	16.9	0.3673	
3	44	16.9	0.3840	

Table 5 : Tapped density calculation of herbal powder

Sr.No	Tapped volume	Mass of the powder	Tapped density (gm/ml)	Average tapped density (gm/ml)
1	50	16.9	0.339	0.336
2	50	16.9	0.334	
3	50	16.9	0.332	

Table 6 : Physicochemical Property

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

Table 7 : Foming index calculation for herbal powder

T1	T2	T3	T4	T5	T6	T7	T8	T9	T10
0.8	0.7	0.7	0.9	0.5	0.6	0.9	0.8	1	0.8

Note: T1 - T10 Test tube numbers 1 to 10

$$\text{foming index} = \frac{1000}{a} \\ = \frac{1000}{9} = 111.1\%$$

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