



**International Journal of Research
in
Pharmaceutical and Nano Sciences**

Journal homepage: www.ijrpns.com

<https://doi.org/10.36673/IJRPNS.2020.v09.i04.A21>



**FORMULATION AND EVALUATION OF HERBAL SHAMPOO AND COMPARISON
WITH COMMERCIAL SHAMPOO**

**Mullaicharam*¹, Amaal Aden Elmi¹, Juveria Pervez Abdul Rahman¹, Rawan Osama Babiker¹,
Malarkodi Velraj²**

¹College of Pharmacy, National University of Science and Technology, Bowsher, Muscat, Sultanate of Oman.

²Department of Pharmacognosy, School of Pharmaceutical Sciences, Vels Institute of Science, Technology and Advanced Studies, Chennai, Tamil Nadu, India.

ABSTRACT

The study aimed to formulate polyherbal shampoo and to evaluate and compare its physicochemical properties with the marketed synthetic and herbal shampoos. The herbal shampoo was formulated by adding the extracts of *Aloe barbadensis* leaves (*Aloe vera*), *Phyllanthus emblica* fruit (Amla), *Azadirachta indica* leaves (Neem) and *Rosemarinus officinalis* leaves (Rosemary in different proportions to a 10% aqueous gelatin solution. Small amount of methyl paraben was added as a preservative and pH was adjusted with citric acid. Several tests such as visual inspection, pH, wetting time, % of solid contents, foam volume and stability, dirt dispersion, were performed to determine the physicochemical properties of both prepared and marketed shampoos. These tests were done on commercial shampoos to compare the results with the formulated shampoos. Formulations 2 and 3 are better than formulation 1 in terms of PH and foam volume. Formulations 1 is better than both formulations 2 and 4 in terms of percentage of solid contents. All the formulated shampoos were the same in terms of colour, odour and foam type and they all had good foam retention. As for the marketed shampoos, Pantene and Himalaya shampoo, Himalaya shampoo was found better than Pantene in terms of pH and percentage of solid contents whereas Pantene is better than Himalaya shampoo in terms of foam volume. Both have similar colour, good odour, foam type, and good foam retention. The results indicated the formulated shampoo is having excellent conditioning performance, at par with commercially available shampoo. However, further research and development is required to improve its quality and safety.

KEYWORDS

Polyherbal, Shampoo, Evaluation of shampoo and Herbal extracts.

Author for Correspondence:

Mullaicharam,
College of Pharmacy,
National University of Science and Technology,
Bowsher, Muscat, Sultanate of Oman.

Email: mullaicharam@nu.edu.om

Available online: www.uptodateresearchpublication.com

INTRODUCTION

Hair is an important part of the overall appeal of the human body^{1,2}. The hair care zone is one of the biggest income units amongst cosmetics. It consists of shampoos. A shampoo may additionally be described as a beauty preparation supposed for the washing of hair and scalp, packed in a structure

July – August

184

convenient for use. Its major function is cleaning the hair of collected sebum, scalp particles and residues of hair-grooming preparations. The delivered features of shampoo include lubrication, conditioning, bodybuilding, prevention of static charge build up, medication and so on. Finally, the complete shampoo components must be medically safe for long term usage¹. Shampoos based totally on herbal components are usually related with a healthful existence style and their use is becoming very popular. Investigations have been carried out these days to improve shampoos primarily based on natural and naturally derived ingredients. Formulating shampoos using only herbal raw components is challenging. This is due to the significance of choosing materials that can be rationally justified as natural and formulating them into natural shampoos which are related with their artificial counterparts. On the other hand, herbal shampoos contain different kinds of minerals and essential oils. A wide range of active principles of various plants including vitamins, hormones, phyto-hormones, bioflavanoids, enzymes, tannic acid, fruit acids, amino acids, sugars, glycosides and essential oils, are being considered useful in cosmetic formulations. The awareness and need for cosmetics with herbs is on the rise, primarily because it is believed that these products are safe and free from side effects³. The aim of the study is to prepare herbal extracts which were used to develop the herbal shampoo and evaluate its properties in comparison to marketed shampoos.

MATERIAL AND METHODS

Sample collection

The chosen plant materials for the herbal shampoo were *Aloe barbadensis leaves* (Aloe vera), *Phyllanthus emblica* fruit (Amla), *Azadirachta indica leaves* (Neem) and *Rosemarinus officinalis leaves* (Rosemary). They were collected from our college's garden (National University of Sciences and Technology) as well as purchased from the local super market. A description of the herbal ingredients of the shampoos are shown in Table No.1.

Equipment used

Beakers, Graduated cylinders, test tubes, hot plate, pH indicator, blender, droppers.

Detergents

Tween 80 was used as a non-ionic detergent. Most commercial shampoos contain viscous detergents, so in this herbal shampoo a less viscous ingredient was used.

Additives

Additives are added in shampoos for stability and enhancing the performance of shampoos. In the formulated herbal shampoo, gelatine was used as an additive.

Conditioning agents

Conditioning agents are needed for lubrication and to prevent static. *Aloe vera* was used in the herbal shampoo as it contains conditioning properties.

Preparation of extract

50g of each of the plant materials, namely *Aloe barbadensis leaves* (Aloe Vera), *Phyllanthus emblica fruit* (Amla), *Azadirachta indica leaves* (Neem) and *Rose marinus officinalis leaves* (Rosemary) were homogenized. A decoction of each of the homogeneous plants (Neem and Rosemary leaves) was prepared in one part of water by boiling for 4 hours and the extracts were separated and evaporated. *Aloe Vera* and Amla extracts were blended until smooth⁴.

Formulation of herbal shampoos

Three formulations of herbal shampoos were prepared, each containing a different amount of an ingredient. The amount of the ingredients added were changed in each formulation to see how each formulation would differ in terms of physicochemical properties and physical appearance.

The ingredients of the herbal shampoo and the amount of each ingredient are given in the above tables. Each plant extract was added to a 10% gelatine solution and mixed by shaking continuously at the time interval of 20 min. Tween 80, a non-ionic detergent and emulsifier was added as well as Methylparaben, which acts as a preservative. To improve aroma of the shampoo, 0.1ml of perfume was added and the formulation

was made up the volume to 100ml with water. To evaluate the prepared formulations, quality control tests were carried out and the results were compared with marketed formulations.

Evaluation of herbal shampoo

To evaluate the shampoo formulations, quality control tests were carried out, including visual inspection and physicochemical tests such as pH determination were performed. In order to assure the quality of products, specific tests for shampoo formulations including determination of dry residue and moisture content, dirt dispersion, foaming ability and foam stability were performed⁵.

Physical appearance/visual inspection

The formulated herbal shampoo was inspected for clarity, color, and odour and froth content⁶.

pH determination

pH of the prepared herbal shampoo was determined by dipping a pH analyser or litmus paper into a 10% v/v shampoo solution at room temperature⁷.

Percentage of solid contents

A clean dry evaporating dish was weighed and 4 grams of shampoo was added to the evaporating dish. The dish and shampoo were weighed. The exact weight of the shampoo was calculated. The evaporating dish with shampoo was placed on the hot plate until the liquid portion was evaporated. The weight of the solids only obtained after drying was calculated.

Dirt Dispersion

Two drops of prepared herbal shampoo were added in a large test tube containing 10ml of distilled water. 1 drop of India ink was added; the test tube was stoppered and shaken 10 times. The amount of ink in the foam was estimated as None, Light, Moderate or Heavy⁸.

Foaming ability and foam stability

Cylinder shake method was used for determining foaming ability. 50ml of the 1% shampoo solution was put into a 250ml graduated cylinder, covered with hand and shaken for 10 times. The total volumes of the foam content after 1 minute of shaking were recorded. Immediately after shaking, the volumes of the foam at 1 minute intervals for 4 minutes were recorded⁹.

Wetting Time

Wetting time was measured using Drave's test, wherein a canvas paper was allowed to sink through a wetting solution in a 500-mL graduated cylinder, and the time taken for the canvas paper to completely sink was considered as the wetting time. A canvas paper weighing 0.40g was cut into a disc of diameter measuring 1 inch. The canvas paper was kept over the shampoo (which was a 1 percent solution) surface and the time taken for the paper to sink was measured using a stopwatch. The lower the time required for sinking, the greater the wetting efficiency¹⁰.

RESULTS AND DISCUSSION

Discussion

This research was done to see how different shampoos produce different results by having different ingredients. The shampoos were seen if they are effective by performing many physicochemical tests such as foam volume, pH and percentage of solid contents. Physical appearance tests were also done such as color, odour and foam type.

Physical Appearance

The formulated shampoos each showed good characteristics in terms of appearance and foaming effect. It was compared to two commercial shampoos. All formulated shampoos showed a brown color. They all also had a good odour. The foam type for all shampoos was small and dense. The colors for the commercial shampoos were almost close to the color white and as for the formulated shampoos they were all brown. All in all, all shampoos, including the commercial shampoos, showed very good results.

pH Determination

The pH of shampoos is significant in improving the quality of hair, as it can reduce eye irritation and stabilize the ecological balance of the scalp. Having a low pH is one of the ways to prevent hair damage. Mild acidity reduces swelling and promotes tightening of the scales, thereby inducing shine. The pH value of our shampoo is 5.5 which falls in the range for commercial shampoos' pH of 5-7. The

commercial shampoos Pantene and Himalaya shampoo also had the desired pH value and also fell in the range 5-7. (5.7 and 5.4 respectively).

Percent of Solids Contents

Ideal shampoos usually have 20-30% of solid content, which allows it to be easily applied and rinsed out from the hair. With fewer amounts of solids, the shampoo will be too watery and will wash away quickly. On the other hand, shampoos with too many solids will be difficult to wash out. The result of percent of solids contents after heating 4g of shampoo turned out to be 21%. This means that the tested shampoo is expected to wash out easily. The commercial shampoos also had the ideal percentage of solid contents (26% for Pantene and 24% for Himalaya Shampoo).

Dirt Dispersion

Dirt dispersion is a test that helps to determine how well a shampoo can clean the hair. When India ink was added to the shampoo, the ink in the foam was not concentrated and was light, which is considered good quality. Shampoos where the ink concentrates in the foam are considered of poor quality because ink in the foam indicates that it would be difficult to wash off and may get re-deposited, so, because of this, the ink should be seen in the water portion which improves the shampoo's efficacy in cleaning the hair.

Foaming ability and foam stability

Foam generation has little to do with a shampoo's cleaning ability; however, it is significant to the consumer. Realistically, a person would like foam to form from the shampoo while cleaning the hair. The foam ability test was done by using the cylinder shake method. The foam volume for Pantene and Himalaya shampoo were 96ml and 93ml respectively. As for the formulated shampoos 1, 2 and 3, the foam volumes were 88ml, 94ml and 97ml respectively. The good foam performance is most probably due to the aloe vera plant.

Foam Retention

After the foam ability test was done, the foam was left to sit for 4 minutes. The amount of foam volume was taken each minute for up to 4 minutes. For all of the shampoos, the foam volume remained

the same for the entire four minutes. (96ml, 93ml, 88ml, 94ml and 97ml for Pantene, Himalaya Shampoo, formulation 1, formulation 2 and formulation 3 were the foam volumes of the shampoos respectively).

Wetting Time

The wetting time test is a test that is good for knowing how effective a shampoo is. A canvas in the shape of a circle was used for the test. The canvas was placed in the shampoo solution and was timed until the canvas reached the bottom. For Pantene and the Himalaya shampoo, the wetting time was 138 and 161 seconds respectively. For formulations 1, 2 and 3, the wetting time was 172, 177 and 182 seconds respectively. The higher the amount of detergent is added to a shampoo, the lower the wetting time would be. So in this case, Pantene has the lowest amount of detergents because it has the least wetting time and formulation 3 of the shampoo formulated has the highest wetting time, which indicates it has the least amount of detergents added.

Table No.1: Composition of formulated polyhedral shampoos

S.No	Ingredient	Amount Required (Formulation 1)	Amount Required (Formulation 2)	Amount Required (Formulation 3)
1	<i>Aloe Vera</i> extract	2.0ml	2.5ml	2.75ml
2	Amla extract	2.0ml	2.0ml	2.0ml
3	Rosemary extract	2.0ml	2.0ml	2.0 ml
4	Neem extract	2.0ml	2.0ml	2.5ml
5	Gelatin	q.s	q.s	q.s
6	Tween 80	1.0ml	1.0ml	1.0ml
7	Methylparaben	1mL of 0.05% solution	1mL of 0.05% solution	1mL of 0.05% solution
8	Perfume	0.1ml	0.1ml	0.1ml
9	Water	q.s	q.s	q.s

Foam volume

Formulation 1	88ml
Formulation 2	94ml
Formulation 3	97ml
Pantene	96ml
Himalaya Shampoo	93ml

Foam type

Formulation 1	Small; Dense
Formulation 2	Small; Dense
Formulation 3	Small; Dense
Pantene	Small; Dense
Himalaya Shampoo	Small; Dense

Color

Formulation 1	Brown
Formulation 2	Light Brown
Formulation 3	Light Brown
Pantene	Creamy White
Himalaya Shampoo	Ivory-White

pH

Formulation 1	5.5
Formulation 2	5.4
Formulation 2	5.4
Pantene	5.7
Himalaya Shampoo	5.4

% of Solid Contents

Formulation 1	21 %
Formulation 2	22%
Formulation 3	23.5 %
Pantene	26 %
Himalaya Shampoo	24 %

Odour

Formulation 1	Good Odour
Formulation 2	Good Odour
Formulation 3	Good Odour
Pantene	Good Odour
Himalaya Shampoo	Good Odour

Foam Retention

S.No	Time: 0 mins	Formulation 1: 88ml	Formulation 2: 94ml	Formulation 3: 97ml	Pantene: 96ml	Himalaya Shampoo: 93ml
1	Time: 1 min	88ml	94ml	97ml	96ml	93ml
2	Time: 2 mins	88ml	94ml	97ml	96ml	93ml
3	Time: 3 mins	88ml	94ml	97ml	96ml	93ml
4	Time: 4 mins	88ml	94ml	97ml	96ml	93ml

Wetting time

Formulation 1	172 seconds
Formulation 2	177 seconds
Formulation 3	182 seconds
Pantene	138 seconds
Himalaya Shampoo	161 seconds

CONCLUSION

This research was done with the aim of formulating an ideal herbal shampoos that is considered both safe and effective compared to that of commercial shampoos. Many physicochemical tests were performed to see if the formulation of the shampoo was effective. These included Ph, percentage of solid contents, and foaming ability as well as other parameters. These tests were done on commercial shampoos to compare the results with the formulated shampoos. Formulations 2 and 3 are better than formulation 1 in terms of PH and foam volume. Formulations 1 is better than both formulations 2 and 4 in terms of percentage of solid contents. All the formulated shampoos were the same in terms of colour, odour and foam type and they all had good foam retention. As for the marketed shampoos, Pantene and Himalaya shampoo, Himalaya shampoo was found better than Pantene in terms of pH and percentage of solid contents whereas Pantene is better than Himalaya shampoo in terms of foam volume. Both have similar colour, good odour, foam type and good foam retention.

This shampoo was formulated with goal of used less aggressive ingredients which can be found in commercial shampoos. Tween 80 was used as a non-ionic detergent and Aloe Vera was added in order to give the shampoo a conditioning effect, as it is a good conditioning agent and results in soft and smooth hair. Our formulated shampoos produced very pleasing results and had the qualities of an ideal herbal shampoo. With further scientific research and validation, this would improve the overall quality of the formulated herbal shampoo.

ACKNOWLEDGEMENT

The authors wish to express their sincere gratitude to College of Pharmacy, National University of Science and Technology, Bowsher, Muscat, Sultanate of Oman for providing necessary facilities to carry out this research work.

CONFLICT OF INTEREST

We declare that we have no conflict of interest.

REFERENCES

1. Cash T F. The Psychology of hair loss and its implication for patient care, *Clinical Dermatology*, 19(2), 2001, 161-166.
2. Messenger A G. Medical management of male pattern hair loss, *International Journal of Dermatology*, 39(8), 2000, 585-586.
3. Arora P, Nanda A and Karan M. Shampoos based on synthetic ingredients vis-a-vis shampoos based on herbal ingredients: A review, *International Journal of Pharmaceutical Sciences Review and Research*, 7(1), 2011, 41-46.
4. Dessai P, Phatarpekar S. Formulation and evaluation of herbal shampoo formulations and to compare formulated shampoo with marketed shampoos, *World Journal of Pharmacy and Pharmaceutical Sciences*, 5(9), 2016, 1467-147.
5. Ashok K, Rakesh R M. Evaluation of prepared shampoo formulations and to compare formulated shampoo with marketed shampoos, *Int J Pharm Sci Rev Res*, 3(1), 2010, 120-126.
6. Aghel N, Moghimipour B, Dana R A. Formulation of a herbal shampoo using total saponins of *Acanthophyllum squarrosum*, *Iran J Pharm Res*, 6(3), 2007, 167-172.
7. Tarun J, Susan J, Susan V J, Criton S. Evaluation of pH of bathing soaps and shampoos for skin and hair care, *Indian J Dermatol*, 59(5), 2014, 442-444.
8. Ali H S, Kadhim R B. Formulation and evaluation of herbal shampoo from *Ziziphus spina* leaves extract, *IJRAP*, 2(6), 2011, 1802-1806.
9. Klein K. Evaluation of shampoo foam, *Cosmet Toilet Mag*, 119(10), 2004, 32-35.
10. Manikar A R, Jolly C I. Evaluation of commercial herbal shampoos, *Int J Cosmet Sci*, 22(5), 2000, 385-391.

Please cite this article in press as: Mullaicharam *et al.* Formulation and evaluation of herbal shampoo and comparison with commercial shampoo, *International Journal of Research in Pharmaceutical and Nano Sciences*, 9(4), 2020, 184-190.