

An overview on Herbal Shampoo Formulation and Development

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ABSTRACT:

Hair plays an important role in your overall appearance and is also an indicator of your health. Recent advances in hair and hair care technology have introduced new techniques and strategies for hair and cosmetic treatments. In the past, hair and scalp care was all about using shampoo for a good, gentle wash. However, shampoo is more than just a washing product, it contributes to health and beauty by adding shine and luster to hair.

Ease of administration. Herbal shampoo, a natural hair care product designed to remove oil, dirt and dandruff and promote hair growth, strength and shine. It also adds softness, smoothness and shine to the hair. The creation of beauty shampoos contains many ingredients, some of which can cause problems such as hair loss, increased dandruff, itching, pain, nausea and headaches.

Keywords: Herbal Shampoo, Cosmetics, Natural & Healthy, Evaluation of shampoo.

I. INTRODUCTION:

From antiquated time past memory, mankind has been borrowing inexhaustibly from nature to care for their wellbeing, skin and hair, as characteristic fixings that have preventive, defensive and remedial activity. The distribution center of makeup, nature gives such flexible normal fixings that improve magnificence of the skin and hair. Hair makeup are an vital instrument that makes a difference to extend patient's attachment to alopecia and scalp medications. Shampoos are not as it were scalp cleaners, but indubitably act as avoiding the hair shaft harm. Numerous scalp infections are moreover treated by dynamic fixings that are included to the shampoo's details. It is alluring that anything may the infection or condition be (dermatitis, seborrhea, alopecia, psoriasis), the hair strands are kept stylishly satisfactory, protecting its delicate quality, combability and sparkle whereas treating the scalp [1]. Presently a day's people groups are cognizant approximately hairs due to extend in contamination hairs get harmed. Toxins gravely impacts on hair come about into spilt closes, harshness, impeded

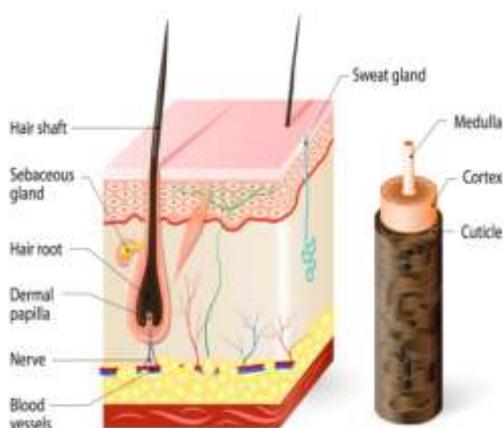
development of hairs, misfortune of sparkle of hair and hair falls. These all issues of hair are covered by cleanser but in case of manufactured shampoos they are made from chemical constituents appears side impacts on hairs.

❖ Hair:

Hair is an important part of the body, along with these baceous glands, sweat glands and nails, which play a protective role in the integumentary system. These structures, known as epidermal outgrowths, originate from the ectoderm of the skin during development. There are three main parts of the hair: the bulb, the root, and the shaft, which are located in the hair follicle soft he dermis. The bulb, located at the deepest end of the hair, responsible for hair growth, is connected to the nutrient-rich dermal papilla, which provides essential nutrients for hair growth. The root remains in the hair shaft and becomes the shaft, the visible part of the hair that extends from the surface of the skin. Roots and stems have three layers: pith, cortex and epidermis. The cortex, the largest and thickest part, influences many of the mechanical properties of the hair, and is made up of spindle-shaped cortical cells filled with keratin filaments parallel to the hairshaft.

Cross-linked by covalent disulfide bonds Cysteine residues between adjacent keratin chains, especially cysteine residues, influence the shape, stability and texture of hair[2]. The cuticle, formed by a resistant layer of dead cells, forms a protective barrier against external environmental factors. Divided into the inner and outer cuticle, it is responsible for the hair's shine and texture, and its smooth texture and light-reflecting properties help reduce friction between the hair.

HAIR ANATOMY



The cuticle has three distinct layers: the b-layer, the a-layer, and the epicuticle. The epicuticle, described by Hordinsky et al., is a hydrophobic lipid layer composed of 18-methyleicosanoic acid that covers the surface of the hair, including the f-layer, which overlaps the cuticle cells and surrounds the elongated polyhedral cortical cells. The interaction between this outer hydrophobic layer and the cortex contributes to the physical properties of the hair's shine and volume. What does "healthy hair" look like? When hair is damaged by friction or exposure to chemicals that remove the first hydrophobic protective layer of the hair, the hair fibers, is greatly weakened. It is worth noting that hair fibers contain a variety of components, including sulfur-rich proteins, lipids, water, melanin, and trace elements. Keratin is a fibrous protein and is the main component of hair. The amino acid chain is an α -helix structure and consists primarily of tyrosine, glycine, and cysteine. Keratin can exist in acidic, neutral and basic forms.^[3]

❖ Hair Care:

Hair surface and sparkle are regularly related with surface properties, whereas the generally basic judgment of hair is essentially ascribed to the hair cortex. To improve these perspectives, different hair items have been created, counting those that fortify the basic judgment of hair strands, increment ductile quality, boost volume, decrease frizz, upgrade reasonability, and indeed fortify unused hair growth. Modern restorative items are planned with the point of not as it were cleansing the hair from pollutions but

moreover reestablishing and upgrading its physiological condition. For occurrence, seriously conditioning specialists can incidentally act as a substitute for the f-layer, improving dampness maintenance within the cortex and mostly re-establishing a few of the hair's reduced physical properties. Consequently, achieving shinier hair could be a note worthy advantage of these advanced items^[4].

❖ Shampoo:

Shampoo is an air product that comes in various forms such as liquid, solid and powder. When used as intended, it should effectively and safely remove surface oils, dirt, and cuticle debris from the hair without any adverse effects to the user. The best thing about the shampoo is that it really removes dirt and excess sebum, cleans the hair well, produces agreeable lather, washes off easily with water, leaves hair soft, shiny and manageable, smells sweet. If absorbed, no adverse effects on the skin and eyes. Also, avoid rough or cracked hands.^[5]

• Types of Shampoo:

Shampoo comes in various forms, each with its unique characteristics:

1. Liquid shampoo
2. Solid cream shampoo
3. Jelly shampoo
4. Powder shampoo
5. Lotion shampoo
6. Aerosol foam shampoo

Additionally, there are specialized shampoos designed for specific purposes:

1. Conditioning shampoo
2. Antidandruff shampoo
3. Baby shampoo
4. Two-layer shampoo

These variations cater to different hair care needs and preferences^[6].

• Composition of Shampoo:

1. Principal surfactant
2. Secondary surfactant
3. Antidandruff agents
4. Conditioning agents
5. Pearlescent agents
6. Sequestrants
7. Thickening agents
8. Colors, fragrances, and preservatives

These ingredients work together to cleanse, condition, and enhance the overall performance and appeal of the shampoo^[7].

❖ **Herbal Shampoo:**

Shampoo is one of the most used cosmetic products on a daily basis to wash the hair and scalp. Herbal shampoos are cosmetic preparations designed to cleanse the hair and scalp, similar to regular shampoos but containing traditional Ayurvedic herbs. This herbal shampoo is used to remove oil, dandruff, dirt and environmental impurities.



Home grown shampoos are picking up noticeable quality as an elective to engineered shampoos accessible within the advertise [8]. This move is driven by the expanding inclination for home grown items over chemical ones due to their perceived health-enhancing qualities. There's a developing mindfulness of and request for home grown make up since they are accepted to be secure and free from undesirable side impacts.

• **Characterization of Herbal Shampoo:**

Here are the procedures for two tests related to shampoo evaluation:

1. pH Measurement:

A 1% shampoo solution was prepared and used to measure its pH by employing a pH meter^[9].

2. Solids Percentage Determination:

The initial weight of a clean and dry evaporating dish was recorded. Then, 4 grams of the shampoo formulation (not the 1% solution) was placed in the evaporating dish. The dish, along with the shampoo, was weighed, and the initial weight

of both the dish and shampoo was recorded. The exact weight of the shampoo alone was calculated and its initial weight was noted. Subsequently, the evaporating dish containing the shampoo was heated on a hot plate until the liquid component had evaporated. After drying, the dish and the shampoo solids were weighed, and the results were recorded. This procedure allowed for the determination of the percentage of solids in the shampoo formulation^[10].

Here are the steps for evaluating foam-related characteristics of the shampoo:

3. Foam Formation (Shake Test):

The beginning weight of a clean and dry vanishing dish was recorded. At that point, 4 grams of the cleanser detailing (not the 1% arrangement) was put within the evaporating dish. The dish, at the side the cleanser, was weighed, and the introductory weight of both the dish and cleanser was recorded. The precise weight of the cleanser alone was calculated and its starting weight was famous. Along these lines, the dissipating dish containing the cleanser was warmed on a hot plate until the fluid component had vanished after drying, the dish and the cleanser solids were weighed, and the comes about were recorded. This strategy permitted for the assurance of the rate of solids within the cleanser detailing [10]. Here are the steps for assessing foam-related characteristics of the shampoo.

4. Foam Quality and Retention:

Immediately after the shake test, start a timer and record the time.

Then, at 1-minute intervals, record the volume of foam for a total of 5 minutes. This will help assess the quality and how well the foam is retained over time^[12].

Here are the procedures for additional tests related to shampoo evaluation:

5. Surface Tension Assessment:

A 1% v/v solution of the shampoo was prepared by mixing 2 ml (equivalent to 40 drops) of shampoo with 200 ml of distilled water.

The shampoo was placed in a beaker, and distilled water was gradually added while thoroughly mixing the shampoo and water.

Surface tension was determined using a stalagmometer.

6. Skin Irritation Test:

The solution of the prepared shampoo was applied to the skin and left in place for 5 minutes^[13].

Observations were made for any signs of skin redness or irritation. No redness or irritation was observed.

7. Visual Stability Assessment:

The prepared shampoo was subjected to a visual stability test for 21 days at room temperature with a relative humidity of 65 ± 5 .

Observations were made for any changes in color and pH during this period. No changes in color or pH were noted within the 21-day period, and there was no phase separation between the oil and water components of the shampoo^[14].

8. Viscosity Measurement:

Viscosity was determined using an Ostwald viscometer.

9. Dirt Dispersion Test:

Two drops of cleanser were added to 10 ml of refined water in a wide-mouthed test tube.

To the formulated shampoo, one drop of Indian ink was added and the test tube was sealed with a stopper.

The contents were shaken for 10 minutes, and the volume of ink in the foam was measured and categorized as none, slight, medium, or heavy dispersion^[15].

10. Wetting Time Assessment:

Wetting time was calculated by noting the time it took for a canvas paper disc (0.44 g, 1-inch diameter) to sink completely when placed over the shampoo.

11. Visual Assessment:

The prepared formulation was visually evaluated for color, clarity, odor, and foam content^[16].

12. Conditioning Performance Evaluation:

To assess the conditioning effect of the optimized polyherbal shampoo (F4) and compare it with a commercial shampoo, a hair tress from an Egyptian woman was obtained.

The hair tress was cut into three swatches, with one remaining unwashed as a control.

The other two swatches were washed with the optimized polyherbal shampoo formulation (F4) and the commercial shampoo^[17].

Twenty-five blindfolded female volunteers assessed the conditioning performance of the tested shampoos based on smoothness and softness using a tactile test, rating them from * (poor) to ** (excellent).

13. Microbial Control Assessment:

Soybean-casein Digest Agar Medium (SCDA) was used for the preliminary evaluation of microorganisms.

Microbial suspensions at concentrations of 10^5 and 10^8 for strains of *Candida albicans*, *Escherichia coli*, *Pseudomonas aeruginosa*, and *Staphylococcus aureus* were prepared.

A sample of shampoo was diluted with SCDA at a 1:10 ratio.

Then, 1 ml of the prepared diluted solution was added to 9 ml of SCDA in four test tubes.

0.1 ml of each microbial suspension was added individually to one of the corresponding test tubes.

The test tubes were sealed, shaken, and incubated at 37°C for 24 hours^[18].

14. Microbial Limits Test:

This test was performed using the plate count method.

Various dilutions (1:10, 1:20, 1:30, 1:40, and 1:50) of the diluted licorice shampoo were prepared.

1 ml of each dilution was added to five test tubes containing 9 ml of SCDA.

Then, 1 ml of the mixture from each test tube was plated on a nutrient-agar and melted agar plate, which was then incubated for 24 hours^[19].

15. Antimicrobial Preservative Effectiveness Test:

20 ml of licorice shampoo and 0.1 ml of each microbial suspension were combined in individual test tubes.

These test tubes were kept at room temperature for various time intervals (7, 14, 21, 28, and 35 days for *Candida albicans*).

1 ml of the contents from each tube was placed on two sterile plates, and 40°C melt soybean-casein digest agar was added to them.

After solidification, they were incubated at 37°C for 24 hours^[20].

16. Evaluation of Consumer Satisfaction:

50 volunteers were given the licorice shampoo to use for 30 days, with ethical approval.

Volunteers aged 25–35, living locally, were instructed on shampoo usage and advised not to use other shampoos during the trial.

After the trial, volunteers filled out a questionnaire covering various aspects related to the shampoo, including its quality, impact on hair, scalp, and eyes, as well as its effects on hair complications like itching, dandruff, and more^[21].

The consumers rated different aspects of the shampoo as excellent, good, or bad in the questionnaire.

❖ Evaluation of herbal powder shampoo:



Here are descriptions of various tests related to the properties of a substance:

1. Solubility Assessment:

Solubility refers to a substance's ability to dissolve in a solvent.

A precise measurement of one gram of the powder is taken and transferred into a beaker containing 100 ml of water.

The mixture is thoroughly shaken and gently heated to enhance solubility^[22].

After cooling, the solution is filtered, and the weight of the residue is recorded.

2. Loss on Drying Measurement:

Loss on drying is a percentage expression of the mass lost.

Two grams of the powder are accurately weighed and placed into a dry Petri dish.

The Petri dish is then positioned in a desiccator for two days, using calcium chloride crystals.

The powder is subsequently weighed accurately to determine the weight loss during the drying process.

3. Swelling Index Determination:

The swelling index measures the volume, in milliliters, occupied by one gram of a substance, along with any adhering mucilage, after it has swollen in an aqueous liquid for four hours.

One gram of the powder is accurately weighed and placed in a glass stopper measuring cylinder containing 25 ml of water.

The mixture is shaken thoroughly every 10 minutes for an hour, followed by a three-hour rest at room temperature.

The volume, measured in milliliters, is recorded^[23].

The angle of repose is the maximum angle between the surface of a pile of powder and the horizontal plane.

Two methods are used to determine the angle of repose:

I. Funnel Method:

A specified quantity of dry powder is placed in a funnel positioned 6 cm above a horizontal base.

The powder flows to create a heap on a horizontal surface, and measurements are taken for the heap's height and radius^[24].

II. Open-ended Cylinder Method:

A specific amount of dry powder is loaded into a cylindrical tube open at both ends and placed on a flat surface.

The funnel is raised to create a heap, and measurements are recorded for the heap's height and radius.

• Bulk Density:

Bulk density is the ratio of a given mass of powder to its bulk volume.

The required amount of powder is dried and filled into a 50 ml measuring cylinder up to the 50 ml mark.

The cylinder is dropped onto a hard wood surface from a height of 1 inch at 2-second intervals.

The volume of the powder is measured, and its weight is recorded. This process is repeated to obtain average values^[25].

• **Foaming Index:**

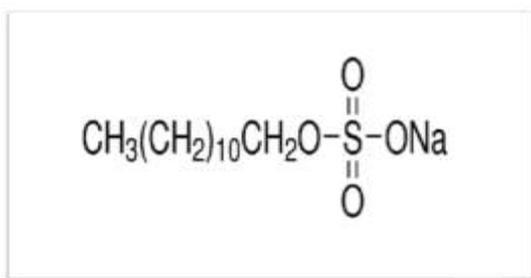
One gram of the powder is accurately weighed and transferred into a 250 ml conical flask containing 100 ml of boiling water.

The mixture is gently warmed for 30 minutes.

❖ **Side effects of various chemicals used in commercial shampoos:**

➤ **Sodium lauryl sulfate (SLS),**

Commercial shampoos commonly found in stores often contain chemicals that may have adverse effects, such as Sodium Lauryl Sulfate (SLS).^[26]



Sodium lauryl sulfate (SLS), also known as sodium laurethsulfate, is a particularly concerning chemical commonly found in most shampoos. It is derived from sulfuric acid, monododecyl ester, and sodium salt. SLS has the capability to be absorbed through the skin, potentially accumulating in various organs, including the brain and heart, over extended periods of use, which can lead to harm. Furthermore, if SLS is contaminated, it may contain dioxane, a known carcinogen (Black and Howes, 1979).^[26]

❖ **Side effects of Diethanolamine:**

• **Acute Effects:**

- Acute inhalation exposure to diethanolamine in humans may result in irritation of the nose and throat, and dermal exposure may result in irritation of the skin.
- Animal studies indicate that exposure to diethanolamine by intravenous injections can cause increased blood pressure, pupillary dilatation, and salivation.
- At very high doses in animals, sedation, and coma may. Result.
- Acute animal studies have shown that dermal exposure to diethanolamine may burn skin, and eye contact. With the chemical may impair vision.

- Acute animal tests in rats have shown diethanolamine to have moderate acute toxicity from oral exposure.^[28]

❖ **Chronic Effects (Noncancer):**

➤ **Noncancer:**

- **No information is available** on the chronic effects of diethanolamine in humans.
- Animal studies have reported effects on the liver, kidney, blood, and CNS from chronic oral exposure to. Diethanolamine.
- Skin lesions were observed in mice following daily topical administration of diethanolamine.
- EPA has not established a Reference Concentration (RfC) or a Reference Dose (RfD) for diethanolamine.
- The California Environmental Protection Agency (CalEPA) has established a chronic reference exposure level. Of 0.02 milligrams per cubic meter (mg/m) for diethanolamine based on effects on the blood in rats.
- The CalEPA reference exposure level is a concentration at or below which adverse health effects are not likely to. Occur. It is not a direct estimator of risk but rather a reference point to gauge the potential effects.^[28]

➤ **Reproductive/Developmental Effects:**

- No information is available on the reproductive or developmental effects of diethanolamine in humans.
- Animal studies have reported testicular degeneration and reduced sperm motility and count from oral. Exposure to diethanolamine.^[28]

➤ **Cancer Risk:**

- No information is available on the carcinogenic effects of diethanolamine in humans.
- The NTP reported an increased incidence of liver and kidney tumours in mice and no increased incidence in
- rats from dermal exposure to diethanolamine. (4)
- EPA has not classified diethanolamine for carcinogenicity.^[28]

❖ **Beneficial herbal ingredients in natural shampoos:**

The demand for cosmetics and shampoos containing herbal ingredients has increased

significantly. This trend is driven by the belief that such products are safe and come with minimal side effects. Nowadays, the market offers a wide variety of herbal shampoos enriched with plant extracts and essential oils. Numerous plant-based ingredients have been identified for their beneficial effects on hair and are commonly utilized in shampoo formulations.^[29]

1. Aloe Vera: Aloe Vera's proteins have been found to successfully break up dead skin cells and abundance sebum, anticipating hair follicle clogging. Aloe moreover contains salicylic corrosive, which has anti-inflammatory and gentle anti-microbial properties. The atomic structure of aloe gel closely takes after keratin, a key protein in skin and hair composition. In this manner, aloe Vera may be a useful choice for advancing hair development, as proposed by Mainkar and Jaunty in 2001.^[30]



2. Punicagranatum.L: Having a place to the Punicaceae family, Punicagranatum L. encompasses a long history of utilize in treating different sicknesses, especially dandruff and scalp aggravation. This plant contains a extend of chemical constituents, counting citric corrosive, ellagic corrosive, ellagitannins (such as punicalagins), luteolin, β -sitosterol, icosanoic, linolenic, malic corrosive, protocatechuic corrosive, chlorogenic corrosive, caffeic corrosive, ferulic corrosive, coumaric corrosive, anthocyanins, polyphenols, and tannins. These chemical compounds have illustrated different pharmacological properties, such as anti-dandruff, anti-inflammatory (hindering pro-inflammatory cytokines), anti-itching, and antioxidant impacts in numerous considers. They have moreover appeared inhibitory impacts on proteins like cyclooxygenase (COX), lipoxygenase (LOX), and phospholipase A2 (PLA2). These properties make Punicagranatum L. a profitable fixing in

shampoos, as COX and LOX are key chemicals included within the generation of prostaglandins and leukotrienes, which contribute to irritation. Besides, ellagic corrosive, phenolic corrosive, and tannin found within the plant have anti-dandruff, antifungal, and antimicrobial properties, as famous by Barel et al. in 2001.^[30]



II. CONCLUSION:

Globalization has gotten to be an fundamental necessity in today's world, and by 2005, the worldwide showcase will be open to all. The worldwide slant is moving towards the utilization of home grown medications for healthcare, well being nourishments, and corrective items, counting hair arrangements. India, with its differing climatic conditions, brags a wealthy legacy within the development and generation of home grown drugs.

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