

(RESEARCH ARTICLE)



Formulation and evaluation of herbal shampoo

Sushil Kumar Pal ¹, Shashank Tiwari ^{2,*}, Sunil Mishra ¹ and Sachit Saran ¹

¹ Lucknow Model College of Pharmacy, Lucknow, India.

² (Academics & Research), Lucknow Model College of Pharmacy, Lucknow, India.

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Abstract

The main objective of these study is to evaluate and formulate herbal shampoo. Shampoo are one of the cosmetic products used in daily life. Synthetic preservatives and detergents have sometimes been the cause of adverse effects among consumers. A more radical approach in reducing the synthetic ingredients is by incorporating natural ingredients whose functionality is comparable with their synthetic ingredients. The ingredients used in formulation of Herbal Shampoo are Ficus Religiosa leaves (Powder), Hibiscus Leaves (Powder), Reetha (Powder), Shikakai (Powder), Aloe vera, then prepared by mixing with each other and evaluated for its organoleptic and physio-chemical characteristics and performance tests in terms of wetting time test, pH, solid contents, surface tension, dirt dispersion, foam Stability, and Viscosity was performed. The combination of several such ingredient of herbal origin has made it possible to secure highly effective dry powder shampoo. The formulation at laboratory scale was done and evaluated for number of parameters to ensure its safety and efficacy

The Formulated Herbal Shampoo was clear and good appealing. It demonstrated good froth stability, detergency, good cleansing, small bubble size, low surface strain, and execution of good conditioning property. The physicochemical evaluation of the formulated shampoo showed ideal results. However, to improve its quality, product performance, and safety, further development was required.

Keywords: Herbal shampoo; Ficus Religiosa; Hibiscus; Reetha; Shikakai; Aloe vera.

1. Introduction

Cosmetics are not only used to modify appearance of an individual, but are also used for care of skin and body, there are various types of cosmetics available with specific and significant purpose. Many distinct races and cultures employ cosmetics in the day-to-day life. The creative self-expression and self-identity aspect are considered to be the key factors which contribute to the fame of cosmetics in current scenario. The main significance of cosmetics is to provide a new decent look to the person after application. Even though there is a booming success in cosmetic industry but the actual meaning of cosmetics is misunderstood in many Western countries for makeup products but US FDA clearly explained that cosmetics are products, which are generally intended for Application in the human body for altering the appearance, promoting attractiveness, cleansing or beautifying without affecting the body's structure or functions". As per this definition, any product which matches the above statement becomes cosmetic product, but US FDA clearly rejects pure soap as a cosmetic. In Indian cosmetic market which traditionally a stronghold of a few major Brands like Lakme and ponds has seen a lot foreign entrance to the market within the last decade.

* Corresponding author: Shashank Tiwari

2. Herbal shampoo

Herbal formulations are considered as alternative to synthetic shampoo but formulating cosmetics using completely natural raw material is a difficult task. There are large numbers of medicinal plants which are reported to have beneficial effects on hair and are commonly used in formulation of shampoo. These plant products may be used in their powdered form, crude form, purified extracts or derivative form.

Herbal shampoos are prepared from natural ingredients and are meant for cleansing hair and scalp just like regular shampoo. These shampoos are free from side effects since no surfactants are involved it has good stability and are less harmful compared to synthetic shampoo. Synthetic shampoo contains surfactants and long term use of these surfactants can lead to serious effects like scalp irritation, loss of hair, drying of hair, greying of hair, split ends and skin irritation. Due to these reasons public is getting attracted towards herbal cosmetics due to its insignificant side effects and inexpensive nature.

2.1. Vedic history

(*Ficus religiosa*) commonly known as Peepal is the most popular member of the genus *Ficus* and it is known by more than 150 names. *Ficus religiosa* has got mythological, religious and medicinal importance in Indian culture.

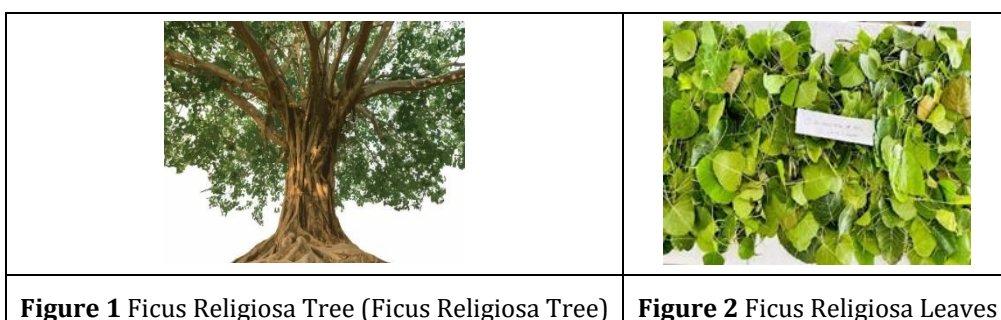
2.2. Taxonomy / botanical classification

Table 1 Classification of *Ficus Religiosa*

Domain:	Eukaryota
Kingdom:	Plantae
Phylum:	Tracheophyta
Class:	MagnoliopsidaBrongniart.
Family:	Moraceae
Division:	Magnoliophyta
Tribe:	Ficeae
Genus:	<i>Ficus</i> (FY-kus) Linnaeus

2.3. Nomenclature

'*Ficus*' is the Latin word for 'Figure', the fruit of the tree. '*Religiosa*' refers to 'religion' because the tree is sacred in both Hinduism and Buddhism and is very frequently planted in temples and shrines of both faiths. 'Bodhi' or its short form 'Bo' means 'supreme knowledge' or 'awakening' in the old Indian languages. 'Pipal' relates (I believe) to the same ancient roots which give rise to English words like 'Pip' and 'Apple' and therefore mean something like 'fruit-bearing tree'. 'Ashwattha' and 'Ashvattha' come from an ancient.



3. Shampoo

Shampoos are most probably used as cosmetics. It is a hair care product that is used for cleaning scalp and hair in our daily life. Shampoos are most likely utilized as beautifying agents and a viscous solution of detergents containing suitable additives preservatives and active ingredients. It is usually applied on wet hair, massaging into the hair, and cleansed by rinsing with water. The purpose of using shampoo is to remove dirt that is build up on the hair. Many synthetic shampoos are present in the current market both medicated and non medicated however, herbal shampoo popularized due to natural origin which is safer and free from side effects which is increasing consumer demand. In synthetic shampoos, surfactants (synthetic) are added mainly for their cleansing and foaming property, but the continuous use of these surfactants leads to serious effects such as skin irritation, scalp irritation, loss of hair and dryness of hairs.

3.1. Types of shampoo

Shampoos are of following types given below

- Baby shampoo
- Lotion shampoo
- Powder shampoo
- Solid gel shampoo
- Medicated shampoo
- Clear liquid shampoo
- Conditioning shampoo
- Liquid herbal shampoo
- Anti-dandruff shampoo

3.2. Benefits of herbal shampoo

- More shine
- Less hair loss
- Remove dandruff
- Long lasting colour
- Promote hair growth.
- All natural, no chemicals
- Keep healthy natural oils
- Keep healthy natural oils
- Won't irritate skin or scalp
- Stronger and more fortified hairs

3.3. Function of herbal shampoo:

- Lubrication
- Conditioning
- Hair growth
- Maintenance of hair colour
- Medication

3.4. Anatomy of hair

The hair is made up of 95% keratin a fibrous, helical protein (shaped like a helix) that forms part of the skin and all its attachments (body hair, nails etc.). The hair structure consists of 3 different parts:

Medulla: It is the innermost layer of the hair shaft, made up of an amorphous, soft, oily substances.

Cuticle: Thin protective outer layer that contains nutrients beneficial for hair growth. It is highly keratinized with cells shaped like scales that are layered one over the other, measuring about 60 micro-meters long and about 6 micro-meters wide.

Cortex: It is the main constituent of the hair, containing long keratin chains which gives elasticity, suppleness and resistance to the hair. The cells of the cortex are joined together by an intercellular cement rich in lipids and proteins.

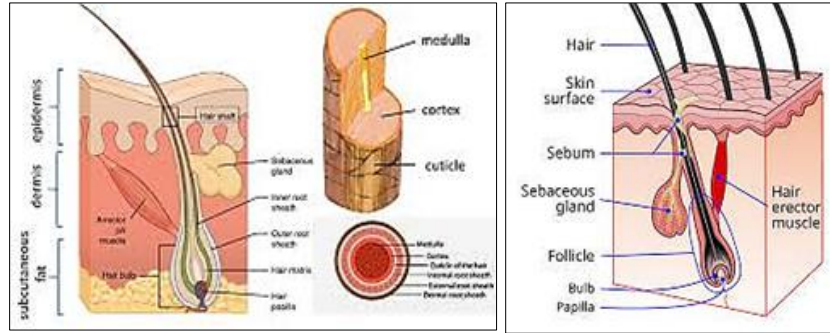


Figure 3 Anatomy of Hair

3.5. Hair problem

Split ends:- When the oil from the scalp doesn't reach the ends of the hair, it tends to dry and split over time and another reason is heat worse the ends. Applying a dash of oil on the ends can avoid split ends.

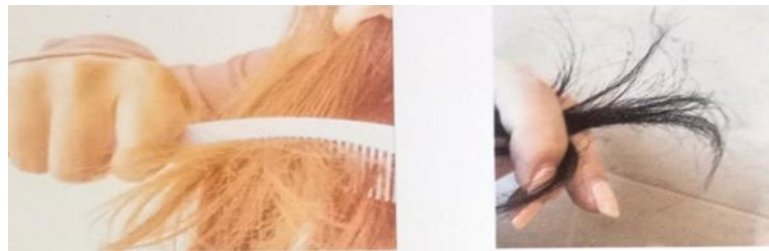


Figure 4 Split ends of Hair

Hair loss:- Hair loss occurs due to several factors such as stress, hormonal imbalance, and using the wrong products. Prevention is possible by using protein-rich food, switching to mild shampoos, massage with hot oil, staying hydrated, and exercise regularly.

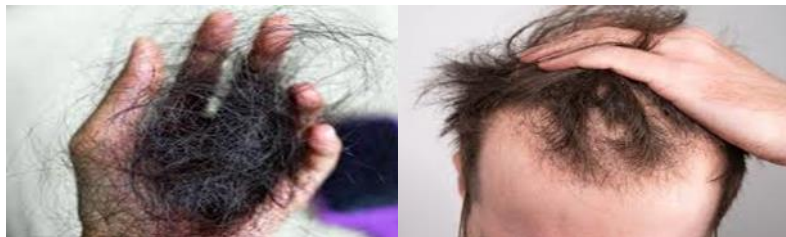


Figure 5 Hair Loss Problem

Dandruff:- The scaly particles that cling to the root of the hair is dandruff which is caused by poor diet, dry scalp, infection, excess sebum, and sensitivity to certain products. It is a harmless, non-inflammatory skin condition that affects the scalp and can lead to hair loss.



Figure 6 Dandruff Problem in Hair

Hair colour damage:- Regular colouring sessions can damage the hair in the long run. The chemicals in the dye can also cause dryness, dandruff, breakage, and split ends. Medicated shampoos extra care, conditioning, and nourishing can treat the damaged hair.



Figure 7 Hair Colour Damage

Oily scalp:- Many reasons like poor diet, genetics, or hormonal changes, the biggest culprit of an oily scalp is excessive washing. Ingredients like lactic acid help to regulate the production of oil.



Figure 8 Oily Scalp

4. Materials and method

Ingredients that are used in the preparation of herbal shampoo are:-

4.1. Active Pharmaceutical Ingredients (API)-: (Ficus Religiosa Leaves Powder)

Ficus Religiosa is a Botanical name of Peepal tree, which is also known as Bodhi tree. It is a herb commonly used as traditional medicine for about fifty types of disorders & hair. The stem bark of F. religiosa are reported phytoconstituents of phenols, tannins, steroids, alkaloids and flavonoids, β -sitosterol-D-glucoside, vitamin K, n-octacosanol, methyl oleanolate, lanosterol, stigmasterol, lupen-3-one.

Application: Hair Follicle Regeneration, Promote Hair Growth.



Figure 9 Weighing Ficus Religiosa Leaves Powder

4.2. Other Ingredients

4.2.1. Hibiscus

Hibiscus is a genus of flowering plants in the mallow family, Malvaceae. The genus is quite large, comprising several hundred species that are native to warm temperate, subtropical and tropical regions throughout the world. Hibiscus is

a flowering plant native to warm, tropical regions, such as Africa, Asia, and the Pacific Islands. This herb has been used in traditional medicine for centuries to treat hair loss and thinning hair.

Application-: Hair fall control.

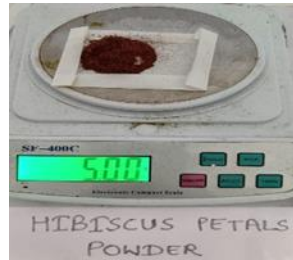


Figure 10 Weighing Hibiscus Petals Powder

4.2.2. *Aloevera*

Aloevera is a succulent plant species of the genus *Aloe*. It is widely distributed, and is considered an invasive species in many world regions. Aloe vera has many active ingredients and minerals that can help strengthen your hair. It has fatty acids and amino acids and is rich in vitamins A, B12, C, and E. These play a part in healthy hair follicles and controls greasy hair.



Figure 11 Weighing Aloe vera Gel

Application-: Moisturizer.

4.2.3. *Shikakai*

Shikakai is a spiny climbing shrub native to China and tropical Asia, common in the warm plains of central and south India. It is renowned as a raw material for shampoo, and the leaves and young shoots are often eaten. Shikakai has been used traditionally for hair care in the Indian Subcontinent since ancient times. It is traditionally used as a shampoo and it is also added in synthetic Ayurvedic shampoos. It is an herb especially used for controlling hair fall and dandruff.

Application-: Anti Dandruff.



Figure 12 Weighing Shikakai Powder

4.2.4. *Reetha*

Reetha is a species of tree in the family Sapindaceae. It is a deciduous tree that grows in the lower foothills and mid hills of the Himalayas at altitudes of up to 1,200 metres, the value of the tree mostly comes from its fruit. With regular use of it, any scalp infection, such as dandruff, is treated. It is also useful in getting rid of head lice, which frequently occur

when dirt and soap residue is left to fester. It ensures that the hair and scalp are thoroughly cleansed and that head lice are not present.

Application:- Conditions Hair.



Figure 13 Weighing Reetha Powder

4.2.5. Methyl Cellulose

Methyl cellulose is a compound derived from cellulose. It is sold under a variety of trade names and is used as a thickener and emulsifier in various food and cosmetic products, and also as a bulk-forming laxative. Like cellulose, Methyl cellulose is occasionally added to hair shampoos, tooth pastes and liquid soaps, to generate their characteristic thick consistency.

Application:- Thickener.



Figure 14 Weighing Methyl Cellulose

4.2.6. Sodium Lauryl Sulphate

Sodium lauryl sulphate (SLS), is an anionic detergent and surfactant found in many personal care products (soaps, shampoos, toothpaste, etc.) and for industrial uses. It is derived from palm kernel oil or coconut oil. In herbicides, it is used as a surfactant to improve absorption of the herbicidal chemicals and reduces time the product takes to be rain fast.

Application:- Surfactant.



Figure 15 Weighing Sodium Lauryl Sulphate

4.2.7. Jasmine oil

Jasmine oil is generally considered safe and non-irritating and reports of skin irritation are very rare. *Jasmine Oil* is renowned for its skin-friendly, & produce fragrance properties.

Application:-: Fragrance.



Figure 16 Jasmine Oil

4.2.8. Menthol

Menthol shampoo treats your hair and scalp to a well-deserved detox: It gently yet deeply cleans hair and reliably removes invisible residues. Deeply cleaned and reinvigorated, your scalp's natural balance will be restored in no time. Menthol consists cooling, calming and anti-irritation properties.

Application:-: Coolant.



Figure 17 Menthol

Process of Material Preparation

- Preparation of Ficus Religiosa Leaves Powder:-
- At first, we collected Ficus religiosa leaves.
- Washed and Dried the Ficus Religiosa leaves in a tray drier or Shade dry.
- After drying, grinded it in grinder and make a fine powder.
- Sieved the Ficus Religiosa Leaves powder by sieve number 120.
- At last, collected the fine Ficus Religiosa Leaves Powder in air tight sample bag.
- After collection use the Ficus Religiosa Leaves Powder in the Formulation.



Figure 18 Preparation of Ficus religiosa leaves powder

Preparation of Hibiscus powder:-

- At first, we collected hibiscus flower.
- Dried the Hibiscus Petals in tray drier.
- After drying, grinded it in grinder and make a fine powder.
- Sieved the Hibiscus Petals powder by sieve number 120.

- At last, collected the fine Hibiscus Petals powder in air tight sample bag.
- After collection use hibiscus petals powder in the formulation.



Figure 19 Preparation of Hibiscus petals powder

Preparation of Shikakai powder:-

- Firstly, we collected shikakai pods.
- Washed the shikakai pods with distilled water.
- Dried it in tray drier.
- After drying, grinded it in grinder and make a fine powder.
- Now, sieved the shikakai powder by sieve number 120.
- At last, collected the fine shikakai powder in air tight sample bag.
- After collection use Shikakai powder in the formulation.



Figure 20 Preparation of Shikakai Powder

Preparation of Reetha powder:-

- Firstly, we collected the Reetha fruits.
- Remove the seeds from the fruits.
- Dry fruits in the Tray dryer.
- Grind the dried fruits in a mixer or grinder and make a fine powder.
- Sieve the powder by sieve number 120.
- Collect it in air tight sample bag.
- After collection use Reetha powder in the formulation.



Figure 21 Preparation of Reetha powder

Preparation of Aloevera gel-

- At first, we collected Aloevera leaves.
- After collection, peel it in a Beaker.
- Then grinded the aloe vera in grinder.
- After grinding, transfer the grinded aloe vera into the beaker for use.



Figure 22 Preparation of Aloe-vera gel

Procedure

Table 2 Ingredients use in Herbal Shampoo

S.NO.	INGREDIENTS	QUANTITY	USES
1.	Ficus religiosa leaves powder	10 gm	Hair follicle regeneration, hair growth
2.	Hibiscus petals powder	5 gm	Hair fall control
3.	Shikakai powder	5 gm	Anti dandruff
4.	Reetha powder	5 gm	Conditioner
5.	Aloevera juice	5 ml	Moisturizer
6.	Sodium lauryl sulphate	7 gm	Surfactant
7.	Methyl cellulose	1 gm	Thickener
8.	Menthol	2 ml	Coolant
9.	Jasmine oil	Q.S.	Fragrance
10.	Distilled water	Q.S.	—

Formulation of the Ficus Religiosa herbal shampoo was done as per the formula given in above Table:

- Firstly, we weighed all the ingredients according to the formula.
- Powder of Ficus Religiosa leaves, Hibiscus petals and Aloevera gel were prepared in one part of distilled water.
- Powder of Reetha and Shikakai were prepared in another part of distilled water.
- Mix both the mixture with each other and stir it continuously.
- Pour all ingredients into mortar pestle to make uniform mixture.
- After that add Sodium Lauryl Sulphate and Methyl cellulose as a surfactant and thickening agent.
- At last, Jasmine oil and Menthol were added to it for Fragrance and coolant property.
- Heated on Hot plate and make up the volume using Distilled water.
- The product was prepared and transferred to the container.
- Labelled the container properly and stored it in a cool and dry place.



Figure 23 Formulated Herbal Shampoo

4.3. Evaluation of herbal shampoo

To evaluate the prepared formulations, quality control tests including visual assessment and physicochemical controls such as pH, density and foaming were performed.

Organoleptic properties:- We have done the visual inspection of product and observed that it was of-

- Colour - Brown
- Odour - Aromatic
- State - Liquid
- Consistency - Viscous



Figure 24 Organoleptic properties of Herbal shampoo

Determination of pH:- The pH of formulated shampoo was 6.2. A formulated shampoo is acid balanced which is near to the skin pH. The pH of shampoo is important for improving and enhancing the qualities of hair, minimizing irritation to the skin and stabilizing the pH balance of the scalp. Mild acidity prevents swelling and promotes tightening of the scales, thereby inducing shine.



Figure 25 pH Determination of prepared herbal shampoo

Foaming Stability:- The stability of the foam was determined using cylinder shake method. About 50 ml of formulated shampoo (1%) solution was taken in a graduated cylinder of 50 ml capacity and shaken for 10 times vigorously. Foam stability was measured by recording the foam volume of shake test after 1 min and 4 min, respectively. The total foam volume was measured after 1 min of shaking. From the consumer point of view, foam stability is one of the important needs of a shampoo. The foam volume produced by the formulated shampoo is above 10 ml. The prepared shampoo generates uniform, small sized, compact, denser, and stable foam.



Figure 26 Foaming test of prepared herbal shampoo

Solid contents (%) -: A Clean dry china dish was weighed and 4 grams of shampoo was added to it. The weight of dish and shampoo was noted. The exact weight of shampoo was calculated. Place the china dish with herbal shampoo on hot plate until the liquid portion was evaporated. The weight of shampoo (solids) after drying was calculated.



Figure 27 Calculation of Solid Content in prepared herbal shampoo

Surface Tension-: 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 and after cleaning determine the surface tension.



Figure 28 Determination of Surface tension using Stalagmometer

Cleaning action-: About 1 g of grease is spread on non-adsorbent cotton and kept in conical flask containing 1% shampoo solution. The conical flask is shaken for 1 hr in mechanical shaker. Cotton is collected, dried and weighed. The amount of grease removed is determined by observation.

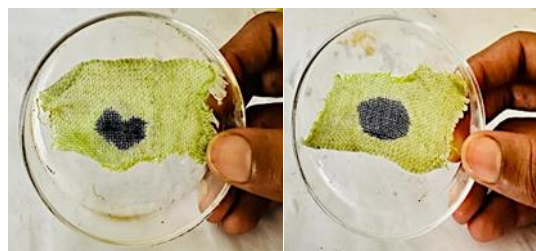


Figure 29 Determination of cleaning action of Herbal shampoo

5. Result and discussion

Table 3 Test results of Herbal Shampoo

S.no.	Parameters	Result
1.	Colour	Dark Brownish
2.	Odour	Aromatic
3.	pH	Mild acidic (6.2)
4.	Foam type	Small, Dense
5.	Solid Content	1.12 gram
6.	Texture	Smooth

The Formulated shampoo was clear and good appealing. It demonstrated good stability, detergency, cleansing, small bubble size, low surface strain and execute good conditioning property.

The herbal shampoos are the preparations which are used for the washing and cleaning of hairs and to provide nourishment. The herbal shampoos are widely used due to their no or less side effects as compared to conventional shampoos, because it contains pure natural or herbal ingredients rather than synthetic chemicals. Herbal shampoo does not require animal testing and it is skin friendly. Herbal shampoo was formulated by mixing different Ingredients in specific proportions. Selected plant materials are rich in polyphenol compounds such as alkaloid, flavonoid, tannins and saponin. They have found to exhibit Anti hairfall, Anti dandruff, cleansing, moisturising and surfactant properties. Physicochemical properties of the herbal shampoo were statistically evaluated. The effectiveness of herbal shampoo containing *Ficus religiosa* leaves, *Hibiscus* petals, *Aloevera*, *Shikakai* and *Reetha* can vary depending on several factors, including individual hair type and condition. While these ingredients are commonly used in ayurvedic and herbal hair care remedies, there is limited scientific research specifically on the combination of these ingredients in shampoo form.

6. Conclusion

The formulated shampoo is not only safer than the chemical conditioning agents but also greatly reduce the hair loss as well as strengthen the hair growth. The pH of the shampoos was adjusted to 6.2 to retain the acidic nature of scalp. Synthetic preservatives have sometimes been the cause of adverse effects among consumers. We have used the physicochemical approach to preservation and by formulating a self - preserving shampoo and avoided the risk posed 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 and they enjoy market popularity, especially if they foam well. This is mainly due to the false information among consumers that 'a shampoo that foams well works well', and no real effort was taken on the part of manufacturers to counter this fallacy. In the present scenario, it seems improbable that herbal shampoos are better in performance and safer than the synthetic ones which are popular in consumers. A more radical approach in popularizing herbal shampoo would be to change the consumer expectations from a synthetic 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 harmful shampoo. All the ingredients used to formulate the shampoo are safer than generic commercial shampoos and the physicochemical evaluation showed ideal results. The main purpose behind this investigation was to develop a stable and functionally effective shampoo. The present study was carried out with the aim of preparing the herbal shampoo that provides smooth and straight effect to hairs, safer than the chemical conditioning agents. Herbal shampoo was formulated with the powder of medicinal plants that are commonly used for cleansing and smoothening hair traditionally.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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