



FORMULATION AND EVALUATION OF TEA TREE HERBAL SHAMPOO IN THE MANAGEMENT OF DANDRUFF

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Abstract:

Shampoo is essential for removing surface oil and dirt from the hair shaft and scalp. Shampoo's principal function is to perform cleaning or detergent activity. However, the foamy property of shampoo is important in its acceptance. Shampoo is perhaps the most significant cosmetic product used in everyday life; hence it has the biggest market share among hair care products. The formulation and evaluation of pure herbal shampoo is the goal of this study since synthetic shampoo can have a number of negative effects on the hair and scalp. Tea tree, mentha, neem, tulsi, shikakai, reetha, black cumin, lavender oil, gelatine tested for organoleptic, foam test, pH determination, and surface tension measurement were used to make the herbal shampoo. The shampoo has healthy elements including polyphenol, flavonoids, saponins, vitamins, antioxidants, tannins, and volatile oils that have antibacterial, antioxidant, and anti-hair fall properties. These compounds boost the shampoo's cleaning capacity and encourage the growth of healthy hair. The advantages of using herbal cosmetics, which prevent allergic reactions and have minimal adverse effects. As a result, in the current work, we discovered the herbal shampoo to have good capabilities and further optimised explore the advantages of herbal shampoo on human utilised as a beautifying agent.

Key Words:

foamy property, pH determination, surface tension measurement, antibacterial, antioxidant

Introduction:

1.1 Hair Anatomy:

Hair is an essential component of human attractiveness. It is a protein filament that arises from dermal or skin follicles. It is one of the distinguishing features of animals. Aside from patches of glabrous skin, the human body is covered in follicles that generate dense terminal and fine vellus hair¹. Hair is composed of 95% keratin, a fibrous, helicoidal protein (formed like a helix) that is found in the skin and all its attachments (body hair, nails etc.)².

1.2 Dandruff:

Dandruff is becoming the most prevalent and serious hair problem. The term dandruff is a mixture of the words 'tan' which means 'tetter' and 'drof' which means 'dirty'³. Dandruff is a chronic scalp ailment characterised by scaling, itching, and redness of the scalp caused by the loss of epidermal cells. Dandruff is a group of coenocytes that stick together and detach from the surface of the stratum carenum⁴. However, the true source of dandruff is a yeast-like fungus called *Malassezia globosa*, which grows on our scalp and feeds on skin oils⁵. A yeast overgrowth can induce dandruff with shedded skin. This occurs because the *Malassezia* fungus employs an enzyme called lipases to digest the oils, producing oleic acid as a byproduct (pro-inflammatory free fatty acids). In vulnerable individuals, this fatty acid penetrates the top layer of the scalp, causing irritation and increased skin cell flaking⁶. *Malassezia* (previously *Pityrosporum*) is a fungus genus. *Malassezia* can be found naturally on the skin surfaces of many animals, including humans⁷.

1.3 Materials

1.3.1 Tea tree

Common name: Tea plant, Tea shrub

Botanical name: *Camellia sinensis*

Family: Theaceae

Genus: *Camellia*

Species: *C. sinensis*

Benefits:

- prevents dandruff and lice
- aids in acne treatment
- avoids skin infections
- It protects against skin cancer
- decreases hair loss⁸

1.3.2 Reetha

Common name: Soap nut, Soap berry, aritha, washnut

Botanical name: *Sapindus mukorossi*

Family: Sapindaceae

Genus: *Sapindus*

Species: *S. mukorossi*

Benefits:

- Reetha is utilised as the major ingredient in soaps and shampoos for cleaning hair since it is beneficial to hair health⁹.
- It is a common plant in the Ayurvedic list of herbs and minerals and is used as a significant element in cleansers and shampoos.
- It is also used to remove lice from the scalp since it has moderate insecticidal properties.

- The plant is renowned for its antibacterial effects that are useful to septic systems.
- It has also been used for washing and whitening cardamoms, which helps to improve their colour and flavor¹⁰.

1.3.3 Neem

Common name: Neem, Nim, Margosa

Botanical name: *Azadirachta indica*

Family: Meliaceae

Genus: *Azadirachta*

Species: *A. indica*

Benefits:

- Neem has an anti-inflammatory function that aids in the reduction of acne.
- Neem is high in Vitamin E, which aids in the healing of damaged skin cells.
- *Azadirachta Indica* contains antifungal and antibacterial characteristics that help eradicate dandruff and strengthen your hair.
- Neem has a scientifically proved antifungal property that aids in the treatment of fungal infections.
- Neem washes and pastes may be used to eliminate germs, bacteria, dirt, and other impurities from our skin, hence reducing rashes and skin illnesses.
- It aids in the removal of dead skin cells from the skin's surface, hence preventing the formation of blemishes¹¹.

1.3.4 Mentha

Common name: Mint, Pudina

Botanical name: *Mentha piperita L., Mentha spicata*

Family: Lamiaceae

Genus: *Mentha*

Species: *M. officinalis, M. piperita, M. spicata*

Benefits:

- Nutritious.
- May help with Indigestion.
- May enhance brain function.
- Breastfeeding Pain May Be Reduced.
- Can conceal bad breath¹².

1.3.5 Shikakai

Common name: Shika, Seekaaya, Soap pod

Botanical name: *Acacia concinna*

Family: Fabaceae

Genus: *Acacia*

Species: *A. concinna*

Benefits:

- Shikakai can make our hair soft and shiny.
- Heals our scalp and prevents the agony of a dry scalp.

- Fight stubborn dandruff with shikakai.
- Shikakai promotes hair growth.
- Shikakai delays greying of hair.
- Works on hair lice.
- Works as a natural hair cleanser¹³.

1.3.6 Tulsi

Common name: Tulsi, Holy Basil

Botanical name: *Ocimum tenuiflorum*

Family: Lamiaceae

Genus: Basil

Species: *O. tenuiflorum*

Benefits:

- Soothes and nourishes the scalp.
- Reduces hair greying.
- Reduces frizz and makes hair easier to handle.
- Fights dandruff and soothes itching.
- Cleans the scalp and roots.
- Promotes the development of silky, healthy hair.
- Deeply cleanses the skin¹⁴.

1.3.7 Black cumin

Common name: Kalongi, Kala jeera, Nigella, Shahi jeera

Botanical name: *Nigella sativa*

Family: Nigellaceae

Genus: Nigella

Species: *N. sativa*

Benefits:

- Promotes hair growth.
- Prevents premature greying.
- Repairs hair damage.
- Prevents hair loss.
- Conditions dry hair.
- Promotes scalp health¹⁵.

1.3.8 Lavender oil

Common name: Lavender oil

Botanical name: *Lavandula angustifolia*



Family: Lamiaceae

Genus: Lavandula

Species: L. angustifolia

Benefits:

- Soothe Scalp Irritation & Itching.
- Lavender oil contains analgesic and anti-inflammatory qualities that can soothe any sensitive skin.
- Promotes hair growth.
- Keep lice at bay.
- Struggles with hair loss¹⁶.

1.3.9 Gelatin

Benefits:

- Gelatin is an excellent approach to immediately thicken hair, since it coats each strand and adds volume with the first application.
- Strong bodily tissues.
- Gelatin has a high protein content in its finest, powdered form.
- Skin care products.
- Blood sugar control¹⁷.

1.4 Herbal shampoo

Shampoo is essential for removing surface oil and dirt from the hair shaft and scalp. Shampoo's principal function is to perform cleaning or detergent activity. However, the foamy property of shampoo is important in its acceptance. Numerous herbal extracts have proven to be beneficial in treating illnesses of the scalp layer¹⁸. Reetha is a natural surfactant, Tea tree is an anti-fungal agent, Neem and Black cumin are anti-dandruff agents, Mentha is a cooling, Gelatine is a thickening, Shikakai is a colouring agent, and Tulsi and Lavender oil are preservatives. These herbal extracts contain phytochemicals that encourage hair development¹⁹.

1.4.1 Ideal characteristics of herbal shampoo:

- It should effectively and thoroughly remove dust and excess sebum.
- Hair should be washed efficiently.
- Should generate a lot of foam.
- Rinsing with water should readily remove the shampoo.
- Hair should be non-drying, silky, shiny, and manageable.
- Should not cause the hand to become rough and chapped.
- There should be no negative effects or irritation to the skin or eyes^{20,21}.

Benefits:

- Promotes hair growth and prevents hair loss.
- Strengthens hair.
- Provide nutrition to our hair follicles.
- Hair is shiny and silky²².

So, I planned to create an anti-dandruff shampoo utilising plant extracts and its physicochemical properties.

Methodology**Table No.01: List of herbs used**

Name of herbs used	Uses of herbs
Tea tree oil	Antifungal activity.
Reetha	Used as a natural surfactant.
Neem	Cleanses and hydrates the scalp. Anti-dandruff treatment. Encourages hair growth.
Mentha	Used as a Cooling agent that improves circulation.
Shikakai	Imparts colour.
Tulsi	Hair follicles are strengthened. Antimicrobial activity.
Black cumin	Anti-dandruff treatment. It also keeps hair from falling out. Prevents premature hair greying.
Gelatin	It is a wonderful way to instantly thicken hair.
Lavender oil	Hair growth that is antimicrobial.

Table No.02: Formulation

Sl. No	Ingredients	Quantity
1.	Tea tree oil	3 ml
2.	Reetha	25 ml
3.	Neem	4 ml
4.	Mentha	3 ml
5.	Shikakai	2 ml
6.	Tulsi	3 ml
7.	Black cumin	6 ml
8.	Gelatin	2 gm
9.	Lavender oil	2 ml

Materials and Methods**Crude drugs**

1. Tea tree oil
2. Reetha
3. Neem
4. Mentha
5. Shikakai
6. Tulsi
7. Black cumin
8. Gelatin

9. Lavender oil

Collection methods

All medicinal herbs, including Tea tree oil, Reetha, Neem, Mentha, Shikakai, Lavender oil, Tulsi, Black cumin, and Gelatin were collected for the Herbal anti-dandruff shampoo study. The plant specimen was obtained from a local market and Pharmacognosy laboratory.

Extraction methods²³

1. Reetha extraction:

- 35 gm of Reetha fruits were precisely weighed.
- 100ml of water was added to the Reetha fruits.
- Stirred thoroughly.
- And boiled in a water bath for 60 minutes.
- It was afterwards cooled.
- The solution was then filtered and collected.



a) Extraction of Reetha

b) Extract of Reetha

Fig.no.1: - Extraction and Extract of Reetha

2. Neem extraction:

- 8.5 gm of Neem powders were precisely weighed.
- 50 ml of water was added to the Neem powders.
- Stirred thoroughly.
- And boiled in a water bath for 45 minutes.
- It was afterwards cooled.
- The solution was then filtered and collected.



a) Extraction of Neem

b) Extract of Neem

Fig.no.2: - Extraction and Extract of Neem

3. Mentha extraction:

- 12 gm of Mentha leaves were weighted.
- 35 ml of water was added to the Mentha leaves.
- Stirred thoroughly.
- And boiled in a water bath for 30 minutes.
- It was afterwards cooled.
- The solution was then filtered and collected.



a) Extraction of Mentha

b) Extract of Mentha

Fig.no.3: - Extraction and Extract of Mentha

4. Shikakai extraction:

- 25 gm of Shikakai were precisely weighed.
- 150 ml of water was added to the Shikakai.
- Stirred thoroughly.
- And boiled in a water bath for 45 minutes.
- It was afterwards cooled.
- The solution was then filtered and collected.



a) Extraction of Shikakai

b) Extract of Shikakai

Fig.no.4: - Extraction and Extract of Shikakai

5. Tulsi extraction:

- 7.5 gm of Tulsi powders were precisely weighed.
- 50 ml of water was added to the Tulsi powders.
- Stirred thoroughly.
- And boiled in a water bath for 45 minutes.
- It was afterwards cooled.
- The solution was then filtered and collected.



a) Extraction of Tulsi

b) Extract of Tulsi

Fig.no.5: - Extraction and Extract of Tulsi

6. Black cumin extraction:

- 25 gm of Black cumin seed were precisely weighed.
- 100 ml of water was added to the Black cumin seed.
- Stirred thoroughly.
- And boiled in a water bath for 60 minutes.
- It was afterwards cooled.
- The solution was then filtered and collected.



a) Extraction of Black cumin b) Extract of Black cumin

Fig.no.6: - Extraction and Extract of Black cumin

Method of preparation²³:

The following steps are involved in the preparation of herbal antidandruff shampoo:

- **Collection of materials-** All the plant ingredients were collected from an Ayurvedic shop and laboratory and washed thoroughly and dried.
- **Weighing-** All the ingredients were precisely weighed and steeped in water overnight.
- **Decoction preparation-** On medium heat, boil the all ingredients in the same water used for soaking, then cool and filter.
- The solution was then gently swirled after thickening agents were introduced.
- Later Preservatives, colouring agents, and fragrance agents are added to the mixture and carefully mixed.

Finally, the herbal antidandruff Shampoo was prepared by a simple mixing technique and stored in a container. The shampoo contains Reetha as a surfactant, Neem and black cumin as anti-dandruff agents, Gelatin as a thickening agent, Tulsi as an anti-bacterial agent, Tea tree as an anti-fungal agent, Menthol as a cooling agent, Shikakai as a colourant, and Lavender oil as a perfume.

Evaluation of Herbal antidandruff Shampoo²³:

Prepared shampoo was evaluated for product performance, which included physicochemical factors.

1. Physical parameters/Organoleptic evaluation/visual assessment:

The physical properties of the prepared herbal shampoo, such as colour and odour, were assessed.

2. Determination of pH:

1ml of manufactured shampoo was diluted with 10ml of distilled water, and the pH of the shampoo was determined at room temperature using pH paper.

3. Solubility check:

2ml of shampoo was added to 100ml of water, and the resulting solution was stirred and heated to increase solubility. After 10 minutes, the solution was cooled and the amount of residue was measured.

4. Cleansing action:

1 g of grease is smeared on non-adsorbent cotton and kept in a conical flask with 1% shampoo solution. The conical flask is mechanically shaken for 1 hour. Cotton is gathered, weighed, and dried. The amount of grease removed is calculated using the following equation:

$$DP=100(1-T/C)$$

Where,

C - Weight of grease in control sample

T - Weight of grease in test sample

DP- Percentage of detergency power

5. Determination of percentage solid content:

A clean, dry China dish was weighed, and 4 mL of shampoo was applied. The weight of the dish and shampoo was recorded. Shampoo's precise weight was determined. Place the China dish with shampoo on a hot plate until all the liquid has evaporated. The weight of the shampoo (solids) after drying was determined.

6. Stability studies:

It was done by storing the prepared shampoo in a closed container in a cool, dry area for three days. Colour and texture changes in shampoo were detected during a certain time period.

7. Foam determination:

For foam determination, the cylinder shaking method was applied. 50ml of 5% shampoo solution was placed in a 250 ml measuring cylinder and shaken for 12 times (inverted and reverted position). The cylinder was then set aside for 60 seconds.

8. Nature of hair after washing:²⁴

Individual volunteers' reactions to the nature of their hair after washing with prepared shampoo were observed.

Result

Evaluation of Herbal antidandruff Shampoo:

1. Physical Appearance / Visual Inspection:

The shampoo was found to be smooth with elegant appearance.

Colour: Brick red

Odour: pleasant smell



Fig.no.7: - Antidandruff Shampoo

2. Determination of pH:

The pH of herbal shampoo has been demonstrated to be crucial in improving hair quality, reducing eye discomfort, and regulating the scalp's ecological balance. Followers of herbal shampoo are the current trend. One method for reducing hair damage is to adjust the pH. Mild acidity reduces swelling and promotes scale tightness, resulting in shine. As can be seen in the table below, all the shampoos were acid balanced, with pH levels ranging from 6.7 to 7.3, which were close to the pH of the scalp.

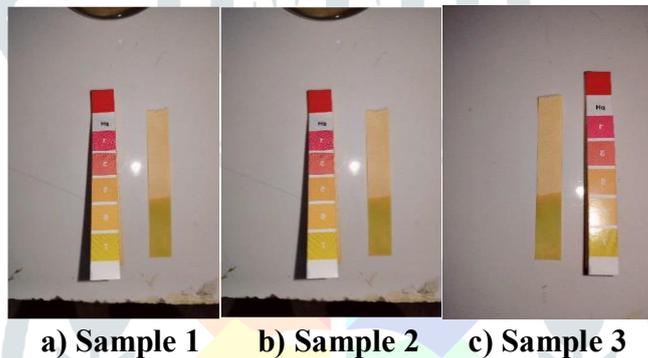


Fig.no.8: - Determination of pH

Table No.03: Table showing in formulation and pH

Sl. No	Formulation	pH
01	Sample 1	6.7
02	Sample 2	7.1
03	Sample 3	7.3

3. Solubility check:

The shampoo was water soluble. As a result, the shampoo was simple to apply to the hair.



Fig.no.9: - Solubility

4. Cleansing action:

When compared to the marketed formulation, the detergency ability was found to be between 30-33%.



Fig.no.10: - Cleansing action

Table No.04: Cleansing action

Sl. No	Formulation	Cleansing (%)
01	Sample 1	31.27
02	Sample 2	32.46
03	Sample 3	32.69

Natural shampoo's forming capacity is often thought to be inferior to that of synthetic shampoo. However, the study shows that a mixture of natural surfactants, such as reetha, at an optimal concentration may generate enough foam for shampoo. These results may demonstrate the ability of natural surfactants such as reetha in optimal concentrations to substitute harsh synthetic detergents. The anti-dandruff action of the formulated formulation was shown to be effective.

5. Determination of percentage solid content:

A clean, dry China dish was weighed, and 4 mL of shampoo was applied. The weight of the dish and shampoo was recorded. Shampoo's precise weight was determined. Place the China dish with shampoo on a hot plate until all the liquid has evaporated. The weight of the shampoo (solids) after drying was determined.

Table No.05: % Solid content

Sl. No	Formulation	%Solid content
01	Sample 1	34.31
02	Sample 2	35.48
03	Sample 3	39.26



Fig.no.11: - Determination of percentage solid content

6. Stability studies:

The stability and acceptability of formulations' organoleptic qualities during storage suggested that they are chemically and physically stable. For three days, the shampoo was monitored for physicochemical changes. There was no discernible difference. The shampoo was found to be stable.

7. Foam determination:

Although foam creation has nothing to do with shampoo cleaning action, it is critical to the customer and hence an essential criterion in shampoo evaluation. The shampoo produced a lot of foam.

Sl. No	Number of tests containing ml of solution	Height of foam in cm
01	1ml	0.7
02	3ml	1.4
03	5ml	1.9



Fig.no.12: - Foam determination

8. Nature of hair after washing:

Hair was found to be smooth and silky.

Discussion

The current study was conducted with the goal of developing an herbal anti-dandruff shampoo. The primary goal of this investigation was to develop a stable and functionally successful shampoo and to analyse the prepared shampoo for satisfactory product performance. Which was prepared using the aqueous extract of several medicinal herbs that are historically used for hair washing. Experiment findings clearly reveal a potential composition of quality upgraded herbal shampoo with a distinct aroma, colour, and cleaning, anti-dandruff, and foaming ability. On the basis of their evaluation parameters, we can conclude that the herbal shampoo formulation was more stable.

Conclusion and Outcome

Based on theoretical knowledge, an herbal anti-dandruff shampoo formulation was created. The goal of the study was to create an effective and stable product. It was discovered to be a safe and effective formula. The shampoo contains beneficial ingredients such as polyphenol, flavonoids, saponins, vitamins, antioxidants, tannins, and

volatile oils, which provide antibacterial, antioxidant, and anti-hair fall activity, enhancing the cleansing power of the shampoo and promoting healthy hair development. The demand for herbal anti-dandruff shampoo is high right now since it has fewer side effects, is less expensive, and is more effective than synthetic shampoos. The results of the experiments clearly show a promising composition of quality improved herbal shampoo with a distinct fragrance, colour, and cleansing, anti-dandruff, and foaming capacity.

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