

A Review on Formulation and Evaluation of Herbal Anti-Dandruff Shampoo

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ABSTRACT :The aim of the present study is to formulate and evaluate herbal Anti dandruff shampoo containing natural ingredients with an emphasis on safety and efficacy. It clears dirt, dandruff, promotes hair growth, luster , strengthens and darkens the hair. The shampoo sector is probably the largest unit of among the hair care products. Since the shampoos are one of the cosmetic product used in daily as the hair is special and cherished feature of humans. Majority of ingredients in the shampoos are chemicals and hence have been under severe attack due to its potential risk of side effects with its usage. The main objective is to study how to eliminate harmful synthetic ingredients from anti-dandruff shampoo formulation and substitute them with safe natural ingredients. An attempt has been made to combine modern formulation technology into a formula based on natural ingredients. The shampoo was prepared by taking the extracts of Orange peel powder (*Citrus Aurantium Dulcis-Rutaceae*) (active ingredient), Curry Leaves (*Murraya Koenigii-Rutaceae*), Ginger (*Zingiber Officinale-Zingiberaceae*), Aloe vera (*Aloe Barbadensis Miller-Asphodelaceae*), Reetha (*Sapindus Mukorossi-Sapindaceae*) in different proportions. Several physicochemical tests were performed for visual assessment, wetting time, pH, assurance of solid contents, surface tension, detergency, dirt dispersion, conditioning performance, foam stability. The formulated herbal shampoo is black in color with demonstrable good froth stability, detergency, good cleansing, low surface tension, optimum pH and conditioning activity. All these are the ideal characters for good quality of the herbal shampoo to be used in daily life. However, further scientific investigation is required for validation of its overall quality.

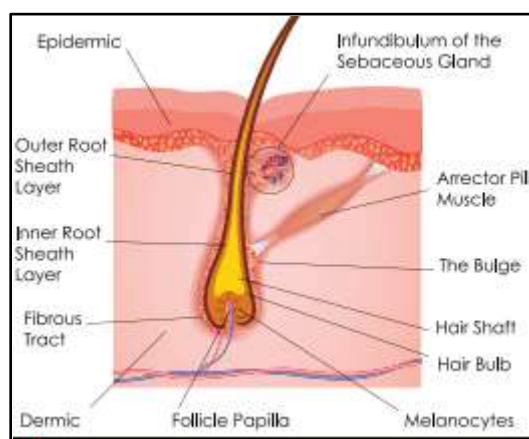
KEYWORDS : pH,Herbal shampoo, Natural ingredients, Hair,Dandruff, Cleansing action, Dirt removal

I. INTRODUCTION :

- ▶ Hairs are the integral part of human beauty.
- ▶ Hair is a protein filament that grows from follicles on the dermis or skin.
- ▶ Scientific name of hair is pili or pilus.
- ▶ Hair is a component of the integumentary system and extends downward into the dermal layer where it sits in the hair follicle.
- ▶ The presence of hair is a primary differentiator of mammals as a unique class of organisms. In humans, it is a cherished and highly visible indicator of health, youth, and even class.
- ▶ It has a sensory function, protects from cold and UV radiation, and can have a significant psychological impact when its growth or structure is deranged.
- ▶ At a microscopic level, the variety in length, color, diameter, and cross-sectional shape of each hair creates the characteristic profiles seen across ethnic groups and among individuals.

Hair Anatomy:

▶ Hair grows from hair follicles situated within the fatty layer of the scalp. Contrary to the popular belief that hair grows as single strands, hair follicles actually grow in groups of 1-4 hairs called "follicular units".▶ At the base of each hair follicle is a hair bulb where the growth mechanism for producing hair occurs. Hair follicles get their nourishment from the blood vessels within the dermis. The cells divide and develop to produce the hair shaft.▶ While the hair is still developing underneath the epidermis, it maintains a soft form. Once the pushes past the epidermis, its outside layer hardens into keratin.



Parts of the Hair:

Dermal papillae: The dermal papilla is responsible for regulating the hair cycle and hair growth, and is also comprised of androgen receptors that are sensitive to the presence of DHT.

Matrix: The matrix surrounds the dermal papillae and contains all the active cells needed for hair growth and for the development of the different parts of the hair, particularly the outer root sheath, the inner root sheath and the hair shaft. Combined, the matrix and the dermal papillae make up the hair bulb.

Outer root sheath: The outer root sheath, or tricholemma, is the outermost part of the hair and is keratinized. It covers the entire hair follicle inside the dermis and then transitions through to the epidermis, providing the hair follicle with an opening from which to surface from.

Inner root sheath: inner root sheath is comprised of three parts: the Henley layer, Huxley layer, and cuticle. The Henley's and Huxley's layers are capsular layers that anchor onto each other with the purpose of stabilizing the hair. The cuticle, which is the innermost part that is closest to the hair shaft, is made from dead hardened cells and give the hair shaft added protection. This, together with the capsular layers that make up the Henley's and Huxley's layers, secures the hair and allows it to grow in length.

Hair shaft: The hair shaft is the solitary part of the hair follicle that fully exits the surface of the skin. The hair shaft is made up of three layers: the medulla, cortex, and the cuticle.

► The **medulla** is described as an unsystematic and unstructured area located in the innermost region of the hair shaft and is not always present. ► The **cortex**, in contrast to the medulla, is highly structured and organized. The cortex is made up of keratin and is responsible for giving hair its strength and durability, as well as its water uptake. The cortex also contains melanin and determines the color of hair based on the number, distribution and types of melanin granules present. ► The **cuticle** is the hair's outer protective layer and is connected to the internal root sheath. It is a complex structure with a single molecular layer of lipids that helps hair repel water.

HAIR PHYSIOLOGY: ► **Anagen** (growth phase): Most hair is growing at any given time. Each hair spends several years in this phase. ► **Catagen** (transitional phase): Over a few weeks, hair growth slows and the hair follicle shrinks. ► **Telogen** (resting phase): Over months, hair growth stops and the old hair detaches from the hair follicle. A new hair begins the growth phase, pushing the old hair out.



PROBLEMS RELATED TO HAIR:

- Dandruff
- Dry hair
- Split ends
- Oily hair
- Frizzy hair
- Limp hair
- Hair loss
- Heat damage
- Color damage
- Grey hair

DANDRUFF:

► It is a harmless, chronic condition that occurs when the scalp becomes dry or greasy and produces white flakes of dead skin that appear in the hair or on the shoulders.

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► Although it is harmless, dandruff can be embarrassing for those who have it. ► Skin cells are formed continuously on the scalp, so the shedding of the dead skin cells is a normal process. With dandruff, however, skin cells are shed at a faster rate than normal. Oil from the scalp causes the skin cells to clump together and appear as white flakes.



CAUSES OF DANDRUFF :

- Dry skin.
- Irritated, oily skin.
- Not shampooing often enough
- Other skin conditions:
 - A. Eczema
 - B. Psoriasis
 - C. Seborrheic dermatitis
- Malassezia-yeast like fungus
- Sensitivity to hair products (contact dermatitis)

TREATMENT :

- Follow a healthy diet.
- Avoid stress.
- Shampoo use a combination of special ingredients to control dandruff.

SHAMPOO:

A Shampoo is a preparation of a surfactant in a suitable form -liquids, solid or powder-which when used under the specified conditions will

- Remove surface grease
- Dirt and
- Skin debris

From the hair shaft and scalp without adversely affecting the user.

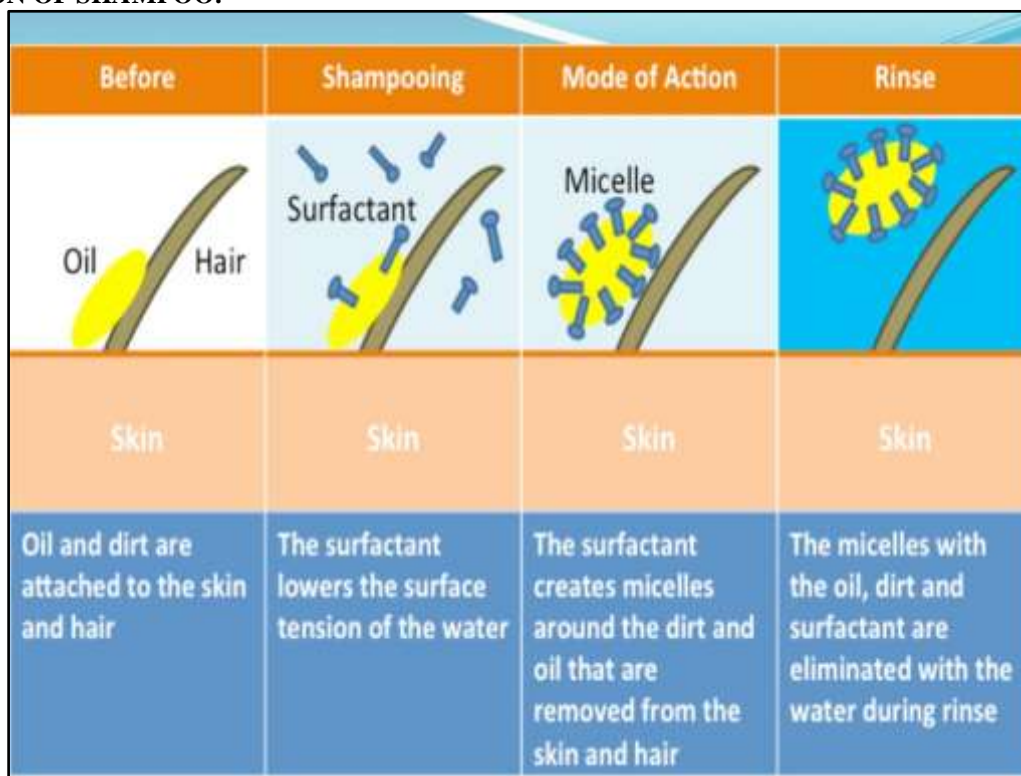
ADVANTAGES OF SHAMPOO:

- Cleansing properties
- Improving hair hygiene.
- Treating scalp conditions
- Treatment for dry scalp
- Treatment for hair loss.
- Treatment for greasing or oily hair.
- Relieves itch and irritation
- Repairs damaged hair.
- Shampoo keeps hair silky or smooth.
- Keeps your hair beautiful and blossomed.

IDEAL PROPERTIES OF SHAMPOO:

- To make the hair smooth and shiny.
- Produce good amount of foam
- Should not cause irritation to scalp ,skin and eye.
- Should completely, effectively remove dirt.
- Impart pleasant fragrance to hair.
- Good biodegradability
- Low toxicity
- Slightly acidic (ph less than 7) since a basic environment weakens the hair by breaking the disulphide bonds in hair keratin.

ACTION OF SHAMPOO:



TYPES OF SHAMPOO :

1.Powder shampoo :It is available in the form of dry powder, initially it was prepared from dry soaps, but nowadays dry synthetic detergents are used for their preparation. Powder shampoo is prepared where addition of water or other solvent reduces the activity of the components, especially in case of medicated shampoo. Nowadays, these shampoos are not used due to the difficulty experienced in their application.

2.Liquid shampoo :These are clear liquid preparations that are most widely used. They are usually made by using detergent of low cloud point. Some of these shampoos may be transparent.

3.Cream shampoo :These are called as lotion shampoos which are modification of clear liquid cream shampoos. Solubilising agents such as magnesium stearate is also used to dissolve the added opacifier.

4.Jelly shampoo :These are transparent and thick usually made by incorporating a gelling agent, (e.g., cellulose).There is great use in hair salons and beauty parlors. The principle ingredient is detergent which can be used either alone or in combination with soap. By altering the proportion of detergent, gel of required consistency can be obtained. Addition of methyl cellulose to clear liquid shampoo and its subsequent thickening also gives rise to gel shampoo.

5.Aerosol shampoo :They are called aerosol shampoos because they are packed in aerosol containers. Their formulation, preparation and packing is complicated as an additional propellant is included. The propellant added must be compatible and should not reduce the activity of shampooing ingredients. The container opening is provided with a valve. Shampoo comes out as foam when the valve is pressed. Hence also called as foam type shampoo.

6.Keratin shampoo : When your shampoo(or any hair care product) is infused with keratin oil, you reap benefits that nourish and condition the hair. This helps it look shiny and smooth. It also helps to fight frizz, tame fly always, and protect against damage caused by styling tools like a straightening iron or blow dryer.

7.Volumizing shampoo : Volumizing or volume shampoos make hair appear fuller, bouncier and more full of body. It's more about the texture of the

hair than the thickness of the hair strands. ... Instead, volumizing shampoos should be lightweight enough to not weigh down your hair, thus creating more body in the end.

8.Specialised shampoo : Speciality shampoos are marketed to people with dandruff, color-treated hair, gluten or wheat allergies, an interest in using an organic product, infants and young children ("baby shampoo" is less irritating).

A. Conditioner

B. Anti dandruff

C. Baby

D.Two layer

E.Anti hairfull

HERBAL SHAMPOO:

They are the cosmetic preparations that with the use of traditional ayurvedic herbs are meant for cleansing the hair and scalp just like the regular shampoo.

They are used for removal of oils, dandruff, dirt, environmental pollution, etc.

ADVANTAGES OF HERBAL SHAMPOO:

- ▶ Herbal shampoo are made out of pure and organic ingredients and there are no synthetic additives or surfactants are free of any side effects.
- ▶ Are bio-degradable and earth friendly.
- ▶ It doesn't cause irritation to the eyes.
- ▶ It is cost friendly,not much expensive
- ▶ Regular usage of herbal shampoo can do wonders for your hair.
- ▶ By using herbal shampoo, you can get the perfect oil balance.
- ▶ They are made out of natural essential antiseptic properties that prevent our hair and scalp from the harsh u.v rays of the sun thus preventing skin infections

FUNCTIONS OF INGREDIENTS:

Orange peel:Citrus Aurantium Dulcis,Rutaceae.It is good for itchy scalp and removes dandruff as it loaded with antibacterial agents and a high content of essential compounds like vitamin C.It will give you a nice and refreshing feel by adding good smell to your crowning glory.



Reetha :Sapindus Mukorossi-Sapindaceae, Reetha or Soapnuts is also called as Arishtak in Ayurveda and “Soap nut tree” in India. It is well known for its traditional medicinal uses and is commonly used as a hair cleanser. It is an anti hair loss shampoo, the natural antifungal and anti bacterial which may help in anti dandruff. It can be used on a daily

basis to provide nourishment to the hair scalp and promote hair regrowth. Reetha helps to control dandruff and promotes hair growth due to its Tridosha balancing property. The Tikshna (sharp) nature of Reetha also helps to keep the scalp dandruff-free.



Hibiscus : Hibiscus rosa-sinensis, malvaceae, The Hibiscus nourishes the hair follicles, softens the hair and makes it more manageable. To reap the nourishing benefits of Hibiscus for your hair, you

can use conditioners that have Hibiscus as the key ingredient. Flowers and leaves contain mucilage and plant proteins that help in treatment of anti dandruff and hair loss.



Ginger : Zingiber Officinale-Zingiberaceae, the anti-septic properties of ginger help in treating

dandruff effectively by getting rid of infections and fungus on the scalp. One of the main reasons for

dandruff is imbalance in PH. Ginger balances the PH of the scalp that ultimately helps in hair growth.



Curry leaves : *Murraya Koenigii-Rutaceae*, Curry leaves help to control dandruff. Its antifungal properties help in reducing dandruff and itchiness leaving you with a clean scalp and healthy hair. Curry leaves moisturize your scalp, promote hair

growth, and prevents dandruff. Curry leaves are rich in cell reinforcements that saturate the scalp while disposing the dead hair follicle, helps in preventing hair fall, premature hair graying, and dandruff.



Aloe vera :

Aloe Barbadensis Miller-Asphodelaceae, Aloe vera may also reduce inflammation, which can help people with dandruff symptoms, such as

itchiness. It is an antifungal and antibacterial properties of Aloe vera may prevent dandruff. It will restore the PH of scalp and increases the hair growth.



Function of other chemicals:

1) Glycerine: It helps in moisturizing of hair.



2) Sodium Chloride: It is used as a thickener.



3) Sodium lauryl sulphate (SLS): It is used as a surfactant.



4) Lemon juice: It is used as a preservative.



5) Gum (acacia): It is used to increase viscosity.



6)Castor oil: It helps for seal out moisture, reduce breakage, and protect the hair from damage



FORMULATION OF HERBAL SHAMPOO:

Formulation of the herbal shampoo was done as per the formula given in Table 1. To increase the thickness of formulation, SLS (7.5%) solution was prepared using 0.1 M NaCl. Twenty ml of the herbal extract was added to 20 ml SLS solution with 20 ml NaCl solution and mixed by shaking gently. The final volume was made to 100

ml by adding 10 ml acacia gum extract, 2 ml of glycerine and 25 ml of water. To improve aroma in the formulation, sufficient quantity (q.s.) of essential oil (castor oil) was added. The shampoo also included one capsule of Vitamin E for conditioning, activated charcoal for color and 2 ml of lemon juice as preservative.

TABLE 1: COMPOSITION OF HERBAL SHAMPOO

INGREDIENTS	QUANTITY
Herbal extract	20 ml
Sls	20 ml
0.1 M Nacl	20 ml
Acacia (gum)	10 ml
Glycerine	2 ml
Vitamin E capsules	2
Lemon juice	2 ml
Essential oil (castor oil)	q.s
Water	25 ml

Materials and methods Collection of plants:

The parts of plants like orange (peel), Reetha (fruit), Ginger (root) and Guar gum were collected from the local market. Curry patta (leaves) and Aloe vera (leaves) were obtained from nursery locally. These were washed under running water to remove contaminants. They are dried in sunlight, converted into coarse powders and sieved using 60meshes. The extracts were prepared by

decoction method and the prepared extracts were stored in well-closed containers.

Preparation of herbal extract:

5g of Curry patta powder, 5g of Ginger water, 10g of Aloe vera gel, 20g of Reetha and 5g of orange peel powder (Table 2) were mixed with 100 ml water in a stainless steel vessel. The mixture was kept for boiling until the water

reduced to one quarter. It was then filtered. The clear extract obtained was used as herbal extract .

TABLE -2:INGREDIENTS OF HERBAL EXTRACT:

PLANT	PART	QUANTITY FOR 100 MG
Curry patha	Leaves	5%(5GM)
Ginger	Root	5%(5GM)
Orange peel powder	Peel	20%(20GM)
Retha	Fruit	10%(10GM)
Hibiscus	Leaves	5%(5GM)
Aloe vera	Leaves	10%(10GM)

EVALUATION OF HERBAL SHAMPOO:

To evaluate the prepared formulations, quality control tests including visual assessment and physicochemical controls such as pH, density, viscosity, surface tension, foam volume, foam stability and wetting time were performed using standard protocols.

1. Physical appearance/visual inspection:

The formulation prepared was evaluated for the clarity, color, odor and foam producing ability and fluidity [14].

2. Determination of pH:

A 10% v/v shampoo solution was constituted in distilled water and the pH of the solution was measured by using a calibrated pH meter [15].

3. Determination of solid content percentage:

A clean dry evaporating dish was weighed and 4 grams of shampoo was added to the evaporating dish. The evaporating dish with shampoo was placed on the hot plate until the liquid portion was evaporated. The weight of the solid contents present in the shampoo was calculated after drying.

4. Wetting time:

Wetting time was calculated by noting the time required by the canvas paper to sink completely [16] . A canvas paper weighing 0.44 g was cut into a disc of diameter measuring 1-inch. Over the shampoo (1% v/v) surface, the canvas paper disc was kept and the time taken for the paper to sink was measured using the stopwatch.

5. Rheological evaluation:

The viscosity of herbal shampoo was determined by using Ostwald's viscometer . The viscosity of the herbal shampoo was measured by counting drops of herbal shampoo from the mark to bottom.

$$\eta_{sp} = \frac{t - t_w}{t_w} \times \frac{d_w}{d_y}$$

- nw: viscosity of water
- ny: viscosity of tested liquid
- dw: density of water
- dy: density of tested liquid
- tw: timing of runoff of water
- ty: timing of runoff of tested liquid

6. Dirt dispersion:

Two drops of herbal shampoo were added in a wide mouthed falcon tube containing 10ml of distilled water. 1 drop of India ink was added, the falcon tube was covered and shaken for ten times. The amount of ink in the foam was estimated as None, Light, Moderate, or Heavy .

7. Cleansing action:

The cleansing property of the herbal shampoo was evaluated by the application of the shampoo on hair that has not been washed for seven days. The shampoo was used to wash the hair of human subject that had applied oil 4-5 hours before washing. The performance of the shampoo was assessed on its ability to remove oily dirt from scalp.

8. Surface tension measurement:

Measurement was carried out with herbal shampoo through stalagometer . The principle is to measure the weight of the drops of herbal shampoo falling from a capillary glasstube, and thereby

calculate the surface tension of the fluid. We can determine the weight of the falling drops by counting them. From it we can determine the surface tension as shown below .

$$\sigma = \frac{nl}{nw} \times \frac{dl}{dw} \times \frac{tw}{\pi r}$$

- nl: no. of drops of liquid
- nw: no. of drops of water
- dl: density of liquid
- dw: density of water
- tw: 71.2 dyne/cm

9. Foaming ability & foam stability:

Cylinder shake method was used for determining foaming ability. 50ml of the 1% herbal shampoo solution was put into a 250ml graduated cylinder & the cylinder was covered with hands and shaken for 10 minutes. The total volume of the foam content after 1 minute shaking was recorded. Immediately after shaking the volume of foam at 1 minute intervals for 10 minutes were recorded. The foam volume remains same throughout the period of about 5 min showing that the generated foam by the shampoo has good stability and the prepared shampoo exhibits higher foam property which may be due to the presence of soapnut.

10. Stability Study:

The stability of the formulation was studied for a period of four weeks by keeping at temperature of 25-30°C.

11. Skin Irritation Test:

Prepared herbal shampoo was applied on skin for 5 minutes after that was washed and tested for irritation or inflammation to the skin.

12. Conditioning attributes:

The conditioning effect of the shampoo on the hair was evaluated after the hair had been washed with it. Conditioning properties include all desirable benefits imparted to the hair such as increased mass to the hair, improved lustre, softness and silkiness [21] .

13. Microbial examination:

100 microlitre of shampoo was mixed with melted Mueller Hinton agar and poured to sterile petridishes under aseptic conditions. The plates were rotated to mix thoroughly and then allowed to set. The plates were incubated at 37°C for 24 hours and observed for microbial growth .

This test was carried out to determine the susceptibility or resistance of organisms to formulation ingredients according to the method

described by Cheesbrough . The Gram positive (Bacillus) and Gram negative (E.coli) test organisms were subcultured on nutrient broth and incubated at 37°C till desired turbidity. The developed culture was streaked on the surface of Mueller Hinton agar on which four wells were punched with sterile cork borer. 25, 50, 100 and 150 ul shampoo were filled in these wells in increasing order. The plates were incubated at 37 °C for 24 hrs. and zone of inhibition around the wells were measured using a ruler.

II. CONCLUSION:

The objective of the study was to develop a stable and functionally effective herbal shampoo by excluding synthetic chemicals, which are normally incorporated in such formulations to larger extent. Synthetic hair shampoo is known to damage the hair cuticle leaving it brittle, dull and dry . Although the formulated shampoo contains synthetic chemical as SLS (7.5%) but its percentage is too small as compared to synthetic shampoo (10-40%) available in the market. The evaluation study on our shampoo showed good cleaning action, better foaming capacity, and quick wetting time. We have used Aloe-vera gel to provide the conditioning effects.

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