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Research Article

Formulation And Evaluation of Herbal Hair Conditioner

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ABSTRACT

Hair is an important part of the human body that protects the scalp. Hair conditioners are skin care product that are applied to the Ends of the hair and later used for cleansing, conditioning the hair, and rinsing. It is used to make the hair shiny and smooth. Increases The luster of hair. Mainly prevents hair breakage, reduces split ends and improves manageability. Its main purpose is to reduce friction Between hairs, making brushing and combing easier. Fenugreek, hibiscus flowers and curry leaves are used as the main ingredients in Herbal conditioners. It was evaluated and analyzed based on physicochemical parameters such as efficiency, stability studies. A more Radical approach to popularizing herbal conditioners would change consumer expectations and emphasize safety and efficacy. The Purpose is to manufacture herbal hair conditioners. All herbal conditioners exhibited pH within the specified range, comparable solids %, stable lather and high viscosity properties along with good wetting properties compared to synthetic conditioners.

INTRODUCTION

Herbal product have grown in popularity over the past decade. Currently used by 20-30% of the population products are made from natural sources such as flowers, stems, bark, seeds, leaves and medicinal plants. Hair conditioners are hair care products that condition the hair after shampooing[1]. Restores hair to in natural state, leaving it soft, shiny and manageable This product is suitable for all hair types. It restotes moisture and smoothes the hair follicle cuticle Hair

conditioners with powerful antioxidants can reduce UV damage to your hair, including hair colour changes and protein damage. Plant-based conditioners contain chemicals and sulfates. Today's of formulations go beyond pare hair cleansing. In addition to cleansing power, conditioners have many properties such as Conditioning and hair shine. It is expected not to irritate the skin or macous membrane[2]. Herbal hair conditioner is a natural hair care product formulated using plant-based ingredients and

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botanical extracts to nourish, soften, and protect the hair. Unlike conventional conditioners that often contain synthetic chemicals, silicones, and preservatives, herbal conditioners focus on using nature-derived components to provide gentle yet effective care for the scalp and hair strands. These conditioners are rich in vitamins, essential oils, amino acids, and antioxidants, which help maintain healthy hair structure, promote growth, reduce breakage, and improve manageability. Herbal hair conditioners are particularly suitable for individuals with sensitive scalps, allergies, or those pursuing a more eco-conscious and holistic lifestyle.

Natural Ingredients: Common ingredients include Fenugreek seeds, hibiscus flowers, curry leaves, mind oil, Almond oil, Aloe Vera gel.

Scalp Health: Many herbs have anti-inflammatory, antifungal, and antibacterial properties that support a healthy scalp and reduce dandruff.

Moisture & Shine: Herbal oils and extracts help lock in moisture, reduce frizz, and impart a natural shine.

Sustainable & Safe: Free from parabens, sulfates, and artificial fragrances, making them environmentally friendly and safer for regular use.

Increasing demand of consumers for healthy foods has urged the food industry to develop food products that promote health. Foods that provide significant nutrition, exert health advantages, inhibit disease and/or assist health have become more readily accepted by the industry and can be used as successful marketing tools. This has caused the emergence of functional foods that comprise a wide range of components such as probiotics, prebiotics, vitamins, minerals and dietary fiber[3].

It has been shown that Fenugreek has antidiabetic, anticancer, hypocholesterolemic, anti-inflammatory, antioxidant and chemopreventive activity due to its useful chemical constituents. This review discusses nutraceutical properties and potential food application of fenugreek which has not been reviewed anywhere before. Secondary metabolites are organic compounds found in many plants that are not typically involved in the growth and development of organisms but frequently play a crucial role in plant defence[4]. One of the most significant sources of medications comes from plants. The traditional medical system known as "Ayurveda" makes considerable use of medicinal plants worldwide[5]. Given that it is mostly found in South-east China and a few islands in the Pacific and Indian Oceans, the lovely flowering plant *Hibiscus rosasinensis* is frequently referred to as the "Queen of the Tropics" or the "China rose." One of Hawaii's beloved national plants, the Hibiscus, is frequently worn in the hair for ceremonial purposes[6].

Characteristics of herbal hair conditioner:

The conditioner's intrinsic need to have the highest level of moisture provision. It needs to be extremely moisturizing and replenish the natural oils that regular shampooing and styling have stripped from hair. Humectants and emollients will add lustre and moisture. A good conditioner will not only add moisture, but also slip, which helps with detangling. For successful detangling and length retention, slip is essential. Rich, thick, and creamy conditioners have a preference for consistency. The conditioner needs to get inside the hair shaft in order to have a high level of absorption and protection. One way to do this is with a water-based conditioner. It is imperative that you read the ingredients if you have a preference for natural components. Softens hair after use. A conditioner that leaves your hair feeling like cotton has done its job. If you suddenly



Have hand in hair syndrome, you can add the conditioner to your hair care routine[7].

❖ **The conditioners' functions include:**

- 1) Boost compatibility.
- 2) Emulate the natural lipid outer layer of hair.
- 3) Make hydrophobicity whole.
- 4) Close the cuticle.
- 5) Prevent or reduce frizz and friction to offset the appalling rate.

❖ **Herbal conditioner benefits:**

- 1) Provides smoothness and luster to hair.
- 2) Cut down on split ends.
- 3) Make things more manageable.
- 4) Avoid breaking off hair.
- 5) Guards against mechanical and chemical damage to hair[8].

❖ **Other conditioners on the market have the same drawbacks:**

- 1) Generally poisonous and damaging to hair.
- 2) Generates ocular discomfort.
- 3) The principal ingredients of other conditioners are ammonium and sodium laureth sulfates.
- 4) They promote split ends and frizz by drying out the hair shaft[9].

PIANT PROFILE:

1. Fenugreek seeds



Fig.no.1: Fenugreek seeds

It helps to repair hair shafts damaged by dehydration. A rich source of iron and protein, two nutrients essential for Hair growth. Fenugreek contains lecithin, which acts as a natural emollient that nourishes and moisturizes the scalp and hair. Fenugreek Contains mucus fibers that absorb moisture tremendously. This will improve the shine and soft texture of your hair. Fenugreek seeds Contain significant amounts of fiber, phospholipids, glycolipids, oleic acid, linolenic acid, choline, vitamins A, B1, B2, C, nicotinic acid, Niacin, and many other functional elements[10].

Scientific Name: Trigonella Foenum.

Synonyms : Methi seeds, Trigonella Foenum graecum .

Chemical Constituents: Fatty acids, amino acid, flavonoids, alkaloids and other compounds.

Uses: Blood sugar control, promoting hair, Anti-cancer skin health, kidney stones, weight loss, reduces cholesterol, prevent cancer.

2. Hibiscus flower



Fig.no.2 : Hibiscus flower

In herbal, hibiscus is one of the most famous herbs for promoting hair growth. Hibiscus flowers and leaves contain large amounts of mucus that acts as a natural conditioner. Crushed hibiscus flowers and leaves feel slimy thanks to this natural conditioner. Hibiscus has been used as a natural dye to cover gray hair. The antioxidants and vitamins in hibiscus help produce melanin, the natural pigment that gives hair its natural color[11].

Scientific Name: Hibiscus rosa-sinensis.

Synonyms: Chinese hibiscus, china rose, rose mallow, tropical hibiscus.

Chemical Constituents: Tannins, Saponins, glycosides, flavonoids and terpenoids, alkaloids.

Uses: lowering blood pressure, digestion and supporting liver health Anti-inflammatory effects, weight management, Diuretics effects, Blood sugar regulation.

3. Curry leaves



Fig.no. 3 : Curry leaves

Curry leaves contain vitamin C, vitamin B, protein and antioxidants, all of which contribute to cell regeneration and promote healthy blood flow to the blood vessels of the scalp. The properties help promote hair growth and skin regeneration and improve the overall health of the scalp. Applying the ingredient topically rejuvenates hair follicles and promotes hair growth[12].

Scientific Name: Murraya Koenigii

Synonyms: Bergera Koenigii

Chemical Constituents: Tannins, Saponins, polyphenol, flavonoids, essential oil, nutrients and alkaloids.

Uses: Digestive Disorders, Kidney Disorders, prevent diabetes, Treatment of morning sickness, nausea and vomiting, The juice of the root can be taken to relieve pain associated with the kidneys, Stimulate hair growth, Treat burns, bruises and skin eruptions, External application in stings and bites of poisonous creatures.

4. Aloe Vera gel



Fig.no.4: Aloe Vera gel

It contains many active ingredients and minerals that help strengthen your hair. It protects against ultraviolet [UV] radiation that comes from the sun. Aloe Vera contains many active ingredients and minerals that help strengthen hair. It contains Fatty acids and amino acids and is rich in vitamins A, B12, C and E. These play a role in healthy hair follicles. Aloe Vera cleanses the Hair shaft very effectively. Aloe Vera contains proteolytic enzymes that repair dead skin cells on the scalp[13].

Scientific Name: Aloe barbadensis

Synonyms: Aloe Konrad

Chemical Constituents: Amino acid, Sugars, Vitamins, Steroids, mineral, Salicylic acid, enzyme.

Uses: Moisturizes dry skin ,Soothes irritated skin ,Prevent premature aging, Treats sunburn, Fights acne and blemishes , Remove dark circles, Eliminates dead skin cells, Reduce stretch marks , Relieves eczema and psoriasis

EXCIPIENT PROFILE:

1. Almond oil :

Moisturizes the scalp and hair for healthy, straight hair. Being rich in B-7 and biotin, almond oil helps keep hair Healthy and strong. Oiling is considered the most beneficial for promoting hair growth. Massaging it improves blood flow to the roots, Promotes hair growth, and makes hair stronger[14].

Type: Natural Oil (Vegetable-derived)

Role: Emollient Solvent, Skin-conditioning agent, Carrier oil, Mild thickening agent in some oil-based systems

Description: Almond oil is a fixed (non-volatile) oil expressed from the kernels of sweet almonds (*Prunus amygdalus dulcis*). It is a pale yellow, bland oil commonly used in topical, oral, and occasionally parenteral formulations. It provides lubrication, enhances skin hydration, and acts as a carrier for fat-soluble actives. Used in creams, ointments, and oil-based dosage forms for its emollient and softening effects.

Chemical Structure: Almond oil is a complex mixture of triglycerides, primarily composed of:

Major components:

Triolein (glycerol ester of oleic acid)

Trilinolein

Tripalmitin

Fatty Acid Content (approximate):

Oleic acid (55–86%)

Linoleic acid (7–35%)

Palmitic acid (4–9%)

General triglyceride formula: $\text{RCOOCH}_2\text{--CH(OOCR')--CH}_2\text{OOCR''}$

(Glycerol backbone + 3 fatty acid chains[15].

2. Propyl paraben:

Promotes hair growth and prevents the growth of harmful bacteria and mold. They are effective Preservatives in many types of formulations. These compounds and their salts are primarily used for their antifungal and antibacterial Properties. They are found in shaving gels, shampoos, and conditioners as preservatives[16].

Type: Propyl Paraben

Role: Preservative – Antimicrobial agent effective against molds and yeasts

(Note: Propyl paraben is not a thickening agent, emulsifier, or stabilizer like beeswax; those roles apply to beeswax.)

Description: Propyl paraben (propyl 4-hydroxybenzoate) is an ester of p-hydroxybenzoic acid and n-propanol. It is a white crystalline powder, widely used in pharmaceutical, cosmetic, and food products to prevent microbial growth and extend shelf life.

Chemical Structure:

IUPAC Name: Propyl 4-hydroxybenzoate

Chemical Formula: C₁₀H₁₂O₃

Structure Type: Ester

General Ester Formula: R–COOR'

R = Phenyl group with a hydroxyl (OH) at para position

R' = Propyl group (CH₃CH₂CH₂)

Mechanism of Action: Propyl paraben works by disrupting microbial cell membranes and inhibiting enzyme activity, helping to preserve formulations from spoilage[17].

3. Glycerine :

Glycerin is a humectant. This means that it can actually absorb moisture from the air, keeping your hair moisturized And healthy. It is a popular ingredient in skin and hair care products because of its effectiveness. Glycerin's antibacterial properties help Treat itchiness caused by dryness and dandruff. Glycerines is used to nourish and condition hair, leaving it soft and frizz-free[18].

Type: Glycerine (Glycerol)

Role: Humectant, solvent, thickening agent, plasticizer, preservative, and emollient.

Description: Glycerine is a simple polyol compound, commonly used in pharmaceutical, cosmetic, and food formulations. It is a clear, colorless, odorless, and viscous liquid with a sweet taste. Glycerine attracts and retains moisture, making it an effective humectant. It also acts as a co-solvent and enhances the smoothness and spreadability of topical preparations.

Chemical Structure: Chemical formula: C₃H₈O₃

IUPAC name: Propane-1,2,3-triol

Structure: HO–CH₂–CHOH–CH₂–OH (Three hydroxyl groups contribute to its hygroscopic and solubilizing properties.)[19].

4. Citric acid:

Citric acid is known to balance the pH of the scalp as hair care products make the scalp more alkaline. Citric Acid is used as a natural alternative in hair conditioners. Rinsing your hair with diluted citric acid has a conditioning effect on your hair, Leaving it silky and shiny[20].

Type: Natural organic acid

Role: pH adjuster, chelating agent, preservative, buffering agent



Description: Citric acid is a weak organic acid naturally found in citrus fruits. It is widely used in pharmaceutical and cosmetic formulations for its ability to maintain pH balance, enhance stability of active ingredients, and act as a mild preservative. It also improves solubility and acts synergistically with antioxidants.

Chemical Structure: Molecular formula: $C_6H_8O_7$

IUPAC name: 2-hydroxypropane-1,2,3-tricarboxylic acid

Structure: $HOOC-CH_2-C(OH)(COOH)-CH_2-COOH$

Functional Groups: Three carboxylic acid groups and one hydroxyl group

Synonyms: 2-Hydroxy-1,2,3-propane-tricarboxylic acid, E330[21].

4. Rose Water:

Rose water softens hair in many ways. Rosewater is a mild astringent and can help reduce oiliness and dandruff. Rosewater acts as an astringent on the scalp, tightening the skin and preventing excess sebum production. By reducing oil production, Rose water prevents the formation of dandruff on the scalp.

Type: Natural aromatic water

Role: Solvent, fragrance agent, skin-conditioning agent, mild anti-inflammatory

Description: Rosé water is a by-product of the steam distillation of rose petals during the extraction of rose essential oil. It contains water-soluble components of the rose plant, including trace amounts of essential oils and flavonoids. Used in topical and oral formulations for its soothing, aromatic, and mildly antimicrobial properties.

Chemical Composition: Rose water is a dilute solution composed primarily of water, with minor constituents including:

Geraniol

Citronellol

Nerol

Phenylethyl alcohol

Functional Categories:

Fragrance

Skin conditioning agent

Cooling agent in topical applications[22].

MATERIAL AND METHOD :

Table no.1 formulation Table

Ingredients	Quality	Role
Fenugreek seeds	2ml	Nourishment, prevent hair loss
Hibiscus flowers	1ml	Promote hair growth ,Antioxidant and Anti-inflammatory
Curry leaves	1ml	Improve scalp health , Strength hair
Almond oil	2ml	Moisturizes nourishment ,Shine softness
Aloe Vera gel	6ml	Moisturizes scalp, reduced dandruff
Propyl paraben	1.5 ml	Preservatives, Prevent microbial growth , increase self life
Glycerine	2ml	Provide moisture , Improves Hair Texture
Citric acid	0.2g	Adjust pH , Preservative r
Rose water	4ml	Balance the scalp pH
Distilled water	q.s	Solvent, balance consistency

Method:

Soak fenugreek seeds, hibiscus flowers, and curry leaves in warm water overnight.

1. Extraction of Herbal Ingredients:

Grind and filter to obtain smooth paste or extract.



Fig.no.6: Extraction of Harbal ingredients

2. Aqueous Phase:

Mix rose water, aloe vera gel, glycerine, and herbal extract.

Heat mildly ($\sim 40\text{--}45^\circ\text{C}$) while stirring.



Fig.no.7: Aqueous phase

3. Oil Phase:

In a separate container, mix almond oil, and propyl paraben.

Heat gently to the same temperature.



Fig.no.8: oily phase

4. Emulsification:

Slowly add oil phase into aqueous phase with continuous stirring to form a emulsion.

5. Additives:

Add citric acid (dissolved in small amount of water) to adjust pH to 4.5–5.5.

Add paraben as preservative and stir well.

6. Cooling and Storage:

Allow the conditioner to cool at room temperature.

Store in a clean, sterilized container[23].

Evaluation Parameter :

1.pH test: Soak the pH strips in the herbal conditioner solution and wait for the color to change. Determine the pH by comparing The pH meter was calibrated and then the electrode Was dipped in Hair conditioner[24].

The color of the pH strip to the color chart.

□ pH of hair strands: 3.6 to 5.5

□ pH of hair conditioner: 3 to 7



Fig.no.10: Skin irritation test

5. Spread-ability: Spread-ability indicate the limit of the area in which the gel spreads easily on the skin or the affected part. The biological availability of the functionality to create a gel also depends on the value of the extension. By slides spread-ability two seconds, put the second slide to slide out of jail, it shows below a certain weight. Reduce the time needed to separate the two slides, a good spread-ability diluted conditioners and the complete sinking time of ball in the conditioner

2. Dirt dispersion test: Two drops of conditioner were added to a large test tube containing 10 ml of distilled water, one drop Of Indian ink was added, the test tube was capped and shaken 10 times. The amount of ink present in the foam was rated as none, light, Medium, or heavy.

3. Skin Irritation: Mark the area on right hand dorsal surface. The conditioner was applied to that area and the time was noted for 24hr .



was measured. The spreadbility was expressed in terms of time in second taken by two petri dishes to slip off from the conditioner, under certain load lesser the time taken for separation of two slides better the spreadbility. Apply a small amount on a glass slide and observe how easily it spreads.

6. Physical appearance: To check organoleptic properties of the conditioner.

i. Color:

ii. Odor:

iii. Texture:

7.Stability testing: Store the herbal hair conditioner at 37°C for 6 weeks and observe changes in color and viscosity.



Fig.no.11: Spreadability test

RESULT AND DISCUSSION:

A natural hair conditioner must be made and evaluated in a few steps. First, choose suitable herbal ingredients (such Almond oil and aloe vera) that are known for nourishing hair. After that, you'll create a recipe taking Into account variables like viscosity, pH equilibrium, and component compatibility. Following manufacturing, You will assess the conditioner's performance in terms of hair softening, detangling, and nourishment. This May involve sensory analyses and laboratory testing for factors like hair strength and moisture retention. Lastly, input from customers can aid in improving the formula for market readiness.

Table.no.2 Evaluation Parameter

Sr.no.	Evaluation Parameter	Observation
1.	Colour	Mint green/faint green
2.	Order	Pleasant
3.	Texture	Smooth
4.	pH	3.8
5.	Spreadability	Easily spreadable
6.	Skin Irritation	No irritation
7.	Stability Testing	Did not show any change in colour and viscosity

SUMMARY AND CONCLUSION:

SUMMARY:

The study focuses on developing a natural herbal hair conditioner using plant-based ingredients known for their hair care benefits, such as Fenugreek seeds, Hibiscus flowers, Curry leaves and aloe Vera gel. These herbs were selected for their moisturizing, strengthening, anti-dandruff, and hair growth-promoting properties. The final formulation was evaluated for pH, viscosity, spreadability, stability, microbial safety, and conditioning performance. Results showed that the

herbal conditioner was pH balanced, easy to apply, and provided good conditioning effects like shine, softness, and detangling. It was stable and free from harmful chemicals, making it a safe and effective alternative to commercial conditioners. A herbal hair conditioner was formulated using natural ingredients like Fenugreek seeds, hibiscus flower, curry leaves, and aloe vera gel for their nourishing and conditioning properties. The conditioner was prepared by extracting active components from these herbs and blending them into a natural base. It was evaluated for pH, texture, stability, and effectiveness on hair. The

results showed it was safe, stable, and improved hair softness, shine, and manageability, offering a natural alternative to chemical-based products. In summary, aloe vera hair conditioner enhances the general health, look, and manageability of hair by utilizing the advantageous qualities of aloe vera gel. It promises to hydrate and soothe the scalp, feed the hair strands, improve luster, and possibly even encourage hair growth. The hydrating and calming qualities of aloe vera can aid in the fight against dryness, minimize frizz, and ease inflammation on the scalp. Its nutritious ingredients also help to create healthier, thicker hair. Aloe vera hair conditioner is a natural solution for people looking to enhance the condition of their hair and boost overall hair wellbeing,

CONCLUSION:

From the above studies, it can be concluded that hair conditioner exhibits excellent conditioning properties. Conditioners are applied to hair after washing and are intended to smooth hair, improve shine and repair damaged, Mechanically damaged, and weathered hair. Herbal Hair Conditioner are free of chemical ingredients and are therefore safe to use on All scalp types. Hair conditioner contains ingredients that strengthen, smoothen and protect and promote shiny, healthy hair. pH value Of hair rinse, dirt dispersion test, determination of wetting time and stability have been tested and has been found to Be safe and effective to use. The prepared hair conditioner shows an excellent Property of conditioning. The herbal hair conditioner has no chemical Ingredients which makes it safe to use for all types Scalp. Formulated hair conditioner has a cationic Surfactant which gives good cleansing action. Which provide strengthening, smoothening and Protective effect which promote lustrous, shining And healthy hair. The hair conditioner was evaluated for Their pH, stability testing, viscosity test , Dirt dispersion test, Skin irritation test, and Spreadability test and they were proven to be safe

And effective for use. The conditioner was found Not irritated on the sin 24 hr. The formulated conditioner was found to be stable as there was no Change colour and formulation. It is clear from the research mentioned above that hair conditioner has superior conditioning qualities. Conditioners are used to smooth hair, enhance luster, and restore worn, mechanically damaged hair. They are Applied to hair after washing. Because herbal hair conditioner doesn't include any chemicals, it's safe to use On any kind of scalp. Ingredients in hair conditioner help to protect, strengthen, and smooth hair while also Encouraging lustrous, healthy hair. It has been determined through testing that the hair rinse's pH value, dirt Dispersion test, wetting time calculation and stability are all safe and useful.

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