

HERBAL CONSTITUENTS' FORMULATIONS AND THEIR SIGNIFICANCE IN HAIR CARE PRODUCTS: A COMPREHENSIVE REVIEW

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ABSTRACT

The article highlights review study on herbal cosmetics and medicated preparations used for scalp and hair health, including their ability to promote hair growth, reduce, dandruff, and improve scalp health. Common herbs including hibiscus, fenugreek, aloe vera, neem use in treating dandruff. Herbal shampoos physicochemical properties like pH, viscosity, foam ability, and stability review were done. Cosmetics with Herbal ingredients demonstrating less side effects gaining importance in usage. Hair care and scalp health compromised during conditions like Dandruff, Hair fall needed to be treated in early stages to prevent hair loss. Treatment options include Drug Formulations of natural source as herbal extracts, vitamins, Herbal ingredient's role in hair Care Products and dandruff prevention plays vital role. Review on herbal shampoo revealed good cleansing and detergency, low surface tension, good foam stability and antidandruff property. Review study on herbal shampoo explored scientific basis of herbal shampoos, parameters like foaming ability, detergency, stability and safety are critically reviewed. Herbal shampoo with Ritha fruits, Liquorice, with all ingredients was more effective on dandruff. The herbal shampoo of rosemary extract supported scalp health, promotes hair growth. Herbal gel shampoo of *Hibiscus*, showed good, detergency, foam stability. Herbal lice removal shampoo, containing a standardized extract of paw paw, thymol and tea tree oil demonstrated effectiveness in removing head lice, along with good stability. Herbal Anti dandruff shampoo with orange peel powder, Curry Leaves, Ginger, Aloe vera, Reetha herbal had good froth stability, low surface tension, pH. This review encompassed on the use of herbal formulations in hair care and highlight their potential benefits for promoting healthy hair.

Introduction:

Cosmetics: Herbal cosmetics is defined as the beauty products, which possess desirable physiological activities, such as skin healing, smoothening, appearance, enhancing and conditioning properties with the help of herbal ingredients.

Herbal ingredients used in the cosmetics preparation for hair: Anti-dandruff: soap nut, shikakai, arnica, thyme, rosemary, Aloe Vera, parsley, Kapur kachari, Birch, Gule-abbas, Stinging nettle

Anti-lice, kachur-sugandhi, sitaphal, Hair tonic: Jatamansi, coconut oil, sesame oil, Brahmi, Amla, Hibiscus, Rosemary Arnica, Mandukarparni, Nariyal, Bhringraj, Shatoot, jaborandi, Benajwain. Hair wash Amla, soap nut shikakai, marigold, Methi, Bihi. Hair dye: Eclipta, Amla, Henna, Hibiscus, Sage, Chamomile, Bhringraj, Patang. Hair conditioner Eclipta, rosemary fenugreek, henna Amla, hibiscus. Shinning of hair: soap nut, shikakai ¹.

Hair is an important part of human body. The problems associated with it includes hair loss, unruly hair, lack of hair volume, conditioning, immature greying, dandruff, thinning of hair, dullness etc. Hair can vary in shape, length, diameter, texture, and colour. The cross section of the hair could also be circular, triangular, irregular, or flattened, influencing the curl of the hair. All mammals have hair. Its main purpose is to regulate body temperature. It also wants to decrease friction, to guard against sunlight, and to act as a way organ. Hair is crowning glory of a person that plays an important role in the life of human being. For the scalp, hairs were known as protective covering in ancient times. From the colour, type and amount of hair, one can be judged as from which society he/she belongs ¹.

Hair care is important for maintaining hair health, enhancing appearance and confidence, and ensuring overall hygiene. Consistent, proper care prevents issues like dryness, breakage, and dandruff, while also promoting hair growth and reducing hair loss. A healthy hair routine can improve self-esteem and the ability to style hair.

For hair and scalp health: Promotes growth: A healthy scalp, which is a result of good care, improves blood circulation and supports hair Prevents damage: Regular care prevents issues like split ends, breakage, and dryness. Prevents hair problems: It helps prevent common issues such as dandruff, dryness, and excessive oiliness, and can help reduce hair loss. Ensures hygiene: Proper washing removes dirt, sweat, and excess oil that can accumulate, preventing unpleasant odour and keeping hair clean. For personal confidence and appearance. Boosts confidence: Healthy, shiny hair can significantly improve self-esteem and make you feel more confident. Enhances appearance: Hair frames the face and plays a big role in your overall look; healthy hair can make you feel more attractive and put-together. Improves manageability: A good hair care routine makes hair easier to manage, style, and detangle. Expresses personality: For many people, hair is an important part of their personal style and self-expression ².

Hair Problems: Hair Loss: Although historically discussed as a haul among men, hair loss/thinning hair is additionally common among women. for several men, it's getting to be male pattern balding. Female hair loss is typically caused by stress, medication, changing hormones, and even menopause. Additionally, many hair styling products (chemicals/excessive heat) can contribute to hair loss. Dry Hair: Shampooing too often causes dry hair. Although squeaky clean hair may be a good thing, many overdo it by washing once, sometimes twice or per day which will strip away all of the hair's natural oils. Colour Damaged Hair: When you colour your hair, chemicals are used to open your hair shaft, leaving your hair extremely porous and prone to brittleness and breakage. Gray Hair: To many, grey hair is a badge of honour. But others would prefer to get rid of it because grey hair can be brittle and more unruly than other strands ².

Dandruff: Dandruff is little white pieces of dead skin in someone's hair, or fallen from someone's hair. It's apparently caused by a fungus called *Malassezia restricta* and *Globosa malassezia* formerly called *Pityrosporum* may be a yeast causing infection of skins and scalp. It's caused by not brushing hair, allergy, stress, not showering enough etc. Dandruff is a common disorder

caused by *Pityrosporum* yeast which affects the scalp condition. Dandruff cannot be eradicated completely but can only be managed and controlled effectively ³.

There are two types of dandruff: Dry dandruff Dry (universal) dandruff known to be caused by *Pityri* as is simplex and is characterized by excessive development of minute scales of white greyish or ash colour accumulate on the scalp area. Scales visible on the scalp are divided cells of keratinised layer whose renewal cycle is pathologically compact. During this sort of dandruff, no excessive hair loss is observed ³.

Oily dandruff: Other sort of dandruff is named oily dandruff or *Pityriasis steatoides*. It arises on the scalp skin with varied intensity of sebum production. It appears mainly frequently in young men next puberty. Inflammation of various intensity develops on the scalp skin alongside the looks of oily scales of dirty yellow colour which will form lesions. These lesions are often related with ruritic of various intensity ³.

Hairfall: The hair fall is ordinary. It's going to also exacerbate androgenetic alopecia, the foremost common site suffering from this sort of dandruff is scalp but it can arise among eyebrows along the side of nose behind the ears over the breastbone and sometimes within the armpits. Over-brushing hair, excessive perming, too much heat, and lack of a good conditioner cause split ends. Oily/Greasy Hair Oily hair is caused when the scalp produces an excessive amount of natural oil called sebum. Sebum is produced by sebaceous glands, which may sometimes work overtime, leading to excessive amounts of oil ⁴.

Frizzy Hair: Frizzy hair occurs when the hair's moisture level falls below normal levels, and it can also be hereditary. Dull Hair: There are many causes of dull-looking hair chemical or heat styling damage, and environmental soils. Heat Damaged Hair: Use your curling iron or flat iron too much and your hair will become damaged.

Causes of Hair Problems: Hair loss is typically related to one or more of the following factors: Childbirth, High fever, Sudden weight loss (crash dieting), Severe illness, Surgery, Severe emotional stress or loss, Family history (heredity), Hormonal changes and medical conditions. Medications and supplements, Radiation therapy to the head, Hairstyles and treatments ⁴.




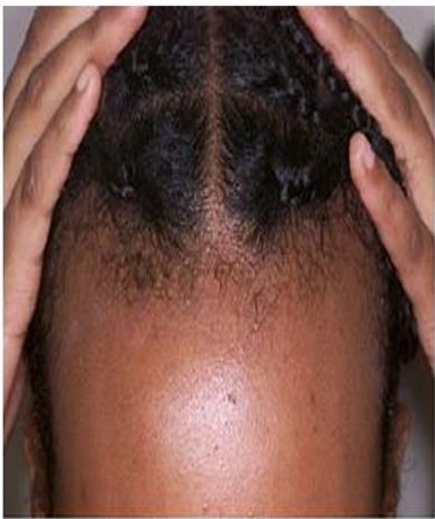
Fig.1 a. Male-pattern baldness	Fig.1 b. Female-pattern baldness
 <p>Fig.1 c. Patchy hair loss</p>	 <p>Fig.1 d. Traction alopecia</p>

Fig.1. Symptoms and conditions of hair loss

Hair should have the following characteristics: They should give luster to the hair, Retain them soft and flowing, Invigorate their growth, Keep the brain cool, Should not be sticky.

Treatment: Although hair issues certainly vary from person to person, by following these simple steps, these common problems are easily repairable. Your hair problems will soon be a thing of the past and you will get on you thanks to an excellent head of hair before you recognize it.

Drug Formulation: Drug formulation is critical for hair care products to ensure efficacy, safety, and desired physical properties like viscosity, pH, and stability. Proper formulation allows for the effective delivery of active ingredients to the scalp and hair, whether they are traditional herbal extracts, vitamins, or other compounds, while minimizing negative side effects such as irritation or damage ^{5, 6}.

Key factors include: Optimizing the concentration of ingredients, choosing appropriate surfactants and thickeners and ensuring the product is stable and user-friendly. Key aspects of drug formulation in hair care Efficacy and delivery: Formulation ensures that active ingredients reach the hair follicle and scalp to provide benefits like strengthening, moisturizing, and stimulating growth. The formulation's structure can impact how well the ingredients penetrate the hair and scalp, as seen in the use of microneedles for enhanced delivery in some treatments.

Safety and stability: pH levels: Products must have an acceptable pH range to avoid scalp irritation and itching. Ingredient compatibility: The formulation must ensure ingredients are compatible and stable over time to prevent degradation or unwanted reactions. Natural alternatives: Formulations can be designed to use natural ingredients with fewer side effects compared to harsh chemicals ^{5, 6}.

Physical properties: Viscosity: This determines how the product feels and spreads, with the right thickness ensuring it stays on the hair and scalp without being too runny or heavy. Stability:

Proper formulation ensures the product maintains its consistency, colour, and effectiveness throughout its shelf life. Product characteristics
Cleansing and lathering: Formulations are developed to provide good cleansing action, often using natural surfactants like saponins from Reetha. **Desired sensory experience:** Formulation includes elements like colour, scent, and texture to improve user acceptability. **Dandruff control:** Formulations can Practice Good Hair Care. **Wash wisely:** Over-washing strips natural oils. Wash only when your hair feels dirty or oily, not on a strict daily schedule. **Condition regularly:** Always follow shampoo with conditioner to restore moisture and smoothness. **Limit heat and chemicals:** Reduce the use of hot tools & harsh chemical treatment like perming or colouring. **Be gentle:** Use a wide-tooth comb on wet hair to prevent breakage. **Eat balanced meals:** Protein, iron, omega-3 fatty acids, and vitamins (like biotin and vitamin D) are essential for strong hair. **Stay hydrated:** Water keeps your scalp and hair moisturized. **Manage stress:** Stress can trigger hair loss. Relaxation techniques like yoga or meditation help maintain healthy growth^{7,8}.

Herbal ingredients used in the cosmetics preparation for hair: Anti-dandruff: soap nut, shikakai, arnica, thyme, rosemary, Aloe Vera, parsley, Kapur kachari, Birch, Gule-abbas, Stinging nettle, Anti-lice kachur-sugandhi, sitaphal, Hair tonic: Jatamansi, coconut oil, sesame oil, Brahmi, Amla, Hibiscus, Rosemary, Arnica, Mandukarparni, Nariyal, Bhringraj, Shatoot, jaborandi, Benajwain, Hair wash Amla, soap nut, shikakai, marigold, Methi, Bihi. Hair dye: Eclipta, Amla, Henna, Hibiscus, Chamomile, Bhringraj, Patang, Hair conditioner Eclipta, Rosemary, fenugreek, henna, Amla, hibiscus, shining of hair: soap nut, shikakai, sage, Reduce hair falls: Amla, arnica.

Drug delivery: Drug delivery and formulation are crucial in hair care for targeted delivery of active ingredients to the hair follicles, which increases efficacy for conditions like hair loss and dandruff while minimizing side effects. Formulation techniques, including the use of nanoparticles and specialized vehicles, enhance penetration and control the release of compounds, making products more effective and addressing specific concerns like solubility and texture⁹.

Importance of drug delivery systems:

Targeted delivery: The hair follicle acts as a direct entry point, or shunt route, to the skin's viable layers and deeper dermis, allowing for more precise delivery of active ingredients to the target site. **Enhanced efficacy:** By concentrating treatments in the hair follicles, these systems improve therapeutic outcomes for conditions like hair loss (androgenetic alopecia) and acne.

Reduced systemic side effects: Targeting the scalp and follicles minimizes the amount of drug that is absorbed into the bloodstream, which can lead to fewer systemic side effects compared to oral medications. **Controlled release:** Advanced delivery systems, such as microencapsulation and nanoparticles, can create a reservoir of the active ingredient in the follicle, providing a prolonged and sustained release of the treatment¹⁰.

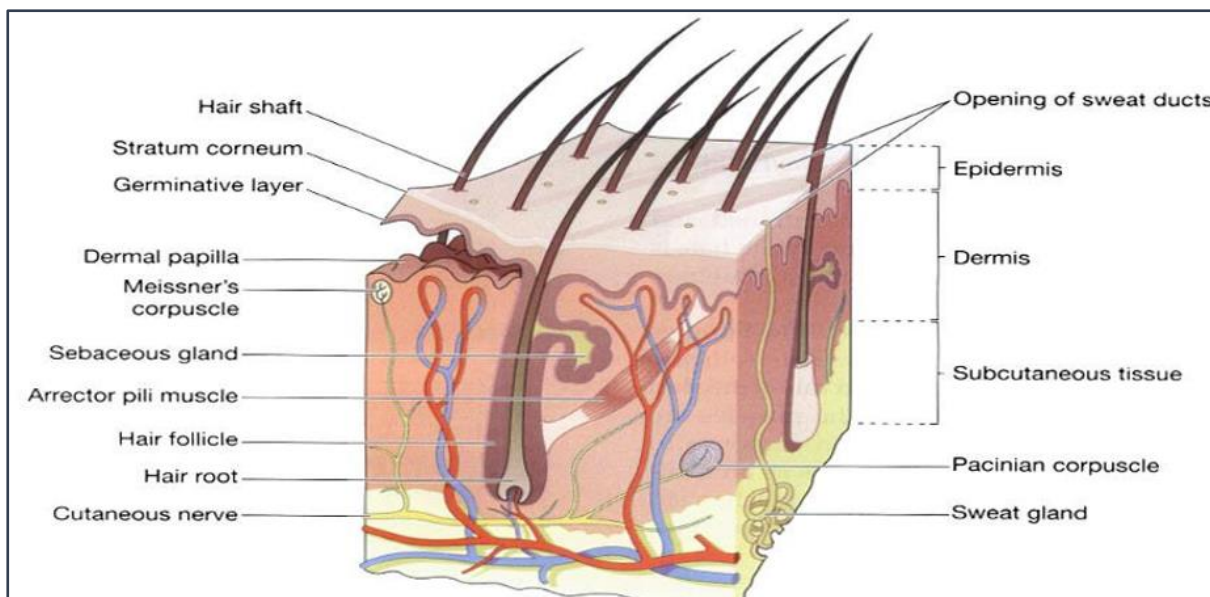


Fig.2 Structure of Hair

Importance of formulation:

Improved solubility and bioavailability: Nanoparticles and other carriers like liposomes and nano emulsions can encapsulate ingredients, making them more soluble and improving their ability to penetrate the hair follicle and scalp. Vehicle selection: The choice of vehicle (e.g., hydrophilic or lipophilic) is critical, as it can significantly influence how well the active compound penetrates the skin and hair follicle barrier. Physicochemical properties: Formulation scientists control properties like viscosity and solid content to ensure the product is easy to apply, rinses out effectively, and performs as expected. For example, a shampoo's solid content percentage is a key factor in how well it washes out. Multifunctional products: Formulations can be designed to deliver not only therapeutic benefits but also other cosmetic functions, such as conditioning, colouring, or protecting the hair and scalp. Application and consumer experience: Formulation affects the overall user experience. For instance, foam generation is very important to consumers for shampoo evaluation, even if it doesn't directly relate to cleansing ability ¹¹.

Hair Care Products:

- 1) Hair oil
- 2) Hair dye
- 3) Hair lotion
- 4) Anti-dandruff
- 5) Hair Gels
- 6) Conditioner
- 7) Hair Shampoo

Hair Oil : The hair oils are used for dressings and nourishing the hair. This preparation is generally used to increase the growth of hair and to make them healthy. Herbal hair oil not only moisturizes scalp but also reverses dry scalp and dry hair condition. It provides essential nutrients required to maintain normal functions of sebaceous gland and promote natural hair growth ¹².

Marketed Herbal Hair Oil:

- 1) Mayukhi Herbal Hair Oil
- 2) Indulekha bringha oil
- 3) Kesh king oil



Fig. 3. Herbal Hair Oil

Hair Dye:

These are preparations which are used for the colouring of the hair. They enhance the attractiveness of grey hair. They are applied externally on the hair with help of brush.



Fig.4. Herbal Hair Dye

Marketed Herbal Hair Dye:

- a) Biotique bio henna fresh powder hair colour
- b) Logona Herbal Hair colour
- c) Radico Colour Me Organic hair dye



Fig. 5. Ingredients used in the herbal hair dye

Hair Lotion: Hair lotion has a stimulating effect upon the hair follicles. They are generally perfumed with oil of rosemary and others ascends as it possesses a good stimulating property ¹².



Fig. 6. Hair Lotion

Marketed Herbal Hair Lotion:

- a) Aparajita Ayaskam Tail Hair Oil
- b) Rosemary Hair Oil
- c) Herbal Essences Hair Care:
- d) Hard Water Hair Revival Kit

Anti-dandruff: Dandruff is a scalp condition that is associated with itchiness, redness and white flakes of skin. It is caused by the fungus *Malassezia Globosa*. Your scalp naturally secretes oil to protect itself and your hair. But due to poor hair hygiene, this oil can buildup on your scalp and

become food for the fungus. This itchy feeling will allow only one question into your mind - how to get rid of dandruff¹³.

Causes of Dandruff: After all the dandruff-struggles you are going through it's not one but many. There are several reasons for the growth of dandruff on your head, such as dry skin, *Malassezia*-a fungus, psoriasis, oily skin, usage of chemical-based hair care products etc¹³.

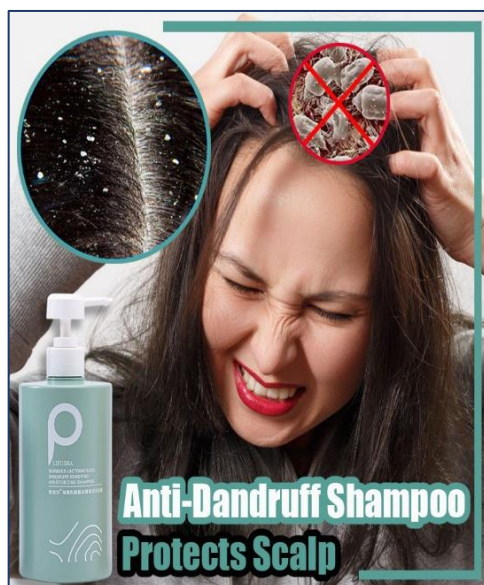


Fig. 7. Anti-Dandruff Shampoo Protects Scalp

Dandruff and its Treatment: Dandruff is clinical condition caused by *Malassezia Pityrosporum* species is of great cosmetic concern over the world. *Pityrosporum ovale* is strongly suspected to play a role in the manifestation of the seborrheic dermatitis. Dandruff is known to be controlled by fungistatic ingredients in Antidandruff shampoos. Herbal formulation has growing demand in the world market. The natural remedies are more acceptable in market because it's safe and fewer side effect antidandruff shampoo and nutritional shampoo containing vitamins and aminoacids, proteins and hydrosalates¹³.

Selected herbs for the preparation of Anti-dandruff Shampoo:

1. *AzadirachAcaciata indica* (neem)
2. *Fenugreek*(methi)
3. *Sapindus mukorossi* (reetha)
4. *Ocimum santu* (tulsi)
5. *concinna* (shikakai)



Fig. 8. Anti-Dandruff Shampoo

Advantages of Herbal Antidandruff Shampoo: Free from side effects. Pure and Organic ingredients. No surfactants. e.g SLS. No synthetic additives. No animal testing. Earth and Skin friendly. No petroleum-based ingredients.

Hair gels: Hair gels are actually categorized by "Hold", which refers to the strength-holding capacity of the gel. Light Hold: Light-hold hair gel is indicated for hairstyles that do not require the hair to be secured tightly in place. Light-hold hair gel is the only type of hair gel recommend for long hair. Firm Hold: Firm-hold hair gel provides a tighter grip on the hair than the one from light-hold hair gel. Firm-hold gel is especially useful for straight and wavy hair of short and medium length. Strong Hold: Strong-hold hair gel offers the strongest grip on the hair and is ideal for gravity- defying hairstyles and/or hairstyles that need very-precise shaping and molding. Strong-hold: Hair gel is recommended for straight and wavy hair of short to medium length ¹⁴.

Why Hair Gels Over Others: Stiffen a hair style and keep it from falling apart. Stronger Hold than others in adverse condition too. Mildly wet appearance of hair for longer duration. Conditioning agent to keep hair manageable. Sunscreen components to protect hair from UV and other detrimental radiation. Moisturizers to keep hair healthy.



Fig. 9. Hair Gel

General Composition of Hair Styling Gels: Humectants, Solvent, Neutralizers, Solubilizers, Preservatives, Colorants, Stabilizers, Chelating Agents, Fragrance, Various Vitamin extracts.



Fig. 10. Hair Gels

Hair Conditioner: Conditioner is that the backbone of one's hair-care routine. Conditioner refortifies the cuticle with a protective coating, allowing the hair to stay growing and not break easily. When the hair is exposed to the surface world, the cuticle, or outer lining, gets damaged until it ultimately breaks; the conditioner fills in those injuries and coats the hair to help the cuticle. Conditioner may be a conditioning or moisturizing agent generally made from ingredients like silicones, oils, and emollients, also as cationic surfactants. When combined, these ingredients replenish hair's moisture. There are various sorts of conditioner, too. Of the foremost common are in fact your traditional post-shampoo hydrator; deep conditioner, therein it's meant to be left on longer so as to penetrate the strands more deeply ¹⁴.



Fig. 11. Hair Conditioner

Cleansing Conditioner: Which acts as shampoo and conditioner hybrid that simultaneously cleanses and conditions the hair; and leave in conditioner, a post-shower, no-rinse treatment that nourishes and protects the hair throughout the day.



Fig. 12. Cleansing Conditioner

Dry Conditioner: According to cosmetic chemist Ron Robinson, is designed to spritz on just enough to make your hair shinier, smoother and softer, without making hair greasy.



Fig. 13. Dry Conditioner

Shampoos: Herbal shampoos 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 pollutions etc



Fig. 14. Herbal Shampoo

Type of shampoo: Clarifying shampoo- To cleanse the hair. Moisturizing shampoo- To moisturize hair. Sulphate free shampoo- To prevent excessive oil loss. Colour safe shampoo- To colour hair. Volumizing shampoo- To raise the volume of shampoo. Anti dandruff shampoo- To prevent dandruff. Anti-fungal shampoo- To reduce fungal growth. Strengthening shampoo- To strengthen the hair. Baby shampoo- Used for children. Medicated shampoo- To serve medicinal purpose. Dry shampoo- Dry shampoo doesn't need water, it typically comes in powder or aerosol spray form. Leave in shampoo/ leave-in conditioner - Hair care product that is applied to the hair after washing and left in, without rinsing, to provide continuous moisture, detangling, and protection. Organic/Natural shampoo- Herbal shampoo containing herbal ingredients. Curl enhancing shampoo- These shampoos enhance curls and waves providing extra shine and frizz defence ¹².

Different type of Hair shampoo: Powder shampoo, Clear liquid shampoo, Liquid cream or lotion shampoo, Jelly shampoo, Baby shampoo, medicated anti-dandruff shampoo, Cream or paste shampoo, Conditioning shampoo.

Ideal Properties of Shampoo: Clean the hair thoroughly and remove dirt, sebum and excess oil. Generate sufficient foam to aid in even application and cleansing. Be easily removed by rinsing with water. Leave the hair non-dry, soft, and lustrous with good, manageability. Impart a pleasant fragrance to the hair. Be gentle on the hands, without causing dryness or roughness. Be safe for the skin, eye and free from any side effects or irritation

About Herbal Shampoo: Herbal shampoos are hair care products made from natural, plant-based ingredients that gently cleanse and nourish the hair and scalp without relying on harsh synthetic chemicals like sulphates, parabens, and silicones. They offer a holistic approach to hair care by addressing various concerns like hair fall, dandruff, and dryness through botanical extracts and essential oils ¹⁴.

Benefits of Herbal Shampoo: Gentle Cleansing: Herbal shampoos use natural surfactants (like reetha/soapnuts or shikakai) to clean the hair without stripping away its natural oils, which can cause dryness and frizz. Nourishment and Strengthening: Infused with vitamins, antioxidants, and minerals from plant extracts, they nourish hair follicles, strengthen hair roots, reduce breakage, and promote healthy growth. Improved Scalp Health: Many ingredients have natural anti-

inflammatory, antibacterial, and antifungal properties (e.g., neem, tea tree oil, aloe vera) that help soothe irritation, reduce dandruff, and combat scalp infections. Safe for All Hair Types: Due to their mild formulation, herbal shampoos are generally suitable for all hair types, including sensitive scalps and color-treated hair. Environmental Friendly: Most herbal shampoos are biodegradable and often use sustainable packaging, making them a more eco-friendly choice compared to conventional shampoos that use petroleum-based ingredients.

Table. 1: Difference between Synthetic Shampoo & Herbal Shampoo

Synthetic Shampoo	Herbal Shampoo
They are synthetically derived, synthetic products may contain certain hazardous substances.	Herbal products are derived naturally they are entirely devoid of any dangerous ingredients.
Products that are made from chemicals are referred to as synthetic.	Products made from plants for their medical properties are referred to as herbal.
They may be harmful for sensitive skin. More side effect than herbal product	Safer to use than cosmetics made of chemical.
For short period of treatment usually synthetic drugs are more preferred.	Longer period of treatment may be required while using herbal drugs.
Synthetic drugs generally act on symptoms caused by specific disease.	Herbal or ayurvedic preparations having high patient compliance.
In emergency and chronic condition synthetic drugs are most preferred medicines.	Herbal medications generally act direct towards aiding the body's own healing process.
Ex. Cetaphil Extra gentle daily scrub.	Ex. Plum Green Tea gentle revival face scrub

Functions of Herbal Shampoo: Herbal shampoos can soothe and calm indignant scalps, lowering infection and itching. Certain herbs, inclusive of tea tree oil and neem, have antifungal and antibacterial properties, helping to manipulate infections and promote a healthful scalp. Herbal shampoos can offer comfort from psoriasis and eczema signs, including redness, scaling, and itching. Natural shampoos can efficiently easy the hair and scalp, eliminating dust, oil, and impurities. Eco friendly, not causing redness, itching, irritation, and harmful, use pure organic ingredients there are no additive surfactant, The powdered material was extracted with distilled water, by boiling for 4 h. The extract of each plant material was separated and evaporated. Free from side effects, Pure and organic ingredients, No synthetic addition, Herbal shampoos can assist stability the pH of the scalp, reducing infection and promoting, Lubrication, Conditioning, Hair growth, Maintenance of hair colour, Medication ¹⁴.

Advantages of Herbal Shampoo: Herbal shampoos are Non – toxic, Easily available, Cheaper in price, About 100 g of each powdered plant materials namely *H. rosa-sinensis*, *E. officinalis*, *A. concinna*, *S. indica*, *E. preostrate*, *A. barbadensis*, and *C. auriculata*

Limitations of Herbal Shampoo: Herbal drug have slower effect as compare to Allopathic dosages form. Also it require long term therapy, They are difficult to hide taste and Odor, Most

of the herbal drugs are not easily available, Manufacturing process are time consuming and complicated, No pharmacopoeia defines any specific procedure or ingredients to be used in any of herbal cosmetics.

Formulation of herbal shampoo: To the gelatin solution (10%), added the herbal extract and mixed by shaking continuously at the time interval of 20 min. 1 ml of lemon juice was also added with constant stirring. To improve aroma in the formulation, sufficient quantity of essential oil (rose oil) was added and made up the volume to 100 ml with gelatine ¹³.

Table. 2:- Ingredients used in shampoo formulation

Sl. No	Ingredient	Name	Parts	Active Coonstituent	Uses
1	Soap nut extract	<i>Sapindus indica</i>	Fruit	saponins	Conditioning agent
2	Amla extract	<i>Emblica officinalis</i>	Fruit	phyllemblin	Antidandruff agent
3	Shikakai extract	<i>Acacia concinna</i>	Pods	Lupeol, spinasterol	Hair cleanser
4	Hibiscus	<i>Hibiscus rosa-sinensis</i>	Flower	anthocyanin	Conditioning agent
5	Bhiringraj extract	<i>Eclipta prostrata</i>	Plant	Wedelolactone, Apigenin	Hair growth
6	Cassia extract	<i>Cassia auriculata</i>	Leaves	Sennosides A&B	Antidandruff agent



Fig. 15. Ingredients used in herbal shampoo

Marketed Herbal Shampoo:

1. Himalaya herbal shampoo
2. Vaadi herbals amla shikakai shampoo
3. Patanjali herbal shampoo

Evaluation of Herbal shampoo: There are various evaluation aspects includes, testing of wetting: How quickly the shampoo solution spreads on hair/skin. Visual assessment: Colour, clarity, consistency (fluidity, texture). Olfactory: Odor/smell. pH determination: Measured in a diluted solution (e.g., 10%) to check compatibility with skin/hair pH (ideally near 5.5). Determination of solid content percentage: Percentage of non-volatile matter. Surface tension measurement: How easily it spreads, lower is generally better. Foam stability test: Measured by the cylinder shake method; volume and persistence of foam after shaking ¹³.

- 1. Visual assessment:** The formulations was assessed for colour, clarity, odour and froth content.
- 2. pH determination:** The pH of the prepared herbal shampoo in distilled water (10% v/v) was evaluated by means of pH analyzer at room temperature
- 3. Determination of solid content percentage:** The percentage of solid substance was determined by weighing about 4 g of shampoo in a dry, clean, and evaporating dish. To confirm the result, the procedure was repeated again. The liquid portion of the shampoo was evaporated in a dish by placing on hot plate. The percentage and the weight of the solid contents present in the shampoo were calculated after drying completely
- 4. Surface tension measurement:** The prepared shampoo in distilled water (10% w/v) was evaluated for surface tension using stalagmometer in room temperature.
- 5. Testing of wetting:** Wetting time was calculated by noting the time required by the canvas paper to sink completely. 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.
- 6. Foam stability test:** The stability of the foam was determined using cylinder shake method. About 50 ml of formulated shampoo (1%) solution was taken in a graduated cylinder of 250 ml capacity and shaken for 10 times vigorously. Foam stability was measured by recording the foam volume of shake test after 1 min and 4 min, respectively. The total foam volume was measured after 1 min of shaking ¹⁴.

Literature studies:

Dhayanithi S et.al; formulated herbal shampoo and evaluated for its physicochemical properties. The herbal extracts used in formulation are *Sapindus mukorossi* (reetha), *Glycyrrhiza glabra* (liquorice), *Azadirachta indica* (neem), *Nardostachys jatamansi* (jatamansi), *Ocimum tenuiflorum* (tulsi), *Lavendula angustifolia* (lavender oil), *Musa acuminata* (banana root). Marigold used as preservative. The herbal shampoo was tested for physicochemical properties. The evaluation methods viz. visual inspection, pH determination, solubility, cleansing action, percentage solid content was studied. The formulated shampoo showed good cleansing and detergency, low surface tension, good foam stability and antidandruff property. The pH of herbal shampoo was 6.2 which is good for scalp. They found that the shampoo was enriched with constituents like polyphenol, flavonoids, saponins, vitamins which contribute antibacterial, antioxidant activity, anti-hair fall which promote growth of healthy hair with less side effects, low cost and more effective than synthetic shampoos ¹⁵.

Neha B et.al. reviewed studies on herbal shampoos incorporate bioactive plant extracts, oils, and natural surfactants that not only cleanse but also impart therapeutic benefits such as antimicrobial, antioxidant, anti-dandruff, conditioning, and hair growth-promoting effects. They explored scientific basis and formulation strategies of herbal shampoos, focusing on the role of commonly used botanicals such as Reetha, Shikakai, Amla, Neem, Hibiscus, Aloe vera, and Bhringraj.

Extraction methods, standardization challenges, and incorporation techniques are discussed to highlight their impact on product quality and reproducibility. Evaluation parameters including physicochemical analysis, foaming ability, detergency, stability, and safety assessments are critically reviewed. The review concludes with future perspectives emphasizing the integration of nanotechnology, green surfactants, standardized extracts, and clinical trials to ensure consistency, efficacy. By addressing challenges in standardization, preservation, mechanistic validation, and regulatory compliance, herbal shampoos can evolve from niche natural products into mainstream, globally accepted, sustainable alternatives to synthetic hair care formulations ¹⁶. Revansiddappa M, et.al., prepared Herbal shampoo with Ritha fruits, Liquorice stolons, Bengal gram seeds, Brahmi leaves, Greengram seeds, Banana roots, Pomegranate seeds, Hibiscus leaves, Marigold flowers, and Lemon fruits. Prepared extract with all ingredients and different formulations prepared. Formulation 4 was found to be the best formulation based on the evaluation parameters and stability studies and it was found to be harmless, more effective and economical compared to synthetic anti dandruff shampoo ¹⁷.

Saziya P. et.al., studied on the formulation and evaluation of herbal shampoo enriched with *Rosmarinus officinalis* (rosemary), with antioxidant, antimicrobial, and hair-stimulating properties. The herbal shampoo was formulated using a combination of rosemary extract along with other natural cleansing and conditioning agents such as *Sapindus mukorossi* (reetha), *Acacia concinna* (shikakai), *Emblica officinalis* (amla), and *Aloe vera* gel. The formulation was evaluated for physicochemical properties, pH, viscosity, foam stability, surface tension, solid content and detergency. Results indicated that the shampoo exhibited ideal pH levels (close to that of the scalp), good foaming capacity, and stable viscosity, making it suitable for regular use. The presence of rosemary contributed significantly to the antimicrobial activity of the shampoo, particularly against dandruff-causing organisms such as *Malassezia furfur*. Sensory evaluation reported favorable feedback regarding the fragrance, texture, cleansing action. They concluded that formulated herbal shampoo supports scalp health, promotes hair growth, and provides a gentle cleansing experience ¹⁸.

Pradyumn T. et.al. formulated and evaluated an herbal gel shampoo. The extracts prepared from *Hibiscus rosa-sinensis*, *Emblica officinalis*, *Acacia concinna*, *Sapindus indica*, *Eclipta prostrata*, *Aloe barbadensi*, *Azadirachta indica*, *Lawsonia inermis* in different proportions. Evaluated for Physical appearance, pH, Determine percent of solids contents, Foaming ability and foam stability, Stability studies was performed. They found that the shampoo prepared was clear. It showed cleansing, detergency, foam stability, small bubble size, and conditioning execution ¹⁹.

McCage CM. et.al conducted studies on development and clinical testing of an herbal lice removal shampoo, containing a standardized extract of paw paw, thymol and tea tree oil. Optimum concentrations of the ingredients, treatment times, and dosing schedules were established through in vitro tests with head lice. In addition to pilot studies involving 21 participants, a final clinical trial, using the optimum shampoo formulation in 16 participants, demonstrated 100% effectiveness in removing head lice and nits. The *in vitro* and initial clinical tests shampoo D was developed as offering the best results, along with good stability. Shampoo D contains a combination of ingredients (paw paw extract, thymol, and tea tree oil) which depletes ATP levels. A second clinical study was conducted with school children and their family members in New Jersey. Shampoo D was applied to the dry hair and left on for one hour before rinsing. A success

rate of 100% was demonstrated in all 16 participants in removing lice and nits after three shampoo applications eight days apart ²⁰.

Sravanthi K. et.al. formulated and evaluated herbal Anti dandruff shampoo with natural ingredients for safety and efficacy. The shampoo was prepared by taking the extracts of orange peel powder (*Citrus Aurantium*), Curry Leaves (*Murraya Koenigii*), Ginger (*Zingiber Officinale*), Aloe vera (*Aloe Barbadensis*), Reetha (*Sapindus Mukorossi*) in different proportions. Physicochemical tests were performed for visual assessment, wetting time, pH, assurance of solid contents, surface tension, detergency, conditioning performance, foam stability. The formulated herbal shampoo is black in color which demonstrated good froth stability, detergency, good cleansing, low surface tension, optimum pH and conditioning activity. They concluded that further scientific investigation is required for validation of its overall quality ²¹.

Rakesh MR. et.al studied to formulate herbal shampoo. The extracts of *Asparagus racemosus*, *Acacia concin*, *Sapindus mukorossi* was used. Defatted air-dried plants powders were extracted with methanol. The phytochemical screening was done to identify the natural phytochemicals in plant extracts by TLC. The pH of the Shampoo was adjusted to 5.5, to retain the acidic mantle of scalp, self-preserving shampoo avoided risk posed by chemical preservatives ²².

Nitin K. et.al. prepared Herbal shampoo by Amla powder, Hibiscus (leaf), Bhringraj, Reetha, Neem, Shikakai, and Aloe gel, in different quantities. Evaluation of Organoleptic and physical-chemical characteristics was conducted. It showed cleansing and detergency, low surface tension, good foam, stability, and anti-dandruff properties. The pH of herbal shampoo was 6.4 which is good for the scalp. The shampoo produced good foam. The shampoo showed ideal pH, viscosity, surface tension, foamability and stability ²³.

Anitha P. et.al. conducted studies on herbal shampoo using fenugreek (*Trigonella foenumgraecum*), hibiscus (*Hibiscus rosasinensis*), aloe vera, reetha (*Sapindus mukorossi*), and neem (*Azadirachta indica*). The components was chosen for its hair care: fenugreek for dandruff prevention and nourishing, hibiscus for hair growth stimulation, aloe vera for conditioning and moisturizing, reetha for natural cleansing, and neem for potent antibacterial properties. Standard cosmetic formulation techniques were used to make the shampoo, while maceration and decoction processes were used to acquire the extracts of the chosen herbs. According to findings, the shampoo had a pH between 6.0 and 6.5, foaming qualities, a decent cleansing effect, stability ²⁴.

Summary and Conclusion:

This review gives knowledge about detail about the chemistry of hair, with its problems and also provides their solutions. This text also main specialize in the hair problem and with its solutions like allopathic, other remedies. It helps to researcher to seek out area of problems where easy to solution concerning hairs and also provides selection best polymers utilized in the preparation of dosage form for treating the hairs problems with cost effectiveness and its better stability with selecting proper preservatives. It also helps within the formulation of shampoo with its ideal properties. The key to choosing the best shampoo is knowing your particular hair needs, which include your hair type, scalp health, and desired results. While washing is the primary function, modern shampoos usually provide additional benefits like hydration, volume, or colour retention. For the best possible hair health and appearance, it is essential to select a shampoo that targets your unique hair issues for which the herbal shampoo is chosen which is suitable for almost all hair types and it leaves no side effects and less added artificial agents.

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