

# Formulation and Evaluation of Hair Growth Promoting Shampoo Containing Brahmi

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**Abstract:** Herbal shampoos are products used to clean hair and the scalp while keeping the hair shiny, soft, and healthy. This study focuses on creating and testing a herbal shampoo that uses Brahmi as the main active ingredient. Brahmi is known for its ability to nourish, strengthen, and promote hair growth. The shampoo was made using natural components like Brahmi extract, surfactants, thickening agents, preservatives, and conditioning agents. This helps in cleaning the hair effectively with fewer side effects compared to shampoos made with synthetic chemicals. The created product was tested for several physical and chemical properties, such as appearance, colour, smell, pH level, thickness, foaming ability, how long the foam lasts, surface tension, how well it spreads over the scalp, how quickly it wets the hair, and how stable it remains during storage. The results showed that the herbal shampoo cleans well, has a suitable pH level, good foaming properties, and remains stable when stored. It was found to be safe, effective, and suitable for regular use without causing any irritation or damage to the hair.

**Keywords:** Brahmi (*Bacopa Monnieri*), Herbal Shampoo, Hair Growth Promotion, Hair Care Formulation, Phytochemical Extract, Anti-Hair Fall Activity, Scalp Health, Shampoo Evaluation, Natural Cosmetic Product, Herbal Drug Delivery System.

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## I. INTRODUCTION

Proper hair care is important for keeping your hair and scalp in good condition. Shampoo is a common product used to clean hair and remove dirt, oil, sweat, and pollution from the scalp. These are safer, more effective, and cause fewer side effects. Herbal shampoos are made using natural herbs and plant extracts that have cleansing, conditioning, and nourishing benefit. These shampoos not only clean the hair but also improve scalp health and support hair growth. Herbal ingredients are biodegradable, eco-friendly, and usually work well with all types of hair. Brahmi is a popular herbal ingredient used in Ayurveda medicine for hair care and brain health. It contains active compounds like bacosides, alkaloids, flavonoids, and saponins that offer antioxidant, anti-inflammatory, and nourishing benefits. In hair care, Brahmi helps strengthen the roots, reduce dandruff, improve scalp circulation, decrease hair loss, and support healthy hair growth.

**Hair:** Hair is one of the most important parts of how we look and plays a big role in how beautiful and confident we feel. It is made of a protein called keratin and grows from tiny structures called hair follicles located in the outer layer of the skin. Hair has several important roles, including protecting the scalp, helping to control body temperature, and improving our overall appearance.

Keeping hair healthy requires taking care of the scalp and maintaining good hygiene. The scalp has hair follicles, oil-producing glands, and blood vessels that supply the hair with the nutrients it needs to grow and stay strong. However, things like pollution, bad diet, stress, and using too many chemical-based hair products can harm the health of the hair. These issues can result in common problems such as hair loss, dandruff, dryness, and scalp irritation.

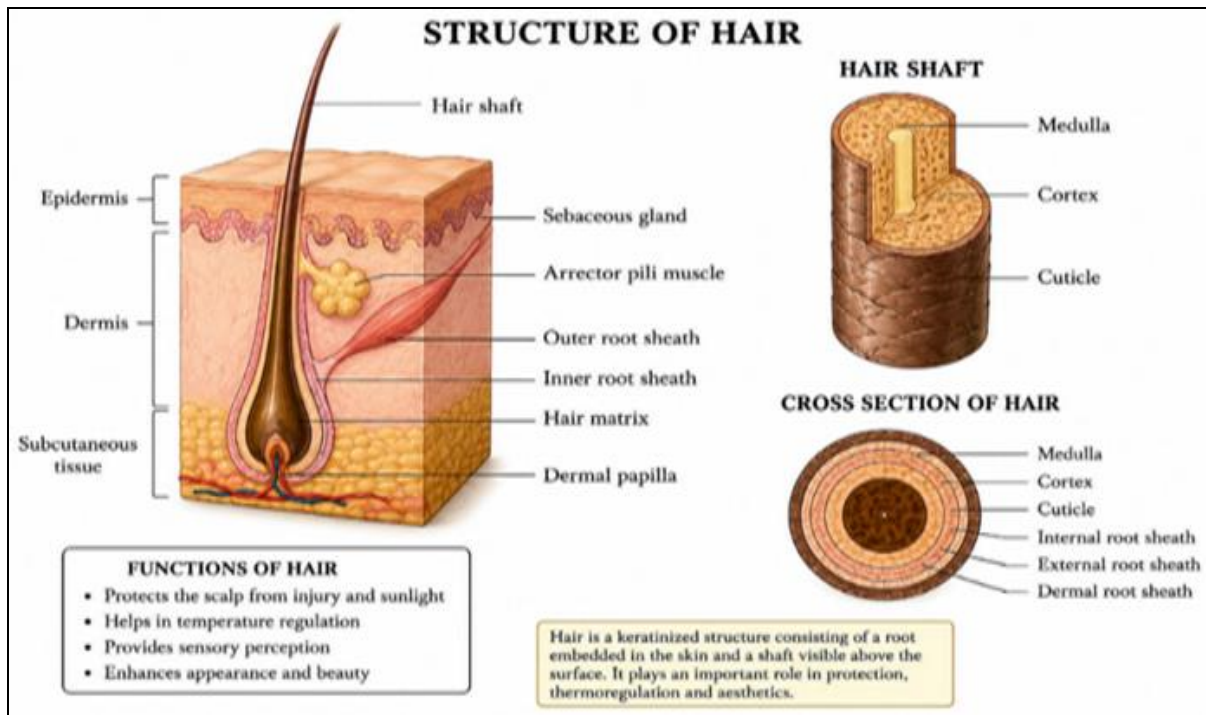


Fig 1 Structure of Hair

➤ *Physiology of Hair*

• *Hair Growth Cycle:*

Hair grows in a repeating cycle called the hair growth cycle. Each hair follicle goes through separate stages of growth, shrinking, rest, and shedding on its own. This cycle has three main phases: Anagen, Catagen, and Telogen. Knowing about these phases is key in fields like cosmetic science and trichology, as it helps in making products such as

shampoos, conditioners, hair oils, and treatments for hair loss.

The anagen phase is the stage when hair actively grows. During this time, cells in the hair matrix divide quickly, which helps hair keep growing continuously. The hair follicle is deeply rooted in the dermis and gets enough nutrients from the dermal papilla and blood vessels. This phase is the longest part of the hair growth cycle and plays a key role in how long, thick, and healthy the hair becomes. At any moment, about 85 to 90 percent of the hair on the scalp.

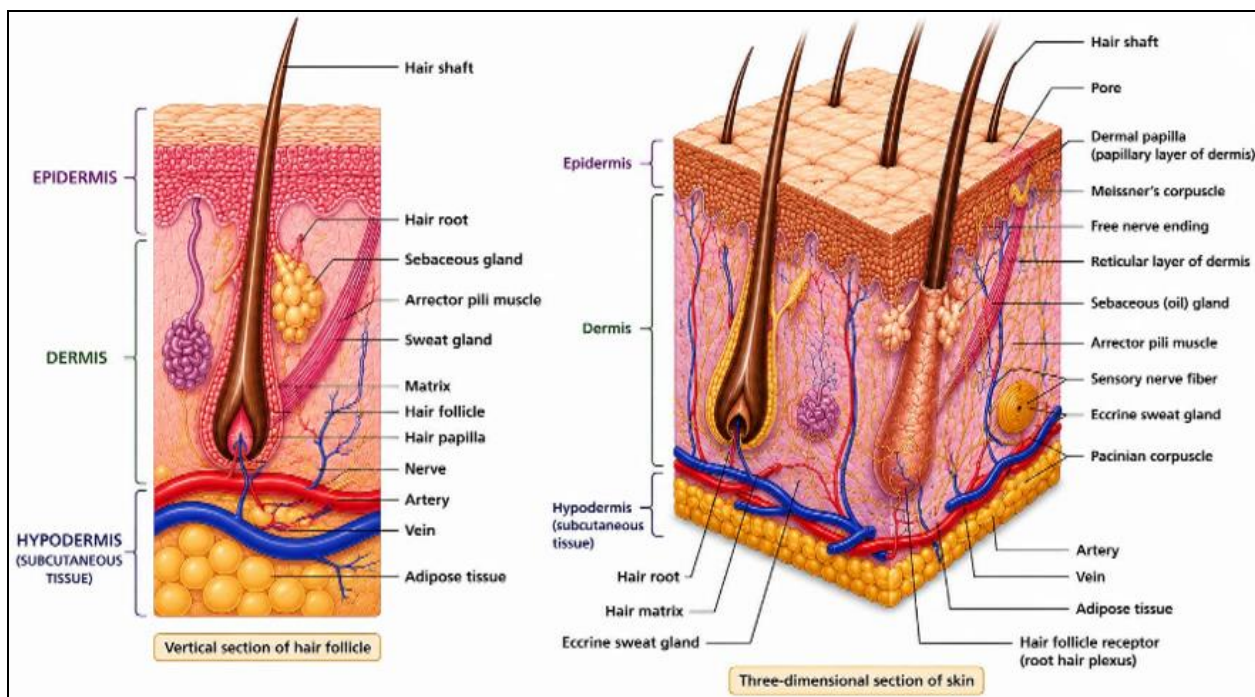


Fig 2 Physiology of Hair

• **Anagen Phase:**

The anagen phase is the stage when hair actively grows. During this time, cells in the hair matrix divide quickly, which helps hair keep growing continuously. The hair follicle is deeply rooted in the dermis and gets enough nutrients from the dermal papilla and blood vessels. This phase is the longest part of the hair growth cycle and plays a key role in how long, thick, and healthy the hair becomes. At any moment, about 85 to 90 percent of the hair on the scalp is usually in the anagen phase.

• **Catagen Phase :**

The catagen phase is the stage in the hair growth cycle that happens between the anagen (growth) phase and the telogen (resting) phase. During this time, hair growth stops, and the hair follicle starts changing and shrinking. This phase is the shortest part of the hair cycle and usually only affects about 1 to 2% of scalp hairs at once. The lower part of the

follicle separates from the dermal papilla, which cuts off the blood and nutrients that the hair needs.

• **Telogen Phase :**

The telogen phase is the resting stage in the hair growth cycle where the hair follicle stops being active. During this time, no new hair grows, and the completely formed hair shaft stays in the follicle until it falls out naturally. This phase marks the end of the hair cycle before a new growth phase, called anagen, begins. Normally, about 10 to 15 percent of the hair on the scalp is in the telogen phase at any moment.

• **Exogen Phase :**

The exogen phase is when hair sheds during the growth cycle and is part of the telogen phase. In this stage, the old hair, which has stopped growing, comes loose from the follicle and falls out, while a new hair starts growing from the same follicle below

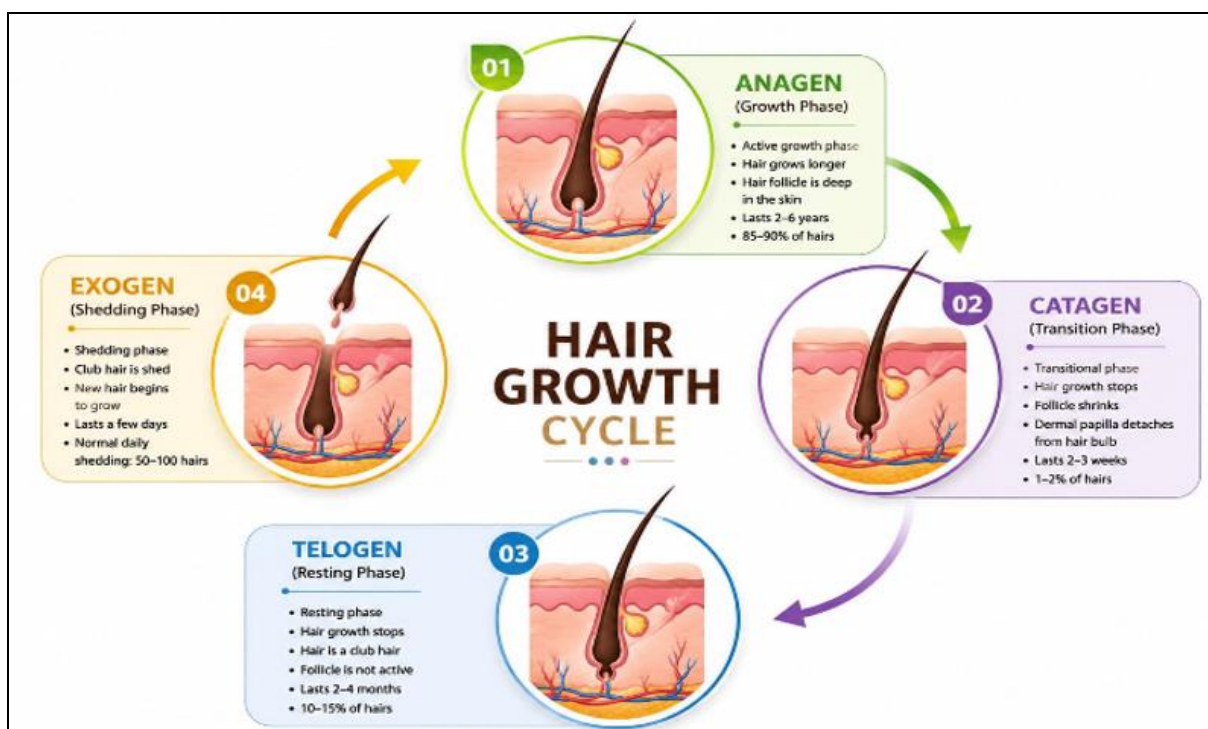


Fig 3 Hair Growth Cycle

➤ **Shampoo:**

Shampoo is a widely used product for taking care of your hair. It is made to clean your hair and scalp by removing dirt, extra oil, sweat, dandruff, dead skin, and leftover chemicals from styling products. Besides cleaning, shampoos also help keep the scalp healthy, make hair softer, give it a glossy look, and prevent damage. These days, shampoos are made to clean hair well while also making it smooth and strong, without causing irritation or making it dry.

➤ **Type of Shampoo:**

- Liquid cream shampoo
- Solid cream shampoo
- Gel shampoo

- Powder shampoo
- Anti-dandruff shampoo
- Aerosol foam shampoo
- Herbal shampoo
- Medicated shampoo
- Baby shampoo
- Conditioning shampoo
- Protein shampoo
- Volumizing shampoo
- Clarifying shampoo
- Moisturizing shampoo
- Dry shampoo
- Color-protect shampoo
- PH-balanced shampoo

- Pearlized shampoo
- Natural or organic shampoo
- Shampoo bars

➤ *Benefits of Using Shampoo:*

- **Cleanses Hair and Scalp:** The main job of shampoo is to clean the hair and scalp well. It washes away dust, dirt, sweat, extra oil, dead skin cells, and harmful substances from the environment. Cleaning regularly keeps the scalp clean and healthy.
- **Removes Excess Oil:** The scalp naturally produces oil called sebum from the sebaceous glands. Too much of this oil can make hair look greasy and messy. Shampoo helps control oil production and makes hair look clean and fresh.
- **Eliminates Product Build-Up:** Using hair products like sprays, gels, creams, and serums a lot can leave a residue on the scalp and hair. Shampoo helps break down and remove these residues, making the hair look brighter and preventing clogged scalp.
- **Controls Dandruff:** Shampoos that help with dandruff have ingredients that fight fungal growth and calm the scalp. They reduce flaking, itching, and irritation, and make the scalp feel better.
- **Maintains Scalp Health:** A clean scalp is less likely to get infections, irritation, or bad smells. Many shampoos have ingredients that fight bacteria and soothe the scalp to keep it in good condition.
- **Improves Hair Texture:** Ingredients like silicones, proteins, vitamins, and oils in shampoos smooth the hair cuticle. This makes hair feel softer, look shinier, and have a better overall look.
- **Enhances Hair Manageability:** Shampoo makes hair easier to brush, style, and handle. It cuts down on tangles and frizz, which helps prevent damage from brushing.

➤ *Ideal Properties of Shampoo:*

- **Good Cleansing Action:** The main job of shampoo is to clean the hair and scalp well. It should take away dirt, dust, sweat, extra oil, dead skin cells, and pollutants from

the environment without leaving any leftover residue behind.

- **Adequate Foaming Property:** A good shampoo should create a lot of foam that lasts and feels rich. Even though foam doesn't directly mean it's cleaning well, people usually think that more foam means better cleaning.
- **Easy Rinsibility:** The shampoo should wash out easily with water without leaving any sticky or greasy stuff on the hair or scalp. Proper rinsing stops irritation and product build-up.
- **Non-Irritating and Safe:** It should be gentle and not cause any irritation on the scalp, skin, or eyes. Harsh chemicals can lead to itching, redness, dryness, or allergic reactions. The product should be safe for regular use as tested by dermatologists.
- **Maintains Natural Moisture:** A good shampoo should clean without taking away all the natural oils from the hair and scalp. It should keep the moisture balance in place to avoid dryness and breakage.
- **Good Conditioning Effect:** After washing, the hair should feel soft, smooth, shiny, and easy to manage. The conditioning ingredients in the shampoo help reduce tangles and make combing easier.
- **Suitable pH:** The shampoo should have a pH that's similar to the scalp and hair, usually between 5 and 7. A proper pH helps keep the hair cuticle intact and prevents damage or roughness.
- **Pleasant Appearance and Fragrance:** A good shampoo should look nice, have a good texture, and a pleasant smell. These qualities make people feel happy and satisfied when using it.
- **Chemical and Physical Stability:** The shampoo should stay the same during storage and transport. It shouldn't separate, change color, form lumps, or lose its effectiveness under normal conditions.
- **Compatibility with Additives:** The shampoo should mix well with herbal extracts, medicinal ingredients, preservatives, fragrances, and colorants. It should not become unstable or lose effectiveness when mixed with these ingredients.

➤ *Formulation Table*

Table 1 Formulation Table

Sr no.	Ingredient	F1	F2	F3
1	Brahmi Powder	1.8 ml	3ml	2.4 ml
2	Neem Powder	6ml	6ml	6ml
3	Fenugreek Seed Powder	1.8 ml	1.8 ml	2.4 ml
4	Amla Powder	1.8 ml	1.8 ml	1.5 ml
5	Hibiscus Powder	1.5 ml	1.5 ml	1.8 ml
6	Shikakai Powder	2.4 ml	2.4 ml	2.4 ml
7	Reetha Powder	2.4 ml	1.8 ml	2.1 ml
8	Methyl Paraben	0.0024 g	0.0024 g	0.0024 g
9	SLS	0.9 g	0.9 g	0.9 g
10	Carbopol	1.38 g	1.38 g	1.38 g
11	Rose Oil	2-3 drops	2-3 drops	2-3 drops
12	Distilled Water	Q.s	Q.s	Q.s

## II. DRUG PROFILE

### ➤ *Brahmi*

- Synonym: Water hyssop, Brahmi, Jalneem
- Biological Source: Brahmi consists of the fresh and dried whole plant of *Bacopa monnieri* (L.) Pennell, belonging to the family Scrophulariaceae. It is a small creeping perennial herb commonly found in wet and marshy places. Brahmi is widely used in Ayurvedic medicine as a brain tonic and memory enhancer.
- Family: Scrophulariaceae (According to some classifications: Plantaginaceae)
- Geographical Source: Brahmi is distributed throughout India, especially in wet, tropical and subtropical regions. It is commonly found near riverbanks, marshes, ponds, and damp soils. It also grows in Nepal, Sri Lanka, China, Pakistan, Vietnam, and other Asian countries.
- Chemical Constituents: The major chemical constituents of Brahmi are: Bacosides A and B, Brahmine Alkaloids Saponins, Flavonoids, Sterols Betulic acid, D-mannitol



Fig 4 Brahmi

### ➤ *Physical Characteristics:*

- Color: Bright green to dark green.
- Shape: Small creeping herb with succulent stems and oblong leaves.
- Texture: Soft, smooth, fleshy and juicy.
- Odor: Slight characteristic odor.
- Taste: Bitter and slightly sweet.
- Leaves: Thick, opposite leaves with rounded tips.
- Flowers: Small, white to light purple flowers.

### ➤ *Health Benefits of Brahmi:*

Brahmi (*Bacopa monnieri*) is one of the most important medicinal herbs used in Ayurveda. It is popularly known as a “Medhya Rasayana,” meaning a rejuvenator for the brain and nervous system. Due to the presence of active constituents such as bacosides, alkaloids, flavonoids, and saponins, Brahmi possesses several therapeutic and cosmetic benefits.

### ➤ *Uses of Brahmi in Shampoo*

- Prevents Hair Fall: Brahmi strengthens hair follicles and nourishes the roots, reducing hair breakage and excessive hair fall. Regular use of Brahmi shampoo improves hair strength and minimizes shedding.
- Strengthens Hair Roots: The nutrients and phytochemicals present in Brahmi improve blood circulation in the scalp and provide nourishment to hair roots. Strong roots help maintain healthy and thick hair.
- Reduces Dandruff: Brahmi possesses antimicrobial and anti-inflammatory properties that help control dandruff-causing microorganisms.

Precaution High concentration of Brahmi may cause mild irritation, redness, or sensitivity in some individuals. Proper formulation concentration should be maintained.

### ➤ *Neem*



Fig 5 Neem

- Synonym: Indian Lilac, Margosa
- Biological Source: Neem consists of the fresh and dried leaves, bark, seeds, and seed oil obtained from *Azadirachta indica* A. Juss., belonging to the family Meliaceae. Neem is an evergreen medicinal tree widely used in Ayurveda, Siddha, and Unani systems of medicine for its antimicrobial, antifungal, and therapeutic properties. Family: Meliaceae
- Geographical Source: Neem is native to the Indian subcontinent and is widely distributed throughout tropical and subtropical regions of the world. It grows abundantly in India, Pakistan, Bangladesh, Sri Lanka, Myanmar, and African countries. In India
- Chemical Constituents: Neem contains several biologically active compounds responsible for its medicinal and cosmetic properties. The major constituents include: Azadirachtin, Nimbin, nimbidin, Nimbolide, Gedunin, Salannin, Quercetin, Tannins, Flavonoids, Alkaloids, Glycosides, Fatty acids, Limonoids

➤ *Physical Characteristics:*

- Color: Dark green leaves with brown bark.
- Shape: Tall evergreen tree with spreading branches.
- Texture: Rough bark; smooth and leathery leaves.
- Odor: Strong characteristic bitter odor.

➤ *Uses of Neem in Herbal Shampoo*

- Neem (*Azadirachta indica*) is one of the most widely used medicinal plants in herbal cosmetic preparations because of its excellent antimicrobial, antifungal, antioxidant, and anti-inflammatory properties. In herbal shampoo formulations, neem acts as a natural therapeutic agent that helps maintain scalp hygiene, improve hair health, and prevent various scalp disorders. The presence of active constituents such as azadirachtin, nimbin, nimbidin, quercetin, flavonoids, and limonoids makes neem highly effective in hair care applications.
- Anti-Dandruff Activity : Neem is extensively used in herbal shampoos due to its potent antifungal activity against dandruff-causing microorganisms such as *Malassezia* species. The bioactive compounds present in neem inhibit fungal growth and help reduce scalp flaking.

➤ *Common Forms Used in Shampoo*

Neem is incorporated into shampoos in various forms depending on formulation requirements.

- Neem Powder: Dried neem leaves are powdered and added directly into herbal formulations.
- Neem Extract: Concentrated neem extracts provide higher therapeutic activity and stability.
- Neem Oil: Neem seed oil is widely used for its antifungal and nourishing properties.

Precautions Excessive Use May Cause Dryness: Overuse of neem preparations may lead to excessive dryness of hair and scalp.

➤ *Fenugreek Seed Power*



Fig 6 Fenugreek Seed Power

- Synonym: Fenugreek
- Biological Source: Fenugreek consists of the dried ripe seeds of *Trigonella foenum-graecum* Linn., belonging to the family Fabaceae. It is an annual aromatic herb extensively used as a medicinal plant, food ingredient, and cosmetic agent. Fenugreek seeds are rich in proteins, mucilage, vitamins, and bioactive compounds that provide therapeutic and hair care benefits.
- Family: Fabaceae (Previously Leguminosae)
- Geographical Source: Fenugreek is native to the Mediterranean region and Western Asia but is now widely cultivated throughout the world. It grows well in warm climates and fertile soil. In India, fenugreek is mainly cultivated in: Rajasthan, Gujarat, Maharashtra, Uttar Pradesh, Punjab, Haryana, Madhya Pradesh. It is also cultivated in Egypt, Turkey, China, North Africa, and several European countries.
- Chemical Constituents: Fenugreek contains numerous phytoconstituents responsible for its medicinal and cosmetic properties. The major constituents include: Trigonelline, Diosgenin, Galactomannan, Saponins, Alkaloids, Flavonoids, Proteins, Amino acids, Mucilage, Fiber, Vitamins A, C, and B-complex, Minerals such as iron, calcium, phosphorus, and magnesium.

• *Physical Characteristics:*

- ✓ Color: Yellowish-brown seeds.
- ✓ Shape: Small, hard, angular or rhomboid seeds.
- ✓ Texture: Smooth and hard externally; mucilaginous when soaked in water.
- ✓ Odor: Strong characteristic aromatic odor.
- ✓ Taste: Bitter and slightly sweet.
- ✓ Leaves: Small green trifoliate leaves.
- ✓ Flowers: Small yellowish-white flowers.

• *Uses of Fenugreek in Shampoo*

- ✓ Hair Growth Promotion : Fenugreek is highly effective in promoting healthy hair growth because it contains proteins, nicotinic acid, iron, and essential nutrients that nourish hair follicles and stimulate hair development. The active constituents improve blood circulation to the scalp and strengthen the roots of hair.
- ✓ Anti-Hair Fall Activity: Hair fall occurs due to weak hair roots, nutritional deficiencies, scalp infections, stress, and environmental damage. Fenugreek strengthens hair follicles and improves the attachment of hair roots to the scalp.

• *Precautions*

- ✓ Allergic Reactions: Some individuals may develop itching, redness, irritation, or scalp rashes after using fenugreek-based shampoos.
- ✓ Excessive Use May Cause Dryness: High concentrations of fenugreek can sometimes make hair dry or rough due to its cleansing and protein-rich nature.

➤ *Amla*

Fig 7 Amla Powder.

- **Biological Source:** This consists of dried, as well as fresh fruits of the plant *Embolica officinalis*.
- **Family:** Euphorbiaceae
- **Geographical Source:** The amla plant, also known as the Indian gooseberry, is native to India and is also grown in other parts of the world, including: Pakistan, Uzbekistan, Sri Lanka, Southeast Asia, China, Malaysia, Iran
- **Chemical Constituents:** Vitamin C (Ascorbic acid), Alkaloids (Phyllantine), Carbohydrates (Pectin), Hydrolysable Tannins (Embliganin A & B)

• *Physical Characteristics:*

- ✓ **Appearance:** Light green or yellowish-green fruit with vertical stripes.
- ✓ **Taste:** Sour, slightly bitter with astringent notes.
- ✓ **Texture:** Firm and juicy when fresh.

• *Uses of Amla in Shampoo*

- ✓ **Strengthens Hair Roots:** Amla is rich in vitamin C and essential fatty acids that penetrate deep into the scalp, strengthening the hair follicles and reducing breakage.
- ✓ **Promotes Hair Growth:** The nutrients in amla improve blood circulation to the scalp and stimulate hair growth.
- ✓ **Prevents Premature Greying:** Amla is rich in natural antioxidants and phytonutrients that help preserve the hair's natural pigment, delaying or reducing premature greying.

• *Common Forms Used in Shampoo:*

- ✓ **Amla Extract:** Liquid or concentrated form used in herbal shampoos for hair nourishment and strengthening.
- ✓ **Amla Powder:** Often combined with other herbs like shikakai or reetha in herbal shampoo formulations.
- ✓ **Amla Oil:** Infused oil used for conditioning, scalp nourishment, and strengthening hair roots.

• *Precautions:*

- ✓ Amla is generally safe for all hair types.
- ✓ Always perform a patch test before using new herbal products, especially for sensitive skin.

➤ *Hibiscus*

Fig 8 Hibiscus

- **Synonyms:** Hibiscus is commonly known as China Rose, Shoe Flower, and Gudhal in Hindi.
- **Biological Source:** Hibiscus consists of the dried flowers and leaves of *Hibiscus rosa-sinensis* belonging to the Malvaceae family.
- **Geographical Source:** Hibiscus is widely distributed in tropical and subtropical regions such as India, China, Sri Lanka, and Southeast Asian countries. It is commonly cultivated in gardens throughout India.
- **Chemical Constituents:** Hibiscus contains: Flavonoids, Anthocyanins, Mucilage, Saponins, Tannins, Vitamin C, Calcium and Iron, Antioxidants and amino acids

• *Physical Characteristics:*

- ✓ **Appearance:** Bright red flowers with soft petals (also available as powder)
- ✓ **Texture:** Powder is smooth and slightly coarse
- ✓ **Smell:** Mild floral odor
- ✓ **Taste:** Slightly sour and mucilaginous

• *Uses of Hibiscus in Shampoo:*

- ✓ **Natural Hair Conditioner:** Hibiscus contains mucilage that helps soften hair, improve smoothness, and reduce dryness.
- ✓ **Promotes Hair Growth:** Its rich antioxidant and amino acid content strengthens hair follicles and supports healthy hair growth.
- ✓ **Prevents Hair Fall:** Hibiscus nourishes hair roots and helps reduce hair breakage and hair fall when used regularly.

- *Common Forms Used in Shampoo:*

- ✓ Hibiscus flower powder: Prepared from dried hibiscus flowers and widely used in herbal shampoos for hair conditioning, shine, and nourishment.
- ✓ Hibiscus leaf powder: Made from dried leaves rich in natural mucilage that helps cleanse the scalp gently and reduce dryness.
- ✓ Aqueous extract: Water-based extract containing water-soluble nutrients and antioxidants used for scalp soothing and dandruff control

- *Precautions:*

- ✓ Excess use may cause dryness in some hair types.
- ✓ Use fresh and properly dried flowers to avoid contamination.

- *Shikakai*



Fig 9 Shikakai

- *Synonyms* : Shikakai is also known as “Shikai” in Tamil, which means “fruit for hair”.
- *Biological Source* : Shikakai is the dried gummy exudation from the stems and branches of the *Acacia arborea* tree, which belongs to the family Leguminosae. The common name is “soap pod”. It comes from the genus *Acacia*, a climbing shrub that grows in the warm plains of central and southern India.
- *Chemical Constituents* : Shikakai is primarily made up of arabin, which is a complex mixture of calcium, magnesium, and potassium salts of arabic acid.

- *Physical Characteristics*

- ✓ *Appearance*: Brownish, wrinkled pods (also available as powder)
- ✓ *Texture*: Powder is finely ground
- ✓ *Smell*: Mild earthy, slightly nutty scent
- ✓ *Taste*: Bitter and astringent

- *Uses of Shikakai in Shampoo*

- ✓ *Natural Hair Cleanser*: Shikakai contains natural saponins that create mild lather. It gently cleanses the hair and scalp without removing natural oils, making it suitable for dry and sensitive scalps.
- ✓ *Promotes Hair Growth*: Its antioxidant and micronutrient-rich composition strengthens hair roots and promotes new hair growth, especially when used regularly.
- ✓ *Prevents Dandruff and Scalp Itchiness*: With antifungal and antimicrobial properties, shikakai helps treat and prevent dandruff, dry scalp, and itching.

- *Common Forms Used in Shampoo*

- ✓ *Shikakai Powder*: Blended with other herbal powders like amla and reetha.
- ✓ *Shikakai Extract*: Used in liquid herbal shampoos.
- ✓ *Shikakai Oil*: Infused in hair oil-based cleansers for extra conditioning.

- *Ideal Combinations*

- ✓ *With Amla and Reetha*: For complete cleansing, conditioning, and strengthening.
- ✓ *With Fenugreek*: For dandruff control and nourishment.
- ✓ *With Aloe Vera or Hibiscus*: For extra moisture and shine.

- *Precautions*

- ✓ Shikakai is very mild and suitable for all hair types.
- ✓ It may not produce heavy lather like synthetic shampoos, but it cleans effectively.

- *Reetha*



Fig 10 Reetha

- *Synonyms* : Reetha is also known as soapnut, soapberry, and washnut. In Ayurveda, it is called Arishta.

- **Biological Source :** Reetha comes from the dried fruits of the *Sapindus mukorossi* tree, which belongs to the Sapindaceae family.
- **Geographical Sources :** The reetha tree is native to India, Indochina, Southern China, Japan, and Taiwan. It is a deciduous tree that grows in the lower foothills and midhills of the Himalayas, and in western coastal Karnataka, Maharashtra, and Goa.
- **Chemical Constituents :** The main constituent of reetha is saponins, but it also contains other constituents like sopic acid, oleanolic acid, sapindoside A & B, and mukuroziosides.

- *Physical Characteristics*

- ✓ **Form:** Small, round, brown wrinkled fruits (also available in powder or liquid extract form)
- ✓ **Texture:** Smooth when soaked, sticky when crushed
- ✓ **Smell:** Mild, earthy aroma
- ✓ **Taste:** Bitter and soapy

- *Uses of Reetha in Shampoo*

- ✓ Reetha is highly valued in herbal shampoo formulations for its natural cleansing and conditioning properties, making it ideal for all hair types, especially oily or dandruff-prone hair.
- ✓ **Natural Cleanser :** Reetha contains high levels of saponins that create a mild lather, effectively removing dirt, excess oil, and buildup from the scalp and hair without harsh chemicals.
- ✓ **Gentle on Hair and Scalp :** It cleans without stripping the natural oils from the scalp, keeping hair soft and moisturized. This makes it suitable for sensitive skin or scalp conditions.

- *Common Forms Used in Shampoo*

- ✓ **Reetha Powder:** Mixed with water or other powders like amla and shikakai.
- ✓ **Reetha Extract:** Added to herbal liquid shampoos.
- ✓ **Reetha Liquid Decoction:** Boiled and strained for natural use as a hair wash.

- *Best Combinations*

- ✓ **With Amla & Shikakai:** For complete herbal hair care — cleansing, strengthening, and conditioning.
- ✓ **With Neem:** For dandruff and lice treatment.
- ✓ **With Hibiscus or Aloe Vera:** For softness and scalp hydration.

- *Precautions*

- ✓ Avoid contact with eyes — the saponins may cause irritation.
- ✓ Does not produce as much foam as synthetic shampoos but cleans deeply.

- *Rose Oil*



Fig 11 Rose Oil

- **Synonyms :** Rose oil is also known as Rose Otto, Attar of Rose, and Gulab Oil.
- **Biological Source :** Rose oil is obtained from the fresh petals of *Rosa damascena* and *Rosa centifolia* belonging to the family Rosaceae.
- **Geographical Sources :** Rose is cultivated in India, Bulgaria, Turkey, Iran, Morocco, and France. In India, it is mainly grown in Uttar Pradesh, Rajasthan, and Kashmir.
- **Chemical Constituents :** Rose oil mainly contains citronellol, geraniol, nerol, phenyl ethyl alcohol, farnesol, eugenol, and linalool.

- *Physical Characteristics :*

- ✓ **Form:** Pale yellow to light amber colored volatile oil
- ✓ **Odor:** Sweet, floral, pleasant aroma
- ✓ **Texture:** Smooth and non-greasy liquid
- ✓ **Solubility:** Soluble in alcohol and essential oils

- *Uses of Rose Oil in Cosmetics and Shampoo*

- ✓ **Natural Fragrance :** Rose oil provides a pleasant floral fragrance to shampoos and cosmetic products.
- ✓ **Moisturizes Hair and Scalp :** It helps maintain scalp hydration and prevents dryness.
- ✓ **Reduces Scalp Irritation :** Its anti-inflammatory properties help soothe itching and scalp irritation.

- *Forms Used in Shampoo*

- ✓ **Rose Oil Extract:** Added directly into herbal shampoos and conditioners.
- ✓ **Rose Water:** Used for fragrance and scalp soothing effect.
- ✓ **Rose Petal Extract:** Included in herbal hair care products.

- *Best Combinations*

- ✓ **With Aloe Vera:** For hydration and smoothness.
- ✓ **With Hibiscus:** For hair nourishment and shine.
- ✓ **With Amla:** For strengthening hair roots.

- *Precautions*

- ✓ Avoid direct contact with eyes.
- ✓ Use in appropriate concentration to avoid irritation.
- ✓ Store in a cool and dark place.

### III. METHOD OF PREPARATION

➤ *Extraction Process (Decoction Method)*

The active ingredients from Brahmi powder, amla powder, fenugreek powder, hibiscus powder, and neem powder were extracted using the decoction method. This is a traditional process where herbal materials are boiled in water to bring out water-soluble components.

➤ *Decoction Method for Extracting Active Compounds from Herbal Materials*

The decoction method is a traditional and commonly used way to extract bioactive substances from plant-based ingredients. It works by boiling the herbs in water for a set amount of time, allowing water-soluble compounds like alkaloids, flavonoids, tannins, saponins, and polyphenols to dissolve into the liquid.

➤ *Brahmi Extract Preparation for Shampoo*

Brahmi (*Bacopa monnieri*) is well-known for its ability to nourish and strengthen hair. It can help reduce hair loss, encourage hair growth, improve scalp condition, and provide a cooling and moisturizing effect to the hair. Brahmi contains alkaloids, saponins, and antioxidants that help strengthen the hair follicles and enhance the hair's texture.



Fig 12 Brahmi Extraction

- *Ingredients*

- ✓ 10 g of Brahmi powder
- ✓ 150 ml of distilled water

➤ *Preparation Method*

- *Boiling the Brahmi Powder*

- ✓ Add 10 g of Brahmi powder to 150 ml of distilled water in a clean beaker or saucepan.

- ✓ Heat the mixture on a low to medium flame, stirring now and then.
- ✓ Let the mixture simmer for about 2–3 hours to allow the active components to dissolve into the water.
- ✓ Continue heating until the liquid reduces a bit and the extract becomes more concentrated.

- *Filtration of the Extract*

- ✓ Once the simmering is complete, let the mixture cool down a little.
- ✓ Strain the mixture through a muslin cloth or filter paper to remove any solid bits.
- ✓ Collect the liquid in a clean container.
- ✓ This liquid extract is then used in making the shampoo.

- *Storage*

- ✓ Store the Brahmi extract in a clean amber-colored bottle.
- ✓ Keep it in a cool and dry place, away from direct sunlight

➤ *Preparing Neem Extract for Shampoo*

Neem, also known as *Azadirachta indica*, is well-known for its ability to fight bacteria, fungi, and inflammation. It can help reduce dandruff, scalp infections, itchiness, and too much oil on the scalp. Neem contains flavonoids, tannins, and antioxidants that support healthy hair and scalp.

- *Ingredients*

- ✓ 10 grams of neem powder
- ✓ 150 milliliters of distilled water

➤ *Preparation Method*

- *Boiling the Neem Powder*

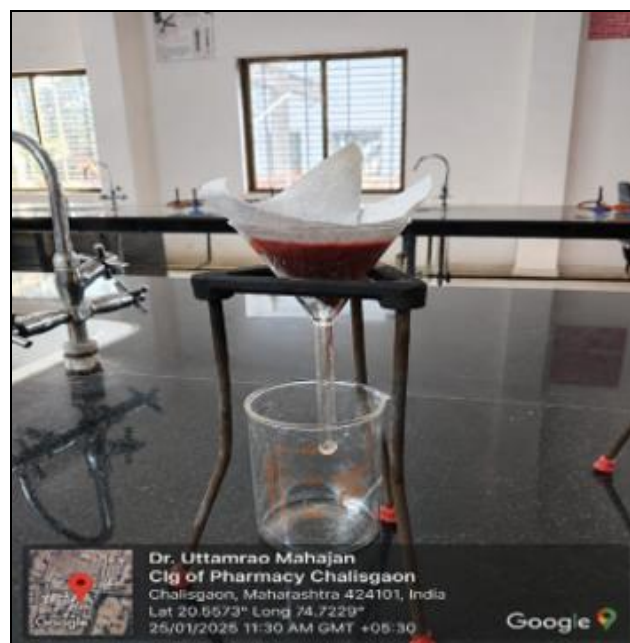


Fig 13 Neem Extraction

- ✓ Place 10 grams of neem powder into 150 milliliters of distilled water in a clean saucepan or beaker.
- ✓ Heat the mixture on low to medium heat, making sure it doesn't boil too quickly.
- ✓ Stir occasionally to help the neem powder mix well with the water.
- ✓ Let the mixture simmer for about 2 to 3 hours so that the active ingredients from the neem are released into the water.
- ✓ During this process, important compounds like nimbin, azadirachtin, flavonoids, and tannins are transferred into the solution, offering beneficial effects for hair and scalp.

- *Cooling and Filtering the Decoction*

- ✓ Once the decoction is complete, take the mixture off the heat and let it cool down to room temperature.
- ✓ Use a muslin cloth, cotton cloth, or filter paper to strain the mixture and remove any solid bits.
- ✓ Collect the clear liquid in a clean and dry container.
- ✓ This filtered liquid is the neem extract used in making shampoo.

- *Storage*

- ✓ Store the neem extract in a clean, airtight amber-colored bottle.
- ✓ Keep it in a cool and dry place, away from direct sunlight.

- *Fenugreek Extract Preparation for Shampoo:*

Fenugreek (Methi) is a potent herb known for its high content of protein, iron, and vitamins that nourish the hair and promote a healthy scalp. Fenugreek is often used in hair care formulations to reduce hair loss, dandruff, and to strengthen and condition the hair. Below is a detailed method for preparing Fenugreek Extract using the decoction process, specifically for use in shampoo preparations.

- *Ingredients:*

- ✓ 10 g of fenugreek powder
- ✓ 150 ml distilled water

- *Preparation Method*

- *Simmering the Fenugreek Powder*

- ✓ Add 10 g of fenugreek powder to 150 ml of distilled water in a clean saucepan or container.
- ✓ Heat the mixture gently on low to medium heat. Stir occasionally to ensure the fenugreek powder is evenly mixed in the water.
- ✓ Simmer the mixture for 2 to 3 hours. During this time, the active compounds from fenugreek powder, including lecithin, saponins, and proteins, are extracted into the water, creating a nourishing decoction for hair care.



Fig 14 Fenugreek Extract

- *Cooling and Filtering the Decoction*

- ✓ Once the decoction process is complete, remove the mixture from heat and allow it to cool to room temperature.
- ✓ Strain the decoction using a muslin cloth or fine mesh strainer to remove solid particles from the liquid.
- ✓ Collect the filtered liquid (fenugreek extract) in a clean, sterile container. This liquid is rich in hair-friendly nutrients and can be used in shampoo formulations.

- *Storage*

- ✓ Store the fenugreek extract in a sterile, airtight container to maintain freshness and potency.

- *Amla Extract Preparation for Shampoo*

Amla, also called Indian gooseberry, is famous for being high in Vitamin C, antioxidants, and for helping to nourish hair. It is commonly used in hair care products to support a healthy scalp and promote hair growth. Below is a step-by-step guide on how to prepare Amla Extract using the decoction method for making shampoo.

- *Ingredients*

- ✓ 10 grams of amla powder
- ✓ 150 milliliters of distilled water

- *Preparation Method*

- *Boiling the Amla Powder*



Fig 15 Amla Extraction

- ✓ Put 10 grams of amla powder into 150 milliliters of distilled water in a clean saucepan or container.
- ✓ Heat the mixture on low to medium heat.
- ✓ Make sure not to let it boil too fast.
- ✓ Stir occasionally to help the amla powder mix well with the water.
- ✓ Let the mixture simmer for 2 to 3 hours.
- ✓ During this time, the nutrients from the amla are released into the water.
- ✓ This process makes the extract rich in Vitamin C, tannins, and antioxidants, which are all beneficial for hair health.

- *Cooling and Filtering the Decoction*

- ✓ Once the decoction is done, take the mixture off the heat.
- ✓ Let it cool down to room temperature.
- ✓ Use a muslin cloth or filter paper to strain the extract and remove any solid bits.
- ✓ Collect the clear liquid for use in your shampoo formulation.
- ✓ Strain the mixture using a muslin cloth or a fine mesh strainer to take out any leftover solid bits from the decoction.
- ✓ Collect the clear liquid, which is the amla extract, in a clean container.
- ✓ This liquid contains helpful ingredients that are good for your hair.

- *Storage*

- ✓ Put the amla extract into a clean, tightly sealed container to keep it fresh and stop any unwanted bacteria from getting in.
- ✓ Keep the extract in a cool, dark place, like a refrigerator, to help it stay effective.
- ✓ When stored correctly, the amla extract can be used for around 2 to 3 weeks.

- *Hibiscus Extract Preparation for Shampoo:*

Hibiscus is rich in amino acids, flavonoids, mucilage, and antioxidants that help nourish the scalp, strengthen hair roots, reduce hair fall, and promote healthy hair growth. It is commonly used in shampoo formulations for conditioning and moisturizing properties. Below is a detailed method for preparing Hibiscus Extract using the decoction method for shampoo formulation.

- *Ingredients:*

- ✓ 10 g of dried hibiscus flowers/leaves
- ✓ 150 ml of distilled water

- *Preparation Method:*

- *Boiling the Hibiscus Material:*

- ✓ Add 10 g of dried hibiscus flowers or leaves to 150 ml of distilled water in a clean stainless steel or glass container.
- ✓ Gently boil the mixture on low to medium heat for about 1 to 2 hours to extract the active compounds such as anthocyanins, flavonoids, and mucilage into the water.
- ✓ Stir occasionally to ensure uniform extraction and prevent sticking at the bottom.

- *Cooling and Filtering the Decoction:*

- ✓ After boiling, remove the mixture from heat and allow it to cool to room temperature.
- ✓ Filter the decoction using muslin cloth, fine mesh strainer, or filter paper to remove all solid particles.

- *Storage:*

- ✓ Store the extract in a clean, airtight, and sterile container.

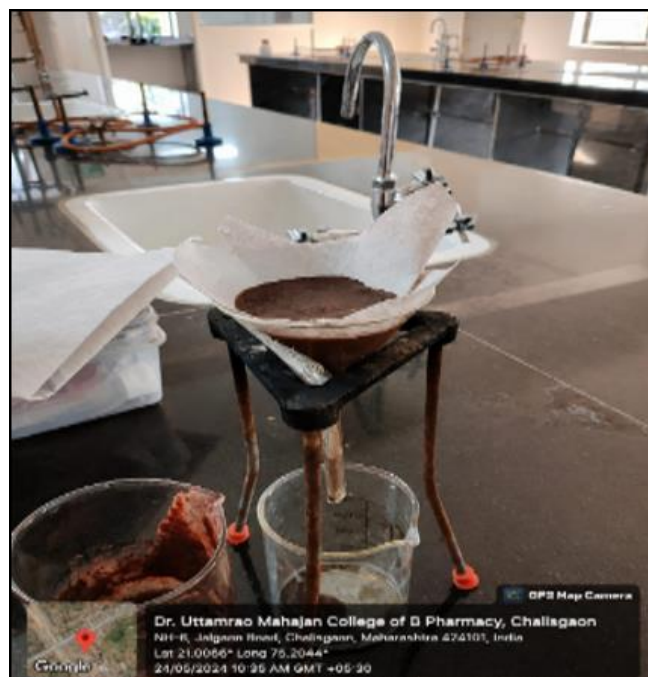


Fig 16 Hibiscus Extract

➤ *Shikakai Extract Preparation for Shampoo:*

Shikakai is one of the most commonly used traditional herbs in herbal hair care preparations. It is rich in natural saponins, alkaloids, flavonoids, vitamins, and antioxidants that provide excellent cleansing and conditioning effects for hair and scalp. Shikakai helps remove excess oil and dirt without stripping away natural scalp oils, making it highly suitable for shampoo formulations. It also assists in controlling dandruff, strengthening hair roots, reducing hair fall, and improving hair softness and manageability. The following is a detailed method for preparing Shikakai Extract using the decoction method for use in shampoo formulations.



Fig 17 Shikakai Extract

• *Ingredients:*

- ✓ 10 g of dried shikakai pods or shikakai powder
- ✓ 150 ml of distilled water

➤ *Preparation Method:*

• *Selection and Preparation of Shikakai:*

- ✓ Select clean, good-quality dried shikakai pods free from fungal growth, dust, and impurities.
- ✓ Wash the pods thoroughly with clean water to eliminate dirt and contaminants.
- ✓ Break the pods into smaller pieces or grind them into coarse powder to increase extraction efficiency.
- ✓ If shikakai powder is used, ensure it is fresh and finely processed.

• *Boiling the Shikakai Material:*

- ✓ Place 10 g of dried shikakai material into a clean stainless steel or glass extraction vessel.
- ✓ Add 150 ml of distilled water into the container.
- ✓ Heat the mixture gently over low to medium heat and allow it to boil for approximately 2 to 3 hours.

- ✓ During the boiling process, natural saponins and phytoconstituents are released into the water, producing a foamy and slightly brownish extract.
- ✓ Stir the mixture occasionally to ensure uniform extraction and to prevent burning or sticking at the bottom.
- ✓ Continue heating until a concentrated decoction is obtained.

• *Cooling and Filtration of the Decoction:*

- ✓ After completion of boiling, remove the container from heat and allow the mixture to cool to room temperature.
- ✓ Filter the decoction through muslin cloth, filter paper, or fine mesh strainer to separate the liquid extract from solid residues.
- ✓ Repeat filtration if required to obtain a clear extract suitable for cosmetic formulation.
- ✓ Collect the filtered shikakai extract in a sterile and dry container.

• *Storage of the Extract:*

- ✓ Store the extract in a clean, airtight, and sterilized container to prevent contamination.
- ✓ Keep the extract refrigerated or in a cool and dark place to preserve its activity and prevent microbial growth.
- ✓ Avoid repeated exposure to air and direct sunlight.

➤ *Reetha Extract Preparation for Shampoo:*

Reetha, commonly known as soapnut, is a traditional herbal ingredient extensively used in natural hair cleansing preparations. It contains high amounts of natural saponins that exhibit excellent foaming and cleansing properties. Reetha extract effectively removes dirt, oil, and impurities from the scalp and hair without causing excessive dryness. It also possesses antimicrobial and anti-inflammatory properties that help maintain scalp health, reduce dandruff, and improve hair texture. The following detailed procedure describes the preparation of Reetha Extract using the decoction method for use in shampoo formulations.



Fig 18 Final Formulation

- *Ingredients:*

- ✓ 10 g of dried reetha shells or reetha powder
- ✓ 150 ml of distilled water

- *Preparation Method:*

- *Selection and Preparation of Reetha:*

- ✓ Select mature and properly dried reetha shells free from contamination and impurities.
- ✓ Wash the reetha thoroughly with clean water to remove dust and unwanted particles.
- ✓ Crush the shells into smaller pieces or prepare coarse powder to facilitate effective extraction.
- ✓ Ensure that the material used is clean and suitable for cosmetic preparation.

- *Boiling the Reetha Material:*

- ✓ Transfer 10 g of crushed reetha shells or powder into a clean stainless steel or glass container.
- ✓ Add 150 ml of distilled water to the container.
- ✓ Boil the mixture gently over low to medium heat for approximately 2 to 3 hours.
- ✓ During heating, natural saponins dissolve into the water, producing a mildly foamy extract with cleansing properties.
- ✓ Stir the mixture occasionally to ensure proper extraction and prevent the material from sticking to the bottom.
- ✓ Continue heating until the decoction becomes concentrated and develops a brownish appearance.

- *Cooling and Filtration of the Decoction:*

- ✓ Remove the mixture from heat after completion of extraction and allow it to cool naturally to room temperature.
- ✓ Filter the decoction using muslin cloth, filter paper, or a fine mesh strainer to remove all insoluble particles and residues.
- ✓ Repeat filtration if needed to obtain a clear and smooth extract.

- *Storage of the Extract:*

- ✓ Store the prepared reetha extract in a clean, airtight, and sterile container.
- ✓ Keep the extract refrigerated or in a cool, dry, and dark place to maintain stability and prevent microbial contamination.
- ✓ Avoid exposure to direct sunlight and excessive heat.
- ✓ Use the extract within 2 to 3 weeks for optimum quality.



Figure 1 Reetha Extract

#### IV. EVALUATION PARAMETER

- *Organoleptic Properties*

- **Color:** The shampoo should have a consistent color.
- It can be light brown or dark green, depending on the herbs used.
- **Odor:** It should smell nice and not have a bad or sour smell.
- The natural smell of herbs like amla, shikakai, or green tea might be noticeable.
- **Texture:** It should feel smooth, like a gel or cream, and not have any rough bits or separate into layers.
- **Appearance:** The shampoo should look clear if it's transparent or have a uniform look if it's creamy, without bubbles or particles settling at the bottom.

- *PH Determination*



Fig 20 PH Determination

➤ *Foam Ability Test*

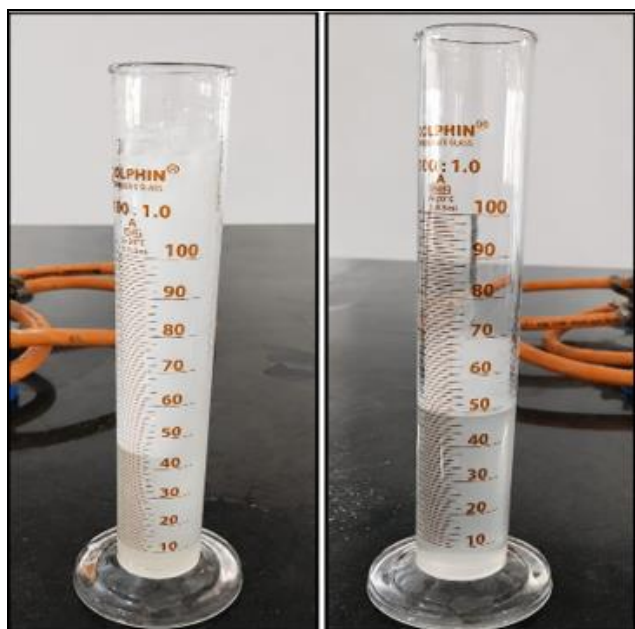


Fig 21 Foaming Ability

• *Observation:*

A good herbal shampoo should produce adequate foam with satisfactory foam stability throughout the observation period.

➤ *Dirt Dispersion Test*



Fig 22 Dirt Dispersion Test

• *Observation*

The formulated herbal shampoo showed slight to medium ink concentration in the foam, indicating good dirt dispersion and cleansing ability.

➤ *Wetting Time Test*



Fig 23 Wetting Time Test

• *Observation*

Faster sinking time indicates better wetting property. Slower sinking time indicates poor penetration and spreading ability.

**V. RESULTS**

The herbal hair growth-promoting shampoo containing Brahmi, Amla, Neem, Fenugreek, Hibiscus, Shikakai, and Reetha extracts was successfully formulated and evaluated. The shampoo showed acceptable color, odor, and texture with good physical stability. It exhibited a scalp-friendly pH, satisfactory foaming ability, effective cleansing action, and good wetting properties. The herbal ingredients provide nourishment to the scalp, help reduce hair fall, strengthen hair roots, and support healthy hair growth. Overall, the formulation demonstrated promising potential as a safe and effective natural hair care product.

**VI. CONCLUSION**

Present study successfully focused on the formulation and evaluation of a herbal shampoo containing Brahmi along with other natural ingredients such as neem, amla, fenugreek, hibiscus, shikakai, and reetha. The formulated herbal shampoo showed satisfactory physicochemical properties including good appearance, acceptable pH, adequate viscosity, good foamability, foam stability, detergency, and cleansing action. The formulation was found to be smooth, homogeneous, and free from any skin irritation.

Brahmi played an important role in nourishing the scalp, strengthening hair roots, and promoting healthy hair growth, while reetha and shikakai acted as natural cleansing agents. Amla and hibiscus helped in improving hair texture and shine, whereas neem provided antimicrobial and anti-dandruff activity. Fenugreek contributed conditioning and moisturizing effects to the hair.

The evaluation studies indicated that the herbal shampoo possessed good stability and was safe for regular use. The formulation effectively cleaned the hair without causing dryness or damage, which is commonly associated with synthetic shampoos containing harsh chemicals.

Therefore, it can be concluded that the formulated herbal shampoo containing Brahmi is an effective, safe, economical, and eco-friendly alternative to synthetic shampoos. The study also supports the growing use of herbal cosmetic preparations due to their therapeutic benefits, better patient compliance, and minimal side effects. Further studies and large-scale production can be carried out to improve the commercial applicability and long-term stability of the formulation.

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