



Formulation and Evaluation of Herbal Hair Powder against Dandruff

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Accepted on: 20-07-2014; Finalized on: 30-09-2014.

ABSTRACT

During the latter part of the 20th century herbalism has become main stream worldwide. This is due in part to the recognition of the value of traditional and indigenous pharmacopeias, the incorporation of some derived from these sources into pharmaceuticals, the need to make health care affordable for all, and the perception that natural remedies are somehow safer and more efficacious than remedies that are pharmaceutically derived. Dandruff, a clinical condition caused by *Malassezia* (*Pityrosporum*) species is of great cosmetic concern all over the world. Dandruff is known to be controlled by fungistatic ingredients in Anti-dandruff shampoos. Our study is presently involved in the development of a completely natural shampoo, in which all the ingredients are plant derived material and are recorded anti-pityrosporum activity. In the present investigation, physico-chemical parameters, conditioning effect, antifungal potential against, *Candida albicans*, anti bacterial effect against gram +ve and -ve bacteria, and stability studies were evaluated.

Keywords: Anti dandruff, Herbal, Shampoo powder.

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 don't have time to look on their 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. Cleanliness of hair and scalp are among the most important personal life consideration today.¹

Dandruff is a common scalp disorder affecting almost half of the post pubertal population of any ethnicity and both genders. The exact nature and etiology of dandruff has always been controversial since the time of the Greeks, through Sabouraud era in late nineteenth century till to-date. Dandruff represents 25% of all scalp disorders and is present in an estimated 15-20% of the total population and more than 50% of adult population. The pathogenesis of dandruff involves hyper proliferation, resulting in deregulation of keratinization.² The corneocytes clump together, manifesting as large flakes of skin. Essentially keratolytic agents, such as salicylic acid and sulfur, loosen the attachments between the corneocytes and allow them to be washed away with shampooing. Keratolytics soften, dissolve and release the adherent scale seen in dandruff, although the mechanism is not fully understood 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.^{3,4}

Herbs are widely used as remedial agents because such drugs are easily available at low cost and comparatively safe and the people have good faith in such remedies. In India, Ayurvedic system evolved over 5,000 years ago and is still in practice. The Rig Veda and Atharvanaveda have included more than 700 medicinal prescriptions. There are also wide range of herbal ingredients like pepper extract, basil extract, neem extract, rosemary oil, basil oil, clove oil, coleus oil, tea tree oil which have been documented to have good anti pityrosporum or antidandruff activity. Herbal formulations have growing demand in the world market.⁵ To overcome this entire problem was the main intension of our project. So we prepared polyhedral antidandruff powder, which is a multipurpose powder for hair care treatment.

MATERIALS AND METHODS

The different parts of the plants were selected for the study having hair care property which is already proved. The lists of herbs are given in the Table 1.

Preparation of the Herbal Shampoo Powder

All the herbal ingredients are in dry form and grinded to make fine powder by using size reduction mill.

Weighing

All the required herbal powders for shampoo preparation were accurately weighed individually by using digital balance. The quantity and compositions are listed in Table 2.



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.

Collection and storage

The powder mixture was collected and store in suitable plastic container and used for doing evaluation parameters.

Evaluation

Prepared formulations of shampoo powders were subjected to following evaluation parameters.

Organoleptic evaluation/visual appearance⁶

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

General powder characteristics⁷⁻¹³

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 spread ability, 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.

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 method, 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

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.

$$\text{Bulk Density} = \frac{\text{Mass}}{\text{Volume}}$$

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/cm³).

Physicochemical evaluation¹⁴**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.

Ash value**Total ash content**

Ash value is calculated to determine the inorganic contents which are characteristic for an 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 5min, insoluble matter was collected in 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 stopper and



shaken for 10 times. The amount of ink in the foam of was estimated as None, Light, Moderate, or Heavy.

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.

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

Skin /eye irritation test

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. Eye and skin irritation tests revealed that the herbal shampoo powder shows no harmful effect

Nature of hair after washes

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

Minimum Inhibitory Concentration (MIC)^{15,16}

Twenty four hours broth culture of the test organism was used for the study. Doubling dilution of ingredients were done (5, 2.5, 1.25, 0.6 µg/ml) in the appropriate solvents. The culture in the Sabouraud Dextrose Broth with olive oil was used for inoculation of the tubes with the test ingredients and incubated at 300 C for 24 hrs. After that, a loop full of broth culture was streaked on a Sabouraud Dextrose Agar (SDA) plate over laid with olive oil to detect the presence or absence of growth of *Malassezia*. Agar dilution method was adapted for evaluation of shampoo powder. Different concentrations viz 2.5, 5, 7.5, 10, 25, 50, 75, 100, 125, 150 mg/ml of shampoo powder (containing active ingredients) were weighed separately in the Petri plates and the molten SDA was poured and mixed thoroughly. Twenty µl of culture was spread over the agar. The plates were incubated at 30° C for 3-5 days. Experiments were done in triplicates with suitable controls.

Zone of Inhibition (ZOI)

Twenty- four hours broth culture was swabbed over the surface of Dixon agar. All the active ingredients and the shampoo powder were dissolved in their respective solvents at 10 mg/ml concentration. A circle of 7 mm diameter was cut at the centre of the agar and 100 µl of the above prepared samples were loaded on the well. Plates were incubated at 30°C for 3-5 days. After

incubation the zone was measured using zone measuring scale and recorded.

RESULTS AND DISCUSSION

Organoleptic evaluation/visual appearance

Organoleptic evaluation parameters like colour, odour and texture were carried out. The results are listed in table 3.

General powder characteristics

All the three shampoo powders were taken at three different levels for the evaluation. The results are listed in table 4.

Physicochemical evaluation

Solubility test

The solubility test revealed that the powder shampoo powder comprises of mostly soluble ingredients which may be helpful in producing comfortable feeling while being mixed with water.

Angle of response

Good flow property is essential in formulation of any powder. The angle of response of herbal shampoo powder was 33°. This confirms that the powder has good flow property. The results are listed in table 5.

Bulk density

The bulk density of the herbal shampoo powder was 0.5. This measurement indicates that the loose powder packing may be to the presence of large interparticle spaces.

Foaming index

This results showed that the powder which is capable to produce high foaming property. This is due to the presence of soap nut is used as foaming agent which mainly consists of saponoside A and B. the results are listed in table 6.

Anti microbial test

This test revealed the fact that the herbal shampoo powder produces zone of inhibition against G (+) ve, G (-) ve and fungal organisms. This confirms the shampoo extract have well anti microbial activity. The results are listed in table 7.

Eye irritation and skin 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.



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. 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.

Table 1: Herbs used in the preparation herbal shampoo powder

Ingredients	Biological name	Use
Fenugreek seeds powder	<i>Trigonella foenum graecum</i>	Smoothens the hair and as an antidandruff agent
Tulasi leaf powder	<i>Ocimum sanctum</i>	Anti microbial agent
Rose Mary oil	<i>Rosmarinus officinalis</i>	Anti fungal and anti bacterial agent
Soap nut powder	<i>Sapindus emarginatus</i>	Detergent anti bacterial agent.
Lemon grass oil	<i>Cymbopogon citrullus</i>	Anti fungal anti bacterial agent
Aloe vera gel	<i>Aloe vera</i>	Sequestering agent anti dandruff agent
Bhring raj	<i>Eclipta alba</i>	Strengthens the hair
NeelaMari	<i>Indigofera tinctoria</i>	Hair coloring and growth promoter
Amla	<i>Emblica officinalis</i>	Strengthens hair and as antidandruff agent
Hibiscus	<i>Hibiscus rosa sinensis</i>	Conditioner

Table 2: Formulations and composition

Ingredients	F1	F2	F3
Fenugreek seed powder	4g	-	3g
Tulasi leaf powder	4g	4g	3g
Amla fruit powder	4g	4g	3g
Rosemary oil	4g	4g	2g
Soap nut powder	2g	-	2g
Lemon grass oil	1g	-	0.5g
Neelamari	1g	-	0.5g
Neem	-	4g	2g
Shikakai	-	2g	1g
Hibiscus oil	-	1g	1g
Bhring	-	1g	2g
Total	20g	20g	20g

Table 3: Organoleptic evaluation

Organoleptic evaluation	F1	F2	F3
Colour	Grey	Light green	Green
Nature	Coarse	Fine	Fine
Odor	Acceptable	Acceptable	Acceptable
Texture	Smooth	smooth	smooth

Table 4: General powder characteristics

Character	F1	F2	F3
Particle size	23	25	20
Angle of repose	33.66	46.70	33.66
Bulk density (mg/ml)	0.51	0.5	0.6
Tapped density (g/ml)	0.32	0.35	0.33

Table 5: Physicochemical Property

Physico chemical evaluation	F1	F2	F3
p ^H	7.2	6.5	7.0
washability	Easily washable	Easily washable	Easily washable
Solubility	soluble	soluble	soluble
Ash value	3.1	3.8	4.2
Dirt dispersion	moderate	moderate	moderate
Nature of hair after washes	soft	manageable	Smooth and manageable

Table 6:

Formulation	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	
Height of foam	F1	0	0.2	0.3	0.6	0.7	0.9	1	1.2	1.5	1.8
	F2	0	0.1	0.2	0.5	0.5	0.6	0.8	1.0	1.1	1.7
	F3	0	0.2	0.4	0.6	0.9	1.2	1.5	1.9	2.1	2.5

Table 7: Anti Microbial Activity of Prepared Formulations

Formulation	Name of micro organism	Zone of inhibition in mm
F1	<i>Candida albicans</i>	12
	Gram +ve bacteria	17
	Gram - ve bacteria	11
F2	<i>Candida albicans</i>	13
	Gram +ve bacteria	17
	Gram -ve bacteria	12
F3	<i>Candida albicans</i>	15
	Gram +ve bacteria	18
	Gram -ve bacteria	14



CONCLUSION

The world market is also moving towards herbal medicines for health care, health foods and for cosmetic purposes including hair preparations. India is rich heritage for cultivation and production of herbal medicines due to its diversified climatic conditions. An Indian traditional literature and ethanopharmacological study presents a number of plants/ formulations with proven efficacy as hair formulations. This study presents a number of plant drugs with proven efficacy as in hair care preparations. In 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. From this investigation it can be concluded that the formulation of anti dandruff herbal shampoo powder contain all good characters of an ideal shampoo and it was found to be harmless, more effective and economic.

Acknowledgements: Authors are highly indebted and thankful to management of Chalapathi educational society for providing necessary facilities at Institute of Pharmacy for conducting this minor project.

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Source of Support: Nil, Conflict of Interest: None.

