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RESEARCH ARTICLE

FORMULATION OF COST EFFECTIVE HERBAL SHAMPOO POWDER: A COMPARATIVE STUDY WITH MARKET SHAMPOOS

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ABSTRACT

Shampoo is a hair care product packed in a convenient way for use to wash hair and scalp. The major function of shampoo is to clean the hair, removal of oils, dirts, scalp debris and accumulated sebum. Formulation of shampoo must be safe and efficient for long use. The major objective of the present study was to formulate an herbal shampoo powder by means of eliminating harmful synthetic ingredients and substitutse them with natural ingredients. Our formulated herbal shampoo powder consists of fenugreek, hibiscus, henna, lemon, vettiver, neeliamari, velvet flower, aswagandha, shikkakai, karisilaankanni, thulsi, amla, brahmi and rose petals in appropriate ratio. The following evaluation tests were carried out – pH test, solid content test dirt test, foaming capacity, wetting time and surface characterization analysis using scanning electron microscopy. As the selected ingredients have been used since long time in several formulations the present investigation will certainly help in standardization of good quality and purity of herbal shampoo powder. From the study, it is possible to formulate a complete herbal shampoo that is better than available synthetic shampoos.

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. The word revitalize truly symbolizes the term what is routinely called as re-nourish or conditioning. The real technology of cleaning the hair and scalp was developed in this century by the introduction of cake soap which was followed by the production of shampoo products (**Arora *et al*., 2011**). The English word shampoo is derived from Hindi "champo" which means head massage with some form of hair oil. The main aim of shampoo is to remove the unwanted particles such as dirt, oil, skin particles, dandruff, environmental pollutants and other contaminant particles from hair without losing much of sebum (oily secretion). Apart from the above mentioned functions it also includes lubrication, conditioning, smoothing of hair surface, anti-dandruff formulas etc., to specially styled and color-treated hair (**Deshmukh *et al*., 2012**). Individual's desire for good hygiene and their concern for appearance is the root cause for the production of shampoo products. Under specific conditions the surface grease, dirt, and skin debris from the hair shaft are removed by the shampoo without adversely affecting the users. This is due to the presence of the surfactant in any suitable form like liquid, solid or powder. A shampoo is said to be ideal when it (i) effectively and completely remove the dust particles and excessive sebum from the scalp and hair, (ii) easily removed when rinsed with water, (iii) leave the hair non dry, soft and manageable, (iv) impart a pleasant fragrance to the hair and (v) cause no side effects or irritation to skin or hair (**Jaya Preethi *et al*., 2013**).

Nowadays natural products dominate over the synthetic products since it has no side effects. This is one reason that the herbal products are popular among the consumers. Synthetic hair products have chemicals which may give short term growth and shine to hair, but definitely when used for long term damages the hair which may even lead to baldness, premature hair graying and hair loss. Some of the chemicals used in synthetic shampoo includes sodium dodecyl sulphate (SDS), N-nitrosodiethanolamine (NDELA), disodium EDTA, formaldehyde, etc., (**Arora *et al*., 2011**).

The rationale of the study include, herbs is been used for thousands of year due to its medicinal properties. Body starts to get cleansed and gets purify itself when herbs are taken .These natural botanicals may be used in their crude form or they may be extracted, purified or derivatized to render them more suitable for cosmetic purposes. There are large numbers of plants which are reported to have beneficial effects on hair and are commonly used in shampoos. Hence in the present study,

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we sought to formulate an efficient herbal shampoo powder with variety of plant products.

MATERIALS AND METHODS

Collection of plants

The dried plants were obtained from the local markets of Coimbatore, Tamil Nadu. These plants are then made into powdered form and stored in air tight containers until it is further used in the formulation.

Formulation of herbal shampoo powder and comparison with market shampoos

The composition of ingredients used for our formulation are listed in Table 1. Sandalwood oil is added to the herbal powders as a fragrance agent and kept in hot air oven for 30 minutes. After 30 minutes it is taken out and covered with aluminum foil and stored in room temperature. For comparison, two commercially available market shampoos were purchased and named as Shampoo A and B respectively.

Table 1. Formulation of herbal shampoo powder

S.No	Scientific name	Common name	Uses	Quantity for 100 gm
1.	*Trigonella foenum-graceum*	Fenugreek	Used for its cleaning and softening activity.	7
2.	*Hibiscus rosa-sinensis*	Hibiscus	Conditioning agent.	15
3.	*Lawsonia inermis*	Henna	Hair coloring and hair growth promoter.	5
4.	*Citrus limon*	Lemon	Antidandruff, natural cleanser, pH modifier.	1
5.	*Chrysopogon Ziznaniodes*	Vetiver	Coolant and anti-bacterial agent.	5
6.	*Indigofera tinctoria*	Neeliamari	Used to promote hair growth.	8
7.	*Amaranthus spinosus*	Velvet flower	Hair conditioner.	1
8.	*Withania somnifera*	Aswagandha	Improve circulation of the scalp.	5
9.	*Acacia concinna*	Shikkakai	Detergent.	15
10.	*Eclipta prostrate*	Karisalaankanni	Used as a natural hair dye.	8
11.	*Ocimum sanctum*	Holy basil	Antimicrobial agent.	9
12.	*Phyllanthus emblica*	Amla	Strengthen hair, antidandruff agent, promotion of hair growth.	10
13.	*Bacopa monnieri*	Brahmi	Support hair growth.	7
14.	*Rosa indica*	Rose	Helps in hair growth.	4

Evaluation Parameters

1. Determination of pH

The pH of the formulated shampoo powder and the synthetic shampoo was determined.

2. Determine percent of solids contents

A clean dry petriplate was weighed and added 4 grams of shampoo to the petriplate. The plate and shampoo was weighed. The exact weight of the shampoo was calculated only and the petriplate 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.

3. Dirt dispersion test

Put two drops of shampoo formulation in a large test tube. Add 10ml of distilled water and 1 drop of Indian ink. Stopper the test tube and shake it for ten times. Estimate the amount of ink in the foam as None, Light, Moderate, or Heavy and record. Shampoos that cause the ink to concentrate in the foam are considered as poor quality. The dirt should stay in the water portion. Dirt that stays in the foam will be difficult to rinse away. It will redeposit on the hair (**Shinde *et al*., 2013**)

4. Wetting time

The canvas was cut into 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 (**Krunali *et al*., 2013**)

5. Cleaning action

1 gram of grease is taken and wiped by non-absorbent cotton and placed inside the conical flask containing 1g of shampoo in 100ml distilled water. The conical flask is kept in mechanical shaker for 1 hour. After 1 hour the solution was removed and the cotton is 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 - Percentage of detergency power,
T - Weight of grease in test sample,
C - Weight of grease in control sample [Krunali *et al.,* 2013].

6. Foaming ability

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 (**Deshmukh *et al*., 2012**).

7. Surface characterization

Surface morphology of the hairs was examined by Scanning Electron Microscopy (SEM). The hair samples were mounted

directly on the SEM sample stub, using double side stitching tape. The photomicrographs of suitable magnification were obtained for surface characterization. The following hair samples were used for surface characterization: Sample 1.Untreated hair sample, Sample 2. Hair sample treated with shampoo A, Sample 3. Hair sample treated with shampoo B, Sample 4. Hair sample treated with herbal shampoo.

8. Ease of distribution

Ease of distribution was performed by applying 5ml of the formulation over the wet hair and the time taken to complete the distribution was measured.

9. Ease of rinsing

The time taken to remove the detergent was performed by applying 5 ml of the shampoo and time taken for complete removal of frothing from wash water was determined.

10. Ease of combing (Wet)

Ease of combing was performed by passing a comb through the wet hair and checking whether the comb glides smoothly.

11. Speed of Drying

The speed of drying was performed by applying 5ml of the shampoo in hair and dried after washing. The drying of hair was performed by using a table fan with constant speed and distance from the subject.

12. Ease of Combing (Dry)

Ease of combing was performed by passing a comb through the dry hair and checking whether the comb glides smoothly.

13.Nature of hair after wash

Nature of hair after wash was done by applying a small quantity of the shampoo on hair and then washed (**Joan Vijetha *et al*., 2013**).

RESULTS AND DISCUSSION

1. pH determination

The pH value plays an important role in minimizing damage to the hair. Mild acidity prevents swelling and promotes tightening of the scales, there by inducing shine. Hair has its maximum strength in acidic pH (**Arora *et al.*, 2011**). From Table 2, it is clear that the pH of the shampoo is slightly acidic and it ranges from 5.6 to 6.5 which is near to skin pH.

2. Solid content test

For a shampoo to be of good quality it should not have too much solid content, if it then it is hard to work into the hair and also too hard to wash out. Table 2 clearly shows that all the three shampoo are having less amount of solid content and also it is found to be good quality. As a result they are easy to wash out (**Joan *et al*., 2013**).

3. Dirt dispersion test

The amount of ink present in the foam determines the quality of the shampoo. Shampoo that cause the ink to concentrate in the foam is considered poor quality, the ink (dirt) should stay back in the water. If the ink (dirt) stay back in the foam it is difficult to wash out and will redeposit on to the hair (**Kumar *et al*., 2010**). Table 2 clearly shows that, the concentration of ink in the foam of all the three shampoo is light.

4. Wetting time

Wetting ability of a solution is a function of its concentration. For an efficient solution the wetting time must be as low as possible, that is minimum the wetting time more efficient the solution (**Ali *et al*., 2011**). Table 2 shows that, the wetting time of all the three shampoos was minimum and all the three shampoos were found to be of good quality.

5. Cleaning action

Cleaning action was tested on non adsorbent cotton in grease. The efficiency of developed formulations to remove the grease applied on the non adsorbent cotton plug was assessed. The percentage cleaning action obtained for the herbal formulation in this investigation was comparable with that of the synthetic shampoos.

Table 2. Evaluation of pH, percent solid content, dirt dispersion, wetting time and cleaning action

Sample	pH	Percent solid content (gm)	Dirt dispersion (presence of ink in foam)	Wetting time (sec)	Cleaning action DP=100(1-T/C)%
Shampoo A	6.2 ± 0.02	0.91 ± 0.01	Light	12 ± 1.5	14.58 ± 0.006
Shampoo B	5.9 ± 0.01	0.78 ± 0.01	Light	14 ± 2.0	10.30 ± 0.005
Herbal	6.5 ± 0.05	0.39 ± 0.02	Light	19 ± 1.0	12.50 ± 0.005

The possible reason behind the improved percentage cleaning action of developed formulation is because of incorporation of two surface active agents, hibiscus and shikakai in optimized concentration (Chandran *et al*., 2013). Table 2 clearly shows that the herbal formulation has a cleaning percentage similar to that of synthetic shampoo.

6. Foaming ability test

Foaming also called lathering does not have much to do with the cleaning process. Normally the foaming ability of natural shampoo is not comparable with synthetic shampoo, but the study proves that herbal shampoo can generate sufficient foam due to the presence of shikkakai. A point to be noted here is the fact that a shampoo that foams well need not clean well (**Potluri *et al*., 2013**). Table 3 clearly shows that the herbals

formulation has low foaming ability when compared to that of the synthetic shampoo.

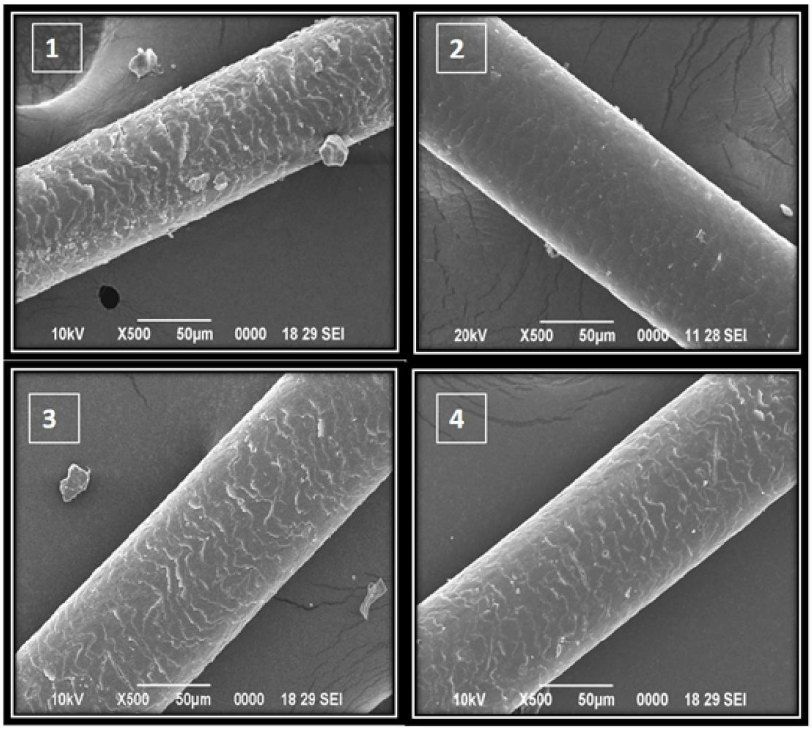
7. Surface characterization using SEM analysis

Digital pictures were obtained by SEM, by which the surface characterization of the treated hair and untreated hair was studied shown in Figure 1. It's important to understand the cleansing action of shampoos by removal of deposited artificial sebum on hairs. The SEM photographs compare untreated hair and hair treated with formulated and marketed shampoos. The untreated hair had a scaled appearance due to desquamation of the hair cuticle. SEM observations provided the evidence for cleansing action. Formulated as well as marketed shampoos possessed good cleansing property as reviewed by micro photographs. Hence the treatment of hairs with shampoos containing natural conditioners protects hair morphological integrity, provided consistency and shine to the hair and easy combing. The cleansing action in the herbal shampoos was provided by active natural foam forming agents.

It can be concluded from SEM studies that natural plants extract present in formulation play an important role in protecting hair structures along with cleansing and conditioning effects (**Kumar *et al*., 2010**).

8. Other evaluation parameters

Table 4 clearly reveals that the herbal formulation was a bit lagging in distribution when compared to synthetic formulation. In the case of ease of rinsing herbal formulation was rinsed out quickly whereas the synthetic shampoo was not. The herbal formulation was compared with commercially available synthetic shampoo and found that the herbal formulation is not only safer than the chemical conditioning agent, but also they reduce the protein loss during combing (**Mali *et al*., 2010**). In ease of combing (wet) all the three treated sample was found a bit hard for combing. In speed of drying they showed nearly same time for drying.



1. Untreated hair sample 2. Hair treated with shampoo A 3. Hair treated with shampoo B 4. Hair treated with herbal shampoo

Fig.1. SEM analysis of hair sample

Table 3. Foaming ability test

Time (mins)	Shampoo A (ml)	Shampoo B (ml)	Herbal (ml)
0	129 ± 1.52	179.6 ± 1.52	49.6 ± 2.51
5	122.8 ± 1.58	167.7 ± 1.61	40.3 ± 2.51
10	119.4 ± 1.28	159.8 ± 0.73	28.3 ± 1.52
15	115.6 ± 1.52	152.3 ± 1.52	14.3 ± 2.08

Table 4. Other evaluation parameters

Parameters	Shampoo A	Shampoo B	Herbal
Ease of distribution	***	***	**
Ease of rinsing	**	**	***
Ease of combing (wet)	**	**	**
Speed of drying	11 min	9 min	8 min
Ease of combing (dry)	***	***	***
Nature of hair after wash	Soft and manageable	Soft and manageable	Soft and manageable

*** Best ** Better

In the case ease of combing (dry) all the three formulations showed better result without friction whereas other formulations showed combing with friction. The nature of hair after wash is the texture of hair and after the washing process. For a shampoo to be of good quality the hair after wash should be soft and manageable. This study clearly shows that the herbal shampoo is soft and manageable as that of the synthetic shampoo.

Statistical analysis

All data values are expressed as Mean (± SD). Statistical analysis were performed using a one-way analysis of variance (ANOVA) followed By Dunnett's test, using Graphpad InStat version 3.0, (GraphPad Software, San Diego, CA).

Conclusion

The formulated shampoos were not only safer than the synthetic shampoo, but also greatly reduce the hair loss during combing as well as strengthen the hair growth. 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. The awareness and need for cosmetics with herbs is on the rise, as it is strongly believed that these products are safe and free from side effects. But when compared to the chemical based shampoos, herbal shampoos are more effective in terms of safety and ease of manufacturing and in the economic point of view they are cheap. From the result, in the present study, the prepared herbal shampoo powder formulation was comparable to the market shampoos in many parameters. Our data suggests that, prepared herbal shampoo powder are recommended as a choice product in cost effective hair care cosemetics.

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REFERENCES

Ali Heyam Saad, Rasool Bazigha Kadhim, 2011. Formulation and evaluation of herbal shampoo from *Ziziphus spina* leaves extract. *International Journal of Research in Ayurveda and Pharmacy*, 2(6), 1802 – 1806.

Arora, P., Nanda, A. and Karan, M. 2011. Shampoos based on symthetic ingredients vis-à-vis shampoos based on herbal ingredients: A review. *International Journal of Pharmaceutical Sciences Review and Research,* 7(1), 42-46.

Chandran, S., Vipin, K.V., Augusthy, A.R., Lindumol, K.V. and Shirwaikar, A. 2013. Development and evaluation of antidandruff shampoo based on natural sources. *Journal of Pharmacy and Phytotheraputics*, 1:4, 10-14.

Deshmukh, S., Kaushal, B. and Ghode, S. 2012. Formulation and evaluation of herbal shampoo and comparative studies with herbal marketed shampoo. *International Journal of Pharma and Biosciences,* 3, 638-645.

Jaya Preethi, P., Padmini, K., Srikanth, J., Lohita, M., Swetha, K. and Vengal Rao, P. 2013. A Review on Herbal Shampoo and Its Evaluation. *Asian Journal of Pharmaceutical Analysis*, 3, 153-156.

Joan Vijetha, R., Fatima Grace, X., Shanmuganathan, S. and Chamundeeswari, D. 2013. Preparation and Evaluation of Polyherbal Shampoo Powder. *International Journal of Research in Pharmaceutical Sciences,* 3, 60-66.

Krunali, T., Dhara, P., Meshram, D.B. and Mitesh, P. 2013. Evaluation of standards of some selected shampoo preparation. *World Journal of Pharmacy and Pharmaceutical Sciences,* 2, 3622-3630.

Kumar Ashok and Rakesh Roshan Mali 2010. Evaluation of prepared shampoo formulations and to compare formulated shampoo with marketed shampoos. *International Journal of Pharmaceutical Sciences Review and Research,* 3, 120-126.

Mali, R.R., Kumar Ashok, Singh Atul Kumar and Talwar Amitabh 2010. Formulation of herbal shampoos from *asparagus racemosus, acacia concin, sapindus mukorossi*. *International Journal of Pharmaceutical Sciences Review and Research*, 4(1), 39-44.

Potluri, A., Shaheda, S.K., Rallapally, N., Durrivel, S. and Harish, G. 2013. A Review on Herbs Used In Anti-Dandruff Shampoo and Its Evaluation Parameters. *Research Journal of Topical and Cosmetic Sciences*, 4(1), 5-13.

Shinde, P.R., Tatiya, A.U., Surana, S.J. and Miss Shinde Poonam Ramesh 2013. Formulation Development and Evaluation of Herbal Antidandruff Shampoo. *International Journal of Cosmetic Science*, 3, 25-33.

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