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Original Research Article

Formulation and evaluation of herbal shampoo byusing ziziphus Jujuba

Kanikella Sivaji[1], Devaki Devi Balusu[2]*, Likhitha Sai Pasta[2], Jahnavi Ramya Teki[2], Seshu Naredla[2], Lakshman Tonta[2], Sony Alekhya Nakka[2]

[1]Dept. of Pharmacology, Nallajerla, Village in Andhra Pradesh, India.
[2]Dept. of Pharmaceutics, Nallajerla, Village in Andhra Pradesh, India.

Abstract

Aim & Objective: The purpose of this study was to create and test a herbal shampoo with Ziziphus jujuba (ZJ) and find out how well it cleaned hair and what physicochemical characteristics it had.
Background: Synthetic shampoos often contain harsh chemicals that can damage hair and the scalp. Herbal shampoos offer a gentler alternative, and Ziziphus jujuba has been traditionally used for its potential hair-beneficial properties.
Materials and Methods: The fruit extract from Ziziphus jujuba was used to create herbal shampoo formulations. Viscosity, foamability, stability, pH, and hair-cleaning qualities were among the factors that were assessed for the manufactured shampoos.
Results: The physicochemical characteristics of the herbal shampoo formulations were deemed satisfactory. The pH was within the ideal range for hair, and the shampoo's foaming and cleaning properties were good.
Conclusion: The study successfully formulated a herbal shampoo using Ziziphus jujuba fruit extract with promising physicochemical properties and hair-cleansing efficacy, suggesting its potential as a natural alternative to synthetic shampoos.

Keywords: Herbal shampoo, Ziziphus jujuba, Hair care, Natural products, Shampoo formulation, Evaluation.

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1. Introduction

One of the body's essential components, hair is made from the ectoderm of the skin and serves to shield the sweat glands, sebaceous glands, and nails. Because they start in the epidermis during embryonic development, they are often referred to as epidermal derivatives.[1] Throughout history, the hair on the head has been linked to social distinction and beauty. Hair plays a big part in how appealing the human body looks overall. There are countless examples from all artistic disciplines that demonstrate the unique importance that people of almost every era and culture place on hair.[2] The process of washing hair has received relatively little attention, despite the fact that it has been cut, sculpted, and even dyed from the beginning of time.

A true method for cleansing the hair and scalp has just been established in this century. In order to promote personal hygiene and body cleanliness, cake soap and sanitary facilities were first widely distributed. Then came the specialty of branded shampoo products for the scalp and hair, It came in a great range of sizes and forms. These days, almost everyone washes their hair and scalp using shampoo. Shampoos, which contain both synthetic and herbal elements, are arguably the most popular hair products on the market today.3

Hair care products can be defined as a preparation designed to rid the scalp and hair of excess oil, dirt, and dandruff. Additionally, hair care products nourish and enhance the appearance of healthy hair. This century, the invention of cake soap and the subsequent development of

*Corresponding author: Devaki Devi Balusu
Email: siva.bpharm09@gmail.com

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shampoo products marked the beginning of the actual method for washing the hair and scalp. In the Indian subcontinent, the shampoo industry first emerged.

2. Reasons for Hair Lossor hair Damage:[4]

1. **Stress:** Divorce, aging parents, or the loss of a loved one can all induce emotional stress, albeit it is less likely to result in hair loss than physical stress. Having a hair fall tip that uses talk therapy, yoga, and meditation to reduce stress and anxiety might be helpful.

2. **Diet:** The main reason of hair loss is a vitamin deficit. Low vitamin B levels and a deficiency in essential minerals are typical causes of hair loss. It happens when the mealis not nourishing and the diet is deficient in nutrients. One strategy to address this issue is to avoid eating items that cause hair loss and substitute them with wholesome foods like lean proteins and an abundance of fruits and vegetables.

3. **Protein Shortage:** Hair loss is frequently caused by a protein deficiency. If you don't consume enough protein, your body will break it down more. As a result, the hair is deprived of the protein required for growth and keratin cannot enter it. To promote hair development, increase your consumption of vital fats and protein.

4. **Chemical-based products/wrong goods:** Among the most common reasons of hair loss is the use of improper hair products. Using products that prevent hair loss and preserve hair health is always a good idea. For instance, anti-dandruff shampoo and conditioner won't help you address the issue if your hair is dry or damaged. Rather, use a shampoo that is made to assist you fight hair loss in a specific way.[4]

5. **Heredity:** One important element that can contribute to hair loss is genetic variety. Both men and women inheriting pattern of hair loss. Numerous genes have been identified as the cause of hair loss. For this reason, it is common to hear that hair loss is inherited.

3. Ideal Properties of Herbal Shampoo:[5]

1. Excessive amounts of other fatty substances, loose corneal cells, and dust should all be successfully and completely removed from the hair.
2. It ought to produce enough foam to satisfy the user's psychological requirements.
3. It should be easy to remove after washing with water.
4. It should leave hair manageable, lustrous, silky, and free of flyaway.
5. It ought to leave the hair smelling nice.
6. It shouldn't irritate the skin or eyes or have other negative consequences.
7. It shouldn't cause the hand to become rough and dry.
8. Shampoo must properly wash hair.
9. Shampoo removal should be easy with a water rinse.
10. Shampooed hair should be manageable, lustrous, and not dry
11. Rough hands shouldn't result from using hair shampoo.
12. Shampoo should not irritate the skin or eyes or result in any negative responses.

4. Classification of Shampoos:[14]

1. Standard shampoo
2. A solid shampoo
3. Shampoo with medicinal properties
4. Shampoo powder
5. Shampoo in liquid form
6. The Cream shampoo
7. The jelly shampoo
8. Aerosol shampoo

5. Materials and Methods[16]

5.1. Preparation of plant extract

The composition was created using a straight forward decoction method. A digital balance was used to precisely weigh each plant; the amount utilize disindicated. Following the collection of the crude herbs, each item was ground into a fine powder using a hand-driven mixer.

After passing through sieve number 120, the powder was combined with 100 milliliters of distilled water and allowed to boil until the water was reduced to a quarter. The final filtrate was obtained by filtering the extract using a muslin cloth after it had cooled to room temperature.

6. Extraction

6.1. Ziziphus jujuba Extraction

In order to do the gel extraction from Ziziphus jujube leaves, the exudates were removed, and the mucilage was scraped off using a blunt -edged knife. In order to homogenize the mucilage, it was vigorously mixed in a blender. This solution was filtered after being strained through a muslin cloth.

7. Preparation of Extracts:[16]

7.1. Amla extract:

50ml of water is added to a beaker containing 10g of amla powder. On the heated plate, this mixture.

7.2. Shikakai extract

50ml of water is added to a beaker containing10g of Shikakai powder. The hot plate is used to boil this combination.

7.3. Hibiscus extract

50ml of water is added to a beaker containing10g of Shikakai powder. The hot plate is used to boil this combination.

7.4. Reetha extract

10gms of Shikakai powder is taken in the beaker and adds the30mlof methanol.

7.5. Ziziphus jujuba

50ml of water is added to a beaker containing10g of ziziphus jujuba. The hot plate is used to boil this combination.

7.6. Curry departs

50ml of water is added to a beaker containing10g of curry leaf powder. The hot plate is used to boil this combination.

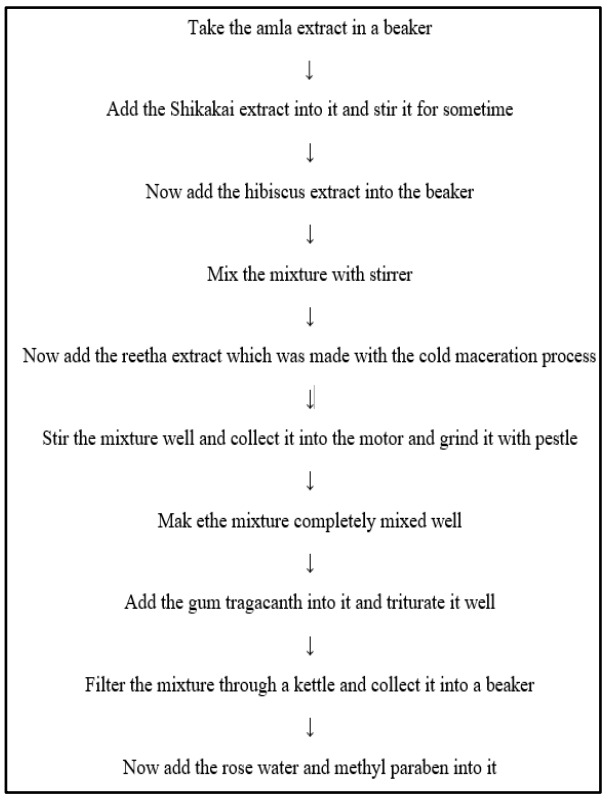
7.7. Making a gelatin solution

Add1g of gelatin powder added to a beaker filled with 50ml of boiling water on a hot plate. Heat continuously for five minutes.

Table1: Ingredient sin the herbal shampoo:

S.no	Ingredients	Purpose
1	Aloe vera	Conditioning agent
2	Hibiscus	Hair growth
3	Regi leaves	Promote hair growth
4	Shikakai	Foam base
5	Henna	Nourishing conditioning
6	Methyl paraben	Preservative
7	Rose oil	Perfume
8	Shikakai	Foam base
9	Tragacanth	Thickening agent

8. Preparation of Hibiscus Shampoo:[15]



9. Preparation of Ziziphus Jujuba Shampoo:[15]

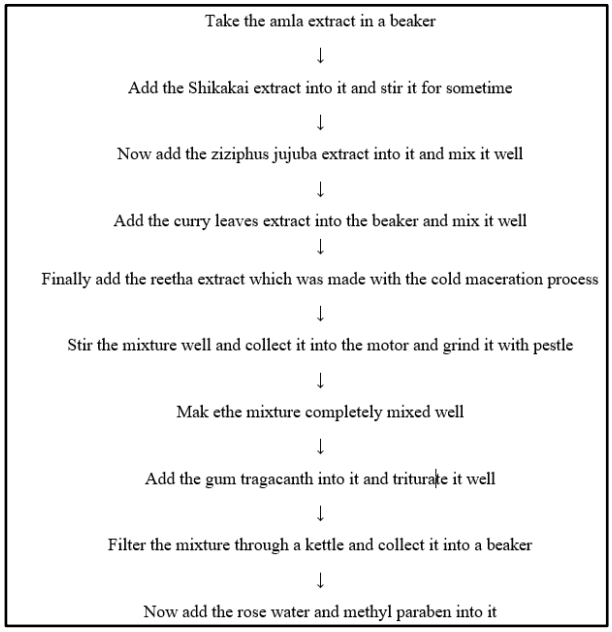


Table-2: Formulation of herbal shampoo:[6]

S. No	Ingredients	F1	F2	F3	F4	F5	F6
1	Ziziphus jujuba	5g	10g	-	-	-	-
2	Curry leaves	5g	10g	-	-	-	-
3	Hibiscus	-	-	5g	10g	-	-
4	Henna	-	-	5g	10g	-	-
5	Amla	5g	5g	5g	5g	5g	5g
6	Shikakai	5g	5g	5g	5g	5g	5g
7	Reetha	5g	5g	5g	5g	5g	5g
8	Methyl paraben	0.5g	0.5g	0.5g	0.5g	0.5g	0.5g
9	Ethanol	20ml	20ml	20ml	20ml	20ml	20ml
10	Rose oil	1ml	1ml	1ml	1ml	1ml	1ml
11	Tragacanth	5g	5g	5g	5g	5g	5g
12	Distilled. water	Up to 100millilits	Up to 100milliliters	Up to 100milliliters	Up to 100 milliliters	Up to 100milliliters	Up to 100milliliters

10. Assessment Methods for Herbal shampoo:[7]

In order to examine the generated formulations, established protocols were used for quality control testing, which included visual evaluation and physicochemical controls like pH, density, viscosity, surface tension, foam volume, foam stability, and wetting time.

10.1. Physical appearance

Like other herbal cosmetic items, the aesthetic appeal of shampoos for consumers is initially assessed visually, therefore look is crucial.

10.2. The stability and capacity for foaming

The most popular technique for figuring out foaming ability is the cylinder shaking method. A 250ml graduated cylinder was filled with 1% of 50ml of the shampoo solution at room temperature, covered with a hand, and shook ten times. After 60 seconds of shaking, the entire amount of the foam content was noted. The foam's height was measured right away. The same process was used to assess foam stability, and the foam volume after 20 minutes was measured.

10.3. pH:[8]

A pH meter was used to measure the pH level of the various shampoos tested in 1% and 10% solutions at room temperature (25±2°C). Most shampoos have a little acidic or neutral pH. The cuticle (outer layer) of the hair shrinks and lies flatter on the hair shaft in acidic liquids. Cuticle swelling and opening are caused by basic solutions. Basic solutions cause hair to become frizzier, whilst acidic solutions make hair smoother.

10.4. Dirt dispersion:[8]

A 1% solution of each shampoo (one g of sample in 100 milliliters of water) was obtained, and a drop of Indian ink was added. The test container was stopped and shaken occasionally. None, light, moderate, or strong ink content were assessed for the foam. Poor quality shampoos are those that concentrate the ink in the foam. The water part is where the dirt should stay. It is difficult to rinse away dirt that is still in the foam, and it will end up back on the hair.

10.5. Measurement of surface tension:[14]

Here is a description of the drop method's underlying premise. It's quick and really convenient. This technique makes use of a stalagmometer. The strength of a liquid's cohesive forces is measured by surface tension. For instance, surface tension is higher in water due to its strong cohesive forces. However, liquids with weak cohesive forces, like benzene, have lower surface tension than water. Smaller drops develop when the liquid's surface tension is lower. Then, for a given volume of a liquid, more drops are created. Therefore, surface tension can be calculated by simply counting the number of droplets for an unknown liquid and water. When the densities of liquids are equal, the aforementioned arguments hold true. Consequently, the weight of the drips determines how much they fall. The foundation of this technique is the idea that the weight (w) of liquid falling from a vertically held capillary tube is roughly proportional to the liquid's surface tension.

10.6. Rheological evaluation:[14]

Liquid viscosity is measured with a capillary viscometer, also known as an Ottwald viscometer. It is calculated how long it takes for a liquid to move between two markings (A and B) as it passes through the capillary tube. The duration of flow

of the liquid being tested is contrasted with the duration needed for the reference sample, which is typically water and has a known viscosity.

10.7. The proportion of solid contents:[9]

On a dry, clean evaporating plate, four grams of the prepared shampoo were put. Using an electronic balance, the weight of the shampoo-containing evaporating dish was measured and recorded as W. Once the liquid content had evaporated, the evaporating dish was placed in a hot air oven set at 50°C. Ultimately, the solid content-containing cooled evaporating dish was weighed and designated as W2.

The percentage (%) of the solid content was calculated as $[(W_1\text{-}W_2) \div W_1] \times 100$

10.7.1. Anti-microbial activity

This technique involves melting the agar, cooling it to 45 degrees Celsius, inoculating it with the test microbe, and then adding it to a sterile petri plate. This technique involves using a sterile cork borer to make holes in the medium that are about 9 mm in diameter after the agar plate has solidified. The antimicrobial agent is then inserted into one of the holes, and another hole is filled with a commercial formulation that serves as a standard. The diameter of the zone of inhibition was measured after inoculation at 30 to 350 degrees Celsius for two to three days.The relative effectiveness of several antimicrobial substances against the tested pathogen is indicated by the diameter of the zone of inhibition.

10.7.2. Skin irritation test:[10]

Prepared polyherbal anti-dandruff shampoo was applied on skin for 5 minutes after washed and test for irritation or inflammation on the skin.

10.7.3. Stability studies:[12]

In accordance with ICH recommendations, stability tests were conducted for the herbal formulations. The formulations were evaluated for PH, transparency, solid content percentage, and physical appearance. Washability:[13]

Once you have shampooed your hands, wash them.

10.7.4. Weetingtime

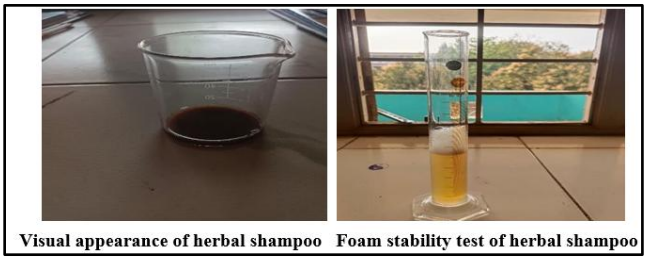
A substance's wetting time depends on its concentration, as stated in.[11] Drave's test is the formal test, but because it is quick and simple, the canvas disc method is typically employed.

11. Assessment criteria Herbal shampoo

Standard procedures were followed to conduct quality control tests, which included visual evaluation and physicochemical controls including pH, density, viscosity, surface tension, foam volume, foam stability, and wetting time, in order to analyze the created formulations.

11.1. Physical appearance

Like all herbal cosmetics, shampoos are mostly evaluated by consumers based on their visual appeal, therefore it's critical to look beautiful.



Visual appearance of herbal shampoo Foam stability test of herbal shampoo

Fig 1:

11.2. Foaming ability and foaming stability

For assessing foaming ability, the most popular technique is the cylinder shaking method. After filling a 250 ml graduated cylinder with 1% of 50 ml of the shampoo solution at room temperature, the cylinder was covered with a hand and shook ten times. After shaking for 60 seconds, the total amount of the foam content was noted. Immediately, the height of the foam that was produced was measured. The identical technique was carried out, and the foam volume after 20 minutes was evaluated in order to assess foam stability.

10.8. PH:

At room temperature (25±2°C), the pH levels of the various shampoos tested in 1% and 10% solutions were measured with a pH meter. Most shampoos were either somewhat acidic or neutral. The hair's outer covering, or cuticle, shrinks and lies flatter on the hair shaft in acidic liquids. The cuticle swells and opens up in basic solutions. The 10% shampoo solution's PH makes hair frizzier, whilst basic solutions make hair smoother. After dipping a single pH paper strip into the solution, compare the strip's colour to the key. After calibration, the pH meter can also be utilized. Shampoos are generally neutral or somewhat acidic. The hair's cuticle, or outermost layer, shrinks and flattens on the hair shaft when exposed to acidic liquids. The cuticle swells and opens up when exposed to basic solutions. Hair appears smoother after using acidic solutions. Hair appears frizzier when using simple solutions. Acidic pH < 7 Neutral pH = 7 Basic H >7.

10.9. Dirt dispersion

After adding one drop of India ink to a one percent (1%) solution of each shampoo (one g of sample in 100 millilitres of water), the test tube was sealed and shook ten times. The foam's ink content was estimated to be either light, moderate, substantial, or non-existent. Shampoos are deemed low quality if they concentrate the ink in the foam. The water part is where the dirt should stay. Rinsing away dirt that is still in the foam will be challenging and will end up back on the hair.

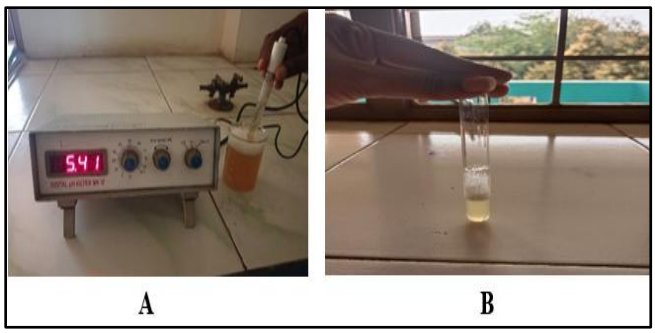


Figure 2: A: Determination of PH of herbal shampoo **B:** Dirt dispersion of herbal shampoo

12. Antimicrobial Activity

This procedure involves melting the agar, cooling it to 45 degrees Celsius, inoculating it with the test microorganism, and then pouring it into a sterile Petri plate. This method involves using a sterile cork borer to create holes in the medium that are approximately 9 mm in diameter after the agar plate has solidified. The antimicrobial agent is then placed in one hole, while a marketed formulation is placed in another hole as a standard. The diameter of the zone of inhibition was measured after inoculation at 30-350C for two to three days. The relative activity of several antimicrobial substances against the tested bacterium is indicated by the diameter of the zone of inhibition.

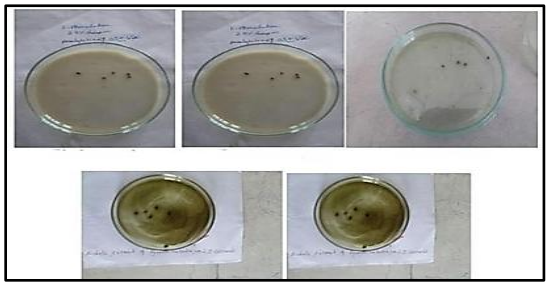


Figure 3: Anti-microbial activity for herbal shampoo

13. Skin Irritation Test:[12]

After washing and testing for skin irritation or inflammation, a prepared herbal soap was applied to the skin for five minutes.

Figure 4; A: pplied on skin of herbal shampoo B: After5minsofherbalshampoo

14. Wash ability:[13]

Table 3: After using soap and water, wash your hands

Parameters			**Observations**			
Dirt removal			Easy clean and no strains observed			
Rinsing easy			Easily wash off in one rinse			
Hair texture			Smooth and silky			
Parameters	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**
Dirt removal	Easy clean and no strains observed	Easy clean and no strains observed	Easy clean and no strains observed	Easy clean and no strains observed	Easy clean and no strains observed	Easy clean and no strains observed
Rinsing easy	Easily wash off in one rinse	Easily wash off in one rinse	Easily wash off in one rinse	Easily wash off in one rinse	Easily wash off in one rinse	Easily wash off in one rinse
Hair texture	Smooth and silky	Smooth and silky	Smooth and silky	Smooth and silky	Smooth and silky	Smooth and silky

Table 4:

S. No	Evaluation Tests	F1	F2	F3	F4	F5	F6
1	Physical appearance	Dark brown	Dark brown	Dark brown	Dark brown	Dark brown	Dark brown
2	Foaming ability and foaming stability	10cm	9.5cm	9cm	9.3cm	9.8cm	9.6cm
3	PH	5.41	5.43	5.46	5.48	6.0	6.2
4	Dirt dispersion	Easily clean	Easily clean	Easily clean	Easily clean	Easily clean	Easily clean
5	Anti-microbial activity	Microbial is not observed	Microbial is not observed	Microbial is not observed	Microbial is not observed	Microbial is not observed	Microbial is not observed
6	Skin irritation test	No irritation	No irritation	No irritation	No irritation	No irritation	No irritation
7	wash ability	Easily washable	Easily washable	Easily washable	Easily washable	Easily washable	Easily washable

15. Results

The findings of this investigation show that employing Ziziphus jujuba fruit extract to create a herbal shampoo is feasible. For hair care products, the designed shampoos' physicochemical characteristics were judged to be within an acceptable range. Given its potential to impact the health of the hair and scalp, the shampoo's pH is an important consideration. In order to avoid dryness and irritation, the formulations' observed pH was 5.5, which is near to the pH of hair naturally. In addition to its cleansing properties, the shampoo's foamability is another crucial feature that influences user approval. Since Ziziphus jujuba contains saponins, the formulations showed good foamability. Saponins are natural surfactants that effectively remove oil and debris from hair by promoting foam formation and lowering surface tension.

For handling, application, and shelf life, the shampoo's viscosity and stability are also crucial. The shampoo formulations were easy to apply and rinse off due to their sufficient viscosity. According to stability studies, the shampoos' qualities persisted throughout the observed time, indicating a good shelf life. The subjective assessment clearly showed that the herbal shampoo was effective at cleaning hair. The participants said that the shampoo left their hair clean and manageable after successfully removing grease and debris. The traditional usage of Ziziphus jujuba for hair treatment is consistent with these findings.

Even though this study yields encouraging results, more investigation is required to refine the composition, assess its long-term impacts on hair health, and carry out thorough clinical studies. Furthermore, it would be good to investigate the precise active ingredients in Ziziphus jujuba that give it its hair-enhancing effect. Additionally, a comparative analysis with other herbal and synthetic shampoos would offer a more comprehensive view of its safety and effectiveness. Lastly, scalability and cost-effectiveness should be taken into account for possible commercialization.

16. Conclusion

Herbal shampoos are the products used to clean and wash hair while also nourishing it. Herbal shampoos are popular because they contain only natural or herbal ingredients rather than synthetic chemicals, which means they have fewer or no negative effects than traditional shampoos. Herbal shampoo is earthy and skin-friendly, and it doesn't require animal testing. The herbal liquid shampoo was created by combining a number of herbal elements. Overall, formulation F2 had a pH of neutral and was non-irritating to the skin. Evaluation studies revealed positive outcomes in terms of appearance, wash ability, skin-non-irritating properties, foam stability, dirt-dispersing ability, and antimicrobial activity.

17. Source of Funding

None.

18. Conflict of Interest

None.

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