



FORMULATION AND EVALUATION OF MULTIHERBAL SHAMPOO

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DOI: <https://doi.org/10.5281/zenodo.22687654>

How to cite this Article: Mr. Bheemanna Munnur*, Bhagyashree S. Kalpana, Shweta Naik, Shubham N., Samarth K. (2026). Formulation And Evaluation Of Multiherbal Shampoo. European Journal of Biomedical and Pharmaceutical Sciences, 13(9), 308-319.

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Article Received on 15/08/2026

Article Revised on 05/09/2026

Article Published on 10/09/2026

ABSTRACT

Polyherbal shampoos are gaining popularity because they are safer and more effective than synthetic shampoos. The present study aimed to formulate and evaluate a polyherbal shampoo using natural ingredients such as Flaxseed gel, Soapnut, Shikakai, Neem, Rosemary, Hibiscus, Fenugreek, Rice Water, and Pomegranate Peel. These herbs were selected for their cleansing, conditioning, anti-dandruff, antioxidant, and hair growth-promoting properties. The herbal extracts were prepared by suitable extraction methods and combined with excipients including Sodium Lauryl Sulfate (SLS), Glycerin, Gum Tragacanth, Citric Acid, Methyl Paraben, Vitamin E, Blackberry Essential Oil, and Purified Water to obtain a stable shampoo formulation. The prepared shampoo was evaluated for physical appearance, pH, viscosity, foam ability, foam stability, dirt dispersion, solid content, skin irritation, and washability. The formulation showed a dark brown colour, pleasant herbal odour, smooth texture, pH of 6.71, good foaming ability, satisfactory viscosity, acceptable solid content, good cleansing action, no skin irritation, and remained stable during the study period. The study concludes that the formulated polyherbal shampoo is safe, stable, and effective for routine hair care. It provides good cleansing, conditioning, nourishment, and protection to the hair and scalp, making it a promising natural alternative to synthetic shampoos.

KEYWORDS: Multiherbal shampoo, Polyherbal shampoo, Flaxseed, Fenugreek seed, Hibiscus, Rice water, Anti dandruff, Hair growth.

INTRODUCTION

For centuries, humans have turned to nature to improve health, skin & hair. Natural ingredients, known for their preventive & protective properties, play a significant role in cosmetics. Hair is often an external reflection of internal health, making proper care essential. Shampooing is the most common hair treatment. While traditional shampoos focus on cleansing, herbal shampoos offer additional benefits such as nourishment & repair. Unlike synthetic shampoos that may dry or damage hair, herbal formulations gently cleanse while delivering nutrients for healthy, shiny hair. The rising demand for natural cosmetics reflects a global preference for purity, safety and long-term efficacy.^[1]

- The purpose of using herbal shampoo is used to remove dirt that is made up on the hair without stripping out much of the sebum.
- Many artificial shampoos are present in the current market both medicated and non-medicated, however, shampoo popularized due to natural origin which is

safe, increases consumers demand and free from side effects.

- Herbal shampoos defined as a preparation with surfactant (surface active material) in suitable form liquid solid or power which when used under the conditions specified will remove surface grease, dirt and skin debris from the hair shaft and scalp without affecting adversely the hair, scalp or health of the user
- Herbal shampoo has so many types are powder, liquid, lotion, cream, jelly, aerosol, specialized HS (Conditioning, Anti-dandruff,). But the future of HS is going to be herbal Shampoo. It contains the natural ingredients with herb extract.
- It helps hairs to improve their standard of moisture, shine, growth, thickening, strength of hair roots.
- Shampoos may be the most widely used cosmetic product for cleansing hairs and scalp in your daily life.

- A shampoo is Shampoos are may be the most widely used the cosmetic product for cleansing hairs and scalp in your daily life.
- A shampoo is basically a solution of a detergent containing suitable additives for other benefits such as hair conditioning, lubrication, medication etc.
- Now many synthetic, herbal, medicated and non-medicated shampoos are available in the market.
- But popularity of the herbal shampoos among consumers is on rise because of their belief.
- The herbal shampoos are safe and free from side effect.
- Herbal shampoos is widely unstable product all over the world it has been used form many years.
- Chemical herbal shampoos are prepared with several chemicals which can care hairs problems but also responsible for damage of hairs.
- Some international researchers said that the chemicals of herbal shampoos also responsible for cancer herbal shampoos are defined as preparation of a surfactant insuitable form liquid, solid or powder which when used under the condition specified will remove surface grease, dirt & skin debris from the hair shaft & scalp.^[2]
- Herbal shampoos have so many types powder, liquid, lotion, cream, jelly, aerosol and specialized herbal shampoos (Conditioning, antidandruff).
- Herbal shampoos contain all the natural ingredients with herb extract.
- It helps hair to improve their quality of moisture, growth, thickening, strength of hair roots.
- The most important thing is that herbal shampoos has no any side effect.
- By using herbal shampoos we can stop the hair loss.
- Hairs are the basic part of human beauty.
- People are using herbs for cleansing, beautifying & managing hair since ancient era.^[2]

History-Indian subcontinent

In the Indian subcontinent, a variation of herbs and their extracts have been used as shampoos since ancient times. A very effective early Shampoo was made by boiling Sapindus with dried Indian gooseberry (Amla) and a selection of other herbs, using the strained extract. Sapindus, also known as soapberries or soapnuts, a tropical tree Widespread in India, is called ksuna. In ancient Indian texts and its fruit Pulp contains saponins which are a natural surf. The extract of Soapberries creates a lather which Indian texts called phenaka, it leaves the hair soft, shiny and manageable. Other products used for hair Cleansing were shikakai (Acacia concinna), hibiscus flowers, ritha (Sapindus mukorossi) and arappu (Albizia amara). GuruNanak the Founder and the first Guru of Sikhism, made references to soapberry tree and soap in the 16th century.^[2]

➤ 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 nonmedicated 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]

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]

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
- Won't irritate skin or scalp^[3]

Function of herbal shampoo

- Lubrication
- Conditioning
- Hair growth
- Maintenance of hair colour
- Medication^[3]

Ideal characteristics

- Non-irritating, biodegradable, slightly acidic (pH< 7)
- Effective cleanser with good foaming and rinsing ability.
- Adds shine and smoothness.
- It should not cause any side-effects/irritation to skin or eye.
- It should not make the hand rough and chapped.
- To perform as a vehicle for the deposition of beneficial materials onto the hair and scalp.^[4]

Herbal composition

- Surfactants
- Anti-dandruff agents
- Herbal extracts
- Conditioners
- Thickeners
- Preservatives
- pH adjusters, and fragrance^[5]

Advantages of shampoo

- Improving hair hygiene
- Treating scalp conditions
- Treatment for dry scalp
- Treatment for hair loss
- Treatment for greasing or oily hair.
- Relieves itch and irritation
- Repairs damaged hair
- Shampoo keeps hair silky or smooth^[6]

Problems Related to hair

- Dandruff
- Dry hair
- Split ends
- Oily hair
- Frizzy hair
- Limp hair
- Heat damage
- Damage hair
- Gray hair^[6]

CLASSIFICATIONS OF SHAMPOO**A) Based on appearance**

- Powder shampoo
- Liquid shampoo
- Gel shampoo
- Oil shampoo^[7]

B) Based on use or function

- Conditioning shampoo
- Anti-dandruff shampoo
- Body shampoo
- Clarifying shampoo^[7]

1) Power Shampoo

Herbal shampoos are cosmetic preparations that involve the use of traditional Ayurveda herbs to clean the scalp and the hair. It is an excellent natural cleanser and conditioner and adds shine and softness to hair. It prevents hair loss, boosts hair growth, controls dandruff, soothes your head, and prevents a dry scalp. Gives you stronger, thicker hair.^[7]

2) Liquid Shampoo

This shampoo is a soapy liquid that you use to wash your hair. A shampoo is a hair care product used to clean the scalp and hair. It has a liquid consistency and is normally applied to wet scalps and hair. Liquid hair shampoo produces a lather when massaged into the scalp, which

helps in the removal of dirt, oil, and product buildup from the hair.^[7]

3) Gel Shampoo

Gel shampoo is used to treat scaly, itchy skin conditions affecting the scalp, such as psoriasis, seborrheic dermatitis, and dandruff. Inactive Ingredients: Water, sodium laurethsulfate, polysorbate 20, cocamidopropylbetaine, bisphenol A, dihydroxypropylstearammonium chloride, fragrance, cocamide MEA, PEG-120 methyl glucose dioleate, DMDM hydantoin, tetrasodium EDTA, sodium hydroxide, citric acid sodium chloride, and triethanolamine.^[7]

4) Oil Shampoo

Oil shampoo is a moisturizing shampoo with a rich, creamy lather and refreshing floral fragrance. Enriched with natural ingredients like aloe vera and argan oil, the shampoo boosts moisturization, shine, and reduces frizz. Oil-based shampoos and conditioners contain natural oils, such as argan oil, coconut oil, and olive oil, and other essential ingredients like vitamin E and antioxidants. These ingredients work together to nourish and hydrate your hair while strengthening and protecting it from damage.^[7]

5) Conditioning Shampoo

A conditioning shampoo retains all the features of a normal shampoo, which are to clean the hair by removing dust, dirt, and pollutants, but also has other ingredients of a conditioner that help to make hair softer and more manageable than one finds after using a normal shampoo. Along with gentle cleaning of the hair to remove dirt, conditioning shampoos condition the hair to keep it shiny and flexible. Conditioning shampoos have proved to be extremely good for dry hair as they add to the natural oil supply and give dry hair shine as well as strength.^[7]

6) Anti-dandruff Shampoo

Anti-dandruff shampoos work by killing the fungus that causes dandruff. They usually contain ingredients like ketoconazole, selenium sulfide, or zinc pyrithione, which are all antifungal agents. These ingredients work to kill the fungus and prevent it from coming back. Anti-dandruff shampoos. Shampoos with antidandruff activity are commonly used to treat dandruff, a scalp disorder caused by the lipophilic *Malassezia* yeasts, which can be suppressed by different antidandruff agents, mostly pyrithione zinc.^[7]

7) Body Shampoo

Total Body Shampoo is a protein-enriched, conditioning hair and body wash formulated to soothe and moisturize hair and skin. Its abundant lather and gentle cleansing action are gentle enough to use every day, and it gently cleanses to keep skin soft and smooth.^[7]

8) Clarifying Shampoo

Clarifying shampoo is a hair care product that deeply cleanses the hair. It is formulated with unique ingredients designed to remove impurities, oil, dirt, product buildup, and other residues from the scalp and hair shaft.^[7]

ANATOMY OF HAIR

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 adjustment 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 colour 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.^[2]

Parts of hair

- The hair is made up of 95% keratin a fibrous, helicoidal 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.^[3]

Medulla: It is the innermost layer of the hair shaft, made up of an amorphous, soft, oily substances.^[3]

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.^[3]

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.^[3]

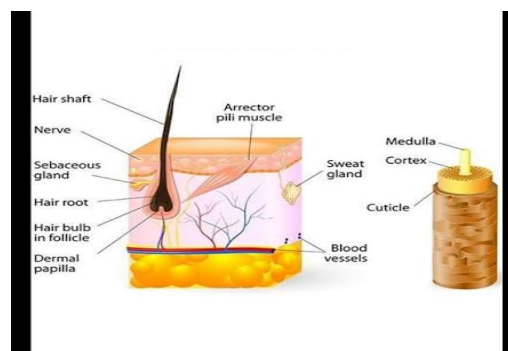


Fig. 1: Anatomy of hair.

Growth cycle of hair

Hair growth cycle consists of four phases:

1. **Anagen (Growth phase):** It is the growing phase. This phase lasts for several years
2. **Catagen (transitional phase):** During this phase the hair follicle shrinks and hair growth slows.
3. **Telogen (resting phase):** It is the resting phase where hair growth stops and new hair begins the growth phase, pushing the old hair out.
4. **Exogen phase:** Last phase of hair growth cycle where hair strand completely detaches from the scalp and sheds off.^[2]

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 worsens the ends. Applying a dash of oil on the ends can avoid.^[3]



Fig. 2: 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.^[3]



Fig. 3: 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.^[3]



Fig. 4: 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.^[3]



Fig. 5: 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.^[3]



Fig. 6: Oily Scalp.

Detail of the herbal material used in study

1) Flaxseed



Fig. 7: Flaxseed.

Synonym: flaxseed; linum(linseed)

Biological source: consists of fixed oil obtained from the dried fully ripe seed of *linum usitatissimum* linm.

Family: linaceae

Chemical constituents: fixed oil to extent 30 to 40%
Protein to extent of 25%

Mucilage which on hydrolysis yields galactose, arabinose, & xylose

Alpha-linolenic acid, lignans

Uses: reduces hair breakage, adds shine, strengthens hair, omega3 fatty acid moisturizes hair.^[8,9,10,11]

2) Soapnut



Fig. 8: Soapnut.

Synonym: Reeth aritha

Biological source: Dried fruit pericarp of *Sapindus mukorossi* Gaertn.

Family: sapindaceae

Major chemical constituents: sapanins from pericarp, hederagenin & oleanolic acid, sapindic acid, flavonoids, triterpenoids

Uses: natural cleanser, foaming agent, remove dirt excess oil, nourish the scalp, eco-friendly, surfactant.^[8,9,10,11]

3) Neem



Fig. 9: Neem.

Synonym: Indian lilac, margosa

Biological source: fresh and dry leaves of *azadirachta indica*

Family: meliaceae

Chemical constituent: limonoids, flavonoids, terpenoid

Uses: antidandruff, antimicrobial, relieve itchy scalp, root strengthening, promote thicker growth, soothing scalp.^[8,9,10,11]

4) Shikakai



Fig. 10: shikakai.

Synonym: acacia concinna, soap pod

Biological source: dried pods of acacia concinna

Family: fabaceae

Chemical constituent: saponins organic acid (vit C) citric, tannins, alkaloids

Uses: mild cleanser, promotes hair growth, prevent dandruff, gives hair more shine^[8,9,10,11]

5) Rosemary



Fig. 11: Rosemary.

Synonym: Rosmarinus officinalis

Biological source: leaves of salvia Rosmarinus spenna

Family: lamiaceae

Chemical constituent: rosmarinic acid, carnosic acid, phenolic diterpens, phenolic acid essential

Uses: stimulates hair growth, improve scalp circulation antioxidant.^[8,9,10,11]

6) Hibiscus



Fig. 12: Hibiscus.

Synonym: hibiscus rose-sinensis (rose mallow) china rosa

Biological source: fresh flowers and leaves of the hibiscus rose- sinensis L

Family: malvaceae

Chemical constituent: anthocyanins, mucilage, tannin, flavonoids

Uses: conditioning hair prevents premature greying, medicinal culinary beauty benefits, stimulate hair follicles.^[8,9,10,11]

7) Rice water



Fig. 13: Rice water.

Synonym: Rice extract

Biological source: Fermented aqueous extract of Oryza sativa grains

Family: poaceae

Chemical constituents: inositol, amino acid, starch, vitamin B & E carbohydrate water protein fat fiber & minerals

Uses: smooth cuticles, reduces friction & boost shine, natural glossy.^[8,9,10,11]

8) Fenugreek



Fig. 14: Fenugreek.

Synonym: Methi, Trigonella foenum- graecum

Biological source: dried ripe seed of trigonella foenum- grecum L.

Family: Fabaceae

Chemical constituents: trigonelline, mucilage, protien, alkaloid, amino acid, steroidal saponins fibres, rolatile oils

Uses: used as culinary ingredient, traditional medical, reduce hairfall.^[8, 9,10,11]

9) Pomegranate peel



Fig. 15: Pomegranate peel.

Synonym: Anar peel, punica granatum**Biological source:** dried fruit rind of punica granatum L.**Family:** Lythraceae**Chemical constituents:** polyphenols, (such as punicalagins & ellagic acid), anthoeyanins (cyanidin, delphinidin), tannins, flavonoids**Uses:** prevents pre-mature greying in hair, reduce inflammation & lower blood pressure, antioxidant, protects scalp.^[8,9,10,11]

MATERIAL AND METHODS

Ingredient used in formulation with uses

Table 1: Ingredients and their uses.

SN.no	Ingredients	Uses
1	Flaxseed	Natural Conditioner
2	Soapnut	Natural cleansing agent
3	Shikakai	Strength hair roots
4	Rosemary	Improve scalp circulation
5	Pomegranate peel	Prevents pre-mature greying hairs
6	Rice water	Nourishes hair
7	Neem	Scalp hygiene
8	Fenugreek	Control hair fall
9	Hibiscus	Promote hair growth & thickening agent
10	Blackberry essential oil	Fragrance agent
11	Glycerin	Moisturizer
12	Gum tragacanth	Thickening agent
13	Sodium lauryl sulfate	Foam booster
14	Citric acid	PH adjuster
15	Methyl paraben	Preservative
16	Vitamin E	Antioxidant

1. Extraction of (flaxseed gel)



Fig. 16: Extraction of flaxseed gel.

The required amount of flaxseeds was weighed and mixed with the required amount of purified water. The seeds were soaked for 5–10 minutes and then heated over a low flame with continuous stirring for 15–20 minutes. During heating, a gel-like mucilage was formed. The hot mixture was then filtered through a muslin cloth to separate the flaxseed gel from the seeds. The collected gel was allowed to cool before use.^[12]

2. Shikakai extraction



Fig. 17: Shikakai extraction.

The required amount of shikakai powder was weighed and mixed with the required amount of purified water. The mixture was soaked for 5–10 minutes and then heated over a low flame with continuous stirring for 5–10 minutes. After heating, the mixture was allowed to cool and filtered through a muslin cloth. The clear filtrate was collected as the shikakai extract.^[12]

2. Soapnut extraction

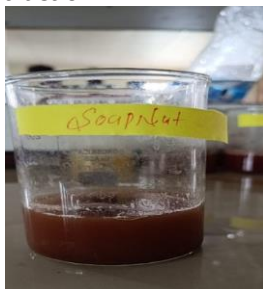


Fig. 18: Soapnut extraction.

The required amount of soapnut powder was weighed and mixed with the required amount of ethanol. The mixture was soaked for 5–10 minutes and then heated over a low flame with continuous stirring for 5–10 minutes. After heating, the mixture was allowed to cool and filtered through a muslin cloth. The filtrate was collected as the soapnut extract.^[12]

4. Neem extract

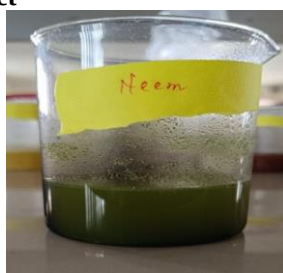


Fig. 19: Neem Extract.

The required amount of neem powder was weighed and mixed with the required amount of purified water. The mixture was soaked for 5–10 minutes and then heated over a low flame with continuous stirring for 5–10 minutes. After heating, the mixture was allowed to cool and was filtered through a muslin cloth. The filtrate was collected as the neem extract.^[12]

5. Rosemary extract

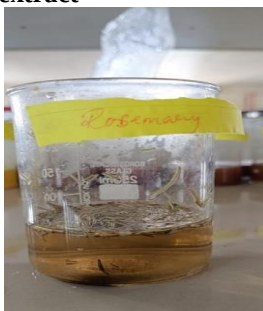


Fig. 20: Rosemary extract.

The required amount of dried rosemary leaves was weighed and mixed with the required amount of purified water. The mixture was soaked for 5–10 minutes and then heated with continuous stirring for 5–10 minutes. After heating, the mixture was allowed to cool and filtered through a muslin cloth. The filtrate was collected as the rosemary extract.^[12]

6. Rice water preparation

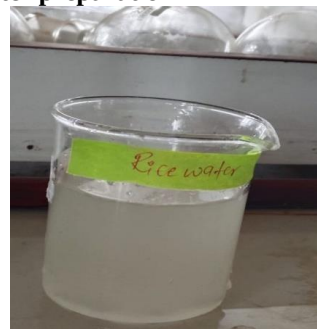


Fig. 21: Rice water.

The rice was washed thoroughly and soaked overnight in purified water. The soaked rice water was then filtered through a muslin cloth, and the filtrate was collected as rice water.^[12]

7. Fenugreek extract

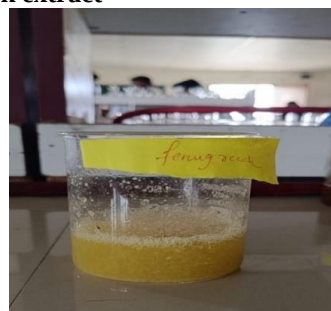


Fig. 22: Fenugreek extract.

The required amount of fenugreek powder was weighed and mixed with the required amount of purified water. The mixture was soaked for 5–10 minutes and then heated with continuous stirring for 5–10 minutes. After heating, the mixture was allowed to cool and filtered through a muslin cloth. The filtrate was collected as the fenugreek extract.^[12]

8. Hibiscus extract



Fig. 23: Hibiscus extract.

The required amount of hibiscus powder was weighed and mixed with the required amount of purified water. The mixture was soaked for 5–10 minutes and then heated over a low flame with continuous stirring for 5–10 minutes. After heating, the mixture was allowed to cool and filtered through a muslin cloth. The filtrate was collected as the hibiscus extract.^[12]

9. Pomegranate extract

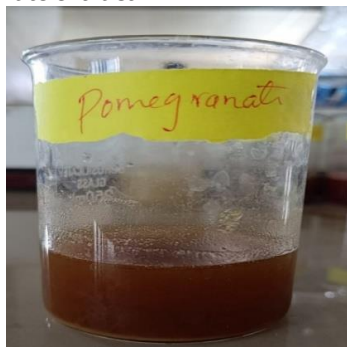


Fig. 24: Pomegranate extraction.

The required amount of pomegranate peel powder was weighed and mixed with the required amount of purified water. The mixture was soaked for 5–10 minutes and then heated over a low flame with continuous stirring for 5–10 minutes. After heating, the mixture was allowed to cool and filtered through a muslin cloth. The filtrate was collected as the pomegranate extract.^[12]

Preparation

1. Mix all the prepared herbal extract one by One in a Clean mortar pestle
2. Add Glycerin & mix well
3. Add citric acid & stir until dissolved
4. Add vitamin E & mix thoroughly
5. Add of methyl paraben as preservative
6. Add Sodium lauryl Sulfate (SLS) Slowly & Stir gently to avoid lumps.
7. Add of fragrancng agent for good odour
8. Make up the final volume with purified H₂O to 100 ml
9. Stir continuously until a smooth homogeneous shampoo is obtained

FORMULATION TABLE

Table 2: Formulation details.

Sr. no	Ingredients	Formulation Batches				
		F1	F2	F3	F4	F5
1	Flaxseed gel	5%	6%	7%	8%	6%
2	Shikakai extract	1.5%	2%	2.5%	3%	2%
3	Soapnut extract	5%	6%	7%	8%	6%
4	Neem extract	2%	3%	4%	4%	3%
5	Fenugreek extract	2%	2.5%	3%	5%	4%
6	Pomegranate peel extract	2%	2.5%	3%	2%	3%
7	Hibiscus extract	2%	3%	4%	8%	4%
8	Rosemary extract	1%	1.5%	2%	3%	1.5%
9	Rice water extract	5%	6%	5%	8%	7%
10	Glycerin	1%	1.5%	2%	2.5%	2.5
11	Gum tragacanth	2%	2.5%	3%	3.5%	4%
12	Sodium lauryl sulfate	2%	2.5%	3%	3%	3%
13	Citric acid	0.05%	0.08%	0.1%	0.10%	0.10%
14	Methyl paraben	0.10%	0.10%	0.10%	0.10%	0.10%
15	Vitamin E	1%	1%	1%	1%	1%
16	Blackberry essential oil	3 drop	3 drop	3 drop	3 drop	3 drop
17	Purified water	Q.S make up100	Q.S make up100	Q.S make up100	Q.S make up100	Q.S make up100

EVALUATION PARAMETERS OF HERBAL SHAMPOO

To evaluate the prepared herbal formulations, various quality control tests including visual assessment and physicochemical controls such as pH, density and viscosity were performed. Also, to assure the quality of products, specific tests for herbal shampoo formulations including the determination of foaming ability or foam stability, skin irritation test, solid content test, microbial contamination, dirt dispersion test etc. are carried out.^[13]

1. Physical appearance/ visual appearance

The herbal preparation was formulated and evaluated for colour, odour, clarity, foaming ability and pH.^[13]



Fig. 25: Physical appearance.

2. Determination of pH

The pH of the prepared samples was measured using a digital pH meter at room temperature ($30 \pm 2^\circ\text{C}$).^[13]



Fig. 26: Determination of Ph.

3. Determination of solid content

A clean dry evaporating dish was weighed and the initial weight of the evaporating dish was recorded. 4 gm shampoo formulation (not the 1% solution) was placed in an evaporating dish. The dish and shampoo were weighed and the initial weight of the shampoo and dish was recorded. The exact weight of the shampoo was calculated and only the initial weight of the shampoo was recorded. The evaporating dish was placed with a shampoo on a hot plate until the liquid portion evaporated. After drying, weighed the dish and shampoo solid and results were noted.^[13]



Fig. 27: Solid content determination.

4. Determination of Viscosity

The viscosity of herbal shampoo was evaluated by using brook field viscometer. The viscosity of shampoo was measured at room temperature i.e. $30 \pm 2^\circ\text{C}$.^[13]



Fig. 28: Viscosity determination.

5. Foaming ability and foam stability

The foaming ability of the formulated herbal shampoo was evaluated by the cylinder shake method. 1 mL of the formulated shampoo was mixed with 2 mL of distilled water to prepare the test solution. The prepared solution was transferred into a suitable graduated cylinder. The cylinder was covered with the hand and shaken vigorously 10 times. It was then kept undisturbed, and the foam volume was recorded after 1 minute.^[13]



Fig. 29: Foam stability determination.

6. Dirt dispersion test

Two drops of the shampoo were added to a graduated cylinder containing 10ml of distilled water. One drop of India ink was added, and the cylinder was stoppered and shakes it ten times. The amount of ink in the foam was estimated to be None, Light, Moderate, or Heavy.^[13]



Fig. 30: Dirt dispersion.

7. Washability Test

The washability test of a multiherbal shampoo on the hand involves applying a small amount (about 1 mL) of the shampoo directly onto the palm or back of the hand. The shampoo is gently rubbed with a little water to produce lather, simulating actual use. After lathering for about 1–2 minutes, the hand is rinsed thoroughly under running tap water without vigorous scrubbing. The ease with which the shampoo is removed, absence of slipperiness or stickiness, and the feel of the skin after rinsing (smooth, non-greasy, and residue-free) are noted. A shampoo with good washability will rinse off completely, leaving the skin clean and free from any film or oily residue.^[13]

8. Homogeneity

Take shampoo in a glass beaker and observe the uniformity, phase separation and lumps.^[13]

9. Skin irritation test

The test was performed on human volunteers. The prepared herbal formulation was applied to the skin for 5 min and then washed. Skin irritation and inflammation were also examined.^[13]



Fig. 31: Skin irritation test.

RESULT AND DISCUSSION

Table 3: Results.

S. no	Parameter	F1	F2	F3	F4	F5
1	Colour	Brown	Brown	Dark Brown	Dark brown	Brown
2	pH	7.25	7.5	6.98	6.71	6.87
3	Odour	Pleasant	Pleasant	Pleasant	Pleasant	Pleasant
4	State	liquid	liquid	liquid	liquid	liquid
5	Texture	Slight watery	Slight watery	smooth	smooth	smooth
6	Consistency	Thin	Thin	Slight thin	Moderate	Thick
7	Viscosity	59.58cp	191.87cp	262.71cp	287.79cp	967.10cp
8	Skin irritation	No	No	No	No	No
9	Solid content	7.50%	12.75%	12.25%	10%	12.25%
10	Homogeneity	Phase separation	Phase separation	uniform	uniform	uniform
11	Foam height	4.5ml	4ml	4.2ml	4.9ml	4.3ml
12	Foam stability	Stable	Stable	Stable	Stable	Stable
13	Dirt dispersion	Light	Light	Light	None	None
14	Washability	Easy washable	Easy washable	Easy washable	Easy washable	Easy washable

The evaluation results showed that the prepared multi-herbal shampoos possessed satisfactory physical and functional properties. The herbal ingredients contributed different benefits to the formulation: Soapnut and Shikakai supported cleansing and foaming, Neem supported scalp hygiene, while Fenugreek and Flaxseed gel provided conditioning and moisture retention. Hibiscus, Rosemary, Rice Water and Pomegranate Peel contributed to conditioning, smoothness, nourishment and antioxidant properties. The excipients also supported the formulation by providing suitable viscosity, moisture, preservation, pH adjustment and stability. Among F1–F5, F4 gave the best overall results, showing good appearance, acceptable pH, stable foam, good cleansing and washability, uniformity, and absence of skin irritation. These findings indicate that F4 was the most suitable formulation among the prepared batches.

SUMMARY AND CONCLUSION

The present study was carried out to formulate and evaluate a multi-herbal shampoo using natural ingredients. Five formulations, F1–F5, were prepared and evaluated for different quality parameters such as appearance, pH, foaming, cleansing ability, washability, and homogeneity and skin compatibility. Among all formulations, F4 showed the most satisfactory overall results and was selected as the best formulation. It showed good physical appearance, acceptable pH, good foaming and cleansing ability, easy washability, good

homogeneity and no skin irritation. Therefore, F4 can be considered a promising multi-herbal shampoo for routine hair and scalp care, providing cleansing and conditioning benefits.

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