

A Review on Hair Care Cosmetics and Indian Medicinal Plants for Hair

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Abstract:

Plants have long served as a valuable source of both sustenance and medicinal remedies. In the realm of beauty, a diverse array of plant oils find application in the formulation of cosmetics and toiletries. Women, driven by their desire to appear attractive and youthful, oftenturn to these herbal-infused beauty products. The hair, being subjected to various aggressions, is susceptible to ailments that can disrupt its normal health. Common hair-related issues include pigmentation problems, such as fading, as well as dandruff and hair loss. The utilization of herbal ingredients in hair care products can be traced back to the ancient Ayurvedic system, which has extensively examined approximately 1000 types of plant extracts for their potential in promoting hair growth. This article provides an overview of the application of various natural substances in promoting hair growth. It discusses the specific plant components utilized, their chemical composition, the active ingredient responsible for the desired effect, and provides a concise description of their primary usage.

Keywords: Hair, Cosmetics, Hair Cosmetics, Herbal Cosmetics, API'S: - Active Pharmaceutical ingredients.

Introduction

Hair

Hair is a distinguishing characteristic present in all mammals, including humans. It serves various purposes, such as safeguarding the skin from external harm and aiding in maintaining a constant body temperature. For instance, eyebrows and eyelashes prevent foreign objects from entering the eyes, while scalp hair shields the head and neck from sunlight, cold weather, and physical injury. Additionally, hair plays a sensory role by enhancing the perception of touch on the skin's surface and plays a significant part in sexual and social communication. The psychological impact of hair disorders, such as hirsutism and hair loss, further emphasizes the importance of hair in one's quality of life. Mammalian skin produces hair throughout the body, except for specific areas like the sole of the foot, the palm of the hand, the buccal surface of the lip, and portions of external genitalia. Human hair growth varies across different body areas, with most of the body surface having tiny and virtually colorless hair, while other areas like the scalp, eyelashes, and eyebrows have longer, thicker, and heavily pigmented hair. Hair characteristics also differ in terms of form (straight, helical, or wavy), color (brown to black or yellow to reddish brown), length, diameter, and cross-sectional shape.[1]

Hair Structure and its characteristics

Each hair on the human body grows from its own unique hair follicle, which is comprised of two main components: the hair bulb and the hair shaft.

The Hair bulb

The hair bulb, located at the base of each hair follicle, houses the growing hair cells, including melanocytes responsible for producing melanin, the pigment that gives color to the hair.

The Hair shafts

The hair shaft, visible above the scalp, is composed of compacted and fused keratin protein. It is comprised of three layers.

The Cuticle

Human hair is coated with a protective layer called the cuticle, which consists of 6 to 10 layers of cells that are 0.2 to 0.5 mm thick. It also maintains the hair's hydration balance and flexibility by reducing moisture movement in and out of the underlying cortex.

The Cortex

The hair's main bulk and color are formed by the cortex, which consists of long keratin filaments held together by disulphide and hydrogen bonds. The cortical cells are closely packed and oriented, measuring approximately 3 to 6 mm in diameter and up to 100 mm in length.

The Medulla

Thicker hair types have a medulla, which is the innermost layer of hair. It is composed of transparent cells and air spaces, forming a soft and thin core. [2,3]

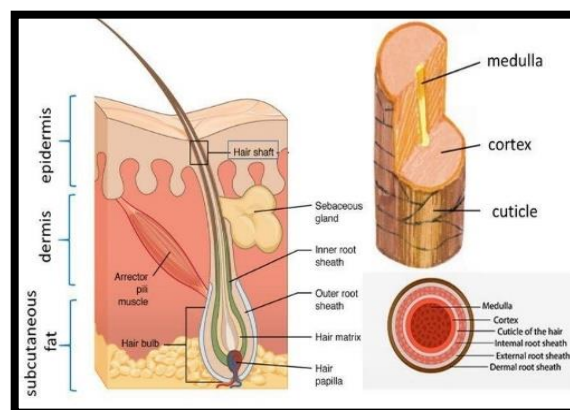


Figure 1: Hair structure

Chemical Composition

Human hair is a complex fiber composed of various morphologic components and different chemical species. The chemical composition of hair varies with its water content, and the main component is protein, which makes up 65-95% of the hair weight. It is keratinous and a condensation polymer of amino acids. Other constituents include water, lipids, pigment, and trace elements. [3]

Cosmetics

The FDA defines cosmetics as products intended for enhancing appearance without affecting the body's structure or functions. Today, cosmetics are readily available in various forms such as creams, lipstick, perfumes, eye shadows, nail polishes, and hair sprays. They serve different purposes, from providing a glow to the skin with face powder to adding color to the lips with lipstick. Both women and men use cosmetics like creams, gels, and colognes daily. In the beauty industry, hair care products have seen significant growth, with many young men using oils and gels to maintain and style their hair. Additionally, there are products available to address hair fall and dandruff concerns.[4]



Figure 2: Cosmetics

Classification

Cosmetics can be classified into four main categories.

Skin Cosmetics

Skin cosmetics are products that improve the skin's appearance, shield it from environmental elements, and offer nourishment and hydration. Examples of skin cosmetics include face powder, body powder, vanishing creams, cold creams, body lotion, and lipstick.

Hair Cosmetics

Hair cosmetics, such as shampoo, hair tonic, conditioners, hair colorant's, hair color remover, shaving soaps, creams, styling gels, hair sprays, hair serum, and hair masks, are utilized to improve the overall look and well-being of hair.

Nail Cosmetics

Nail cosmetics are a range of beauty products that are designed to improve the appearance and health of nails. These products include nail polish, nail polish remover, nail hardeners, cuticle creams, and nail art accessories.

Cosmetics for hygiene purposes

Hygiene-purpose cosmetics encompass a range of products aimed at enhancing and preserving personal hygiene. These include toothpaste, mouthwash, deodorant, and hand sanitizer.[5]

General uses

Cosmetic substances play a crucial role in enhancing the appearance of the body and masking body Odor. They also provide protection and maintain the skin's health. Nowadays, cosmetics are considered indispensable in our daily lives. Creams and lotions are used to moisturize the face and body, sunscreens shield the skin from harmful UV radiation, and treatment products address skin imperfections such as

acne, wrinkles, and dark circles under the eyes.[4]

Hair cosmetics

A head of hair that is considered healthy is one that is shiny, sleek, long, and voluminous, without any signs of hair loss. The hair-care industry has developed a wide range of products to help us achieve this ideal, including those that strengthen and nourish hair fibers, increase hair volume, reduce frizz, and promote new hair growth. These modern cosmetic products are designed to cleanse hair of impurities and improve its overall health and appearance. [6,8]

Different types of hair cosmetics

1. Shampoo
2. Conditioner
3. Oil
4. Hair Styling products
5. Hair colorant
6. Hair Serum
7. Hair tonic

1. Shampoo

Shampoo treatments are widely used for managing hair and scalp conditions. A shampoo is a cosmetic preparation that is applied to clean the hair and scalp from dirt, residues of styling products, and environmental pollutants. It should be tailored to different hair types, age, and individual habits, while also addressing specific hair and scalp problems. The cleaning process should be mild to maintain the balance of essential elements in the hair and leave it glossy. A good shampoo should be easy to rinse off, produce enough foam, and be non-toxic and non-irritating to the hair and scalp. Commercial shampoos also include "specific" options with additional ingredients for treating various hair issues, such as dandruff and dermatitis. [8,9]

Detergent

Surfactants are compounds that possess a dual affinity, being both lipophilic and hydrophilic. Their lipophilic nature arises from the presence of a hydrocarbon fatty chain, typically consisting of 12-14 carbon atoms, which enables them to bind with greasy soil. On the other hand, their hydrophilic properties stem from the polar head group located at Surfactants can be categorized into four primary groups based on the type of polar head they possess: anionics, cationic, amphoteric, and non-ionic.[11]

Table1: classification of surfactant.[12]

Class	Chemical class	Characteristics
Anionic	Lauryl sulphates, Laurate sulphates, sarcosine, sulfosuccinates	Deep cleansing, may leave hair harsh
Cationic	Long-chain amino esters, ammonioesters.	Poor cleansing, and poor lather, impart softness and manageability

Non-ionic	Polyoxymethylene fatty alcohols, polyoxymethylene sorbitolesters, alkanol amines	Mildest cleansing, impart manageability
Amphoteric	Betaines, sultaines, imidazolinium derivatives	Non-irritating to eyes, mild cleansing, impart manageability

Conditioning and active ingredients

The role of the conditioner in these shampoos is to provide manageability, gloss, and antistatic properties to the hair. Typically, substances such as fatty alcohols, fatty esters, vegetable oils, mineral oils, or humectants are used to achieve this function. Hydrolyzed animal protein, glycerin, dimethicone, simethicone, polyvinylpyrrolidone, propylene glycol, and cetalkonium chloride are commonly utilized conditioning substances in shampoos.

Additives

Shampoo products are required to exhibit stability and possess an attractive quality, necessitating the incorporation of various additives. Additives that modify the surfactant effect (viscosity control agents, foam stabilizers), stabilize the product (preservatives) and increase its appeal (fragrances, dyes, and ingredients for consistency and a pearlescent appearance). [9]

Others

1. Foaming properties
2. Thickeners
3. Chelating Agents
4. Special Cake Ingredients [11]

General Method for preparation of shampoo

The process for preparing liquid shampoo typically involves several steps. First, the detergent is converted into a solution form, either by dissolving it directly from the manufacturer or by converting it into a solution. Next, half of the detergent solution is taken and combined with the secondary surfactant, alkanolamine, which is dissolved with gentle heat and stirring. The other half of the detergent solution is mixed with a suitable amount of perfuming agent and dissolved. The perfume solution is then added to the alkanolamine solution. Color and preservatives are dissolved separately in water and added to the main solution, which is mixed well by gentle stirring. The final volume of the preparation is adjusted by adding clear sterile water to create a clear liquid shampoo.

Types of shampoo

There are several available types of shampoos, which are categorized according to their consistency. The classifications are as follows:

1. Clear liquid shampoos
2. Liquid cream shampoos
3. Cream shampoos
4. Gel shampoos

- 5. Powder shampoos
- 6. Aerosol shampoos (Foam type)
- 7. Special shampoos.[5]

2. Conditioner

Conditioning agents are additives that enhance the texture, appearance, fullness, smoothness, shine, and overall manageability of hair. There was a recognized need for a synthetic sebum- like substance or a conditioner that could reduce static electricity, increase hair shine and volume, improve hair manageability, and maintain hair styling. These agents are also utilized to restore the hair's condition after chemical treatments such as waving, straightening, and colouring, as well as after physical damage caused by hair drying, brushing, and styling. Conditioners are employed to minimize friction, detangle the hair, reduce frizz, and improve combing. [6,10,13]

The various types of conditioners can be categorized as

- 1. Rinse Off or Instant Conditioner
- 2. Leave On Conditioner
- 3. Leave In Conditioner
- 4. Deep Conditioners
- 5. Anti-Hair Loss Conditioners
- 6. Blow Drying Conditioners
- 7. Hair Glaze or Hair Thickener Conditioners. [7,13]

Table 2: Ingredients in Hair Conditioning Cosmetics [10]

Ingredient	Function	Example
Water	Solvent	Deionized water
Cationic surfactant	Surfactant, conditioning agent	Behetrimonium chloride, steatrimonium chloride, stearyl amidopropyldimethylamine, beheny amidopropyldimethylamine, stearoxypropyl trimonium chloride, palmitamidopropyltrimonium chloride,
Fatty alcohol	Cosurfactant, conditioning agent	Cetyl alcohol, stearyl alcohol, behenyl alcohol
Silicone	Conditioning agent	Dimethicone, dimethiconol, amodimethicone
Oil	Conditioning agent	Cetyl esters, mineral oil, oleyl alcohol, cetyl ethylhexanoate, squalane
Polyol	Solvent, humectant	Glycerin, propylene glycol, dipropylene glycol, butylene alcohol
Polymer	Rheology modifier	Hydroxyethyl cellulose, PEGs
Organic acid	pH adjuster	Citric acid, lactic acid, glutamic acid

Scalp care active	Scalp care	Zinc pyrithione, octopirox, dipotassium glycyrrhizate
Preservative	preservation	Methylparaben, phenoxyethanol, methylisothiazolinone Methylparaben, phenoxyethanol, methylisothiazolinone
Perfume	Fragrance	—
Color	Appearance modifier	—

Conditioner Formulation

A variety of ingredients are combined to create a hair conditioner that enhances the appearance of thinning hair, as previously discussed for shampoos. Cationic detergents, also referred to as quaternary or quaternary ammonium compounds or quats, effectively enhance the adherence of the cuticular scales to the hair shaft. This results in improved light reflection, adding shine and luster to the hair. Additionally, these detergents can neutralize static electricity caused by processed or damaged hair, as they are attracted to the positively charged quaternary compound. This enhances manageability, making them an ideal choice for patients with dyed or permed hair, as well as those experiencing hair loss. Another type of conditioner, known as leave-in conditioners, is designed to remain on the hair shaft until the next shampooing. These conditioners form a thin layer of polymer, such as polyvinylpyrrolidone (PVP), on the hair shaft. This polymer fills in any defects in the hair shaft, resulting in a smooth surface that increases shine and eliminates static electricity due to its cationic properties. Furthermore, the polymer coats each individual hair shaft, giving the illusion of thicker hair. This type of conditioner is particularly beneficial for individuals with hair loss, as it provides a thicker feel and better style retention. [12]

3. Oils

Essential oils are of significant interest in response to the growing demand for herbal cosmetics in the market. They serve as natural sources of biologically active ingredients, owing to the extensive utilization of such compounds and their chemical composition. Numerous studies have assessed the efficacy of these bioactive ingredients in cosmeceuticals, particularly in repairing hair scalp and shaft damage. Consequently, the quantities and combinations of these compositions determine their properties, which are beneficial for hair cosmetic applications, including antioxidant, anti-inflammatory, and antimicrobial activities. The market for hair oils is experiencing significant growth as consumers increasingly prefer the benefits provided by these products. These benefits encompass hair strengthening, nourishment, accelerated hair growth, and reduced hair fall. Consequently, numerous researchers have directed their efforts towards comprehending the extent to which different ingredients, utilized in hair oils, penetrate human hair and the subsequent impact on the hair's physicochemical properties. The application of oil on hair can enhance shaft lubrication and aid in preventing hair breakage. Moreover, the deposition of oil on the hair yields a beneficial protective effect. Various oils, such as coconut oil, olive oil, castor oil, rice bran oil, sesame oil, and mineral oils, are employed for human hair care. However, the majority of oils available in the market are in the form of blends infused with herbs and nutrients, aimed at promoting hair growth and overall hair health. [11,15]

Volatile substances known as essential oils are derived from different plant parts, including flowers, grass, herbs, fruits, citrus fruit peel, seeds, leaves, bark, rhizomes, and roots, as by-products of plant

metabolism.[14]

Preparation of oil formulations using various ratios of base oils and additive

An oil formulation typically comprises two fundamental elements: base oil and additives. Base oils account for approximately 70%-85% of the overall composition, with additives constituting the remaining 15%-25%. The utilized base oils include Rice Bran Oil (RBO), Refined Til Oil (RTO), and light liquid paraffin oil (LLPO), while the additives encompass herb extract, menthol, camphor, menthe oil, Butylated hydroxytoluene (BHT), cinnamon, vetiver oil, and others.[15]

3. Hair styling products

Hair styling products are specifically formulated to assist in the temporary creation and maintenance of desired hairstyles. Various forms of these products, such as styling mousse, styling spray, styling gel, styling water, styling wax, and styling oil, are available in the market. The hair industry has introduced a wide range of products that can be used before or after physical hair styling procedures, such as curling with rollers, ironing, and back-combing. These products are designed to alter the hair's texture or provide long-lasting hold for a specific style.[6]

1. **Styling mousse:** Styling mousse is recognized for its foaming capability, which is its primary characteristic. Upon dispensing from the container, it transforms into a foam. A superior quality hair mousse should have the ability to produce a rich, creamy, and gentle foam. The foam is initially stable, but when applied to hair, it quickly vanishes, leaving the product on the hair. Due to its relatively low surface tension, a styling mousse can be effortlessly and uniformly distributed on the hair surface by slightly spreading it. Styling mousse can be applied to either wet or dry hair.
2. **Styling spray:** Styling sprays typically consist of styling polymers dissolved in ethanol-water solutions. A notable feature of styling sprays is their ability to quickly dry once applied to the hair. These sprays are commonly used on dry hair to set and maintain the desired hairstyle. With its strong localized style-holding effect, styling spray proves effective in creating hair curls, spiky hairstyles, and hair buns.
3. **Styling gel:** Styling gel typically possesses a thick and robust style-holding capability, often achieved using polymeric thickeners in a water or water-ethanol solvent. This versatile product can be applied to either dry or wet hair and can be used for overall styling or targeted application.
4. **Styling water:** In principle, the process of styling water is like that of styling gel; however, it is characterized by reduced levels of polymeric thickener, resulting in a lower viscosity. Typically, styling water offers a relatively gentle styling effect, providing a cleaner sensation and facilitating easy rinsing.[7]

General formulation of styling products

Styling polymer: Modern styling products utilize hair styling polymers, also known as fixative polymers, as the primary agents for achieving desired hairstyles. These polymers possess the ability to form a film and exhibit adhesive properties. The fundamental mechanism of hair styling with these polymers involves the formation of either a seam weld-like film or a spot weld-like film between individual hair fibers, effectively locking the hair into a specific shape. However, it is important to note that the film formed is susceptible to breakage when the hair is in motion. The longevity of the styling effect is determined by factors such as the quantity of polymer films formed, the strength and flexibility of the polymer film, and the type of weld employed. Styling polymers typically consist of synthetic vinyl

polymers that are soluble in water or water-alcohol mixtures. Some commonly used hair fixatives include polyquaternium-11, polyquaternium-4, polyquaternium-46, polyquaternium-16, polyquaternium-39, polyquaternium-2, polyquaternium-28, VP/methylacrylamide/vinyl imidazole copolymers, PVP, PVP-VA, acrylates type copolymers, butyl or ethyl esters of PVM/MA copolymers, and guar derivatives such as guarhydroxypropyltrimonium chloride.

Solvent: The solvent plays a crucial role as a carrier in facilitating the uniform distribution of the styling polymer onto the hair. Commonly employed solvents comprise water, ethanol, propanol, and their combinations.

Neutralizer: To ensure proper functionality, anionic styling polymers and thickeners must undergo neutralization. Commonly utilized neutralizers include 2-amino-2-methyl-1-propanol, triethanolamine, sodium hydroxide, and potassium hydroxide.

Surfactant: In styling products with a high-water content, such as styling mousse and gel, surfactants are commonly employed at a concentration of 0.5e3% to facilitate the emulsification of water-insoluble components.

Plasticizer: The plasticizer's role is to enhance the flexibility and durability of the film created by the styling polymer, achieved by reducing its glass transition temperature (T_g).

Propellant: In styling mousse or spray, liquefied gases like dimethyl ether and isopentane are commonly utilized as propellants to facilitate the process of spraying or foaming. It is important to note that these propellants possess high volatility and flammability.

Thickener: Styling gel effectively enhances its viscosity through the utilization of thickeners. Typically, these thickeners consist of cross-linked polymers, specifically salts of lightly cross-linked polyacrylic acid, commonly referred to as Carbomer, Acrylates-C10-30 alkyl acrylate cross polymer, and others. [7,17]

1. Hair colorant

Since ancient times, natural dyes have been utilized for various purposes, including hair coloration, medicinal applications, decoration, and religious rituals. Initially, hair dyes were derived from metallic compounds, plant extracts, dried plants, or their combinations. In contemporary times, hair colorings are categorized based on the duration of the color effect. Therefore, the primary classifications include temporary, semipermanent, and permanent hair color products. [18,19]

Temporary Hair Colorants

Temporary hair colorants are products that can add color to the hair but can be easily removed with just one shampoo. These colorants typically contain water-soluble acid dyes, which are too large to penetrate the hair's cuticle and reach the cortex. Instead, the dye is deposited on the hair's surface and can be easily washed away with shampoo.

Semipermanent Hair Colorants

These dyes have a molecular weight that is sufficiently low to allow them to penetrate the cuticle and partially enter the cortex of the hair. Consequently, they exhibit a certain level of resistance to shampooing. Generally, manufacturers claim that semipermanent dyes create an effect that can withstand approximately 6 to 12 shampoos. Furthermore, the effects of these colorants can be eliminated through frequent shampooing, without the need for hydrogen peroxide to develop the color. Consequently, the use of this type of product does not result in any damage to the hair.

Permanent Hair Colorants

The hair coloring market is primarily dominated by permanent hair colorants. These colorants differ from conventional dye stuffs as they consist of colorless precursors that interact with hydrogen peroxide within the hair fiber, resulting in the formation of pigmented molecules. The advantageous decolorizing properties of hydrogen peroxide towards melanin, the natural pigment of hair, enable manufacturers to carefully adjust the quantities of hydrogen peroxide and dye precursors. This delicate balance allows for the achievement of either lighter or darker shades of hair color compared to the individual's natural hair color.

Hair lighting

The hair lightening products that are the most basic consist of pump sprays that contain an acidic solution of hydrogen peroxide. These sprays can be applied onto the hair and will gradually lighten it over a period of several hours.[18]

Hair highlighting

The process of hair highlighting involves the use of the 'foil method' to isolate sections of hair and either lighten or darken them. This is achieved by separating strands of hair with a comb and placing them on an aluminum foil sheet, which is then painted with a mixture of hydrogen peroxide and pigment.[6]

2. Hair Serum

Hair serum is a styling product that forms a protective layer on the surface of the hair. It is known for its high concentration of active ingredients, which provide deep nourishment to the skin and result in a non-greasy finish. This liquid hair care product has a thicker consistency than water and serves multiple purposes beyond styling. It effectively addresses various hair concerns such as dryness, dullness, and unruliness. Different types of hair serums cater to specific hair goals. Depending on the formulation, a hair serum can reduce frizz, enhance shine, or straighten the hair. This silicone-based styling product is specifically designed to coat the hair, offering added shine, smoothness, hydration, and protection against humidity and pollution. It is recommended for use on wet hair.

Procedure of Herbal Hair Serum Formulation

First, ensure that all glassware is thoroughly cleaned and dried according to the standard operating procedure (SOP). Next, accurately measure the required quantity of aloe vera and transfer it into a beaker. Then, mix the necessary amount of vitamin E into the aloe vera. Following this, add rosewater to the aforementioned mixture of aloe vera and vitamin E. After stirring the mixture for a few minutes, heat the prepared solution for a few minutes. Finally, add a few drops of almond oil and continue stirring the preparation using a magnetic stirrer. Once done, transfer the preparation into a measuring cylinder and

adjust the final volume to 30ml. Finally, transfer the final solution into a suitable container.[20]

3. Hair Tonic

The hair, an essential component of the body originating from the ectoderm of the skin, serves as a protective appendage and is classified as an accessory structure of the integument, alongside sweat glands, sebaceous glands, and nails. In modern times, individuals are increasingly drawn to hair care products and conditioning agents, including shampoos, hair tonics, and conditioners infused with herbal extracts, to combat hair loss.

Herbal hair tonic formulation

To formulate the herbal hair tonic, active constituents such as Jojoba oil and Tulsi oil are utilized, while coconut oil serves as the base of the formulation. The ease of mixing Jojoba oil with Tulsi oil allows for the initial mixing of both oils in a separate beaker. In another beaker, coconut oil is added, followed by the addition of the mixture of Jojoba and Tulsi oils. To enhance the attractiveness of the formulation, coloring and perfume are incorporated. The final step involves stirring the mixture on a mechanical shaker to ensure proper mixing and consistency.[21]

Different types of herbal ingredients or API

Herbal cosmetics consist of phytochemicals derived from different botanical sources, which have a positive impact on skin functions and provide beneficial nutrients for healthy and radiant skin or hair. These cosmetics are advantageous as they are made from herbs and shrubs. The natural components in these herbs do not cause any unwanted or side effects on the human skin, but instead nourish and provide favorable nutrients to the skin.

Advantages of herbal cosmetics

1. Eco-friendly
2. Lack of harsh chemicals
3. Nutrition rich
4. Fit budget.[22]

Figure 3: Herbal Ingredients



1. Aloe vera

Botanical name: *Aloe succotrina* Kingdom: Plantae

Order: Asparagales Genus: *Aloe* Species: *A. vera*

Organic source: Aloe vera dried leaves Family: Liliaceae

Uses: Aloe vera provides a conditioning and moisturizing effect that effectively removes dandruff, promotes hair growth, and nourishes the hair. The amalgamation of aloe pulp and coconut oil boasts a plethora of vitamins and minerals. When used as hair and scalp oils, these oils result in healthy, strong, and dandruff-free hair, preventing the occurrence of dandruff. [23,24,25,26,27,29]

2. Shikakai

Botanical name: *senegalia rugata* Kingdom: plantae

Order: fabales

Genus: *senegalia* Species: *s.rugata*

Organic Source - The organic source in question is derived from the fruit of the Acacia tree, specifically the *Acacia concinna* linn. This tree belongs to the fabaceae family and is commonly found in the tropical rainforests of southern Asia.

Family: Fabaceae

Uses - The fruit of the Acacia tree is widely utilized for various purposes. It serves as a natural cleanser, particularly beneficial for individuals with sensitive scalps or those seeking to control dandruff. Additionally, it promotes hair growth, strengthens hair roots, and contributes to the attainment of long, beautiful hair. Furthermore, the fruit is employed in the production of herbal oils. [24,25,26,27]

3. Hibiscus

Botanical name: *Hibiscus rosa-sinesis* Kingdom: Plantae

Order: Malvales Genus: *Hibiscus* L. Species: *Shoeblack* plant

Organic source: Hibiscus Flower Family: Malvales

Uses:

nourishing and thickening hair, acting as an emollient and mind tonic, promoting hair growth and blackening of hair, enhancing the luster of hair, acting as a laxative, treating skin diseases and menorrhagia, and providing remedies for bronchial catarrh, antiscorbutic conditions, and depurative purposes. The plant component that is used is the leaf.

Hibiscus is rich in vitamin C and A, iron, and possesses anti-inflammatory, antioxidant, and anti-bacterial properties. The application of herbal hair masks made from hibiscus flower paste or hibiscus infused oil can effectively address issues such as hair loss, dandruff, and improve hair shine, condition, and promote hair regrowth in terms of length and thickness. [25,26,27,28,29]

4. Curry Leaves

Botanical name: *Bergera Koenigii* Kingdom: Plantae

Order: Sapindales Genus: *Bergera* Species: *B.Koenigii*

Organic source : The leaves of the plant. Family: Rutaceae.

Uses

In Ayurvedic medicine, curry leaves infused oil is highly regarded for promoting hair regrowth and enhancing the strength, shine, thickness, and speed of hair growth. It also effectively reduces hair loss, making it an exceptional herb for achieving thick and lustrous hair. Additionally, curry leaves condition the hair, alleviate scalp infections, prevent premature graying, and possess antibacterial properties. Rich in antioxidants such as vitamin A, C, E, folic acid, and minerals like iron, curry leaves provide nourishment for the hair. [25,26,28]

5. Neem

Botanical Name: Azadirachta Indica Kingdom: Plantae

Order: Sapindales Genus: Azadirachta Species: A. Indica

Organic source: Whole Plant of Neem Family: Meliaceae

Uses

Neem, known for its medicinal properties, is an effective herb for hair loss. Its antibacterial, anti-inflammatory, and antifungal properties make it a great solution for fighting dandruff and promoting hair growth. For these uses, the plant's leaves are employed. These components exhibit antifungal, antibacterial, insecticidal, and other biological activities. The neem tree plays a role in: curing scalp problems, promoting lustrous and healthy hair, facilitating thicker and stronger hair growth, preventing premature greying, and providing a cooling and soothing effect. [26,28,31]

6. Coconut

Botanical name: Cocos Nucifera Kingdom: Plantae

Order: Arecales Genus: Cocos Species: C. nucifera

Organic Source: dried fruits of the Cocos nucifera plant Family: Arecaceae

Uses: Coconut oil is obtained from the milk of the fruit of the coconut palm. It is commonly used as a cooking oil and finds applications in various industrial sectors such as cosmetics and detergent production. It serves as a moisturizer, vehicle, and stimulates hair growth by unclogging pores. Additionally, the oil and milk extracted from coconut are commonly used in cooking and frying. Coconut oil is also widely employed in the production of soaps and cosmetics. [25,26,27,28]

7. Amla

Botanical Name: Phyllanthus Embalica

Kingdom: Plantae

Order: Malpighiales

Genus : Phyllanthus

Species: P. Embalica

Organic Source: Fruit of the Amla Plant

Family: Phyllanthus

Uses

It is commonly used as a hair conditioner and for treating scalp diseases, as well as promoting hair growth. Amla, as it is commonly known, is rich in vitamin C, tannins, phosphorus, iron, calcium, and other minerals that nourish the hair and contribute to thick, black hair. The fruits of the plant are used. It can be consumed as juice or used in dried form as a hair mask. Amla oil, which is widely popular in India and Southeast Asian countries, is derived from this plant and used as a hair oil. Amla is known for its abundance of vitamins, minerals, and antioxidants. [25,26,27,28,29,30]

8. The onion (Allium cepa)

Botanical name: Allium cepa Kingdom: Plantae

Order: Asparagales

Family: Amaryllidaceae Genus: Allium

Species: A. cepa

Allium cepa, scientifically known as *Allium cepa* L., derived from the Latin word "cepa" meaning onion, is commonly referred to as the bulb onion or common onion. It is a vegetable and is widely cultivated as the predominant species within the *Allium* genus. This plant has been utilized for its potential to reduce hair loss by improving blood circulation in the scalp and hair. The presence of Sulphur in the onion juice contributes to the production of essential collagen, which in turn promotes hair growth. [26,27]

9. Jatamansi

Botanical Name: *Nardostachys Jatamansi* Kingdom: Plantae

Order: Dipsacales Genus: *Nardostachys* Species: *N. Jatamansi*

Organic Source: Roots and Rhizomes of *N. Jatamansi* Family: Caprifoliaceae

The utilization of Jatamansi in the Siddha and Ayurveda systems encompasses the application of diverse herbal formulations. These formulations serve various purposes, such as stimulating hair growth (referred to as Roma sanjanana), alleviating digestive issues (Pachana), inducing sleep (Nidhrajnana), relieving the sensation of burning (Dahaprasha), and functioning as a brain tonic (Medhya Volatile Essential Oil). [26,27,29]

10. Bhringraj (*Arnica Montana*)

Botanical Name: *Eclipta Prostrata* Kingdom: Plantae

Order: Asterales

Genus: *Eclipta*

Species: *E. Prostrata*

Source: Leaves, Flower, Fruit And Stem of *Eclipta Prostrata* Family: Asterceae

Bhringraj is renowned for its efficacy in treating various ailments, including skin diseases, cough, asthma, eye disorders, and conditions affecting the head. Additionally, it is known to enhance hair growth, prevent hair loss, and address premature graying of hair. Furthermore, it possesses the ability to prevent hair loss, promote hair growth, enhance hair luster, repair hair damage, and treat baldness. [26,27]

11. Tulsi

Botanical name: *Ocimum tenuiflorum* Kingdom: Plantae

Order: Lamiales

Genus: *Ocimum* Species: *O. tenuiflorum*

Organic source: fresh and dried leaves Family: Lamiaceae

It is abundant in vitamin K and antioxidants. Tulsi is widely acknowledged for its effectiveness in addressing hair loss and is considered an essential component in herbal hair loss treatments. This botanical herb works by fortifying the hair follicles, thereby reducing hair fall and protecting against bacterial and fungal infections. Tulsi leaves serve as a nerve tonic and also enhance memory. Its functions encompass acting as a coagent remedy for hair loss, a treatment for hair loss, strengthening hair roots, and preventing bacterial and fungal infections. [26,28]

12. Bramhi (*Bacopa monnieri*)

Botanical name: *Bacopa monnieri* Kingdom: Plantae

Family: Plantaginaceae Order: Lamiales

Genus: *Bacopa*

Species: B.monniery

The entire plant is utilized, as it contains alkaloids that are believed to stimulate proteins that are responsible for hair growth, while also mitigating hair loss. [26,28]

13.Feenugreek

Botanical name: trigonella foenum-graecum Kingdom: plantae

Order: fabales

Genus: trigonella

Species: T.foenum-graecum

Biological source: The dried seeds of Trigonella foenum Family: Leguminosae

Uses

Methi, also known as fenugreek, is a discreetly concealed remedy renowned for its natural efficacy in promoting hair growth. This botanical marvel, fenugreek, possesses the remarkable ability to prevent hair loss, stimulate hair growth, alleviate dandruff, and provide relief for dry and itchy scalps. Methi is rich in essential nutrients such as protein, Vitamin C, iron, potassium, and lecithin, all of which contribute to strengthening hair follicles, enhancing hair growth, and achieving lustrous locks. [26,28]

14. Henna

Botanical name: lawsonia inermis Kingdom: plantae

Order: myrtales

Genus: lawsonia

Species: linermis

Organic source: leaves of Heena Family: Lythraceae

Uses

The leaves of the henna plant serve as a source of reddish-brown dye, commonly employed for temporary body art and fabric dyeing. Henna exhibits various beneficial properties, including antifungal and antimicrobial effects, maintenance of scalp health, repair of hair damage, improvement of hair elasticity, and reduction of premature greying of hair. [24,26,27]

15. Almond

Almond oil is known for its nourishing properties that effectively soften and fortify hair. It contains a high concentration of vitamin B-7, also known as biotin, which contributes to the maintenance of healthy hair and nails. Moreover, it serves as a natural safeguard against sun-induced damage, offering a commendable sun protection factor of 5. Almond oil can also be used as a treatment for the scalp. It is worth noting that this oil primarily comprises approximately 78% of this particular fat. Additionally, it contains minute quantities of super-unsaturated Omega-3 essential fatty acids, making it remarkably nourishing and effective in enhancing the softness and strength of hair. [23,26,30]

16. Flaxseed

Flax, also referred to as common flax or linseed, is a flowering plant scientifically known as *Linum usitatissimum* and belongs to the linaceae family. Flaxseed is rich in fatty acids and antioxidants, which aid in the elimination of toxins and dead cells from the scalp. It can be topically applied to the scalp and hair as a moisturizer, promoting hair growth and enhancing the resilience of existing hair strands. [26]

Types Evaluation parameter

1. Organoleptic Evaluation

The evaluation process involved assessing physical parameters such as color, odor, texture, and appearance. To determine color, odor, and skin irritation, a manual examination was conducted. Skin irritation was assessed by applying oil to the hand and exposing it to sunlight for 5 minutes, aligning with guidelines in standard reference books. This procedure allowed for identification and notation of any potential skin irritation. [33,34,37]

2. Ph

The pH of Ayurvedic herbal oil was determined using a pH meter or a probe and meter. To achieve accurate pH measurement, a small voltage is passed through the glass electrode of the probe. The voltmeters display pH units instead of volts when measuring the impedance of the glass electrode. To take measurements, the probe must be submerged in liquid until the meter registers a reading. In this study, the pH of the herbal hair dye was dissolved in water and the resulting solution was recorded by dipping the electrode in the solution. The readings were taken at an average of three. Additionally, the pH of the prepared formulation was checked using pH paper. [31,32,33,34,38]

3. Viscosity

The Ostwald viscometer is a device used to measure the viscosity of fluids, which is a property that indicates the fluid's resistance to deformation. Viscosity is determined by assessing the frictional force between adjacent layers of fluid, and it is an indication of the fluid's thickness. The flow behavior of fluids is related to their viscosity, as viscous fluids flow more rapidly near their axis and slower near their walls. Scientists and researchers commonly use the Ostwald viscometer to obtain valuable information about the flow properties of fluids, including the measurement of relative viscosity. [31,32,34,35]

4. Relative Density

To determine the weight per milliliter of a sample, start by rinsing a Relative Density Bottle with distilled water and drying it in an oven for 15 minutes. Once dried, allow the bottle to cool before closing it with a cap. Weigh the bottle to obtain its initial weight. Next, fill the bottle with a substance that has the same density as the sample and weigh it again. To calculate the weight per milliliter of the sample, subtract the initial weight from the weight after filling. To determine the specific gravity of the oil, divide the density of the oil by the density of distilled water. By following these steps and using the specific gravity of the oil and the density of distilled water, you can accurately determine the weight per milliliter of the sample. [31,32]

5. Specific gravity

After rinsing the specific gravity bottle with distilled water, the bottle should be dried in an oven for 15 minutes, cooled down, and then capped. The bottle is then weighed to determine its specific gravity, which is crucial for accurately determining the specific gravity of prepared oil. [32,34]

6. Stability Study

The stability study of the formulation was performed at two different temperature and humidity conditions. The first condition was at 35°C with a relative humidity of 65% RH, and the second condition was at 40°C

with a relative humidity of 75% RH. These conditions were maintained in a stability chamber for a duration of 3 months. Various parameters such as color, odor, pH, texture, and other relevant factors were evaluated to assess the stability of the formulation. In addition, a physical stability test was conducted for two weeks, subjecting the formulation to different temperature conditions, including 45°C, room temperature, 4°C, and 45% relative humidity. The purpose of this test was to evaluate the physical stability of the formulation under various temperature conditions. Furthermore, the thermal stability of the formulations was investigated by placing them in glass tubes and then placing them in a humidity chamber set at 45°C and 75% relative humidity. The appearance and physical stability of the formulations were inspected over a period of 3 months, with evaluations conducted at monthly intervals. Lastly, a stability study was carried out specifically for a prepared herbal shampoo at a standard temperature range of 25-30°C to assess its performance and durability under real-world usage scenarios. These studies provided valuable insights into the formulation's stability and suitability for use. [33,35,36,39]

7. Dirt Dispersion:

A 1% solution of each shampoo sample (1g in 10ml of water) was prepared. India ink (1 drop) was added, and the test tube was shaken ten times. The amount of ink in the foam was then assessed as None, Light, Moderate, or Heavy. For the Dirt Dispersion test, two drops of shampoo were added to a large test tube containing 10ml of distilled water. One drop of India ink was added, and the test tube was shaken ten times. [31,16]

Types of marketed preparation Shampoo

Uses: provides the cleaning of scalp skin and hair.

Conditioner

Uses: makes hair softer and easier to manage. It also protects the hair shaft from damage.

Oil

Uses: enhance lubrication of the shaft and helps to prevent hair breakage.

Hair styling products

Uses: provides heat protection, smooth frizz and make hair more manageable.

Hair colorant

Uses: It covers gray or white hairs and alters the hair color.

Hair serum

Uses: Reduces frizz, detangling it and provide moisture.

Hair spray

Uses: To keep hair in place and to create volume of hairs.

Conclusion: The indigenous knowledge of medicinal plants utilized by the inhabitants of this particular region appears to be deeply ingrained within their culture and traditions. The current research primarily

focuses on various plant species that are employed by the local people for the treatment of dermatological disorders, hair care, and as cosmetic products. Interestingly, some of these plants possess dual properties, serving both curative and cosmetic purposes. Conducting extensive studies in the field of ethnobotany and ethano pharmacology may potentially lead to the discovery of new plants and compounds that can be utilized for hair care and therapeutic purposes. Additionally, the paper also explores the correlation between Ayurveda and cosmeceuticals. The utilization of these herbal ingredients seems to be promising, beneficial, and devoid of any adverse effects. However, it is important to note that their actual efficacy has not been scientifically proven, thus further investigations should be conducted to evaluate their clinical benefits. Nevertheless, there is a substantial body of scientific evidence available regarding the bioactivity of plants with medicinal properties, which could potentially cover the way for the development of herbal cosmetics.

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