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“FORMULATION AND EVALUATION OF HERBAL SHAMPOO”

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Abstract - The formulated methi-shikkakai herbal shampoo proved to be an effective, natural, and safe alternative to commercial chemical shampoos. The combination of methi, shikkakai, amla, reetha, hibiscus, and other herbal ingredients provided excellent cleansing, conditioning, and nourishing properties. Methi enhanced hair strength and reduced dandruff, while shikkakai acted as a gentle natural cleanser. Reetha contributed rich foaming ability, and amla supported scalp health and shine. The evaluation parameters such as pH, foam height, viscosity, stability, and cleansing ability indicated that the herbal shampoo met acceptable quality standards. Overall, the formulation is cost-effective, environmentally friendly, non-toxic, and suitable for regular use, promoting healthy hair and scalp without side effects. The results indicate that this combination provides excellent cleansing, conditioning, and anti-dandruff properties, making it a safe alternative to synthetic surfactants. Methi (fenugreek) acts as a natural conditioner, making hair soft, manageable, and shiny, which reduces the need for synthetic conditioners.

Key words- Nourishment, Evaluation, Dispersion, Anti-dandruff, Antioxidant.

Introduction - Herbal cosmetics have gained significant popularity in recent years due to their safety, effectiveness, and minimal side effects compared to synthetic formulations. Among these products, herbal shampoos are widely preferred for maintaining hair health, preventing hair fall, controlling dandruff, and providing nourishment to the scalp. Shampoos are cosmetic preparations intended to cleanse the hair and scalp by removing dirt, oil, and environmental pollutants. However, many commercially available shampoos contain synthetic surfactants, parabens, artificial fragrances, and colours that may cause irritation, dryness, or long-term damage to the hair.

To overcome these drawbacks, herbal shampoos formulated with natural ingredients such as Shikakai, Reetha, Amla, Neem, Methi, and other plant extracts have emerged as safer alternatives. These herbs possess natural cleansing, conditioning, antimicrobial, anti-dandruff, and hair-strengthening properties. For example, Reetha acts as a natural surfactant due to its saponin content, Shikakai works as a mild cleanser and conditioner, while Amla provides vitamins and antioxidants that promote hair growth.

The formulation of herbal shampoo involves selecting suitable plant materials, extracting their active constituents, and combining them appropriately to achieve characteristics like foaming ability, cleansing action, pH balance, viscosity, and stability. Evaluation of the prepared shampoo is essential to ensure its safety, effectiveness, and quality. Parameters such as physical appearance, pH, foam height, dirt dispersion, surface tension, viscosity, and conditioning effect are analysed to assess the performance of the herbal formulation.

Thus, the formulation and evaluation of herbal shampoo play a vital role in developing a natural, safe, and effective hair-care product that meets consumer expectations and provides therapeutic benefits without the adverse effects associated with synthetic shampoo.

Advantages of Herbal Shampoo:

1. Safe and Chemical-Free:

Herbal shampoos do not contain synthetic surfactants, parabens, sulfates, or artificial fragrances, making them safer for long-term use.

2. Mild and Non-Irritating:

They are gentle on the scalp and suitable for sensitive skin. They do not cause irritation, dryness, or allergic reactions.

3. Nourishes Hair Naturally:

Herbs like Amla, Shikakai, Aloe vera, and Methi provide vitamins, antioxidants, and natural conditioning agents that improve overall hair health.

4. Strengthens Hair Roots:

Ingredients such as Amla, Bhringraj, and Neem strengthen the hair follicles, reducing hair fall and breakage.

5. Natural Cleansing Action:

Reetha and Shikakai contain natural saponins that create foam and cleanse the scalp effectively without stripping natural oils.

6. Improves Hair Texture:

Regular use enhances shine, smoothness, and silkiness due to natural conditioning agents.

7. Anti-Dandruff Properties:

Neem, Tulsi, and Tea tree extracts help reduce dandruff, itching, and scalp infection.

8. Environmentally Friendly:

Herbal shampoos are biodegradable and free from harsh chemicals, making them eco-friendly.

9. No Side Effects:

Since they are made from natural ingredients.

Collection of API/Materials:

Ingredient	Function	Typical Conc. (% w/w)
METHI {Trigonella foenum-graecum}	Strength hair roots, reduces dandruff	8 %
SHIKKAKAI (Acacia concinna)	Natural cleanser, adds shine	10%
AMLA (Phyllanthus emblica)	Promotes hair growth, prevents greying	5%
REETHA (Sapindus mukorossi)	Natural foaming agent	12%
HIBISCUS (Hibiscus rosa-sinensis)	Conditions and softens hair	4%
ALOE VERA (Aloe barbadensis)	Moisturizer, soothes hair	3%
LEMON JUICE (Citrus limon)	pH adjustment (3.0–3.5)	As required
Preservative and Perfume	Prevents microbial growth and shelf-life, fragrance	0.5–1%
DISTILLED WATER		Up to 100%

Materials And Methods:

Collection of plant materials : The herbal hand wash was prepared by collecting various plant materials like neem leaves, aloe vera, lemon from herbal garden and rose water were procured from local market. Splant profile of some herbal material used in preparation of herbal handwash was given below.

Material used in herbal shampoo:

1. Methi :

Synonym: Fenugreek , Greek hay , Methi dana

Biological Source: Methi consists of dried ripe seeds of *Trigonella foenum -graecum* linn.

Kingdom: Plantae

Domain: Eukaryota

Class: Magnoliopsida (Dicotyledonae)

Order: Fabales

Family: Fabaceae

Genus: *Trigonella*

Species: *Trigonella foenum-graecum* linn

Chemical Constituents: Proteins , amino acid , fixed oils , vit.A,C,B-Complex , iron , calcium , potassium.



Uses of Methi: Methi (Fenugreek) is widely used in herbal shampoos due to its excellent conditioning, strengthening, and anti-dandruff properties. It is rich in proteins, mucilage, and nicotinic acid, which help nourish the scalp, reduce hair fall, and promote healthy hair growth. The natural mucilage present in methi acts as a gentle conditioner that smoothens the hair, reduces frizz, and makes detangling easier. Its antifungal and anti-inflammatory activity helps control dandruff, itching, and scalp irritation. Regular use of methi-based shampoo adds shine, improves hair texture, and helps repair dry and damaged hair, making it an essential ingredient in many herbal hair-care formulations.

2. Shikkakai :

Synonym : Soap pod , Soapnut acacia

Biological Source : Shikkakai consists of dried pods of *Acacia concinna* linn

Kingdom : Plantae

Class : Magnoliopsida

Order: Fabales

Family: Fabaceae (Leguminosae)

Genus: *Acacia*

Species: *Acacia concinna* linn

Chemical Constituents: Alkaloids , fibers , fixed oils , vit. A, C, D, E, K , citric acid , oxalic acid , flavonoids , main cleaning agents.



Uses of shikakai : Shikakai is a traditional herbal ingredient widely used in herbal shampoos due to its gentle cleansing and nourishing properties. Rich in natural saponins, Shikakai acts as a mild cleanser that removes dirt and excess oil without stripping the scalp of its natural moisture. It helps maintain the natural pH balance of the scalp, preventing dryness and irritation. Shikakai is also known to strengthen hair roots, reduce hair fall, and promote healthy hair growth. Its antioxidant and antimicrobial properties help control dandruff and keep the scalp healthy. Regular use of Shikakai-based shampoo leaves the hair soft, shiny, and manageable, making it a valuable ingredient in natural hair-care formulations.

Characteristics : It contains natural saponins that act as mild foaming agents, making it a gentle cleanser that does not strip the scalp of essential oils. Shikakai has a naturally low pH, which helps maintain the scalp's moisture balance and prevents dryness. It is rich in antioxidants, vitamins A, C, D, E, and K, which support healthy hair growth. Its mild nature makes hair soft, smooth, and tangle-free, making Shikakai an excellent ingredient for herbal shampoos and natural hair-care products.

3. Amla :

Synonym : Indian gooseberry , Emblic myrobalan , Amla

Biological Source : Amla consists of the fresh or dried fruits of *Embolia officinalis* linn.

Kingdom : Plantae

Class: Magnoliopsida

Order: Magnoliopsida

Family: Phyllanthaceae

Genus: Phyllanthus

Species: *Phyllanthus emblica* linn

Chemical Constituents: Ascorbic acid, polyphenols, amino acid, pectin, calcium, iron, phosphorus, tannins, flavonoids.



Uses of amla: Amla, also known as Indian gooseberry, is widely used in herbal shampoos because of its powerful hair-nourishing properties. It is rich in vitamin C, antioxidants, and essential nutrients that help strengthen hair roots and reduce hair fall. Amla supports healthy hair growth by improving blood circulation to the scalp and providing deep nourishment. Its natural antibacterial and anti-inflammatory help reduce dandruff, soothe scalp irritation, and prevent infections. Amla also acts as a natural conditioner, making the hair soft, smooth, and shiny. In addition, its antioxidant content helps slow down premature greying and protects the hair from damage caused by pollution and environmental stress. Overall, amla enhances scalp health, promotes thicker hair growth, and improves the texture and shine of the hair, making it an important ingredient in herbal shampoos.

4. Reetha:

Synonym: Soapnut, soapberry, Arista, washed nut.

Biological Source: Reetha consists of the dried fruits of *Sapindus mukorossi* Gaertn .

Kingdom: Plantae

Class: Magnoliopsida

Order: Sapindales

Family: Sapindaceae

Genus: *Sapindus*

Species: *Sapindus mukorossi* Gaertn .

Chemical Constituents: Sugers, fatty acids, tannis, glycosides, protein traces, potassium, calcium, iron. Saponins (main foaming and cleaning agents)



Uses of Reetha: Reetha, also known as soapnut, is a key ingredient in herbal shampoos due to its natural cleansing and foaming properties. It contains saponins, which produce a mild lather that effectively removes dirt, excess oil, and impurities from the scalp without stripping away natural moisture. This makes reetha an excellent gentle cleanser suitable for all hair types, especially for people with sensitive scalps. Its antifungal and antibacterial properties help control dandruff, reduce scalp infections, and maintain overall scalp hygiene. Reetha also helps strengthen hair roots, reduce hair fall, and promote healthier, thicker hair growth. Regular use of reetha adds natural shine and smoothness to the hair, prevents dryness, and keeps the scalp balanced. Because it cleanses without chemicals, reetha is widely used in herbal shampoos to provide safe, natural, and effective hair care.

5. Hibiscus:

Synonym : Shoe flower , china rose , japa pushpa Gudhal(hindi)

Biological Source : Hibiscus consists of the flowers and leaves of *Hibiscus rosa-sinensis* linn.

Kingdom : Plantae

Class : Magnoliopsida

Order : Malvales

Family : Malvaceae

Genus : *Hibiscus*

Species : *Hibiscus rosa – sinensis* linn.

Chemical Constituents : Flavonoids , mucilage , tannins , citric acids , malic acids , amino acids , vit,C , minerals , Anthocyanins(responsible for red colour)



Uses of Hibiscus: Hibiscus is widely used in herbal shampoos because of its excellent hair-care and conditioning properties. The flower and leaves are rich in vitamins, amino acids, and antioxidants that nourish the scalp and strengthen hair roots. Hibiscus helps stimulate hair growth by improving blood circulation and providing essential nutrients to the follicles. Its natural mucilage acts as a gentle conditioner, making the hair soft, smooth, and manageable while reducing frizz. Hibiscus also helps control dandruff and soothes an itchy or irritated scalp due to its antifungal and anti-inflammatory properties. Additionally, it enhances the natural shine of hair and helps prevent premature greying by reducing oxidative stress. Overall, hibiscus provides deep nourishment, supports healthy hair growth, and improves the texture and appearance of the hair, making it a valuable ingredient in herbal shampoos.

6. Aloe Vera:

Synonym : Aloe , Ghritkumari , kumari , Barbados aloe .

Biological Source : Aloe vera consists of the fresh leaves and leaf gel of *Aloe barbadensis miller*.

Kingdom : Plantae

Domain : Eukaryota

Class : Liliopsida(Monocotyledonae)

Order : Asparagales

Family : Asphodelaceae(formally Liliaceae)

Genus : Aloe

Species : *Aloe barbadensis miller*

Chemical Constituents: Polysaccharides, vit.A,C,E,B1, B2 , B6 , B12 , amino acids , saponins , sterols, enzymes(Amylase, Lipase, Catalase) , minerals(Magnesium , Zinc , Potassium) , Anthraquinones .



Uses of Aloe Vera: Aloe vera is a popular ingredient in herbal shampoos because of its soothing, moisturizing, and healing properties. It contains vitamins, minerals, enzymes, and amino acids that deeply nourish the scalp and promote healthy hair growth. Aloe vera helps to maintain the scalp's natural moisture balance, making it especially beneficial for dry, itchy, or irritated scalps. Its anti-inflammatory and antimicrobial properties help reduce dandruff and prevent scalp infections. The natural gel in aloe vera acts as a gentle conditioner, leaving the hair soft, smooth, and shiny while reducing frizz and tangles. It also helps strengthen hair strands, reducing breakage and split ends. Additionally, aloe vera supports a healthy pH balance on the scalp, which improves overall hair health. Because of these multiple benefits, aloe vera is widely used in herbal shampoos to cleanse, soothe, and nourish the hair naturally.

7. Lemon Juice:

Synonym : Lemon, Citrus

Biological Source : Citrus lemon

Kingdom : plantae

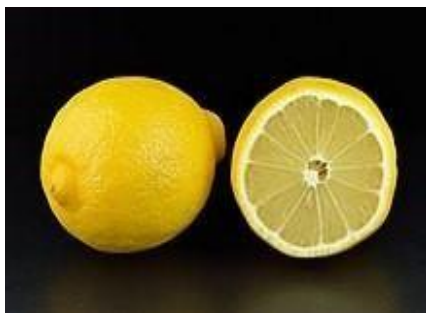
Family : Rutaceae

Order : sapindales

Genus : citrus

Species : c.limon

Chemical Constituents: flavonoids (diosmin, hesperidin, limocitrin) and phenolic acids (ferulic, synapic, p-hydroxybenzoic).



Characteristics :- Citrus Limon is a tree reaching 2.5-3m in height. It has evergreen lanceolate leaves. Bisexual flower are white with purple colour at the axils. The fruit is elongated oval pointed green berry that turns yellow during ripening. Inside the berry is filled with a juicy pulp divided into segment.

Uses of citrus Limon:- The antioxidants activities of flavonoids from citrus Limon-hesperidin and hesepertin was not only limited to their radical scavenging activity but also arguments the antioxidants cellular defence .Limon fruit have shown inhibitory activity against the gram positive bacteria *enterococcus faecalis* and *bacillus substitute* and gram negative *shigella*

Procedure:

1. Preparation of herbal extracts.
2. Take methi seeds, shikkakai, amla, and reetha powders in a clean bowl.
3. Add 200–250 ml of warm water.
4. Soak overnight (8–12 hours) to allow the active ingredients to release saponins and nutrients.
5. Boiling and extraction.
6. Next day, heat the soaked mixture on low flame for 10–15 minutes.
7. Add hibiscus leaves/flowers and boil for another 5 minutes.
8. Allow the mixture to cool.
9. Filtration.
10. Filter the mixture using a muslin cloth to obtain a clear herbal extract
11. Press well to collect maximum liquid.
12. Discard the residue.
13. Addition of aloe vera
14. Add fresh aloe vera gel (or extracted gel) to the filtrate.
15. Mix thoroughly until a smooth, uniform shampoo consistency is achieved.

Evaluation of Herbal Shampoo:

1. Organoleptic / Physical inspection:

Purpose: Appearance, color, odor, texture, clarity.

Procedure: Examine sample in white light and record observations (color, homogeneity, particles). Smell and describe (herbal, rancid?). Check pourability and feel between fingers.

2. pH:

Purpose: Skin-compatibility and stability indicator.

Apparatus: Calibrated pH meter.

Procedure: Dilute shampoo 1:10 (10 g shampoo + 90 mL distilled water). Calibrate pH meter (pH 4.0 & 7.0 buffers). Measure at 25 ± 2 °C.

3. Viscosity:

Purpose: Consumer acceptability & batch consistency.

Apparatus: Brookfield viscometer (spindle & rpm selection depending on viscosity).

Procedure: Measure at 25 °C using appropriate spindle; record readings at steady state. Take 3 readings (different rpm if needed) and report mean.

4. Total Solid Content (% solids):

Purpose: Concentration of non-volatile material.

Apparatus: Oven, pre-weighed dish, analytical balance.

Procedure: Weigh dish (W1). Add known amount of shampoo (e.g., 5.00 g) spread thinly (W2). Dry at 105 °C to constant weight. Cool in desiccator and weigh (W3).

5. Surface Tension:

Purpose: Indicates cleansing/surfactant activity.

Apparatus: Tensiometer (Du Noüy ring or Wilhelmy plate) or stalagmometer.

Procedure: Measure surface tension of 1% and 5% aqueous dilutions at 25 °C.

6. Foam Height & Foam Stability (Ross–Miles or Cylinder shake test):

Purpose: Consumer perception of foaming and foam stability.

Apparatus: Graduated cylinder (500 mL) or Ross-Miles apparatus.

Procedure (cylinder shake): Dilute shampoo (1% w/v). Pour 200 mL distilled water into cylinder; rapidly add 5 mL sample from 30 cm height; measure initial foam height (mm) and height after 1, 5, 10 minutes.

7. Foam Volume & Foam Stability (foamometer method):

Purpose: Alternative quantitative foam test.

Procedure: Use calibrated foam column; generate foam with defined air/solution flow and measure decay time to 50% height.

8. Cleaning/Cleansing Efficiency (Soil removal test):

Purpose: Objective measure of cleaning power.

Apparatus: Standardized soiled fabric/swatches, mechanical shaker, spectrophotometer (or reflectance meter).

Procedure: Soak soiled swatches in defined shampoo dilution, agitate for fixed time, rinse, dry. Measure reflectance/absorbance vs control.

9. Wetting Ability (Draves test):

Purpose: How quickly shampoo wets fibres (surfactant activity).

Apparatus: Draves wetting tester (or glass rod method).

Procedure: Suspend standard cotton skein in 0.5% shampoo solution; record time for skein to sink. Shorter time = better wetting.

10. Dirt Dispersion Test:

Purpose: Evaluate if shampoo keeps dirt in solution or transfers to foam.

Apparatus: Test tube, oil/soil, distilled water.

Procedure: Mix 5 mL shampoo solution, add soil/oil, shake, let settle, observe coloration of foam vs aqueous layer.

11. Viscosity Stability & Accelerated Stability Tests:

Purpose: Stability over time & under stress.

Procedure: Store samples at 4 °C, 25 °C (room), 40 °C $\pm$ 75% RH, and 45 °C for accelerated stress — evaluate at 0, 1, 3 months (accelerated: 1–4 weeks). Test pH, viscosity, appearance, odor, color, % solids.

12. Microbial Limit / Total Viable Count (TVC):

Purpose: Safety and preservative efficacy.

Apparatus: Media (nutrient agar, SDA), incubator, dilution bottles, sterile pipettes.

Procedure: Perform serial dilutions of shampoo; plate on nutrient agar (bacteria) and Sabouraud dextrose agar (fungi). Incubate (bacteria 30–37 °C for 48 h; fungi 25–28 °C for 5–7 days). Count CFU/g or mL.

13. Preservative Efficacy / Challenge Test:

Purpose: Confirm preservative system works.

Procedure: Inoculate product with known strains (*S. aureus*, *P. aeruginosa*, *E. coli*, *C. albicans*, *A. niger*). Monitor log reduction at intervals (0, 7, 14, 28 days).

14. Irritation / Patch Test (Skin compatibility):

Purpose: Safety on human skin. Ethical

Requirement: Obtain IRB/ethical approval if done on volunteers.

Procedure (simple patch test): Apply 0.5 mL diluted shampoo on volar forearm under occlusion for 24–48 h; observe erythema, edema at 48 and 72 h. Score irritation.

15. Sensory & Consumer Panel (optional):

Purpose: Consumer perception: lather, feel, fragrance, after-wash feel, manageability.

Procedure: Recruit 10–30 volunteers, standardized usage instructions, use rating scale (1–5). Analyze results (mean scores).

16. pH Compatibility with Hair (Cuticle check):

Purpose: Check effect on hair cuticle.

Procedure: Treat hair tresses with shampoo, rinse, dry; examine under SEM or light microscope for cuticle damage vs control.

Result & Discussion

The formulation of herbal shampoo using methi (fenugreek), shikakai and hibiscus, often supplemented with reetha (soapnut) and amla, produces a natural, eco-friendly, and effective hair care product. The results indicate that this combination provides excellent cleansing, conditioning, and anti-dandruff properties, making it a safe alternative to synthetic surfactants. Methi (fenugreek) acts as a natural conditioner, making hair soft, manageable, and shiny, which reduces the need for synthetic conditioners. The prepared shampoos show a pH between 5.0 and 6.5, which is close to the natural scalp pH (5.5) and prevents scalp irritation. Hibiscus nourishes follicles, while methi inhibits bacterial/fungal growth, resulting in reduced hair loss and dandruff.

Conclusion

The formulated methi–shikkakai herbal shampoo proved to be an effective, natural, and safe alternative to commercial chemical shampoos. The combination of methi, shikkakai, amla, reetha, hibiscus, and other herbal ingredients provided excellent cleansing, conditioning, and nourishing properties. Methi enhanced hair strength and reduced dandruff, while shikkakai acted as a gentle natural cleanser. Reetha contributed rich foaming ability, and amla supported scalp health and shine. The evaluation parameters such as pH, foam height, viscosity, stability, and cleansing ability indicated that the herbal shampoo met acceptable quality standards. Overall, the formulation is cost-effective, environmentally friendly, non-toxic, and suitable for regular use, promoting healthy hair and scalp without side effects.

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