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Pharmacy Practice and Research
Volume 1 Issue 1

Formulation and Evaluation of Herbal Anti-Dandruff Shampoo from Bhringraj Leaves

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ABSTRACT

Dandruff is a common disorder caused by Pityrosporum yeast which affects the scalp condition. Dandruff can't be removed entirely but can only be handled and regulated effectively. A shampoo is a preparation containing a suitable surfactant (i.e. surface-active material)-liquid, solid or powder-which, when used under the prescribed conditions, removes surface grease, dirt and skin debris from the hair shaft and scalp without adversely affecting the user. Various anti-fungal agents are used for the dandruff procedure in hair care preparations. Such drugs show various side effects such as hair loss, increased scaling, scratching, discomfort, nausea and headache. Therefore, an attempt was made to formulate herbal anti-dandruff shampoo that is safer in terms of health and treating the dandruff condition than the anti-dandruff shampoo based on chemicals. Herbal anti-dandruff shampoos have been formulated using herbal ingredients such as Bhringraj Leaves extract, Lemon Grass Oil, Neem oil, Henna, Aloe Vera gel and other ingredients for base shampoo preparations. The formulated shampoos were subjected to evaluation parameters such as visual inspection, pH, viscosity, solid content percentage, dirt dispersion, surface tension, foaming capacity and consistency of the foam, Pityrosporum Ovale strain anti-fungal activity test. Formulation (F_4) showed strong antifungal activity, i.e., maximum inhibitory region.

Keywords: *Dandruff, Herbal Anti-dandruff Shampoo, Bhringraj Leaves Extract and Foaming Ability.*

AIM

Dandruff represents one of the most common dermatological skin conditions and is a chronic, non-inflammatory condition of the scalp that is characterized by excessive scaling of scalp tissue. Various antifungal agents are employed in hair care preparations for the treatment of dandruff. These products show many side effects such as loss of hair, increased scaling, itching, irritation, nausea, and headache. Hence, an attempt was made to formulate synthetic antidandruff shampoo which is effective in terms of safety and treating the dandruff condition. Dandruff is apparently caused by a fungus called *Malassezia restricta* and *Malassezia globosa*. Malassezia formerly called *Pityrosporum* is a yeast causing infection of skin and scalp. It often causes itching. Warm and humid atmosphere, overcrowding, and poor personal hygiene are ideally suited for the growth of *Malassezia*. Dandruff affects 5% of the population and mostly occurs after puberty, between 20 and 30 years and dandruff affects males more than females. Dandruff occurs exclusively on skin in areas with high levels of sebum. Symptoms of dandruff

mainly include itching, flakes, and redness of scalp. Dandruff can be treated in two ways, using herbal-based antidandruff shampoo and using chemical-based anti-dandruff shampoo.

INTRODUCTION

A shampoo can be described as a surfactant preparation; (*i.e.* Surface active material) in a suitable form-liquid, solid, or powder which when used under the conditions specified will remove surface grease, dirt and skin debris from the hair, shaft and scalp without affecting adversely the hair, scalp or the health of the user. The English term shampoo dates back to 1762, meaning "massage." The term derives from Anglo-Indian shampoo, in effect from Hindi champoo imerative of champna to rub, knead the muscles, massage. Today, there are plenty of shampoos for men and women available.

A good shampoo will form ample foam almost instantly regardless of the type of water used or the amount of soil or fat that needs to be removed from the hair. Though foam formation is not released to the cleansing effect, but people psychologically always prefer a high foam product. Some good shampoos are found to have side effects like drying effect on the hair. It makes hair too dry to be handled or combed with. So proper conditioning of the hair is also an important consideration, some shampoos cause irritation to the eye and a lasting corneal cloud. These should be avoided. The functions of shampoo are expected to be various. A good and acceptable shampoo should have the following characteristics [1].

Composition of Shampoos

The products used to make shampoos are as follows. We include key surfactants. *e.g.* Sodium lauryl sulphate, lauryl sulphate Triethanol. For *eg*, dialkyl sulphosuccinates, monoalkyl sulphosuccinates, secondary surfactants. *E.g.*, salicylic acid, Benzoic acid, germicides and antidandruff agent. Packaging agents e.g. Fatty substances such as lanolin, and fats. E.g.4- methyl-7-diethylamino coumarin is a perlescent agent. Sequesters, *e.g.* EDTA Sodium Salt. Thickeners, *e.g.* They are alginates. Examples of preservatives are formaldehyde, methyl paraben, propyl paraben. Solubilizing agents such as aliphatic alcohols, urea and so on [2–6].

Dandruff represents one of the most common dermatological skin conditions and is a chronic, non- inflammatory condition of the scalp that is characterized by excessive scaling of scalp tissue. Dandruff is apparently caused by a fungus called *Malassezia restricta* and *M. globosa. Malassezia* formerly known as *Pityrosporum* is a yeast that causes skin and scalp infections. Warm and humid environment, overcrowding and poor personal hygiene are ideally suited for the growth of *Malassezia* [7–8]. Dandruff affects 5% of the population and occurs primarily after puberty, between 20–30 years and dandruff affects males more than females. Dandruff occurs predominantly on the skin in areas with high levels of sebum. Symptoms of dandruff include mainly scratching, flakes; redness of scaffolds [9]. A shampoo is a preparation containing a suitable surfactant (*i.e.* surface-active material)–liquid, solid or powder–which, when used under the prescribed conditions, removes surface grease, dirt and skin debris from the hair shaft and scalp without adversely affecting the user. Most shampoos contain water, a detergent (cleaning agent), surfactant (leather-making agent), salt, fragrance (non-polluting agent) Many shampoos often contain vitamins and moisturizing alcohols to avoid too many of the natural oils from being washed away from the hair and scalp during washing. Herbal

Cosmetics, herein referred to as Products, and are formulated using various permissible cosmetic ingredients to form the basis on which only one or more herbal ingredients are used to provide specified cosmetic benefits [10–11]. Herbal medicines are a viable alternative to synthetic medicines, or their formulations. Over the last few decades, the use of natural products in cosmetics has increased dramatically. Nowadays there are many herbal shampoos on the market which contain herbal ingredients such as plant extracts and essential oils. There are a large number of recorded plants that have beneficial effects on hair and are widely used in shampoos. In other shampoo formulations certain herbs such as *Hibiscus rosasinensis, Lawsonia inermis, Citrus aurantifolia, Phyllanthus emblica, Ocimum sanctum, Zingiber officinalis, Azadirecta indica, aloe vera* were used as anti-dandruff agents.

MATERIALS AND METHODS

Lemon Grass Oil, Neem Oil, Bhringraj Powder, Henna oil was procured from local market. Sodium lauryl sulfate glycerin, EDTA was procured form SVR Labs, Hyderabad.

Preparation of Shampoo

Preparation of anti-dandruff shampoo: Shampoo was formulated using simple mixing process. Herbal anti-dandruff shampoo was formulated by adding the required amounts of herbal ingredients as given in the formulation table no 1.

Table1. Formulation of Herbal Anti-Dandruff Shampoo

	F_1	F_2	F_3	F_4	F_5
Neem oil	0.5	1.0	1.5	2.0	2.5
Lemon Grass Oil	0.5	1.0	1.5	2.0	2.5
Bhringraj Powder	0.5	1.0	1.5	2.0	2.5
Henna Oil (ml)	0.5	1.0	1.5	2.0	2.5
Sodium Lauryl Sulfate (gms)	20	15	10	5	-
Glycerin (ml)	1	1	1	1	1
EDTA (gm.)	0.15	0.15	0.15	0.15	0.15
Sodium Hydroxide	To adjust Ph	To adjust pH	To adjust pH	To adjust pH	To adjust pH
Water	q.s	q.s	q.s	q.s	q.s
Perfume	q.s	q.s	q.s	q.s	q.s
Total	100ml	100ml	100ml	100ml	100ml

EVALUTION

To evaluate the prepared formulations, quality control tests including visual assessment and physicochemical controls such as pH, density and viscosity were performed. Also, to assure the quality of products, specific tests for shampoo formulations including the determination of dry residue and moisture content, total surfactant activity, salt content, surface tension, detergency tests were carried out.

Physical Appearance/ Visual Inspection

The formulations prepared were evaluated in terms of their clarity, foam producing ability and fluidity.

Determination of pH

The pH of 10% shampoo solution in distilled water was determined at room temperature 25°C.

Determine Percent of Solids Contents

A clean dry evaporating dish was weighed and added 4 grams of shampoo to the evaporating dish. The dish and shampoo was weighed. The exact weight of the shampoo

was calculated only and put the evaporating dish with shampoo was placed on the hot plate until the liquid portion was evaporated. The weight of the shampoo only (solids) after drying was calculated.

Surface Tension Measurement

Measurements were carried out with a 10% shampoo dilution in distilled water at room temperature. Thoroughly clean the stalagmometer using chronic acid and purified water. Because surface tension is highly affected with grease or other lubricants 5, 6. The data calculated by following equation given bellow: where W_1 is weight of empty beaker. W_2 is weight of beaker with distilled water. W_3 is Weight of beaker with shampoo solution. N_1 is no. of drops of distilled water. N_2 is no. of drops of shampoo solution. R_1 is surface tension of distilled water at room temperature. R_2 is surface tension of shampoo solution.

Dirt Dispersion

Two drops of shampoo 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 shakes it ten times. The amount of ink in the foam was estimated as None, Light, Moderate, or Heavy.

Rheological Evaluations

The viscosity of the shampoos was determined by using Brookfield Viscometer (Model DV-l Plus, LV, USA) set at different spindle speeds from 0.3 to 10 rpm3. The viscosity of the shampoos was measured by using spindle T95. The temperature and sample container's size was kept constants during the study.

Foaming Ability and Foam Stability

Cylinder shake method was used for determining foaming ability. 50 ml of the 1% shampoo solution was put into a 250 ml graduated cylinder and covered the cylinder with hand and shaken for 10 times. The total volumes of the foam contents after 1 minute shaking were recorded. The foam volume was calculated only. Immediately after shaking the volume of foam at 1 minute intervals for 4 minutes were recorded.

RESULTS AND DISCUSSION

In the present Research work Total 5 Formulations were made and evaluated for different parameters. Physical Appearance/Visual Inspection, the results of visual inspection of series of formulations are listed in Table 2. As can be seen, all formulations had the good characteristics with respect to foaming. The pH of shampoos has been shown to be important for improving and enhancing the qualities of hair, minimizing irritation to the eyes and stabilizing the ecological balance of the scalp10. The current trend to promote shampoos of lower pH is one of the ways to minimize damage to the hair. Mild acidity prevents swelling and promotes tightening of the scales, there by inducing shine. As seen from Table 1, all the shampoos were acid balanced and were ranged 5.5 to 5.9, which is near to the skin pH. Percent of Solids contents if the shampoo has too many solids it will be hard to work into the hair or too hard to wash out. The result of percent of solids contents is tabulated in table 1, and was found between 22–29%. As a result, they were easy to wash out. Dirt Dispersion Shampoo that cause the ink to concentrate in the foam is considered poor quality, the dirt should stay in water. Dirt that stays in the foam will be difficult to rinse away. It will redeposit on the hair. All five shampoos showed similar results. These results indicate that no dirt would stays in the foam; so prepared and marketed formulations are satisfactory. Surface tension measurement it has been mentioned that a proper shampoo

should be able to decrease the surface tension of pure water to about 40 dynes/cm12. Surface tension reduction is one of the mechanisms implicated in detergency. The reduction in surface tension of water from 72.8 dynes/cm to 35.37 dynes/ cm by the herbal shampoos is an indication of their good detergent action. The results are shown in Table 2.

Table2. Evaluation of Formulation for Physical Appearance, pH and Solids

Formulations	Appearance	pH	Solids (%)	Cleaning action (%)	Surface Tension (dy/cm)	Dirt Deposition
F_1	Dark Brown, Good Foaming	5.51±0.02	22.11±0.02	24.21±0.05	32.15±0.02	Light
F_2	Dark Brown, Good Foaming	5.53±0.07	24.51±0.02	32.51±0.09	33.22±0.12	Light
F_3	Dark Brown, Good Foaming	5.61±0.02	29.31±0.02	18.81±0.08	31.37±0.62	Light
F_4	Dark Brown, Good Foaming	5.81±0.04	25.41±0.02	33.61±0.05	34.60±0.32	Light
F_5	Dark Brown, Good Foaming	5.91±.01	28.21±0.02	32.11±0.02	33.61±0.42	None

The results of rheological evaluation showed that the viscosity of the samples changes gradually with the increase in rpm, therefore the shampoo formulations were time dependent. Secondly as the data showed the viscosity decreases with increase in rpm, so the shampoo formulations were shear thinning or pseudo plastic in nature.

These formulations showed pseudo plastic behavior which is a desirable attribute in shampoos formulation. At low rpm the herbal shampoos showed high viscosity and increase in the shear rate the viscosity of the shampoos drops, this is a favorable property which eases the spreading of the shampoos on hair. The results obtained from the rheological studies were fitted into different flow behaviors, using the linear or non-linear regression. Table 3 shows the goodness of fitting indices for Newtonian, plastic and pseudo plastic flow behaviors. As can be seen in the Table 2, all the formulations followed a pseudo plastic rheogram.

Table3. Evaluation of Formulations for Viscosity

RPM	Viscosity (cp)				
	F_1	F_2	F_3	F_4	F_5
0.3	95733.33	-	83433.33	-	-
0.5	82150.00	60765.00	73583.33	-	-
1.0	54150.00	42666.66	51516.67	-	17533.33
1.5	50916.67	33350.00	40450.00	-	14916.67
2.5	38778.33	23978.33	28851.66	7598.33	11478.33
5	25425.00	14645.33	17651.66	5945.00	9158.33
10	15775.00	8541.00	10741.66	5156.67	7766.66

Foaming ability and foam stability although foam generation has little to do with the cleansing ability of shampoos, it is of paramount importance to the consumer and is therefore an important criterion in evaluating shampoos. All the five shampoos showed similar foaming characteristics in distilled water. The foam retention ability of five samples is given in figure 1. All five shampoos showed comparable foaming properties. The foam stability of herbal shampoos is listed in table 4. A point to be noted here is that there does not seem to be any direct correlation between detergency and foaming, which only confirms the fact that a shampoo that foams well need not clean well. The final formulation produced stable foams there was little bet change in foam volume.

Table4. Evaluation of Foam Stability of Herbal Shampoo Formulations

Time in Mins	Foam Volume (ml)				
	F_1	F_2	F_3	F_4	F_5
1Min	170	180	140	180	180
2Min	168	177	137	178	177
3Min	167	175	134	176	174
4Min	165	174	135	175	173
5Min	164	173	134	174	172

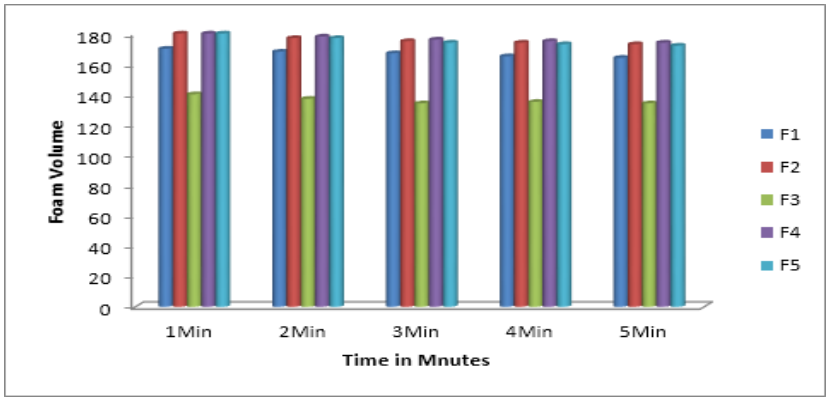

Fig 1. Foam Stability of Herbal Shampoos Formulations

CONCLUSION

The latest research has shown that Bhringraj Powder exhibits excellent antifungal behavior. The antidandruff shampoo was formulated by adding Bhringraj Powder as the principal ingredients of the antidandruff. As additives play an important role in determining any formulation's efficiency, stability and aesthetic appeal, this point was held in mind when selecting the additives for shampoo formulation. Eventually they invented and tested the antidandruff shampoo. As seen from the tests, a herbal antidandruff shampoo can be formulated which is not only equal to the conventional shampoo in its consistency but also has better health, efficacy and purity.

ACKNOWLEDGEMENT

I would like to thank Shri Ram Murti Smarak College of Engineering and Technology (Pharmacy), Bareilly-243202,

(U.P.), India for their support. I would also thanks to my guide Dr. LALIT SINGH for guiding and motivating me.

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