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Formulation and Evaluation of Herbal Anti-Dandruff Shampoo

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ABSTRACT :

Herbal shampoos have gained significant attention due to their mildness, biodegradability, and therapeutic benefits. This study focuses on the formulation and evaluation of an herbal shampoo using natural ingredients such as sugarcane juice, bay leaf (Laurus nobilis), neem (Azadirachta indica), vitamin E, and rose water. Sugarcane juice acts as a natural cleanser and conditioner, promoting hair strength and shine. Bay leaf and neem possess antimicrobial and antifungal properties that help in reducing dandruff and scalp infections. Vitamin E enhances scalp nourishment and promotes hair growth, while rose water provides a soothing effect and imparts a pleasant fragrance. The herbal shampoo was formulated using a simple aqueous extraction method, followed by the addition of natural surfactants and stabilizers. The prepared formulation was evaluated for various physicochemical parameters, including pH, foaming ability, viscosity, dirt dispersion, and cleansing efficacy. Additionally, microbial studies were conducted to ensure the shampoo's safety. The results indicated that the formulated herbal shampoo exhibited good cleansing action, stable foaming properties, and an appropriate pH suitable for scalp health. Furthermore, the absence of synthetic chemicals makes it a safer alternative to commercial shampoos. Thus, the developed herbal shampoo provides a promising natural hair care solution with added therapeutic benefits.

KEYWORD : Herbal shampoo, sugarcane juice, bay leaf, neem, vitamin E, rose water, natural cleanser, antimicrobial properties, hair care, scalp nourishment, foaming ability, dandruff control, eco-friendly.

Introduction :

Shampoos are an essential part of hair care, primarily used for cleansing the scalp and hair by removing dirt, oil, and microbial contaminants. With growing awareness of the harmful effects of synthetic chemicals in commercial shampoos, there has been an increasing demand for herbal alternatives. Herbal shampoos are considered safer, eco-friendly, and enriched with natural ingredients that promote hair health without causing side effects.[1]

This study focuses on the formulation and evaluation of an herbal shampoo using **sugarcane juice, bay leaf (Laurus nobilis), neem (Azadirachta indica), vitamin E, and rose water.** Each ingredient has been selected based on its unique therapeutic properties. Sugarcane juice is a natural source of glycolic acid, which helps exfoliate the scalp and improve hair texture. Bay leaf contains antifungal and antibacterial compounds that help in reducing dandruff and scalp infections. Neem, known for its strong antimicrobial and anti-inflammatory properties, aids in treating scalp conditions such as itchiness and dandruff. Vitamin E is an essential nutrient that nourishes hair follicles, reduces oxidative stress, and promotes hair growth. Rose water provides hydration, soothes the scalp, and adds a refreshing fragrance to the shampoo.[2]

The primary objective of this research is to develop a herbal shampoo using these natural ingredients and evaluate its physicochemical properties, including pH, foaming capacity, viscosity, cleansing action, and microbial safety. By formulating a shampoo free from synthetic surfactants, parabens, and sulfates, this study aims to contribute to the growing demand for effective and sustainable herbal hair care products.[3]

Objective:

1. Formulation of Herbal Shampoo – To develop a natural shampoo using sugarcane juice, bay leaf, neem, vitamin E, and rose water as key ingredients.

2. Evaluation of Physicochemical Properties – To assess the pH, viscosity, foaming capacity, cleansing ability, and stability of the formulated shampoo.

3. Assessment of Therapeutic Benefits – To determine the antimicrobial, antifungal, and hair-nourishing properties of the herbal shampoo.

4. Safety and Compatibility Testing – To evaluate the shampoo's suitability for scalp health by ensuring it is free from harsh chemicals and safe for regular use.

5. Eco-Friendly and Sustainable Approach – To promote the use of natural ingredients as an alternative to synthetic shampoos, ensuring environmental sustainability.

6. User Acceptability Study – To analyze the sensory attributes such as fragrance, texture, and overall effectiveness of the shampoo through user feedback.[4]

Drug Profile :

Bay Leaf :

Synonym : Laurus nobilis.

Biological Source : Bay leaf is obtained from the dried leaves of Laurus nobilis

Family : Lauraceae

Uses :

1. Antimicrobial Properties – Bay leaf has natural antibacterial and antifungal properties that help reduce dandruff and scalp infections.

2. Improves Scalp Health – It soothes the scalp, reduces itchiness, and helps maintain a healthy scalp environment.

3. Strengthens Hair – Rich in antioxidants and essential nutrients, bay leaf strengthens hair follicles, reducing hair fall and promoting hair growth.

4. Adds Shine and Smoothness – Bay leaf helps condition the hair, making it smooth, shiny, and manageable

5. Reduces Excess Oil – It helps regulate sebum production, preventing oily scalp and greasy hair. [5]

Neem:

Synonym: Azadirachta indica.

Biological Source: Neem is obtained from the leaves, bark, seeds, and oil of Azadirachta indica.

Family: Meliaceae.

Uses of Neem:

1. Antibacterial & Antifungal Properties – Neem helps combat dandruff, scalp infections, and fungal growth, keeping the scalp healthy.
2. Reduces Hair Fall – Strengthens hair follicles and nourishes the scalp, reducing hair fall and promoting hair growth.
3. Soothes Itchy & Irritated Scalp – Its anti-inflammatory properties help in relieving scalp irritation, redness, and itchiness.
4. Controls Excess Oil Production – Helps regulate sebum production, making it beneficial for both oily and dry scalps.
5. Prevents Premature Graying – Rich in antioxidants, neem protects hair from environmental damage and premature graying.

Sugarcane:

Synonym: Saccharum officinarum.

Biological Source: Sugarcane is obtained from the stem juice of Saccharum officinarum.

Family: Poaceae (Gramineae).

Uses of Sugarcane:

1. Natural Cleanser – Sugarcane juice contains natural glycolic acid, which helps cleanse the scalp by removing dirt, oil, and buildup.
2. Moisturizes and Hydrates Hair – The natural sugars in sugarcane help retain moisture, keeping hair soft, smooth, and hydrated.
3. Promotes Hair Growth – Rich in essential vitamins and minerals, sugarcane juice nourishes hair follicles and stimulates hair growth.
4. Strengthens Hair Strands – The presence of minerals like calcium, magnesium, and iron helps strengthen hair, reducing breakage and split ends.
5. Adds Shine and Smoothness – Sugarcane juice enhances hair texture, making it shinier, silkier, and more manageable.
6. Maintains Scalp Health – Its natural exfoliating properties help remove dead skin cells, preventing scalp issues like dandruff and dryness.
7. Balances Scalp pH – Sugarcane juice helps maintain a healthy scalp pH, preventing excessive oiliness or dryness.

Vitamin E:

Vitamin E is a popular ingredient in herbal shampoos due to its antioxidant, moisturizing, and scalp-nourishing properties. It enhances hair health by preventing oxidative stress, promoting hair growth, and improving scalp condition.[6]

Uses:

1. Promotes Hair Growth: Vitamin E has antioxidant properties that help improve blood circulation to the scalp, which can stimulate hair follicles and promote hair growth.
2. Prevents Hair Loss: The antioxidant effects of Vitamin E help fight oxidative stress and damage to the scalp, which is a common cause of hair thinning and loss.
3. Improves Scalp Health: Vitamin E can help moisturize and nourish the scalp, preventing dryness, flakiness, or irritation. It can also help with conditions like dandruff by keeping the scalp hydrated and balanced.
4. Strengthens Hair: The nourishing properties of Vitamin E help strengthen hair strands, reducing breakage and split ends. It also helps restore shine and smoothness to dull, damaged hair.

Rose Water:

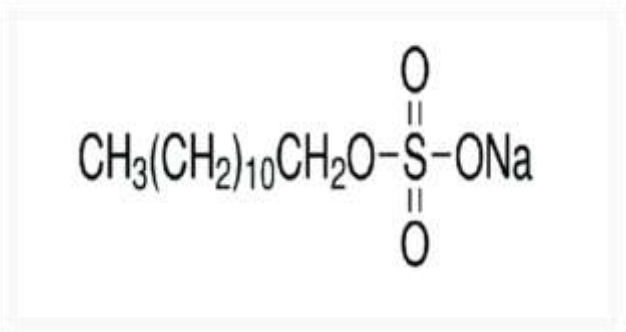
Rose water is a natural, aromatic liquid made by distilling rose petals with water or through steam distillation. It has been used for centuries in skincare, cosmetics, medicine, and culinary applications due to its soothing, hydrating, and antibacterial properties.[7]

Uses:

1. **Strengthens Hair**: Rose oil can help strengthen hair follicles, promoting healthy hair growth.
2. **Reduces Dandruff**: Its moisturizing properties help to soothe a dry, flaky scalp, preventing dandruff.

3. **Adds Shine**: It can give your hair a healthy, natural shine and improve its texture.
4. **Improves Scalp Health**: The antibacterial and anti-inflammatory properties help to keep the scalp clean, reduce itching, and prevent scalp conditions.

Sodium Lauryl Sulphate:



Formula: $NaC_{12}H_{25}SO_4$

Structure: SLS is an anionic surfactant, meaning it carries a negative charge. It is derived from coconut oil or palm kernel oil and consists of a hydrophilic (water-attracting) sulfate group and a hydrophobic (water-repelling) alkyl chain.

Appearance: SLS typically appears as a white, odorless powder or a clear, viscous liquid when dissolved in water.

Glycerine:

Formula: $C_3H_8O_3$

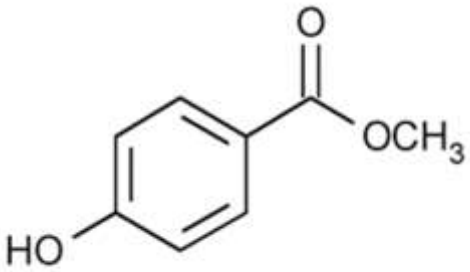
Structure: Glycerine is a simple polyol (sugar alcohol) compound. It contains three hydroxyl (–OH) groups, which are responsible for its hygroscopic (water-attracting) properties.

Appearance: It is a colorless, odorless, viscous liquid that is sweet-tasting and non-toxic.

Uses:

1. Moisturizer: Glycerine is often used in lotions, creams, and soaps to attract water to the skin and keep it hydrated. It helps to maintain skin softness and prevents dryness.
2. Humectant: It attracts moisture from the air, keeping the skin hydrated and preventing dehydration.
3. Soothing Properties: It can calm irritated skin, making it a common ingredient in products designed for sensitive or dry skin.

Methylparaben:



Chemical Name: Methyl p-hydroxybenzoate

Formula: $C_8H_8O_2$

Structure: Methylparaben is an ester of p-hydroxybenzoic acid. It is a colorless, odorless, crystalline powder that dissolves in water, alcohol, and propylene glycol.

Uses:

1. Cosmetics: Found in products like shampoos, conditioners, moisturizers, facial cleansers, and deodorants.

2. Personal Care Products: Included in lotions, sunscreens, makeup, and hair care products.
3. Pharmaceuticals: Used in certain medications, especially liquid formulations, to prevent microbial contamination.
4. Food Products: Occasionally used as a preservative in some foods and beverages, although it is less common in food compared to other parabens.

Material and Method:

Extraction Process:

1. **Preparation of Bay Leaf Extract:**

Collect fresh Bay Leaf and wash them with distilled water. Dry them in a hot air oven and then powder them. Take 5 gm of Bay Leaf powder in 20 ml of ethanol at 100°C for 5 to 10 minutes. Then, it is filtered through filter paper, and a clear solution is obtained.[8]

2. **Preparation of Neem Extract:**

Collect fresh neem leaves and wash them with distilled water. Dry them in a hot air oven and then powder them. Take 5 gm of neem powder in 20 ml of ethanol at 100°C for 5 to 10 minutes. Then, it is filtered through filter paper, and a clear solution is obtained.[9]

Formulation Table:

Sr No.	Ingredients	Quantity (70 ml)
1	Bay leaf extract	3.5 ml
2	Sugarcane extract	3.5 ml

3	Neem extract	2.1 ml
4	Vitamin E capsule	0.5 ml
5	Rose water	7 ml
6	Sodium lauryl Sulphate	10.5 ml
7	Glycerine	3.5 ml
8	Methylparaben	0.21 ml
9	Distilled water	q.s

Formulation of Shampoo:

1. Prepare the Herbal Extracts

If you are using pre-made Bay Leaf Extract, Sugarcane Extract, and Neem Extract, measure out the quantities as per the formula.

If you need to create your own extracts:

Bay Leaf: Boil a few bay leaves in water, let it cool, and strain the liquid.

Sugarcane: If using fresh sugarcane, extract its juice, or buy a ready-made extract.

Neem: Boil neem leaves in water, let it cool, and strain the liquid.

2.Mix Water Phase

In a clean, sterilized mixing container, combine Rose Water (7 ml) and Distilled Water (39.74 ml). Stir gently to mix the two waters together. This will be the base of your shampoo.

Tip: Use distilled water to ensure no impurities affect the product.

3. Add Herbal Extracts

Add Bay Leaf Extract (3.5 ml), Sugarcane Extract (3.5 ml), and Neem Extract (2.1 ml) to the water mixture. Stir well to combine the extracts with the water.

4. Add Surfactant (Sodium Lauryl Sulphate)

Slowly add Sodium Lauryl Sulphate (SLS, 10.5 ml) into the mixture. This is the main cleansing agent of your shampoo, so ensure it is well dissolved into the water-based solution. Stir gently to avoid foam formation, but make sure the SLS is completely incorporated.

5. Add Glycerine

Add Glycerine (3.5 ml) to the mixture. Glycerine is a humectant that will help retain moisture, preventing the hair and scalp from drying out. Stir thoroughly to make sure the glycerine is evenly mixed in.

6. Add Methyl Paraben

Add Methyl Paraben (0.21 ml) as a preservative. This will help prevent microbial growth and extend the shelf life of the shampoo. Ensure that it dissolves well in the solution. If necessary, warm the mixture slightly to help the paraben dissolve, but do not heat it too much as that might affect the stability of the other ingredients.

7. Add Vitamin E Oil

Open 1 Vitamin E capsule and add the oil to the shampoo mixture (0.5 ml). Vitamin E is an antioxidant and will nourish both the scalp and hair, promoting healthy growth and adding a protective layer to the strands. Stir the mixture gently to evenly distribute the Vitamin E oil throughout the shampoo.

8. Mix Well

Stir the entire mixture thoroughly to ensure that all ingredients are well incorporated. Make sure there are no lumps, especially from the SLS or Methyl Paraben.

9. Check pH Level

The ideal pH for a shampoo is between 4.5 and 5.5, which is close to the natural pH of the scalp. You can check the pH using pH test strips. If the pH is too high (alkaline), you can adjust it by adding a small amount of citric acid (a pinch) to bring it down to the ideal range. Mix well after adjusting the pH.

10. Packaging

Pour the shampoo into a sterilized 70 ml bottle. Ensure the bottle is clean and free of contaminants. Seal the bottle tightly.

11. Storage

Store the shampoo in a cool, dry place away from direct sunlight. Use within 2-3 months, or as recommended by the preservative (Methyl Paraben), as it will help prevent bacterial growth and maintain the shampoo's effectiveness.[10]

Evaluation Parameter:

1. **Physical Characteristics:**

Colour: The shampoo should have a uniform, consistent colour, which may vary depending on the herbal extracts used but should be free of any obvious impurities or discoloration.

Odor: The fragrance should be pleasant and natural, derived from the rose water and herbal extracts. There should be no overpowering or unpleasant chemical odours.

Viscosity: The shampoo should have a smooth, medium viscosity (not too runny or too thick), which makes it easy to apply to the scalp and hair. The ideal viscosity will depend on user preferences but should generally fall within a range suitable for a shampoo product (typically 1000-3000 cP, centipoise).[11]

2. **pH Level:**

Ideal Range: The pH of the shampoo should ideally be between 4.5 and 5.5, which is close to the natural pH of the scalp and hair.

Testing Method: Use pH test strips or a pH meter to ensure the shampoo falls within this range. If the pH is too high (alkaline), it may strip hair of natural oils, and if it's too low (acidic), it may cause scalp irritation.[12]

3. **Foam Quality:**

Foam Stability: The shampoo should produce a stable, rich lather when applied to wet hair. The foam should not dissipate quickly.[13]

4. **Solubility:**

Solubility refers to the ability of a substance (usually an active ingredient) to dissolve in the shampoo base, ensuring that the product is homogeneous and effective.[11]

5. **Density :**

The typical density of a shampoo formulation is generally around **1.00 to 1.10 g/cm³** (grams per cubic centimeter). Since your shampoo contains **water, glycerine, herbal extracts**, and **Sodium Lauryl Sulfate**, which are denser than water, the expected density of your shampoo could fall in the **1.05–1.08 g/cm³** range.[14]

6. **Scalp Health and Irritation Test:**

Scalp Comfort: The shampoo should be gentle on the scalp and should not cause irritation, redness, or itching.[13]

Result and Observation:

Sr No.	Parameters	Observation
1	Color	Yellowish white
2	Odor	Pleasant and Natural
3	Viscosity	Smooth, medium viscosity
4	PH	5.6 (Acidic)
5	Foam	Stable
6	Skin Irritation Test	No irritation
8	Density	1.10 g/cm³
9	Solubility	Insoluble in water

Conclusion:

The herbal shampoo made with Bay Leaf, Sugarcane, Neem, Rose Water, Sodium Lauryl Sulphate, Glycerine, Methyl Paraben, and Vitamin E should provide the following expected results:

Cleansing: Effectively removes oils and dirt without stripping moisture.

Moisturizing: Leaves hair soft, hydrated, and shiny.

Scalp Health: Soothes and maintains scalp health with no irritation.

Stability: Remains stable for several months with proper storage.

Safety: Gentle enough for sensitive scalps with no irritation or allergic reactions.

By adhering to these evaluation parameters, you ensure the quality, safety, and performance of your herbal shampoo, making it suitable for consumer use.

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13. Research Articles and Journals such as the International Journal of Cosmetic Science and Journal of Surfactants and Detergents often publish studies that look at the density and other physical properties of shampoo formulations.