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FORMULATION AND EVALUATION OF HERBAL SHAMPOO CORRESPONDING

G. V. Srivani* Kothagadi Veena, Thakur Vaishnavi, Poddutoori Manaswini, Sangem Varsha and S. K. Kovid.

Department of Pharmacognosy, Pulla Reddy Institute of Pharmacy, Dundigal, Hyderabad, Telangana, India, 502313.

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***Corresponding Author**
G. V. Srivani
Department of Pharmacognosy, Pulla Reddy Institute of Pharmacy, Dundigal, Hyderabad, Telangana, India, 502313.

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 reetha(extract), fenugreek (extract) green tea leaves(extract) 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; reetha, fenugreek, green tea leaves.

INTRODUCTION

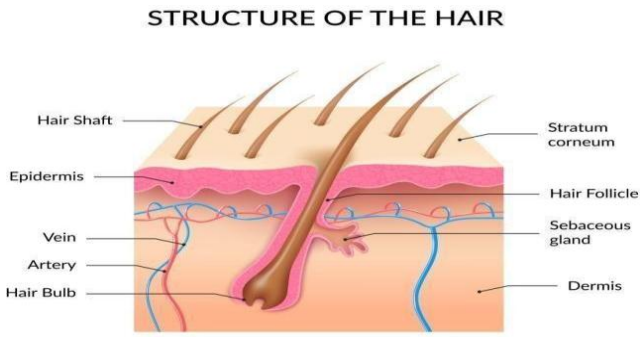

FIG-1.

Hair is a thread like strands growing from the skin of humans, mammals, and some other animals.

At the base of the hair, the hair root widens to a spherical hair bulb. The hair papilla, which elements the hair root with blood, is discovered interior the backside of the hair bulb. New hair cells are continuously being in the hair bulb, shut to the papilla New cells are continuously forming in the hair bulb. These cells stick collectively and harden. The full strand of hair develops from this team of hardened hair cells. Because new hardened cells hold on attaching to the hair from below, it is progressively pushed up out of the skin. In this way, a single hair on your head grows at a fee of about 1 cm per month. The shade of the hair is decided by means of the quantity of melanin in the hardened cells. This can fluctuate a lot from character to person, and it adjustments over the direction of a lifetime. The quantity of melanin typically decreases as human beings get older, and greater air receives trapped inner the hair – it then loses its color and turns white. Depending on someone's authentic hair shade and the variety of white hairs that develop, the hair on their on their head then turns grey or white.

HAIR FOLLICLE (hair root)

Follicle is the living part of hair located beneath the surface of skin. Hair follicle is the growth structure that produces the hair and anchors the hair shaft in the skin.

Hair follicle is made up of 4 parts.

1. Hair bulb
2. sebaceous glands
3. Inner and outer sheath

4. Arrector pili muscle.

HAIR SHAFT: Primarily made up of a protein called "keratin".

This part of hair structure is non-living, which is why haircuts don't hurt! Hair shaft has 3 parts.

1. medulla
2. cortex
3. cuticle.

Cortex and cuticle contain a pigment called "melanin" which determines the colour of hair.

SHAMPOO

Shampoo is a cleansing agent, typically in liquid or gel form, designed to clean the hair and scalp by removing dirt, oil, sweat, dead skin cells, and environmental pollutants. It usually contains surfactants that create a lather to trap and rinse away impurities, along with additional ingredients like moisturizers, conditioners, and active agents tailored for specific hair types or concerns.

IDEAL CHARACTERISTICS OF SHAMPOO

- Should effectively and completely remove the dust, excessive sebum.
- Should effectively wash hair.
- Should produce a good amount of foam
- The shampoo should be easily removed by rinsing with water.
- Should leave the hair non dry, soft, lustrous with good, manageability.

TYPES OF SHAMPOOS

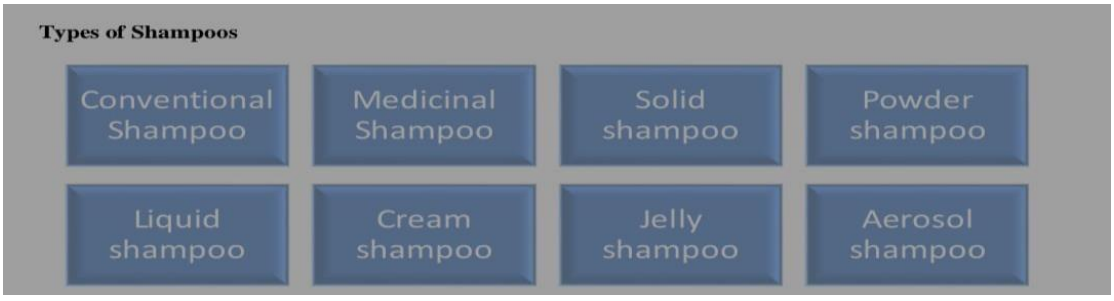

FIG-2

Conventional Shampoo

Shampoo is the most widely used cosmetic product for hair care. According to Arora et al., it's best described as a convenient cosmetic preparation that's applied to the hair and scalp to remove dirt, leftover hair styling product residue, and environmental contaminants.

Medicinal Shampoo

Interestingly, because they contain vitamins, amino acids, sugars, glycosides, phytohormones, bioflavonoids, fruit acids, and essential oils, a wide variety of plants are used in shampoos and have positive effects on hair. helpful procedures for cleaning hair in different ways, artificially soiling it, and using gas chromatography to analyze the lipids that are still present on the hair.

Solid shampoo

There are a few more benefits that solid shampoos offer over. conventional ones Compared to liquid formulations, they have greater microbiological stability, which makes them easier to transport and extend the shelf life.

HERBAL SHAMPOO

An herbal shampoo is a type of shampoo formulated using natural ingredients derived from plants, such as extracts, powders, or essential oils. These ingredients are chosen for their cleansing, conditioning, and therapeutic properties, and are often free from synthetic chemicals, artificial fragrances, and harsh detergents. Herbal shampoos are designed to gently clean the hair and scalp while promoting hair health, addressing issues like dandruff, dryness, or hair fall, and providing a natural alternative to chemical- based shampoos.

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 are 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 without stripping out much of the sebum. 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, increases consumer demand and free from side effects.

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 eye irritation, scalp irritation, loss of hair, and dryness of hairs. Alternative to synthetic shampoo we can use shampoos containing natural herbals.

PLANT PROFILE

REETHA

FIG-3.

Reetha is widely used in preparations like shampoo. The dried fruit powder is used as a foaming agent in shampoos. It cleans the oily secretions in the skin and can be used as a cleanser for hair and a hair tonic as it forms a natural lather. It is also used for removing lice from hair.

The plant is well known for its folk medicinal values

1. Reetha is found in the hilly regions of the Himalayas in India. The fruit of Reetha has been used in Indian Ayurvedic medicine for decades.
2. Reetha is a popular ingredient of many Ayurvedic shampoos and cleansers.

The major constituents present in Reetha are saponins, sugars and mucilage.

1. The seed kernels of Reetha are a rich source of proteins and show a balanced amino acid composition as per the World Health Organization.
2. In addition to proteins, sugars and fibres are also present.
3. Phytochemicals like polyphenols and saponins are also present.
4. The seed oil contains vitamin E and beta-sitosterol.

FENUGREEK

FIG. 4.

Fenugreek (Trigonella foenum-graecum) is widely used in herbal formulations, including shampoos, due to its beneficial properties for hair and scalp. fenugreek can be used in herbal shampoo formulations.

Benefits of Fenugreek for Hair

1. Promotes Hair Growth: Fenugreek seeds are rich in proteins and nicotinic acid, which help strengthen hair and stimulate hair growth.
2. Reduces Hair Fall: The high content of lecithin and iron helps prevent hair fall.
3. Conditions Hair: The mucilage content provides natural conditioning, making hair softer and more manageable.

GREEN TEA LEAVES

FIG-5.

Green tea extract is a popular ingredient in herbal shampoos due to its numerous benefits for hair and scalp health. Here are its main uses.

1. Promotes Hair Growth

Green tea extract contains catechins, especially epigallocatechin gallate (EGCG), which stimulate hair follicles, promote cell turnover, and encourage hair growth by improving blood circulation to the scalp.

2. Reduces Hair Loss

The extract blocks the action of dihydrotestosterone (DHT), a hormone linked to hair thinning and loss, helping reduce hair fall.

3. Strengthens Hair

Rich in antioxidants and nutrients like vitamins B, C, and E, green tea extract strengthens hair shafts, reducing breakage and split ends.

AIM

- To formulate and evaluate the herbal shampoo.

OBJECTIVES

- To select various herbal ingredients necessary for the Herbal shampoo preparation.
- To formulate the herbal shampoo preparation and optimize the product.
- To evaluate for the quality attributes for the herbal shampoo preparation.

MATERIALS AND METHOD:

MATERIALS

- Plant collection: Sapindus trifoliatus, Trigonella foenum-graecum and Camellia sinensis plants are collected from local home garden and nursery
- Chemicals : distilled water
- Requirements: sapindus trifoliatus and Fenugreek
- Instruments: heating mantle, maceration apparatus

THE EXTRACTION BY DECOCTION METHOD

EXTRACTION OF REETHA

- Take 10 grams of dried Reetha (Soapnut) pieces or powder.
- Add 100 mL of distilled water in a steel or glass vessel.
- Boil for 20–30 minutes on low flame.
- Let it cool to room temperature.
- Filter using a muslin cloth or filter paper.

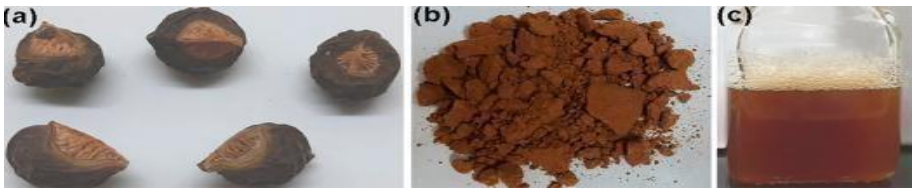

FIG-6 EXTRACTION OF FENUGREEK.

Take 10 grams of Fenugreek seeds.

- Add 100 mL of distilled water in a steel or glass vessel.
- Boil for 20–30 minutes on low flame.
- Let it cool to room temperature.
- Filter using a clean cloth or filter paper.

FIG-7 EXTRACTION OF GREEN TEA.

- Take 10 grams of green tea leaves.
- Add 100 mL of water in a steel vessel.
- Boil for 15–20 minutes on low flame.
- Let it cool at room temperature.
- Filter using a clean cloth or paper filter.

FIG 8.

IDENTIFICATION TESTS

Detection of Alkaloids Mayer s test

- To a few ml of filtrate, a drop or two of Mayer s reagent is added by the side of the test tube.
- A white or creamy precipitate indicates the test as positive.

Wagner's test

- To a few ml of filtrate, a few drops of Wagner s reagent are added by the side of the test tube.
- A reddish-brown precipitate confirms the test as positive.

Dragendorf's test

- To a few ml of filtrate, 1 or 2 ml of Dragendorff s reagent are added.
- A prominent yellow precipitate indicates the test as positive.

Detection of carbohydrates

Molish Test

- To 2 ml of filtrate, two drops of alcoholic solution of alpha naphthol are added, the mixture is shaken well and 1ml of concentrated sulphuric acid is added slowly along the sides of the tube and allowed to stand.
- A violet ring indicates the presence of carbohydrates.

Detection of saponins

- The extract (50 mg) is diluted with distilled water and made up of 20 ml. the suspension is shaken in a graduated cylinder for 15 min.
- A 2 cm layer of foam indicates the presence of saponins.

Detection of Amino acids

Millon's test

- To 2 ml of filtrate, a few drops of Millon s reagent are added.
- A white precipitate indicates the presence of proteins.

Biuret test

- An aliquot of 2ml filtrate is treated with one drop of 2% copper sulfate solution. To this, 1ml ethanol (95%) is added, followed by an excess of potassium hydroxide pellets.
- The pinkcolour in the ethanolic layer indicates the presence of proteins.

Test for sterol

Liebermann Burchard's test

- The extract (50 mg) is dissolved in 2 ml acetic anhydride. To this, one or two drops of concentrated sulphuric acid are added slowly along the sides of the test tube.
- An array of colour changes shows the presence of Phytosterols.

Detection of phenolic compounds and Tannins

Ferric chloride test

- The extract (50 mg) is dissolved 5 ml of distilled water. To this, few drops of neutral 5% ferric chloride Solutions is added.
- Dark green colour indicates the presence of phenolic compounds.

Lead Acetate test

- The extract (50 mg) is dissolved in distilled water and to this; 3 ml of 10% lead, and acetate solution is added.
- A bulky white precipitate indicates the presence of Phenol compound.

FIG-9.

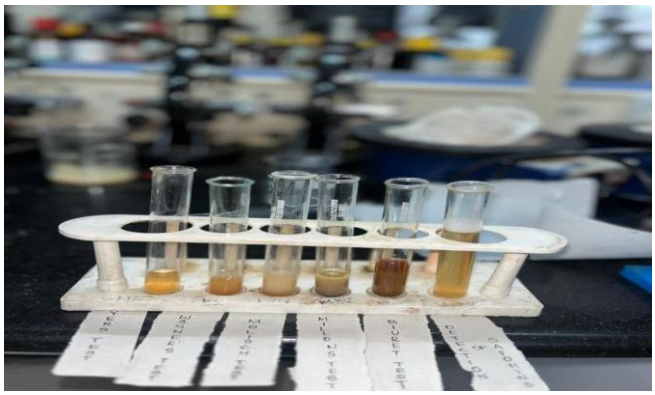

FIG-10.

IDENTIFICATION TESTS FOR REETHA

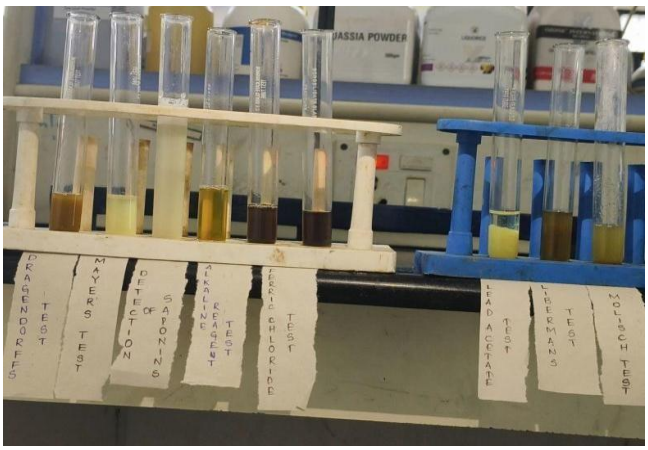

FIG-11.

IDENTIFICATION TESTS FOR FENUGREEK

TESTS	REETHA	FENUGREEK
TESTS FOR ALKALOIDS		
MAYER'S TEST	+	+
WAGNER'S TEST	+	+
DRAGANDROF'S TEST	+	+
TEST FOR CARBOHYDRATES		
TEST FOR SAPONINS	+	+
TEST FOR AMINO ACIDS		
MILLION'S TEST	+	-
BIURET TEST	-	+
TEST FOR STEROLS		
LIBERMAN BURCHARD TEST	+	+
DETECTION OF PHENOLIC COMPOUNDS AND TANNINS		
FERRIC CHLORIDE TEST	+	+
LEAD ACETATE TEST	+	+
ALKALINE REAGENT TEST FOR FLAVONOIDS	-	+
MOLISH TEST	-	-

FORMULATION

INGREDIENTS	F1	F2	F3	F4
REETHA EXTRACT	8ML	10ML	12ML	15ML
FENUGREEK EXTRACT	5ML	8ML	10ML	10ML
GREEN TEA EXTRACT	5ML	5ML	5ML	7ML
CARBOXY METHYL CELLULOSE	0.5GMS	0.5GMS	0.5GMS	0.5GMS
SODIUM BENZOATE	0.25ML	0.25ML	0.25ML	0.25ML
ROSE WATER	5ML	5ML	5ML	5ML
POTASSIUM HYDROXIDE	Q.S	Q.S	Q.S	Q.S
DISTILLED WATER	50ML(Q.S)	50ML(Q.S)	50ML(Q.S)	50ML(Q.S)

An herbal shampoo was formulated using natural plant extracts without the use of synthetic surfactants like Sodium Lauryl Sulphate (SLS). The formulation consisted of Reetha extract (8–15 mL), Fenugreek extract (5–10 mL), and Green Tea extract (5–7 mL), selected for their cleansing, conditioning, and antioxidant properties, respectively. To provide a suitable gel-like consistency, 0.5 g of Carboxymethyl Cellulose (CMC) was dispersed in warm distilled water and stirred until a uniform gel base was obtained. The required quantity of each extract was mixed and added gradually to the gel base with continuous stirring. 5 mL of rose water was incorporated to impart a pleasant aroma and soothing effect. Sodium benzoate (0.25 mL) was added as a preservative to enhance shelf-life. The pH of the formulation was adjusted to 5.5–6.5 using Potassium Hydroxide (Q.S.) to ensure scalp compatibility. Finally, distilled water was added to bring the total volume to 50 mL, and the formulation was stirred

thoroughly until a homogenous shampoo was obtained. Four variations (F1 to F4) were prepared by adjusting the proportions of the herbal extracts to study their individual and combined effects on shampoo performance.

Evaluation

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

1. **Physical appearance/visual inspection**

The formulation prepared was evaluated for the clarity, color, odor and foam producing ability and fluidity.

2. **Determination of pH:** A 10% v/v shampoo solution was constituted in distilled water and the pH of the solution was measured by using a calibrated pH meter.

3. **Determine percent of solids contents:** A clean dry evaporating dish was weighed and added 4 grams of shampoo to the evaporating dish. The dish and shampoo was 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 shampoo only (solids) after drying was calculated.

4. **Rheological evaluations:** Pseudo plastic behavior which is a desirable attribute in shampoos formulation the viscosity of the shampoos was determined by using Brookfield Viscometer set at different spindle speeds from 0.3 to 10 rpm. The viscosity of the shampoos was measured. The temperature and sample container's size was kept constants during the study.

5. **Dirt dispersion:** Two drops of shampoo were added in a large test tube contain 10 ml of distilled water. A Drop of India ink was added; the test tube was stoppered and shakes it ten times. The amount of ink in the foam was estimated as None, Light, Moderate, or Heavy.

6. **Cleaning action:** 5 grams of wool yarn were placed in grease, after that it was placed in 200 ml. of water containing 1 gram of shampoo in a flask. Temperature of water was maintained at 35 ºC. The flask was shaked for 4 minutes at the rate of 50 times a minute. The solution was removed and sample was taken out, dried and weighed. The amount of grease removed was calculated by using the following equation.

DP=100 1−TC In which, DP is the percentage of detergency power, C is the weight of sebum in the control sample and T is the weight of sebum in the test sample.

7. Surface tension measurement: It has been mentioned that a proper shampoo should be able to decrease the surface tension of pure water to about 40 dynes/cm Measurements were carried out with a 10% shampoo dilution in distilled water at room temperature. Thoroughly clean the stalagmo meter using chronic acid and purified water. Because surface tension is highly affected with grease or other lubricants.

The data calculated by following equation given bellow:

R2=

($W3-W1$)$n1$

($W2-W1$)$n2$xR1 Where,

W1 is weight of empty beaker.

W2 is weight of beaker with distilled water.W3 is Weight of beaker with HS solution. n1 is no. of drops of distilled water.

n2 is no. of drops of HS solution.

R1 is surface tension of distilled water at room temperature. R2 is surface tension of herbal shampoo solution

8. Foaming ability and foam stability: Cylinder shake method was used for determining foaming ability. 50ml 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 1minute 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.

9. Stability studies: The thermal stability of formulations was studied by placing in glass tubes and they were placed in a humidity chamber at 45°Cand 75% relative humidity. Their appearance and physical stability were inspected for a period of 3months at interval of one month.

ANTI BACTERIAL AND ANTI MICROBIAL TEST

Antibacterial activity of plant extracts was carried out against bacterial pathogens, such as E. coli and Staphylococcus aureus using agar well diffusion method. Initially, the stock cultures

of bacteria were revived by inoculating in broth media and growth at 37°C for 18hrs.

Nutrient agar plates were prepared and wells were made in the plate. Each plate was inoculated with cultures and spread evenly on the plate. After 20 min, the wells were filled with aqueous plant extract (25%, 50%, 75%, and 100%). The control wells with water prepared. All the plates were incubated at 37°C for 24 h and the diameter of the inhibition zone in mm was noted. A mixture of plant extract (75%) in the proportion (50%, 70%, 90%. 100%) was also filled in another two plates spread with bacteria Staphylococcus aureus and E.coli.

The antimicrobial activity of all the extracts was carried out by Dise Diffusion Method using the following organism.

HUMAN
Bacterial pathogens.
(i) E. coli (ii) Staphylococcus aureus.

Fungal pathogens
(i) Aspergillus niger (ii) Aspergillus fumigate (ili) Malassezia species

DISCUSSION

The prepared herbal shampoo formulations (F1–F4) were subjected to a range of quality control tests to assess their physicochemical properties and overall performance. All formulations exhibited acceptable physical appearance, with natural color, pleasant herbal odor, and good fluidity. The pH values of all shampoos were found to be in the ideal range of 5.5 to 6.5, suitable for scalp and hair, indicating good compatibility with skin. The solid content of the shampoos ranged between acceptable limits, reflecting adequate formulation thickness without over-concentration. The viscosity results confirmed pseudo-plastic (shear-thinning) behavior, which is desirable in shampoos as it allows easy application and rinsing. In the dirt dispersion test, all formulations showed minimal ink retention in foam, suggesting effective cleansing ability without trapping dirt. The cleaning action tests demonstrated that F2 and F3 had slightly higher detergency power, possibly due to balanced proportions of Reetha and Fenugreek extracts. Surface tension measurements showed a significant reduction from that of distilled water, confirming good surface-active properties of the formulations. Foaming ability and foam stability were within satisfactory limits, with F1 producing the

most stable foam. Stability studies over three months showed no signs of phase separation, precipitation, or microbial growth in any formulation, indicating good formulation integrity and shelf stability. Overall, the results suggest that all four formulations meet the standard requirements for herbal shampoo, with some variations that can guide selection based on specific hair care needs.

CONCLUSION

The formulated shampoos were not only safer than the synthetic shampoo, but also greatly reduce the hair loss during combing as well as strengthened the hair growth. The present study was carried out to prepare herbal shampoo that reduces hair loss during combing, is safer than the chemical conditioning agents as well as strengthens the hair growth. Herbal shampoo was formulated with the aqueous extract of medicinal plants that are commonly used for cleansing hair traditionally Use of conditioning agents (synthetic) reduces the protein or hair loss. To provide the effective conditioning effects, the present study involves the use of reetha, Fenugreek and green tea extracts instead of synthetic 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 an economic point of view they are cheap.

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