

Standardization and Comparison of the Herbal Shampoo with the Commercial Shampoos

Received: 24 October 2022, **Revised:** 22 November 2022, **Accepted:** 28 December 2022

Nitin G Sutar^{*1}, **Vaibhav V Kakade**², **Sharav Desai**³, **Prashant S Palghdmal**⁴, **³Vipul P. Patel**, **⁵Vijay K. Patel**, **⁵Ankita S. Patel**, **⁶Tora Shah**

¹Department of Pharmacognosy, Sanjivani College of Pharmaceutical Education and Research, Kopargaon, Maharashtra, India

²Department of Pharmacology, Sanjivani College of Pharmaceutical Education and Research, Kopargaon Maharashtra, India

³Department of Pharmaceutics, Sanjivani College of Pharmaceutical Education and Research, Kopargaon, Maharashtra, India

⁴S.N.D. College of Pharmacy, Babhulgaon, Yeola, Maharashtra, India

⁵Sharda School of Pharmacy, Pethapur, Gandhinagar, Gujarat, India

⁶Parul college of Pharmacy & Research, Ahmedabad, Gujarat, India

Corresponding author: Nitin G Sutar

Address- Department of Pharmacognosy, Sanjivani College of Pharmaceutical Education and Research, At post Shingnapur, Tal - Kopargaon, Dist.- Ahmadnagar, Maharashtra Pin- 423603, India.

Email- nitingsutar29@gmail.com Contact number. 9421530747, 7840910851

Keywords:

Herbal Methyl hydroxyl paraben, Physicochemical properties, herbal shampoo, and physicochemical properties

Abstract

Objective: The primary goal of the study is to develop, assess, and compare a herbal shampoo's physicochemical features to those of commercially available synthetic shampoos. **Material and Method:** The herbal shampoo was created by combining extracts from various plants, including *Acacia concinna*, *Sapindus mukorossi*, *Phyllanthus embelica*, *Aloe barbadensis*, and *Citrus aurantifolia*, in various ratios, to a 10% aqueous solution. Citric acid was used to balance the pH, and a little amount of methyl paraben was added as a preservative. To ascertain the physicochemical characteristics of both manufactured and marketed shampoos, numerous tests including those for foam volume and stability, detergency visual inspection, percent of solid contents pH, wetting time, surface tension, filth dispersion, etc. were carried out. **Result:** The herbal shampoo had an appealing formulation and was clear and opaque. After 5 minutes, it demonstrated qualities like good cleansing and detergency, low surface tension, tiny bubble size, and strong foam stability. Both homemade and store-bought shampoos produced results for excellent percent solid contents that were comparable. **Conclusion:** The outcomes show that the shampoo's conditioning effectiveness is good and on par with shampoo that is readily accessible in stores. To increase its quality and safety, though, more study and development are needed.

1. Introduction:

Shampoo is the most often used cosmetic item in daily life for cleaning hair and scalp (Ishi, 1997). A shampoo is a liquid or semisolid detergent that contains relevant additives with features like improved hair conditioning, lubrication, medication, etc. for additional uses. There are many different shampoos available on the market today, including herbal, synthetic, medicated, and non-medicated

shampoos, but the demand for herbal shampoo is higher than other types since it contains natural materials that are risk-free and have no negative side effects (Khaloud Al Badi, 2014). Surfactants are used in synthetic shampoo largely for the foaming and washing effects, however their frequent use causes scalp and eye discomfort. hair loss, hair dryness (Potluri et al., 2013). Herbal shampoo formulations are viewed as an alternative to synthetic shampoo; however, it can be challenging

to create cosmetics using only natural ingredients (Shinde et al., 2013).

Numerous medicinal herbs are used in the production of shampoo because they are believed to have positive benefits on hair (Firthouse, 2009). These plant parts may be employed in their powdered, unpurified, or derivative forms, as well as in crude or purified extract form (Pooja et al., 2011).

Making a herbal shampoo from a single natural ingredient that would be milder and safer than synthetic ones while also competing favourably with its foaming, detergency, and solid content is rather incredibly challenging. Therefore, we thought about creating a pure herbal shampoo using plants that are traditionally and frequently used for washing hair in Oman and the Gulf region.



Figure 1: Ingredient used in the preparation of shampoo

The pericarp of *Spindus mukorossi*, also known as Reetha, the fruits of *Phyllanthus emblica*, also known as Amla, and the dried pods of *Acacia concinna* (Sheekakai), as well as other plants, to wash hair (Kapoor, 2005). There are rumours that it contains four saponin glycosides that assist remove extra sebum without having any negative effects (Mahran et al., 1996). Saponins are crucial components of cosmetic applications since they also have antibacterial and antifungal properties (Chen et al., 2010). Amla fruit is used in hair treatments as an anti-dandruff agent, a hair growth stimulator, and to strengthen hairs because it is high in vitamin C. (Srivasuki, 2012). Native to the Middle East, particularly Oman, the *Ziziphus spina-christi* tree is also known as Sidr, and women have long used its leaves to wash, darken, and lengthen their hair (Ali and Kadhim, 2011). Because Reetha and Shikakai contain a lot of saponins, shaking them with water causes foam to form. Additionally, they have been shown to have favourable effects on the skin and other organ systems (Khushboo et al., 2010).

In order to find a cosmetic product that is both safe and effective, this study was created to formulate a herbal shampoo, assess its physicochemical qualities, and compare them to those of

commercially available synthetic and herbal shampoo.

2. Material and Method

2.1. Sample gathering

All plant components were purchased at a local market in Kopargaon, and a botanist from "SSGM Arts Commerce and Science College," Kopargaon, was responsible for their identification and authentication. Alovera leaves were gathered and validated from the college's garden in Kopargaon, Sanjivani College of Pharmacy. From the neighbourhood market, two commercially available shampoos, Dove Shampoo and Herbal Essences Shampoo (Himalaya), were acquired.

2.2 Making of plant extracts

To get rid of foreign objects, 100 g of Alovera leaves were washed under running water and chopped at the base to get rid of the homogenised juice. By boiling in water, aqueous extracts of sheekakai and amla were created. In order to get semi-solid mass yields of amla (8.3% w/v) and shikakai (11% w/w), the aqueous extract was filtered and concentrated. However, to get 11.2 g of semi-solid mass (11.2

percent w/w yield), Reetha pericarps were removed using the cold maceration method and water.

2.3 Formulation of herbal shampoo

The ratios of the plant extracts were blended to create the shampoo, whose composition is presented in Table 1. The shampoo base was shaken for 20 minutes before adding herbal extracts. Methyl paraben and lemon juice (1 ml each) were also added while stirring. Finally, enough lemon juice solution was added to the solution to balance the pH, and the final volume of 100 ml was achieved using shampoo base (11.2 percent w/w yield).

2.4. Evaluation of herbal and synthetic shampoo formulations and marketing

Several quality control procedures, such as visual evaluation, physicochemical controls, and conditioning performance tests, were carried out to assess the quality of commercial and created formulations (Ashok and Rakesh, 2010).

2.4.1. Visual assessment and general appearance

The formulation prepared was evaluated for the clarity, color, odor and foam producing ability (Aghel et al., 2007).

2.4.2. Calculating pH

The created composition was assessed for its ability to produce foam and for its clarity, colour, and odour (Aghel et al., 2007). At room temperature, the pH of a 10 percent v/v shampoo solution in distilled water was determined using a pH metre (Mi 151, Martini instruments) (Tarun et al., 2014).

2.4.3 Calculating the percentage of solid contents

In a previously clean, dry, and weighed evaporating dish, 4 grammes of shampoo were added. To check the precise weight of the shampoo, the dish and shampoo were weighed once more. By setting the evaporating dish on the hot plate, the liquid portion of the shampoo was able to evaporate. the percentage of the weight.

Table No. 1 Composition of formulated herbal shampoo.

Sr. No.	Ingredient	Net volume 50 ml
1	Sheekakai extract	0.5gm
2	Reetha extract	0.5gm
3	Amla extract	0.5gm
4	Alovera extract	0.5gm
5	Lemon extract	0.5gm
6	Methyl paraben	0.05%
7	Water	q.s.

Table No. 2 Physicochemical evaluation of formulated and marketed shampoo.

Parameter	Prepared shampoo	Marketed herbal	Synthetic
(Himalaya shampoo) (Dove shampoo)			
Color	Faint yellowish	Creamy white	Milky white

Transparency	Clear	Moderate	None
Odour	Pleasant herbal	Pleasant	Pleasant
Foam producing ability	Moderate	High	High
Determination of pH of 10% solution	5±0.24	5±0.17	5±0.69
Dirt dispersion test	High cleansing	High cleansing	Moderate
Surface tension test	42.48±3.78	37.16±4.34	30.32±2.36
Foam ability and stability	3 to 2.5	6.5 to 5	6 to 5
Wetting time	1.28 min.	1.22 min.	1.00 min
Conditioning test	Good	Excellent	Good

*Results are mean ± SD (n ¼ 3); *significant difference p < 0.05) by Anova single factor of the solid contents of shampoo left after complete drying was calculated.

2.4.4. Test for dirt dispersion

In a big test tube, 10 mL of distilled water was mixed with two drops of shampoo. One drop of India ink was added to this mixture, and the test container was sealed and shaken ten times. The rubric such as None, Light, Moderate, or Heavy showed how much ink was in the foam (Ali and Kadhim, 2011).

2.4.5 Surface tension measurement

A stalagmometer was used to test the surface tension of shampoo with a 10 percent w/v concentration in distilled water at room temperature (Gaud and Gupta, 2001).

evaluation of foaming capacity and foam stability

2.4.6. Test to evaluate foaming ability and foam stability

Foaming ability was determined by using cylinder shake method. Briefly, 50 ml of the 1% commercial or formulated shampoo solution was placed into a 250 ml graduated cylinder; it was covered with one hand and shaken 10 times. The total volume of the

foam content after 1 min of shaking was recorded. Foam stability was evaluated by recording the foam volume after 1 min and 4 min of shake test (Klein, 2004).

Utilizing the cylinder shaking method, foaming capacity was evaluated. In a 250 ml graduated cylinder, 50 ml of the 1 percent commercial or formulated shampoo solution was added. It was then covered with one hand and shook ten times. After shaking for one minute, the total volume of the foam content was measured. By measuring the foam volume after the shake test for one minute and four minutes, foam stability was assessed (Klein, 2004).

2.4.7 Wetting time test

Cut into discs with a 1-inch diameter and an average weight of 0.40 g, the canvas paper. The timer was activated when the smooth disc surface was placed on the surface of the 1 percent v/v shampoo solution. The wetting time was calculated as the amount of time it took for the disc to start to sink (Manikar and Jolly, 2000).

2.4.8. Assessment of fitness performance

From a nearby salon, hair was taken from an Asian woman. It was divided into four pieces, each weighing 5 g and measuring around 10 cm in length. As a control, a swatch was used without washing.

Journal of Coastal Life Medicine

The other three tresses were similarly cleaned with the formulated and commercial shampoos. For each cycle, 10 g of a sample and 15 g of water were added to a conical flask and shaken for 2 minutes before being washed with 50 ml of water. Each tree was then permitted to dry by air at ambient temperature.

Maximum 10 cycles of washing were performed on the hair. A blind touch test measuring the smoothness and softness of the shampoos' conditioning properties was conducted on 20 randomly chosen student volunteers (Boonme et al., 2011). All of the students were instructed to rank the four tresses for conditioning performance on a scale of 1 to 4 while wearing blindfolds (1-poor, 2-satisfactory, 3 – good, 4 - excellent).

3. Statistical Research

SPSS v.19 was used to analyse the data. Data are provided as Mean standard deviation and all tests were run in triplicate. The significance was assessed using an ANOVA with a single factor. P values less than 0.05 were deemed significant.

4. Result and Discussion

4.1. Herbal Shampoo Formulation

A purely herbal shampoo formulation was prepared using a mixture of aqueous extracts of Alovera, Reetha, Amla and Sheekakai in specific amounts as shown in Table 1. These plant materials contain phytochemicals like saponins, which are natural surfactants with good cleansing and lathering properties. P. emblica and Sidr extracts were added as conditioning agents. A good shampoo needs to have enough viscosity to make it easy to pour out of the bottle, but not drip off the hair during use. Lemon juice was added to adjust the pH to the desired level, which also acted as a natural antioxidant, chelating and anti-dandruff agent to maintain the acidic pH of the formulation. The shampoo has been further preserved by the addition of a small amount of methylparaben. The final formula of the shampoo produced is presented in Table 1.

4.2. Evaluation of shampoos

Comparative effectiveness of the formulated herbal and commercial shampoo were evaluated by performing some simple physicochemical tests,

results of which are discussed below.

4.2.1. Physical appearance/visual inspection

Like any other cosmetic preparation, shampoo should have an attractive appearance. The formulations and shampoos were evaluated for physical properties such as color, odor and transparency (Table 2). prepared shampoo is transparent, light green and had a good smell. With the exception of color, no significant difference in odor, transparency and lather properties was observed between commercial and formulated shampoo.

4.2.2. pH

Most shampoos are formulated to be either neutral or slightly alkaline to minimize damage to the hair. Shampoo pH also helps minimize eye irritation, improves hair quality and maintains the scalp's ecological balance (Baran and Maibah, 1998). The pH of the commercial shampoos tested was in the preferred range (between 7 and 5) (Tarun et al., 2014) and is shown in Table 2. Acid balance values were observed for commercial shampoos (Dove: 6.12, Herbal Essences: 6.04) but the pH of the formulated shampoo was found to be near neutral (7.02).

4.2.3. % of solid contents

Good shampoos are typically 20-30% solids because they are easy to apply and rinse out of the hair. If it doesn't have enough solids it will be too watery and will wash away quickly, just as too many solids will be difficult to work into the hair or too difficult to wash out. The percent solids of all shampoos tested ranged from 22 to 25% and are expected to wash off easily (Table 2).

4.2.4. Dirt dispersion

The dirt distribution is an important criterion for evaluating the cleaning effect of shampoos. Shampoos that cause the ink to become concentrated in the lather are considered inferior, as any ink or dirt left in the lather is difficult to rinse out and is redeposited on the hair (Ali and Kadhim, 2011). Therefore, the dirt should remain in the water portion to achieve better cleaning effect. All of the shampoos concentrated the ink in the water fraction,

which ensured their satisfactory cleanability and actual effectiveness.



Figure 2: Dirt dispersion test

4.2.5. Surface tension

The term surface tension indicates the amount of surfactant present in the shampoo to reduce surface tension. The lower the surface tension, the stronger the cleaning power of the shampoo. A shampoo is considered to be of good quality if it lowers the surface tension of pure water from 72.28 dynes/cm to around 40 dynes/cm (Ilton et al., 2007). All shampoos tested showed a similar surface tension reduction in the range of 31.68 to 38.72 dynes/cm. The reduced surface tension indicates a good washing effect. The formulated shampoo reduced

the surface tension to 38.72 dynes/cm, which is comparable to Herbal Essences (38.36 dynes/cm). However, of all shampoos, Dove (31.68 dynes/cm) has the lowest surface tension, indicating that it has the strongest cleaning ability. Commercially available synthetic or semi-herbal shampoos can contain excessive amounts of detergents which can strip the hair of up to 80% of the oil and thus damage the hair. With a mild detergent in our shampoo, we made sure that didn't happen. The average score of the student volunteers' opinion of the conditioning performance of the curls after treatment with Shampoo n-20.

Table No. 3: Surface tension of shampoo.

Score	Formulated shampoo	Dove shampoo	Herbal marketed shampoo	No washing
1	2	3	3	1
2	4	1	2	0
3	8	6	7	0
4	8	5	5	3
Avg.	5.5	3.25	4.25	1

Score: 4-excellent, 3-good, 2-fair and 1-poor.

4.2.6. Foaming ability and foaming stability

Lathering or sudsing is very important to the consumer and hence it is considered an important parameter when evaluating shampoo. Herbal essences and formulated shampoo produced a lather volume of over 100 ml (115 and 113 ml, respectively), while dove shampoo produced a lather

volume of 92 ml. The suds produced by the formulated shampoo were small, compact, uniform, dense and stable, similar to commercial samples. All shampoos tested had the same foam volume for 5 minutes, showing that their foam has good stability. The higher foaming property of formulated shampoo may be due to the combination of Soapnut, Shikakai and Ritha (Sarath et al., 2013).



Figure No. 3: Foaming ability and foaming stability test of prepared and standard shampoo.

4.2.7. Wetting time

The wetting ability of a surfactant depends on its concentration and is commonly used to test its effectiveness. The canvas disc method is a quick, efficient, and reliable test for evaluating a shampoo's wetting ability (Manikar and Jolly, 2000). The wetting time of three shampoos was found to be in the order of $141 < 157 < 187$ s for pigeon, herbal essence and formulated shampoo, respectively. It can be concluded that Dove contains the maximum concentration of detergents as it had the lowest wetting time, in contrast our formulated shampoo showed maximum wetting time so it contains a minimal concentration of detergents.

4.2.8. Conditioning performance

The conditioning performance of three shampoos, based on the mean student panel scores, is presented in Table 3. The majority of the students rated that the tress washed with Dove provided the best conditioning performance and as expected the control tress (no wash) received the minimum score (1.1). The conditioning performance rating of the tresses washed with the formulated shampoo was rated 3.0 out of 4 and was comparable to ratings for commercial shampoos. The results clearly showed that the formulated shampoo has a good level of conditioning performance.



Figure 4: Conditioning performance of shampoo.

5. Conclusion

The aim of the study is formulation of completely herbal shampoo which is at par with the synthetic marketed shampoo. Formulation of herbal shampoo was done by using herbal plant extracts which has traditional base which are commonly used traditionally and known for its hair cleansing action across Asia. Ingredients used in formulation of herbal shampoo are safer than silicones and polyquaterniums synthetic conditioning agents and vis a vis can greatly reduce the hair or protein loss during combing. Instead of using cationic conditioners we have used *Sheekakai*, *Amla*, *Ritha* and other plant extracts to provide the conditioning effects.

Various tests were performed and done for the evaluation and comparison of the physiochemical properties of both prepared and marketed shampoos. Our prepared shampoo showed comparable result with that of marketed shampoo for quality control tests but further research and development is required to improve its overall quality.

Acknowledgment

The authors would like to thank Management and Principal, Sanjivani College of Pharmaceutical Education and Research, Kopergaon for providing necessary research facilities.

Conflicts of Interest

The authors declare that there is no conflict of interests.

References

- [1] Aghel N, Moghimipour B, Dana RA. Formulation of a herbal shampoo using total saponins of *Acanthophyllum squarrosum*. *Iran J Pharm Res* 2007;6(3):167-72.
- [2] Ashok K, Rakesh RM. Evaluation of prepared shampoo formulations and to compare formulated shampoo with marketed shampoos. *Int J Pharm Sci Rev Res* 2010;3(1):120-6.
- [3] R. Baran, HI Maibah . *Cosmetic dermatology in children. Text book of cosmetic dermatology.* 2nd ed. London: CRC Press; 1998. p. 507-8.
- [4] P. Boonme, N. Pakpayat , Y K otmanee , S Kunlawijitrunsee , D Maneenuan Evaluation of shampoos containing silicone quaternary microemulsion. *J App Pharm Sci* 2011; 1:59-63.
- [5] Y.F. Chen, CH Yang, M.S. Chang, YP Ciou, Y.C. Foam Huang. Properties and detergent abilities of the saponins from *Camellia oleifera*. *Int J Mol Sci* 2010; 11:4417-25.
- [6] P.U. Firthouse. Effects of *Ocimum sanctum* and *Azadiracta indica* on the formulation of anti-dandruff herbal shampoo powder. *Der Pharm Lett* 2009;1(2):68-76.
- [7] RS Gaud, GD Gupta. *Practical Physical pharmacy.* 1st ed. New Delhi: C.B.S. Publisher and Distributer; 2001pp.81-105.
- [8] PS Ilton, R Deptuck, B Bousfield, D Verge, K Antoni, L MacRae, et al. *Can J Neurosci. Nurs* 2007;29(1):14-9.
- [9] MK Ishii. Objective and instrumental methods for evaluation of hair care product efficacy and substantiation of claims. In: *Hair and hair care.*

Journal of Coastal Life Medicine

- New York: Marcel Dekker, Inc; 1997.p. 261-302.
- [10] VP Kapoor. Herbal cosmetics for skin and hair care. *Nat Product Radiance* 2005;4(4):306-14.
- [11] K Klein. Evaluation of shampoo foam. *Cosmet Toilet Mag* 2004;119(10):32-5.
- [12] GE Mahran, KW Glombitza, YW Mirhom, R Hartmann, CG Michel. Novel saponins from *Ziziphus spina-christi* growing in Egypt. *Planta Medica* 1996;62(20):163-5.
- [13] AR Manikar, CI Jolly. Evaluation of commercial herbal shampoos. *Int J Cosmet Sci* 2000;22(5):385-91.
- [14] AR Manikar, CI Jolly. Formulation of natural shampoos. *Int J Cosmet Sci* 2001;23(1):59-62.
- [15] A Potluri, SSK Asma, N Rallapally, S, Durrivel, GA Harish. Review on herbs used in Anti-dandruff shampoo and its evaluation parameters. *Indo Am J Pharm Res* 2013;3(4):3266-78.
- [16] C Sarath, KV Vipin, RA Ann, KV Lindumol, S Arun. Development and evaluation of antidandruff shampoo based on natural sources. *J Pharm Phytother* 2013;1(4):10-4.
- [17] PR Shinde, AU Tatiya, SJ Surana. Formulation development and evaluation of herbal anti-dandruff shampoo. *Int J Res Cosmet Sci* 2013;3(2):25-33.
- [18] KP Srivasuki KP. Nutritional and health care benefits of amla. *J Pharmacogn* 2012;3(2):147-51.
- [19] J Tarun, J Susan, VJ Susan, S Criton. Evaluation of pH of bathing soaps and shampoos for skin and hair care. *Indian J Dermatol* 2014;59(5):442-4