

Design, Development and Evaluation of Methi-Shikakai Herbal Shampoo

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Abstract:- Shikakai, scientifically known as *Acacia concinna*, is a traditional Indian herb widely used for hair care due to its cleansing and conditioning properties. This research paper aims to Design, develop and evaluation of a shampoo incorporating shikakai extract, assessing its efficacy in terms of cleansing ability, hair conditioning, and overall performance. The formulation process involves selecting appropriate surfactants, additives, and optimizing concentrations to achieve desired attributes. Evaluation methods include physical characterization, such as pH, viscosity, and foam ability, as well as performance testing through sensory evaluation and hair analysis. The results of this study will provide valuable insights into the development of herbal-based shampoos and their potential benefits for hair health and maintenance.

Keywords:- Shikakai, Shampoo Formulation, Herbal Cosmetics, Hair Care, Evaluation.

I. INTRODUCTION

The quest for healthy, lustrous hair has been a timeless pursuit, transcending cultural and geographical boundaries. Throughout history, various civilizations have explored natural remedies and botanical extracts to cleanse, nourish, and beautify hair. Shikakai (*Acacia concinna*), an ancient botanical treasure native to the Indian subcontinent, has long been revered for its exceptional hair care properties. Derived from the fruit pods of the *Acacia concinna* tree, shikakai has been a cornerstone of Ayurvedic medicine, celebrated for its gentle cleansing, conditioning, and strengthening effects on hair.

The resurgence of interest in natural and herbal hair care solutions, coupled with the increasing consumer demand for environmentally friendly and sustainable products, has propelled shikakai into the spotlight of modern hair care formulations. Shikakai extracts, rich in saponins, flavonoids, and vitamins, offer a holistic approach to hair care, addressing a myriad of concerns such as dandruff, scalp irritation, and hair breakage, while promoting overall scalp health and vitality.

The formulation of shikakai shampoo represents a synergistic blend of ancient wisdom and contemporary innovation, harnessing the botanical prowess of shikakai to deliver effective and nurturing hair care solutions. By integrating shikakai extracts into shampoo formulations, manufacturers aim to offer consumers a natural alternative to conventional shampoos, free from harsh chemicals and synthetic additives, yet equally efficacious in cleansing, conditioning, and revitalizing hair.

The objectives of this study are twofold: firstly, to develop a formulation for shikakai shampoo that optimizes the therapeutic properties of shikakai while ensuring product stability and user acceptability; and secondly, to comprehensively evaluate the physicochemical properties and hair care efficacy of the formulated shampoo through rigorous laboratory and clinical assessments.

Through this research endeavor, we seek to shed light on the potential of shikakai as a key ingredient in modern hair care formulations, bridging the gap between traditional wisdom and scientific innovation. By elucidating the formulation process and evaluating the performance of shikakai shampoo, we aim to provide valuable insights for the development of natural, sustainable, and consumer-centric hair care products, thus empowering individuals to embrace the beauty of their hair with confidence and vitality.^{[1][2][3]}

➤ Advantages of Herbal Shampoo

- It contains natural Ingredients.
- Many herbal shikakai shampoos are free from harsh chemicals.
- Environmental friendly and non-skin irritant.
- Helps to maintain the natural pH balance of the scalp.
- Generally suitable for all hair types.

➤ Disadvantages of Herbal Shampoo

- Taste and odor are difficult to mask.
- Extended Therapy and Delay in Effects.
- An complex and time-consuming production method.
- The necessity of preservatives.

Hair is a crucial component of the human body. Hair loss, unruly hair, lack of length, conditioning, immature graying, dandruff, thinning of hair, and dullness are some of the linked concerns. Hair can vary in shape, length, diameter, texture, and color. Hair's cross section might be round, triangular, uneven, or flattened, determining its curl. Hair covers the entire body of mammals. Its primary function is to control body temperature. It aims to reduce friction, protect against sunlight, and serve as a pathway organ. Hair is a person's greatest glory and plays a crucial role in their lives. In ancient times, hair was used to protect the scalp.^[2]



Fig 1: Hair Fall

➤ *Hair Loss Causes:-*

Hair loss can be caused by a variety of factors, including sickness, emotional strain, rigorous dieting, and hormonal changes such as pregnancy, puberty, and menopause. Hair loss can be caused by various medical diseases, such as thyroid illness, iron deficiency anemia, and syphilis. Thyroid blood tests and lab tests, such as a complete blood count (CBC), are typically normal for those experiencing normal hair loss. However, it is crucial to rule out any treatable reasons for hair loss.

➤ *Hair Loss May be Caused by Following Elements:*

- Family history (heredity).
- Severe emotional distress or loss.
- High fever.
- Sudden weight loss (crash diet)
- Severe sickness.
- Surgery
- Childbirth
- Medical issues and hormonal changes.
- Vitamins and Meds.
- Radiation therapy for head.
- Hairstyles and treatments.
- A stressful incident.^[2]

➤ *Need and Rational*

- Shikakai shampoo is developed to prevent hair fall or hair problem in many peoples.
- For curing various problems related to hair herbal shikakai shampoo is developed

- Herbal shikakai shampoos reduces chemical use and hence reduce hazardous synthetic chemicals adverse action on hair

➤ *Aim and Objectives*

To create a herbal shampoo with natural API to lessen hair loss and issues related to hair, which would boost one's self-esteem.

➤ *The Objective of this Project Includes:*

- To recognize and pick suitable herbal ingredients that have been used traditionally to treat dandruff issues.
- To combine these ingredients to create a herbal anti-dandruff shampoo.
- To assess the Herbal methi-shikakai Shampoo.^[3]

II. MATERIAL AND METHOD

The name "herbal shampoo" refers to the liquid or sweetened soap mixture. Herbal shampoo is a hair care product that is usually liquid in consistency and is used to wash hair. In our study, we provide details on using herbal components to lessen hair issues. In this study, shikakai functions as an antidandruff agent and helps to successfully eliminatedandruff problems, while meth nourishes and conditions hair for healthy development. Additionally, it gives the hair nourishment and modifies its texture. For hair, herbal shampoo is excellent. Additional components like amla and neem are used in this shampoo to battle scalp dryness and encourage hair development in darker hair types. In this study, we created a herbal methi-shikakai shampoo using methi, shikakai, amla, and neem in addition to other ingredients. Assessments were conducted to ascertain the product's physical attributes, pH, foaming index, and appearance.^[4]

➤ *Formulation:*

- To identify and select appropriate herbal ingredient that have been traditionally used for managing dandruff problems.
- To formulate herbal anti dandruff shampoo using these ingredients.
- To do evaluation of the Herbal methi-shikakai shampoo.^[3]

➤ *Application:*

- Efficient removal of soil or dirt.
- Encouragement of hair growth.
- Keeping hairs strong and dark colored.
- Does not cause irritation or adverse effects on the skin or eyes
- Prevention from dandruff and scalp.

III. METHOD OF PREPARATION OF HERBAL SHAMPOO

A. Shikakai(*Acacia concinna*)



Fig 2: Shikakai

➤ Synonym

- Vimala, Bhuriphena^[5]

➤ Botanical Features:

- Kingdom : Plantae
- Division :Magnoliophyta
- Class : Magnoliopsida
- Order :Fabales
- Family :*Fabaceae*
- Subfamily :Caesalpinioideae
- Clade : Mimosoid clade
- Genus :*Senegalia*
- Species : *S. rugata*

➤ Chemical Constituents

Vitamins A, C, D, E, and K are abundant in the Ayurvedic plant shikakai. Saponins, anthraquinone glycosides, alkaloids, sugar, tannin, and flavonoids are all present in shikakai. Lupeol, glucose, arabinose, rhamnose, lactone, spinasterol, and acacic acid are examples of natural sugars. Together with the alkaloids calyctomine and nicotine, it also contains citric acid, spinasterone, oxalic acid, tartaric acid, hexacosanol, succinic acid, and ascorbic acid.[6]

B. Methi(*Trigonella Foenum-Graecum*)



Fig 3: Methi

➤ Synonym[5]

- Methi, Methika, Chandrika.

➤ Botanical Feature:

- Kingdom : Plantae
- Division :Magnoliophyta
- Class :Magnolio
- Order :Fabales
- Family :*Fabaceae*
- Subfamily :Faboideae
- Genus : *Trigonella*
- Species : *T. foenum-graecum*

➤ Chemical Constituents

Carbohydrates, lipids, proteins, alkaloids, flavonoids, fibres, saponins and steroidal saponins, as well as amino acids, vitamins, and minerals are the main constituent of fenugreek.

Flavonoids such as luteolin, apigenin, orientin, quercetin, isovitexin and vitexin are abundant in fenugreek^[6]

C. NEEM(*Azadirachta Indica*)

➤ Synonym

- Margosa, nimtree or Indian lilac,^[5]

➤ Botanical Feature

- Kingdom : Plantae
- Division :Magnoliophyta
- Class : Magnoliopsida
- Order :Rutales
- Family :*Meliaceae*
- Subfamily :Melioidae
- Genus : *Azadirachta*
- Species : *A. indica*



Fig 4: Neem

➤ *Chemical Constituents*

Azadirachtin is the most significant component found in neem leaves, along with sodium nimbinate, nimbin, nimbidin, nimbolinin, nimbidol, gedunin, salannin, and quercetin. Glycerides of both saturated and unsaturated fatty acids, steric acids, compounds containing sulfur, oleic acid, and unsaponifiable nimboesterol are also included.

D. *AMLA(Phyllanthus emblica)*

➤ *Synonym*

- Phyllanthusemblica, Indian gooseberry,
- Phyllanthusemblica

➤ *Botanical Feature*

- Kingdom : Plantae
- Phylum :Tracheophyta
- Class :Magnolipsida
- Order :Malpighiales
- Family :*Phyllanthaceae*
- Genus : Phyllanthus
- Species: P.Emblica



Fig 5: Amla

➤ *Chemical Constituents* ^[6]

Ascorbic acid, or vitamin C, and a number of bioactive phytochemicals, the bulk of which are polyphenols, such as phyllembin, leutolin, apeigenin, gallic acid, chebulagic acid, chebulinic acid, quercetin, corilagin, and so on, are found in amla. The fruit is rich in minerals such as calcium, iron, phosphorus, pectin, and 75% moisture content. It also includes two hydrolyzable tannins, called Emblicanin A and B.

Table 1: Formulation of Herbal Shampoo

Sr no.	Ingredients	Biological name	Weight	Role of ingredients
1	Methi	Trigonella foenum-graecum.	10g	Conditioning and nourishment of hair
2	Shikakai	Acacia concinna	0.04g	Antidandruff agent
3	Neem	Azadirachta indica	0.04g	Anti-dandruff, Fights scalp infections
4	Amla	Phyllanthus emblica	0.04g	Darkening of Hairs and hair growth promoters.
5	Methyl paraben		1g	Preservative
6	Water		Q.s.(80ml)	Vehicle



Fig 6: Ingredients for Herbal Shampoo



Fig 7: Weighing Balance

➤ *Equipments Used*

- Weighing Balance /Analytical Balance: It is the most Important equipment used for any formulation. It gives us the accurate weighed quantity of any drug use for the formulation. All ingredients use for formulation are weighed on same.

- Rectangular Water Bath: It is rectangular with many openings and consist of heater and thermostat to regulatetemperature. It is been use for mixing of oil and water phase at75°C forthe cream herbal cream formulation.



Fig 8: Water Bath



Fig 9: pH Meter

- pH meter: pH, which indicates the concentration of hydrogen ions in the solution. Used to check the acidity or alkalinity of a solution. pH meter provides a numerical value. [3]

➤ Procedure

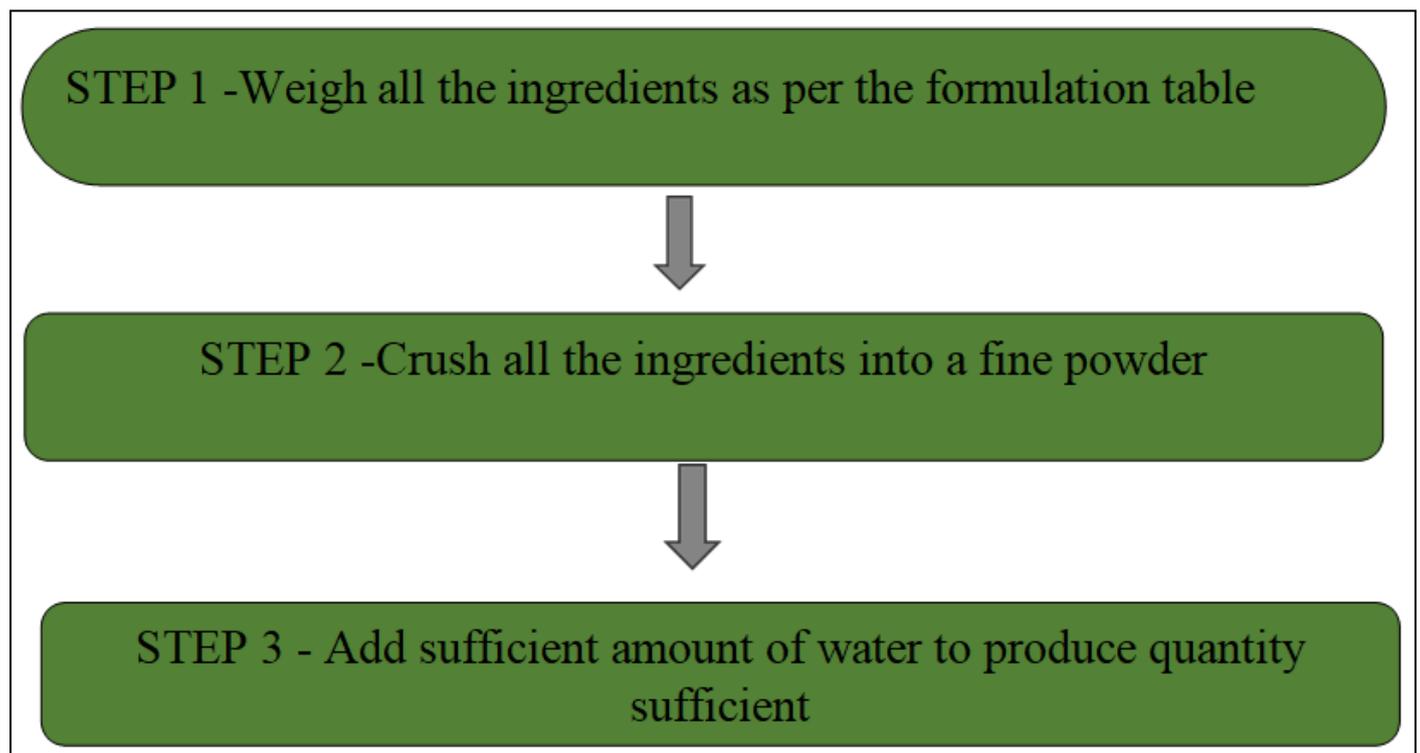


Fig 10: Step-1



Fig 11: Step-2



Fig 12: Step-3

➤ *Evaluation :*

Quality control tests, such as viscosity and pH measurements as well as visual inspection, were carried out to examine the generated formulations. In order to ensure the quality of the products, various testing were conducted for shampoo formulations. These tests included the assessment of dry residue, foaming index, wash ability, and detergency tests.

- *Physical Appearance/ Visual Inspection*

The formulations prepared were evaluated in terms of their, fluidity, foam producing ability and clarity^[7]

- *Determination of Ph*

The pH of 10% shampoo solution in distilled water was determined at room temperature 25°C.^[8]

- *Determine Percent of Solids Contents*

Weighing an evaporating dish that was dry and clean, we put 4 grams of shampoo to it. Weighing was done on the shampoo and dish. Only the precise weight of the shampoo was determined, and once the liquid portion had evaporated, the evaporating dish containing the shampoo was placed on a hot plate. After drying, the weight of the shampoo alone (solids) was determined.

✓ Formula-

$$\text{Total solid content} = A - B$$

Where,

A= weight of Petri dish and 4gm shampoo

B= weight of Petri dish after drying.

$$\% \text{Solid content} = A - B / 4 \times 1000. \text{ [9]}$$

- *Foaming Index*

Accurately weighing two millilitres of shampoo, it was then put into a 250 millilitre conical flask with 100 millilitres of boiling water. After that, it is gradually heated

for 50 minutes, cooled, filtered, and then added to a standard volumetric flask to make up to 100 ml of volume. The heated solution that was obtained is divided into five test tubes, each holding one, two, three, five, and so on. The remaining volume is then filled to ten millilitres with water. After that, the test tubes were shaken for 20 seconds at a speed of 4 frequencies per second in a longwise motion. After that, the test tubes are left in the test tube for a duration of 20 minutes. It was measured how high the foam was.

✓ Formula-

$$\text{Foaming Index} = 1000/A$$

Where,

A= volume of decoction having exact 1 cm foam height. ^[10]

- *Cleaning Action ^[11]*

5 grams of hairs were placed in grease, after that it was placed in 200 ml. of water containing 1 gram of shampoo in a flask. Temperature of water was maintained at 35°C. The flask was shaken for 4 minutes at the rate of 50 times a minute. The solution was removed and sample was taken out, dried and weighed. The amount of grease removed was calculated by using the following equation.

IV. RESULT AND DISCUSSION

A. Formulation of Herbal Shampoo

The powdered herbs were combined with certain amounts of water (Shikakai, methi, neem, and amla) to create a pure herbal shampoo, as indicated in Table 1. These plant materials contain natural surfactants with good foaming and detergency, called saponins, which are phytochemicals. Extracts of amla and methi were used as conditioning agents, while neem and Shikakai were added as anti-dandruff agents that also prevented from the scalp. By dissolving in the right amount of vehicle, all the constituents are thoroughly combined. A small amount of methyl paraben was added to the shampoo to further preserve it. Table 1 displays the shampoo's final formula.

B. Evaluation of Shampoo

➤ *Physical Appearance/Visual Inspection*

Like any other cosmetic preparation, a shampoo should look well. Physical attributes including colour, odour, and transparency of the developed and marketed shampoos were assessed (Table 2). Our designed shampoo was smooth and slippery, light brown in colour, and had a mildly unpleasant taste.

Table 2: Physical Appearance

Sr.no	Test	Observation
1.	Colour	Light brown
2.	Odour	Descent
3.	Texture	Smooth
4	Solubility	Water soluble
5	Thickness	Uniform

➤ pH

In order to minimize damage to hair, most shampoos are manufactured as either neutral or slightly alkaline. Additionally, the pH of shampoo improves hair quality, lessens eye discomfort, and preserves the ecological balance of the scalp. It was discovered that the pH of formulated shampoo was almost 6.65.

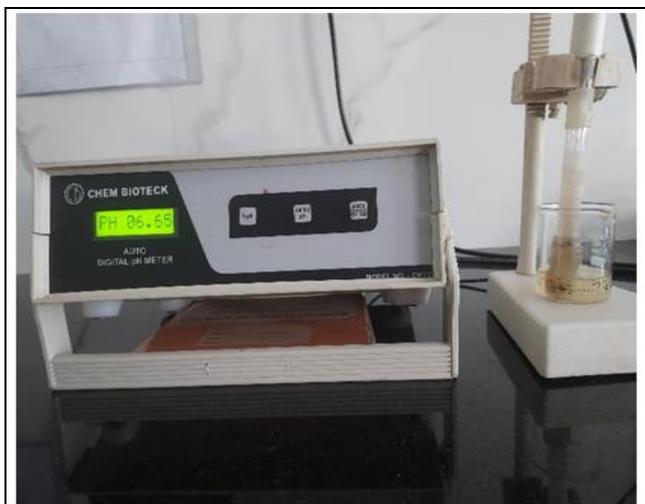


Fig 13: pH of Shampoo

➤ % of Solid Content

Good shampoos are easy to apply and rinse out of the hair, thus they often include 20% to 30% solids. Should there be insufficient solid, it will be excessively diluted and disintegrate rapidly. Likewise, it will be difficult to work too many substances into the hair or very challenging to remove. The percentage of solid material in all of the tested shampoo was discovered to be between 16.5 and are anticipated to wash out quickly.

• Observation

A=66.87 gm and B=66.21 gm
 %Solid content = $A-B/4 \times 100$
 = $66.87-66.21/4 \times 100$
 = 16.5%



Fig 14: Solid Content

➤ Foaming Index

Table 3: Foaming Index

Test Tube	Height of Foam Produced
1	0.6cm
2	0.8cm
3	1.1cm
4	1.7cm
5	2.8cm

✓ Foaming Index :- $1000/A$

Where,

A= 3

$1000/3= 333.33$

Hence, Herbal methi-shikakai shampoo shows good foaming capacity.

V. CONCLUSION

The goal of the current study was to create a herbal shampoo that would promote hair development and lessen hair loss when combing. It would also be safer than chemical conditioning agents. In order to create herbalshampoo, an aqueous extract of medicinal herbs that are historically used to cleanse hair. Utilisation of synthetic conditioning treatments alleviate protein loss or hair thinning. To give the efficient conditioning effects, which are the focus of this work. The substitution of plant extracts such as shikakai, methi, amla, and others for artificial cationic conditioners. Numerous tests were conducted to assess the manufactured shampoo's good product performance. The evaluation studies showed good cleaning action. The developed shampoo's assessment study produced a result for the quality control test that was comparable, but more research is required to confirm the product's overall quality.

Table 4: Design, Development and Evaluation of of Methi-Shikakai Herbal Shampoo

CONTENT	TITLE OF FIGURES & TABLES
Fig No. 1	Hair fall
Fig No. 2	Shikakai
Fig No. 3	Methi
Fig No. 4	Neem
Fig No. 5	Amla
Fig No. 6	Ingredients used for shampoo preparation
Fig No. 7	Weighing balance
Fig No. 8	Water bath
Fig No. 9	pH meter
Fig No. 10	Step 1
Fig No. 11	Step 2
Fig No. 12	Step 3
Fig No. 13	pH of shampoo
Fig No. 14	Solid content
Table No.1	Formulation of Herbal Shampoo
Table No.2	Physical Appearance
Table No.3	Foaming Index

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