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# AN HERBAL AND CHEMICAL SHAMPOO FORMULATION, ASSESSMENT, AND COMPARISON

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**Abstract**
In this research, we created and evaluated pure chemical and herbal shampoos based on information gathered from various sources. The herbal shampoo was prepared by combining extracts from Hibiscus leaves, Henna Leaf, Neem Leaf, Amla fruit, Shikakai fruit, Rita Fruit, Aloe Vera leaf, Lutrous, Soya milk, and other ingredients, which were decocted with water. Guar gum was added to thicken the shampoo. Additionally, a chemical shampoo was formulated using ingredients such as Sulfur, Benzoic Acid, Sodium lauryl Sulphate, Salicylic Acid, Urea, Citric Acid, Sodium EDTA, Guar Gum, Tween-80, and Distilled water.

To determine the physical properties of both shampoos, including pH, solid content percentage, rheological evaluation, skin sensitization test, wetting time, foam amount and stability, surface tension, detergency, and soil dispersion after washing, various tests were conducted. These tests aimed to assess the physicochemical characteristics of the formulated and chemical shampoos.

**Keywords**: Shampoo, Herbal formulation, Chemical formulation, Evaluation, Rheology

## INTRODUCTION

Since time immemorial Shampoo has been used by humans to clean their hair. The most likely application for shampoo as cosmetics. It is a product for hair care that we use on a daily basis to clean the scalp and hair[1]. Often used as beautifying agents and are a viscous solution of detergent with suitable additives preservatives and active ingredients. It is generally useful in wet hair, hair straightening and rinsing with water. The objective of using both shampoos is to remove dirt that accumulates on the hair without separating the sebum. Herbal shampoos belong to the consistency

criteria, depending on the nature of the ingredients, they can be simple or plain shampoo, antiseptic or anti-dandruff shampoo and nourishing shampoo. containing vitamins, amino acids, and proteins hydrolysate. The selection of active ingredients for hair care powders is based on the ability of the ingredient to prevent skin damage and Improve skin quality by cleansing, nourishing and protecting the skin. Some of these additives have to be added to a shampoo formulation to increase its stability and safety herbal shampoo is the type of skin cleanser, but the hair cleansing preparations can be grouped into solely one category and are referred to as shampoo[2,3]. They are water-based total products containing the main surfactants. Its Primary characteristic is of cleaning the hair and grooming preparations. Although herbal shampoos are higher in performance and safer than Chemical ones but will be popular among consumers.

Producing shampoos without side effects has always been a challenging goal for the cosmetic industry. Another noteworthy consideration is the price of such shampoos. Awareness has been created among people in the cosmetic industry for more use of herbal products, nutraceuticals and medicines for good living. Now the cosmetic industry and market are driven by a fundamental change in demand for herbal-based products. Many researchers and scholars have found that some common kitchen ingredients, some properties in search of a safe and effective cosmetic product[4].

## Materials and methods

### Sample collection for herbal shampoo

All plant powder materials were obtained from Shyamtganj Local market of Bareilly, India and were identified and authenticated by a botanist of Forest Research Institute Deemed University Dehradun.

**Table No. 1:** Quantity Taken for different herbal shampoo formulation

| Ingredients | F1 (g) | F2 (g) | F3 (g) | F4 (g) | F5 (g) |
|---|---|---|---|---|---|
| Hibiscus Powder | 3 | 3 | 4 | 4 | 3 |
| Neem Powder | 8 | 5 | 6 | 7 | 4 |
| Heena Powder | 4 | 5 | 5 | 4 | 4 |
| Amla Powder | 15 | 14 | 13 | 12 | 11 |
| Shikakai Powder | 9.5 | 10 | 10.5 | 11 | 11.5 |
| Rita Powder | 9.5 | 10 | 10.5 | 11 | 11.5 |
| Alovera Gel | 15 | 14 | 13 | 12 | 13 |
| Banyan Powder | 10 | 10 | 10 | 12 | 12 |
| Soya milk | 15 | 15 | 15 | 15 | 15 |
| Guar Gum | 2 | 2 | 2 | 2 | 2 |
| Sandalwood | 3 | 3.5 | 4 | 3.5 | 4 |
| Almond | 6 | 5 | 6 | 5 | 6 |

**Decoction Method**: Weighed all the ingredients according to the formula. Decoction of Amla, Retha, and Shikakai Powders, prepared in one part of water. Filter it, by using a muslin cloth. Collect filtrate. Decoction of Shikakai and Retha was prepared in another part of the water. Filter it by using a muslin cloth. Collect filtrate. Mixed of above filtrate with constant stirring. Mixed gaur gum as a thickening agent for maintenance of consistency of herbal shampoo as like semisolid nature. Preservatives and perfume were added lastly.

### Preparation of Chemical shampoo[5,6]

The chemical shampoo was formulated using a simple mixing process. Formulations were made using two anti-dandruff agents such as Sulphur and benzoic acid. The other ingredients used are sodium lauryl sulphate as a surfactant, urea as a solubilizing agent, citric acid as a sequestering agent, sodium ethylene diamine tetra acetic acid as a chelating agent, guar gum as a foam stabilizing agent and thickening agent, tween 80, and distilled water as vehicle.

**Table No. 2:** Quantity Taken for different chemical shampoo formulation

| Ingredients | F1 (g) | F2 (g) | F3 (g) | F4 (g) | F5 (g) |
|---|---|---|---|---|---|
| Sulphur | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 |
| Salicylic acid | 1.75 | 1.5 | 1 | 0.75 | 0.5 |
| Benzoic acid | 1 | 1.25 | 1.50 | 1.75 | 2 |
| Sodium lauryl sulphate | 20 | 20 | 20 | 20 | 20 |
| Urea | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 |
| Citric acid | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| Sodium EDTA | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 |
| Guar gum | 2 | 2 | 2 | 2 | 2 |
| Tween-80 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| Distilled water | Up to 100 ml | Up to 100 ml | Up to 100 ml | Up to 100 ml | Up to 100 ml |

**Evaluations of shampoo developed with herbs and chemicals[7,8,9,10]**

**Visual examination and physical appearance**

Both prepared shampoos were tested in different formulations for clarity, foam-producing capacity, and foam ability.

**Calculation of pH**

1% and 10% diluted shampoo solutions in distilled water were used to test the pH of both shampoos at room temperature (25°C).

**Calculate the proportion of solid contents.**

Weighing 4 grammes of shampoo in a dry Petri dish, evaporating both shampoos on a hot plate, and then weighing the shampoo after the liquid component had evaporated allowed us to determine the percentage solids content.

**Rheological assessment**

How to rationally set the viscosity parameter to make sure the shampoo lives up to client expectations. The richness or creaminess of the shampoo will depend on those particular rheological characteristics. A Brookfield viscometer was used to measure the shampoos' viscosity. The spindle is submerged in 10ml of shampoo for roughly 5 minutes before the reading is taken.

**Surface tension measurement**

A 10% shampoo dilution in distilled water was used for the measurements, which were done at a temperature of 25 °C. Use purified water and chromic acid to clean a stalagmometer. because surface tension is greatly influenced by grease or other lubricants. The information is computed by using the equation shown below:

**$R2 = (W3-W1)\, n1/(W2-W1)\, n2 \times R1$**

**Where**

W1= empty beaker weight
W2= Beaker + Distilled water weight
W3= Beaker + Shampoo
n1= No. of drops of distilled water
n2 = No. of dops of shampoo\
R1=Distilled water surface tension
R2= Shampoo surface tension

**Foaming ability and foam stability**

The ability to produce foam was assessed using the cylinder shake method. A 250 ml graduated cylinder was filled with 50 ml of 1% shampoo solution, and it was shaken ten times. Following a

minute of shaking, the total quantities of the foam contents were noted. The foam value was computed immediately following the recording of the volume of foam for 4 minutes at intervals of 1 minute.

**Dirt dispersion test**[14]

In a test tube, add 2 drops of shampoo and 10 ml of distilled water to make the desired volume. Finally, one drop of Indian ink is added to the water, and the test tube is shaken ten times. The amount of ink in the foam was meticulously measured.

**Wetting time test**[15]

The wetting time test was carried out by timing how long it took the disc to submerge in the shampoo mixture. If the disc sinks more quickly, wetting efficiency is deemed to be higher. The formulated shampoo showed a good wetting time of only 3 sec.

**Antimicrobial activity against *Staphylococcus aureus***

he cup-plate method with the agar medium was used to test the antibacterial activity of the produced shampoo formulations F1 through F5. Its antibacterial action was investigated using 1% anti-dandruff shampoo. Following that, the Petri plates were sealed with Parafilm and incubated for 24 hours at 37°C. Formulation F4 was more successful than other formulations at observing the zone of inhibition.

**Results and discussion**

The many formulations of herbal and Chemical shampoo were created, and various evaluation criteria are described, including:

**Physical appearance:** The colour of the herbal formulation is dark brown, while the colour of Chemical shampoo is light yellow.

**Table No. 3:** Physical appearance, pH and % solid content of shampoo

| **Physical appearance, pH and % solid content of shampoo** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Herbal Shampoo** | | | | | **Chemical Shampoo** | | | | |
| **Formulation** | F1 | F2 | F3 | F4 | F5 | F1 | F2 | F3 | F4 | F5 |
| **Physical appearance** | Dark brown | Dark brown | Dark brown | Dark brown | Dark brown | Pale yellow | Pale yellow | Pale yellow | Pale yellow | Pale yellow |
| **pH** | 5.51 | 5.58 | 5.72 | 5.65 | 5.21 | 6.1 | 6.5 | 6.3 | 6.5 | 6.2 |
| **% Solid** | 21.11 | 22.51 | 24.53 | 24.22 | 26.1 | 27.9 | 27.3 | 27.5 | 28.2 | 26.5 |

**The pH of the Shampoo**[11]

Because pH can irritate the eyes and the skin while also being necessary for healthy, lustrous hair and tightness of the scalp, it is a crucial factor in the evaluation of shampoos. Because alkaline shampoos typically cause the scalp to swell and open up, cosmetic manufacturers offer a wide pH range of shampoos rather than a set pH value. Yet, emerging trends indicate that mildly acidic pH shampoos are becoming more popular with customers. Chemical shampoos have a pH range of 6.1-6.5, which is near to the skin pH, while shampoos made with herbs have a pH range of 5.21-6.1, as shown in the table.

**Determine the % of solid contents**[12]

If there are too many solids in the shampoo, it is difficult to apply it to the hair; nevertheless, if there aren't enough granules, the shampoo is too watery and washes out rapidly. A decent shampoo has 20–30% solids. The percentage of solids in our herbal shampoo formulation ranges from 21.11 to 27.9, whereas the chemical formulation has a figure of 26.5 to 28.2.

**Rheological evaluation[13]**

Since the samples' viscosity progressively varies as rpm increases, the rheological evaluation's findings indicated that the shampoo compositions were time-dependent. Around 35.18 dynes/cm of surface tension decrease was measured in the produced shampoo. The decrease of surface tension is one of the detergency property's mechanisms, and this will be the indicator of a good detergency impact of the shampoo. This may be accomplished by lowering water's surface tension from 72.8 dynes/cm to 32–37 dynes/cm.

**Discussion**

The study presented a comparison between herbal shampoo formulations and chemical shampoo formulations. The herbal shampoo was prepared using extracts of various plants such as Hibiscus leaves, Henna Leaf, Neem Leaf, Amla fruit, Shikakai fruit, Rita Fruit, Aloe Vera leaf, Banyan Powder, Soya milk, and other ingredients. On the other hand, the chemical shampoo was formulated using ingredients like Sulfur, Benzoic Acid, Sodium lauryl Sulphate, Salicylic Acid, Urea, Citric Acid, Sodium EDTA, Guar Gum, Tween-80, and distilled water.

Several evaluations were conducted to assess the physicochemical properties of both types of shampoos. These evaluations included visual examination and physical appearance, pH measurement, percentage of solid content, rheological assessment, surface tension measurement, foaming ability, foam stability, dirt dispersion test, and wetting time test. Additionally, the antimicrobial activity of the shampoos against Staphylococcus aureus was also evaluated.

The results indicated that the herbal shampoo had a dark brown color, while the chemical shampoo had a pale-yellow color. The pH of the herbal shampoo ranged from 5.21 to 6.1, while the chemical shampoo had a pH range of 6.1-6.5. The percentage of solid content in the herbal shampoo formulations ranged from 21.11% to 27.9%, and in the chemical shampoo formulations, it ranged from 26.5% to 28.2%.

The rheological evaluation showed that the shampoo compositions were time-dependent, and the surface tension measurements indicated a decrease in surface tension, which is associated with good detergency. The foam-forming ability and stability, as well as the dirt dispersion and wetting time, were also evaluated, providing insights into the performance of the shampoos.

**Conclusion**

Overall, the study aimed to compare the physicochemical properties of herbal and chemical shampoos. It highlighted the differences in color, pH, solid content, rheological characteristics, surface tension, foaming ability, dirt dispersion, wetting time, and antimicrobial activity between the two types of shampoos. The findings suggest that both herbal and chemical shampoos have their own unique properties and characteristics, and the choice between them may depend on individual preferences and requirements.

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