Int J Pharm Bio Sci 2012 July; 3(3): (P) 638 - 645

Research Article **Herbal Formulation**

International Journal of Pharma and Bio Sciences

ISSN 0975-6299

FORMULATIONS AND EVALUATION OF HERBAL SHAMPOO AND COMPARATIVE STUDIES WITH HERBAL MARKETED SHAMPOO.

SWATI DESHMUKH*, BINDURANI KAUSHAL AND SHWETA GHODE

Siddhant College of Pharmacy,Sudumbare Pune,India

ABSTRACT

A shampoo is a cleaning aid for the hair and is counted among the foremost beauty products. Today's shampoo formulations are beyond the stage of pure cleaning of the hair. Additional benefits are expected, e.g., conditioning, smoothing of the hair surface, good health of hair, i.e., hair free of dandruff, dirt, grease and lice and, above all, its safety benefits are expected. In the present scenario, it seems improbable that herbal shampoo, although better in performance and safer than the synthetic ones, will be popular with the consumers. We have evaluated the formulation, and compared the herbal shampoo, with a marketed shampoo. We have used the physic-chemical approach to preservation and by formulating a self preserving shampoo, have avoided this risk posed by chemical preservatives. However, the aesthetic attributes, such as lather and clarity, of the laboratory shampoo are not comparable with the marketed shampoo. The foam volume was on a par. It is very important to know and understand effects of ingredients used in shampoo formulations. In the present study the shampoos based on synthetic ingredients and herbal ingredients are compared for their effectiveness and safety.

KEYWORDS: Shampoos, Synthetic shampoos, Herbal shampoos, Cosmetics, Formulations.

SWATI DESHMUKH
Siddhant College of Pharmacy , Sudumbare Pune, India

Corresponding author

INTRODUCTION

A Shampoo may be described as a cosmetic preparation meant for the washing of hair and scalp, packed in a form convenient for use. Its primary function is of cleansing the hair of accumulated sebum, scalp debris and residues of hair-grooming preparations. The added functions of shampoo include lubrication, conditioning, medication and so on.[1] The shampoo formulations must be medically safe for long term usage. Evaluation of shampoos comprises the quality control tests including visual assessment and physiochemical controls such as pH, density viscosity , and surface tension. Sodium lauryl sulfate based detergents are the most common but the concentration will vary considerably from brand to brand and even within a manufacturer's product range.[1] Herbal drugs or their formulations are viable alternative to synthetic drugs. During the past few decades, there has been a dramatic increase in the use of natural products in cosmetics. Natural botanicals may be used in their crude form, purified extracts, or derivatives are added to effect. Now-a-days, many herbal shampoos are available in the market which contain herbal ingredients such as plant extracts and essential oil. There are large numbers of plants which are reported to have beneficial effects on hair and are commonly used in shampoos. A list of plants which are commonly used in shampoos is given in Table 1along with their common names and reported functions and uses. [2]

MATERIALS AND METHODS

The following plants were used in the study.
Maka:(*Lepidium meyenii*), Aloe:(*Aloe barbadensis*), Neem(*Azaradicta indica*), Shikakai(*Acacia concinna*), Ritha (*Sapindus trifolatus*), Amla*(Emblica officinalis*), Brahmi:(*Centella asiatica* Linn.) [3]
The powders of Maka ,Aloevera , Neem, Shikakai, Ritha, Amla, Brahmi, were procured from the market.

Preparation of Herbal Shampoo
Decoction of Maka Aloevera, Neem, Shikakai, Ritha, Amla, and Brahmi was prepared in two part of water. Sodium lauryl sulphate was mixed with other part of water. Mixing of both the solutions was done with constant stirring. Water and perfume was added.

Evaluation of Herbal Shampoos
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, solid content, surface tension, thermal and mechanical stability and detergency tests were carried out. The results were compared with marketed formulations [4]

Physical appearance/visual inspection
The formulations prepared were evaluated in terms of their clarity, foam producing ability and fluidity [4]

Determination of pH
The pH of 10% shampoo solution in distilled water was determined at room temperature 25°C[5.]

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.

Rheological evaluations

The viscosity of the shampoos was determined by using Viscometer. The viscosity of the shampoos was measured with the temperature and sample container's size was kept constants during the study.

Dirt dispersion

Two drops of shampoo were added in a large test tube contain 10 ml of distilled water. One drop of ink was added in the test tube, was stopped and shake for ten times. The amount of ink in the foam was estimated as none, light, moderate or heavy.

Cleaning action

5 grams of wool yarn was added in grease and it was placed in 200 ml. of water containing 1 gram of shampoo in a flask. Temperature of water was maintained at 35^0C. The flask will shake for 4 minutes at the rate of 50 shake per minute. The solution was removed and sample was taken out, dried and weighed. The amount of grease removed was calculated by using the following equation:

DP= 100(1-T/C) in which,

DP is the percentage of detergency power, C is the weight of sebum in the control sample and

T is the weight of sebum in the test sample.[6]

Surface tension measurement

Measurements were carried out with a 10% shampoo dilution in distilled water at room temperature.The stalagmometer will be cleaned using chromic acid and purified water because surface tension it will be highly affected with grease or other lubricants. The data was calculated by following equation given below:

$R2 = \frac{(W3-W1)\ N1}{(W2-W1)\ N2} \times R1$

Where W 1 is weight of empty beaker.

W2 is weight of beaker with distilled water W3 is Weight of beaker with shampoo solution.

N1 is no. of drops of distilled water.

N2 is no. of drops of shampoo solution.

R1 is surface tension of distilled water at room temperature.

R2 is surface tension of shampoo solution.

Detergency ability

The Thompson method will be used to evaluate the detergency ability of the samples. Briefly, a crumple of hair were washed with a 5% sodium lauryl sulfate (SLS) solution, then dried and divided into 3g weight groups. The samples were suspended in a n-hexane solution containing 10% artificial sebum and the mixture was shaken for 15 minutes at room temperature. Then samples were removed, the solvent was evaporated at room temperature and their sebum content determined. In the next step, each sample was divided into two equal parts, one washed with 0.1 ml of the 10% test shampoo and the other considered as the negative control. After drying, the resided sebum on samples was extracted with 20 ml n-hexane and re-weighed. Finally, the percentage of detergency power will be calculated using the following equation:

DP= 100(1-T/C) in which,

DP is the percentage of detergency power,

C is the weight of sebum in the control sample and

T is the weight of sebum in the test sample.

Foaming ability and foam stability

Cylinder shake method was used for determining foaming ability. 50ml of the 1% shampoo solution was put into a 250 ml graduated cylinder and covered the cylinder with hand and shaken for 10times were recorded. The total volumes of the foam contents after1 minute shaking. The foam volume was calculated only. Immediately after shaking the volume of foam at 1 minute intervals for 4 minutes were recorded.

Skin sensitization test

The guinea pigs were divided into 6 groups (n=3). Activity was done at Siddhant college of Pharmacy Sudumbare Pune, having animal ethical committee no 1092/ac/07/CPCSEA. On the previous day of the experiment, the hairs on the backside area of guinea pigs were removed. The animals of group I was served as normal, without any treatment. Animal Group II, III, IV,& V were applied with shampoo formulation F1, F2, F3, MS1

respectively. Shampoos were applied onto nude skin of animals of groups. A 0.8% v/v aqueous solution of formalin was applied as a standard irritant on animal Group VI. The animals were applied with new patch/formalin solution up to 72 hours and finally the application sites were graded according to a visual scoring scale, always by the same investigator. The erythema scale was as follows: 0, none; 1, slight; 2, well defined; 3, moderate and 4, scar formation (severe).[6]

Stability Study[7, 8]

Stability and acceptability of organoleptic properties (odor and color) of formulations during the storage period indicated that they are chemically and physically stable. The stability of herbal formulation is listed in table 6.

Table 1
Formula of prepared shampoo

Sr. no	Particulars	Part used	F1 Quantity(10ml)	F2 Quantity(10ml)	F3 Quantity(10ml)
1	*Lepidium meyenii*	Leaf	2gm	1gm	0.5gm
2	*Aloe barbadensis*	Leaf	2gm	1gm	0.5gm
3	*Azaradicta indica*	Leaf	2gm	1gm	0.5gm
4	*Acacia concinna*	Fruit	2gm	1gm	0.5gm
5	*Sapindus trifolatus*	Fruit	2gm	1gm	0.5gm
6	*Emlica officinalice*	Fruit	2gm	1gm	0.5gm
7	*Centella asiatica*	Leaf	2gm	1gm	0.5gm

Table 2
Evaluation of Formulation for physical appearance, pH and Solids.

Sr. no	Formulation	Physical appearance	pH	Solid
1	F1	Dark brown, good foaming	5.51± 0.02	22.11± 0.02
2	F2	Dark brown, good foaming	5.53± 0.02	24.51± 0.02
3	F3	Light brown, good foaming	5.55± 0.02	29.31± 0.02
4	MS1	Dark brown, good foaming	5.91± 0.02	28.21± 0.02

Table 3
Viscosities of herbal shampoos

Sr. no	Formulation	Viscosity (ps)
1	F1	0.012
2	F2	0.0096
3	F3	0.0086
4	MS1	0.0099

Table 4
Evaluation of Formulation for Cleansing, Surface tension and Detergency

Sr. no	Formulation	Cleaning (%)	Surface tension(dynes/cm)	Detergency (%)
1	F1	24.21± 0.03	28.76±0.02	64.23± 0.32
2	F2	32.51± 0.09	29.00±0.12	65.12± 0.02
3	F3	18.81± 0.08	27.86±0.62	53.58± 0.09
4	MS1	32.11± 0.02	31.37±0.42	66.12± 0.42

Table 5
Foam stability of herbal shampoos

Time (min.)	F1 (ml)	F2 (ml)	F3 (ml)	MS1 (ml)
1	50	70	37	70
2	47	65	36	65
3	45	63	35	62
4	44	60	34	60
5	42	55	32	52

Table 6
Stability studies herbal formulations

S.No	Parameter	1month	2 month	3 month
1	Physical appearance/visual inspection	Clear	Clear	Clear
2	pH	5.51± 0.02	5.53± 1.02	5.61± 0.82
3	Solids contents (%)	22.11± 0.02	24.51± 0.02	29.31± 0.02
4	Surface tension measurement (dy. /cm	28.76±0.02	29.00±0.12	27.86±0.62
5	Rheological evaluations (ps)	0.012	0.0096	0.0086
6	Foaming ability and foam stability (ml)	50	70	45

RESULT AND DISCUSSION

Evaluation of Herbal Shampoos

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.

pH.

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 scalp[9]. 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 2, 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.

Rheological evaluations

These formulations showed pseudo plastic behavior which is a desirable attribute in shampoos formulation. 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.

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 retained in the foam; so prepared and marketed formulations are satisfactory.

Cleaning Action

Cleaning action was tested on wool yarn in grease. Although cleaning or soil/sebum removal is the primary aim of a shampoo, experimental detergency evaluation has been difficult to standardize, as there is no real agreement on a standard soil, a reproducible soiling process or the amount of soil a shampoo should ideally remove [10]. As seen from the results, there is a significant difference in the amount of sebum removed by the different shampoos. The results of detergency studies showed that the final formulation has significantly similar detergency ability, when compared with the marketed formulations and it was found in between 18-33%. The results are presented in table 4.

Surface tension measurement

Surface tension reduction is one of the mechanisms implicated in detergency. The reduction in surface tension of water from 72.8 dynes/cm to 27.86 dynes/ cm by the herbal shampoos is an indication of their good detergent action. The results are shown in table 4.

Detergency ability

Although cleaning or soil/sebum removal is the primary aim of shampoo, and the experimental detergency evaluation has been difficult to standardize.. As seen from the results, there is a significant difference in the amount of sebum removed by the different shampoos. Shampoo MS1, being a frequent-use cleanser, was expected to have the maximum detergency. Shampoos F1, F2 and F3 also showed moderate detergency. The results are presented in table 4.

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 four shampoos showed similar foaming characteristics in distilled water. All four 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 bit change in foam volume.

Skin Sensitization Test

In case of cosmetics containing higher percentage of potential irritants like hair dyes, shampoos, hair tonics and patches should not be sealed. These should be used as open patches. There were no hypersensitive reactions by those formulations. All formulations are good.

Eye Irritation Test

The formulation shown no eye irritation after 2 seconds but mild irritation shown after 4 seconds on treatment by all formulations including marketed shampoos. The adverse reactions may occur to one of the primary constituents of the cosmetic formulation or contamination or procedural misconduct. Preservatives are the second most common cause of skin reactions besides fragrances. In most cases, these are only mild or transient such as stinging and smarting and contact urticarial. In few cases, reactions may be more severe with redness, edema, dryness and scaling. All formulations were good.

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. The stability of herbal formulation is listed in table 6.

CONCLUSION

The formulated shampoos were not only safer than the chemical conditioning agents, but also greatly reduce the hair loss during combing as well as strengthen the hair growth. The pH of the shampoos was adjusted to 5.5, to retain the acidic mantle of scalp. The physico-chemical approach used for preservation of formulations .to avoid the risk proposed by chemical preservatives. However, the aesthetic attributes, such as lather and clarity, of the laboratory shampoo are not comparable with the marketed shampoos. The foam volume is on a par. Although the retail products do not fare so well in the tests conducted by us, they enjoy market popularity, especially if they foam well. This is mainly due to the false notion among consumers that ‘a shampoo that foams well, works well’, and no real effort on the part of manufacturers to counter this fallacy. In the present scenario, it seems improbable that herbal shampoo, although better in performance and safer than the synthetic ones, will be popular with the consumers. A more radical approach in popularizing herbal shampoo may be change the consumer expectations from a shampoo, with emphasis on safety and efficacy. Formulators must play an active role in educating the consumers about the potential harmful effects of synthetic detergents and other chemical additives present in shampoos. There is a strong need to change the consumer perception of a good shampoo and the onus lies with the formulators.

ACKNOWLEDGEMENT

Authors are thankful to the Dr.M.D.Burande & Mr.M V.Puri for his valuable comments and technical support.

REFERENCES

1. Eldridge J.M.,surfactant, Science Series, (1997) 68, 83-104.
2 Firthouse P.U, Effects of *Ocimum sanctum* and *Azadiracta indica* on the formulation of Antidandruff Herbal Shampoo Powder, Der Pharmacia Lettre, 1(2), 2009, 68-76.
3. Kokate C. K., A. P. Purohit, S. B. Gokhale, Pharmacognony, 42nd Edition, Nirali Prakashan, Pg No. 8.23, 8.54, 9.3, 14.8,
4. Aghel N., Moghimipour B. and Dana R.A., Formulation of a Herbal shampoo using total Saponins of *Acanthophyllum squarrosum,*: Iranian Journal of Pharmaceutical Research 2007; 6(3):167-172.
5. Mainkar A.R., and Jolly C.I., Evaluation of commercial herbal shampoos, International Journal of Cosmetic Science 2000; 22(5): 385 - 391.
6 Sharma P.P., Cosmetic Formulation Manufacturing and Quality Control, 3rd ed., Vandana Publication Delhi; 2002, 644-647.
7. Umbach W., Cosmetics and Toiletries Development, Production and Use; 1991, 26.
8. Barel A.O., Paye M. and Maibach H.I., Handbook of Cosmetic Science and Technology. (2001) 423, 583-588, 773-775.
9. Griffin J.J., Corcoran R.F, Akana K.K., The pH of hair Shampoo, Journal of Chemistry. 54thed. 1977; 553-554.
10 Mainkar A.R. and Jolly C.I., Formulation of natural shampoos, International Journal of Cosmetic Science 2001; 23(1): 59-62.