https://doi.org/10.33472/AFJBS.6.13.2024.4468-4483

African Journal of Biological Sciences

Journal homepage: http://www.afjbs.com

Research Paper Open Access

FORMULATING SULFATE-FREE SHAMPOO: COMPOSITION, BENEFITS, AND THERAPEUTICAL USE

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Article Info

Volume 6, Issue 13, July 2024

Received: 04 June 2024

Accepted: 05 July 2024

Published: 31 July 2024

doi: 10.33472/AFJBS.6.13.2024.4468-4483

ABSTRACT:

This article illustrates the composition of sulphate free shampoo. Shampoo is a liquid preparation that is mostly used to remove environmental impurities including perspiration, sebum, and other greasy oils, lotions, and sprays, as well as the dirt from the scalp. Its further splits into other categories. The type of shampoo that is mainly addressed in this article is sulphate-free shampoo, which replaces anionic surfactant with a surfactant with a lesser detergency.They focus the health of the fibres of hair more and has a comparatively gentler washing impact. This review was conducted in order to aid in the development of a modern, sulfate-free shampoo that will be efficient as well.

The composition include *Rosmarinus officinalis:* Rosemary, *Murraya koenigii: C*urry leaves, *Aloe barbadensis Mill*: Aloevera, Camellia *sinensis:* Green tea and glycerin shampoo base. It covers the therapeutic application of sulphate-free shampoo, which cleanses he scalp from dirt without eradicating excessive sebum. The shampoo contain curry leaves which are good for hair as they contain a lot of protein and beta carotene, Rose marry which fights scalp diseases, pathogens and improve blood flow, Vitamin B-containing green tea leaves are good for your hair's softness and health and can aid in hair growth and the Aloe vera that stimulates hair growth, prevents irritation, itching and dryness. Moreover, the method of preparation, anti dandruff and anti hair fall uses of shampoo is also discussed in the article.

1. INTRODUCTION

Shampoo is derived from a hindi word meaning "to massage". Shampoo usually contains primary and secondary surfactants for cleasing, foaming, viscosity enhancer, pH adjuster fragrance and color. They are primarily applied to clean the dirt of scalp and environmental pollutants such as sebum, sweat, and other greasy residues such as lotions, oil and sprays. It is easy to formulate a shampoo which will remove the dirt sebum sweat and other greasy residue like oil, lotions, but these types of shampoos will make the hair frizzy, un attractive, dry and rough. Shampoo can also be used to make the hair beautiful and manageable and to soothe the irritated scalp skin in conditions like seborrheic dermatitis. Mainly there are five categories of shampoo that is detergents cationic, anionics, non-ionics, amphoterics and natural [1].Inmost shampoo formulations the surfactants perform many different role the primary function of surfactant include removal of solid particles and also used for foaming,suspending and solubilisation offragrances. A surfactant that is mild for the skin, hair, and eyes should be chosen and mixed.

Properties of surfactant:

The key characteristics of surfactants are listed below.

• The primary function of surfactants is their foaming characteristics, which are crucial for maintaining product quality. The consumer expects plenty of creamy froth from the shampoo.

• Because surfactants concentrate at the interface between water and air and reduce surface tension, theyare capable of producing foam.

• Surface tension of the water forces the bubble close in the absence of surfactant. [2]

• With surfactant, on the other hand, the bubble will persist longer.

- To remove sebum the surfactant work into four ways (a) roll-up (b) penetration (c) solubilization (d) spontaneous emulsification.
- Surfactant helps to prevent the redisposition of soil and helps in the removal of skin debris and solid air pollutants.
- The sodium laureth -2 sulphate is most effective in removing different sebum particles from the hair.
- The rheology of a shampoo is the phase behavior of surfactant.
- Surfactant concentration helps to determine surfactant phase behaviors..
- Fatty acid commonly found in alkyl sulphate surfactant also boost foam.[2]

Sulphate free shampoo:

Over the past 10 to 15 years the alkyl sulphate and alkyl ether sulphate have grown widely. Consumer worry about the severe eye and skin irritation and drying effects these surfactants are having on the skin. The demand of sulphate free shampoo has increased day by day due to the misfortune spread on the internet about sulphate containing shampoo. As a result of which a number of sulphate free shampoo has grown day by day. Alkyl sulfates and alkyl ether sulfates should be avoided for several reasons. To start, replacement surfactants are more costly than sulfate solutions. Second, larger surfactant levels are typically required to produce equal foam in sulphate-free shampoo, which raises the price even further. Reaching the same level of performance as sulphate-free shampoo is challenging. They target the health of hair fibers more and have a comparatively gentler washing impact. Alternative surfactants require sodium benzoate, a common preservative, because they are less stable at low pH levels [2].

Active Ingredients:

S.No	Scientific Name	Common Name
1	*Rosmarinus officinalis*	1. Rosemary

2	*Murrayakoenigii*	2. Curry leaves
3	*Camellia sinensis*	3. Green tea leaves
4	*Aloe barbadensis Mill*	4. Aloe Vera

Rosemary

Taxonomical classification:

a. **Kingdom**	Plantae
b. **Order**	Lamiales
c. **Family**	Lamiaceae or Labiatae
d. **Genus**	Rosmarinus
e. **Species**	R.officinalis
f. **Scientific Name**	*Rosmarinus officinalis*
g. **Common Name**	Salvia Rosmarinus

Rosemary is a word in Latin that means "dew of the sea" is from where the name emerged [3]. Rosemary, or *Rosmarinus officinalis*, is a member of the Lamiaceae family. The aromatic, evergreen rosemary bush has white, purplish-blue, two-lipped flowers and needle shaped leaves. Because of its widespread use as a common food flavoring and disinfectant, rosemary has elevated civilization to a global level. Because of the high level of carnosol/carnosic and ursolicacids, which confer rosemary its antioxidants and anti-inflammatory qualities, rosemary has been utilized in traditional medicine, pharmaceuticals, and cosmetics. Antidepressant, antiulcerogenic, antiviral, antifungal, antibacterial, anti-inflammatory, anticancer, antithrombotic, antinociceptive, and antioxidant properties are all found within rosemary [4].

Morphological evaluation:

Native to the Mediterranean region, rosemary is an evergreen, woody perennial plant that grows into the bushy shrub. It is regularly utilized in cookery as flavor and notable in the people and customary medication as solution for a few illnesses. The utilization of this spice as sweet-smelling plant and as food enhancing in the Mediterranean cooking is generally perceived[5].Its upper leaves are green and straight whereas lower side is pale whitish due to numerous branching.The inflorescence of verticillasters which is developed in leaf axis is supported by pate blue, occasionally pink or sometimes white flowers [6].

Chemical constituents:

The Chemical constituents of rosemary are diterpenes, triterpenes, phenolics and phenolic acids which include rosmarinic acid, carnosic acid, carnosol, rosmanol, betulinic acid and uroslic acid. The main constituents of the oils were borneol, α-Pinene,camphor and 1,8-cineole[6]. The protective characteristics of rosemary and its constituents are mainly mediates by multiple mechanisms including the decrease in inflammatory mediators, such as interleukin-6 (IL-6)and tumor necrotic factor-alpha (TNF-α), interleukin-17 (IL-17), cyclooxygenase-2 (COX-2) and nuclear factor κb (NF-κB), the prevention of oxidative damage as well as the distortion of apoptosis and mitogen-activated protein kinase (MAPK) signaling pathways[7].

Therapeutic uses:

Preserve Intestinal Health:

Rosemary has been utilized as characteristic solution for irritated intestine or stomach, gas and swelling as well as it helps in loosening up the muscles of the digestive tract. Addition to Rosemary to eating regimen can assist with defecation and your gastrointestinal framework [8].

Aid in hair growth:
Rosemary oil might assist with advancing hair development, forestall sparseness, slow turning gray, and treat dandruff. Rosemary oil is captivatingfor the treatment of alopecia by supporting hair development. [8]

Anti-inflammatory:
Two potent components of rosemary that give it anti-inflammatory and antioxidant qualities are carnosic and carnosol [8]. These ingredients have been shown to lessen blood vessel, muscle, and joint inflammation, making it a very effective therapy for a variety of conditions, such as gout, arthritis, and injuries following surgery or strenuous exercise [8].

Enhance memory:
Rosemary was as a mental energizer. It might assist with further developing memory sharpness, insight, and focus. Rosemary forestalls beta-amyloid plaques and stifles acetylcholinesterase (Throb) exercises. They are related with the side effects ofDementia, Alzheimer's, Ataxia etc. [8]

Hepatoprotective:
Rosemary iseffectively utilized for its defensive impact on liver in conventional medicine. Rosemary and olive aided in lessening liver cirrhosis, because of their capabilities of cancer prevention. [8]

Balance hormones:
Carnosol which is present in rosemary diminishes androgen receptor articulation and furthermore upsets Estrogen receptors in specific cells. It likewise brings down the arrival of DHT (dihydrotestosterone) chemical that works on prostate wellbeing and improves hair follicle development [8]

Anti-bacterial& antimicrobial activities
Rosemary is explicitly strong against bacterial contaminations. It is connected to forestalling bacterial sicknesses, which are profoundly infectious and can cause deadly bubbles and rankles. It likewise destroys different gram-negative and gram-positive microorganisms totally. Because of its antibacterial characteristics, rosemary admission has been displayed to forestall the development of H.pylori microscopic organisms, a hazardous microorganism that is related with stomatitis and gastritis. [8]

Stimulate blood flow:
Rosemary might go about as an energizer for the body and lift the development of red platelets and blood stream. Rosemary additionally has an enemy of thrombotic impact and it forestalls blood clumps. [8]

Relieve pain:
As a pain-relieving substance, rosemary natural oil can be applied to the body surface to the impacted region to alleviate the aggravation. [8]

Detoxifies the body:
Rosemary is somewhat diuretic in nature, implying that it can assist with flushing out poisons effectively during pee. [8]

Increase movement:

Cineole in rosemary oil, can be taken either orally or through inward breath, supports body exercises by upgrading motion, as per a review. [8]

Macular degenerations:
Due to the presence of carnosic corrosive in rosemary assists with forestalling age-related macular degeneration, which influences the external retina of the eye. [8]

Curry leaves

a. Kingdom	Plantae
b.Sub-kingdom	Tracheobionta
c. Superdivision	Spermatophyta
d. Division	Magnoliophyta
e. Class	Magnoliospida
f. Subclass	Rosidae
g. Order	Sapindales
h.Family	Rutaceae
i.Genus	Murraya J. Koenig ex L
j. Species	Murrayakoenigii Spreng

Morphological evaluation:
Tree:
Murraya koenigii is a small, spreading, semi-deciduous tree or shrub with a strong, thin, woody stem that can be dark green or brownish in color. It is also fragrant. The tree may attain a height of 4–8.7 m (13–31 ft) and a trunk diameter of up to 81 cm. The diameter of the main stem is over 16 centimeters [9].

Flower:
Small, white, fragrant, funnel-shaped flowers with a diameter of 1.12 cm when fully opened are produced by curry leaves. The flowers are regular, pentamerous, stalked, complete, ebracteate, hypogynous, persistent, inferior, green, corolla, polypetalous, androecium, polyandrous, lanceolate, stigma, bright, sticky, style, short, ovary, inflorescence, a terminal cyme.With a 5-lobed calyx, five petals that are each 5 mm in length, five stamens that are ten in number and around 4 mm in size, dorsifixed, arranged in circles, and a long, dominating pistil that is 5–6 mm in length, each cluster produces 60–90 flowers at once after blossoming. The bisexual, aromatic blooms of the curry tree can self-pollinate to produce small, glossy black berries [9].

Leaf:
Curry leaves are smooth, glossy, and have a pale underside. They have a distinct aroma that is aromatic in nature. The leaves are oblong lanceolate with an oblique base, pinnate, exstipulate, and have reticulate venation. They have 11–21 leaflets, each of which is 0.79–1.57 inches long and 0.39– 0.79 inches broad. The alternating, shortstalked, gland-dotted leaflets have 0.5-cmlong petioles. The margins of the leaves are unevenly serrated.[9]

Stem and bark:
The main stem of Murraya koenigii is 16 cm to 6 meters tall and 15 to 40 cm in diameter. It has spots on the bark that resemble tiny nodes that are exposed when the bark is peeled off lengthwise. The stem's color ranges from brown to dark green. [9]

Fruits:
The Murraya koenigii fruit ranges in quantity from 32 to 80 and is found in cluster form. The fruits have a tiny, ovoid or sub-globose shape and are surrounded by one or more thin pericarps that have the color of spinach green seeds. The fruits have a diameter of 1 to 1.2 cm and a length of 1.4 to 1.6 cm. When they ripen, they turn purple black, are delicious, and yield 0.76% of a volatile yellow oil. Curry leaf fruit weighs approximately 445 milligrams and is 11 mm long. Pulp has a weight of 880 milligrams and a volume of 895 microliters. Since Murraya koenigii seeds are poisonous, they shouldn't be eaten for any purpose. [9]

Texture:
The underside of the leaves is somewhat matte, while the upper surface is smooth and shiny. [9]

Aroma:
The pungent scent of curry leaves is one of their most distinguishing features. They exude a fragrant aroma when crushed or bruised, which is frequently characterized as a combination of citrus, spice, and herbs. [9]

Taste:
Although the leaves themselves have a rough texture and are not usually eaten in significant amounts, but when cooked they add a unique flavor to food. Many people describe the flavor as slightly bitter with hints of citrus and spice. [9]

Chemical constituents:
Murraya koenigii is an abundant source of organic compounds with a wide range of chemical compositions. B-caryophyllene, b-phellandrene, b-gurjunene, and b-elemene are among the terpene hydrocarbons found in it. Citral, linalyl acetate, menthone, menthol, and carvomenthone are among the terpene components that give it taste. Curry leaves are also high in minerals, fiber, vitamins A and C, calcium, carotene, and nicotinic acid. Mahanimbine and koenigine, two carbazole alkaloids found in leaves, exhibit higher levels of antioxidant activity. Girinimbine, murrayanol, and murrayagetin are found in plant roots. Seeds were used to isolate mahanine, girinimbine, koenimbine, isomahanine, and maanimbine. Curry leaf plants produce fruits that contain koenimbine and mahanimbine. [10]

Therapeutical uses:
Promotes hair growth:
Curry leaves are rich in proteins, antioxidants, vitamins B and C, and other nutrients that support healthy blood vessel circulation in the scalp and aid in cellular regeneration. These characteristics improve the general health of the scalp and aid in the creation of new hair and skin. Applying the substance topically stimulates hair follicles and encourages the growth of new hair. [9]

Enhances hair shine:
Curry leaves are a great source of amino acids, which makes them very beneficial for hair. These leaves contain amino acids that support the strength and gloss of hair. [9]

Controls hair loss:
Curry leaves are rich in proteins, vitamins, and other nutrients that support healthy hair follicles, nourish the scalp, and stop hair loss. Calcium, iron, and phosphorus are among the nutrients that provide your hair with essential nourishment. [9]

Prevents premature graying:
Curry leaves are the best treatment for premature graying hair and give the scalp the nutrition it needs. [9]

Clears dandruff:
Curry leaves are effective against and treatment for bacterial, protozoal, and fungal illnesses. Consequently, dandruff can be removed with curry leaves for hair. [9]

Repair damaged hair:
The elements that continuously harm your hair are pollution, heat, and chemicals found in hair care products. Curry leaves, rich in alkaloids and antioxidants, aid in the restoration of damaged hair. [10]

Assist with dry and frizzy hair:
Curry leaves provide organic components that help your hair stay shiny and lustrous. Its anti-oxidant qualities help to relieve dry hair. [10]

Maintains scalp health:
Curry leaves possess essential oil that works like a miracle remedy to strengthen the health of the scalp. While eliminating all dead skin cells from the scalp, the antioxidant-rich oil nourishes the area. [10]

Strengthens the roots:
Curry leaves are a great source of vitamin B5, which strengthens hair from the ground up. Additionally, the vitamin aids in preventing split ends and breaking. [10]

Fights scalp infections:
Curry leaves' anti-inflammatory, antibacterial, and anti-fundal qualities support a healthy scalp. They are safe for those with sensitive scalps and shield the scalp from infections. [10]

Green tea leaves
Taxonomic classification

a. Kingdom	plantae
b. Division	magnoliophyta
c. Class **d. Order**	Magnoliopsida Ericales
e. Family	Theaceae
f. f. Genus	camellia
g. g. Species	*c.sinensis*

Morphological evaluation:
The tea plant is a multi-branched, evergreen shrub. The leaves are elongated oval, approximately serrate, coreacious, alternating, and short-petiolate. They have a glossy, dark green appearance. C. sinensis is an evergreen shrub or tree that grows to a height of 0.6 to 1.5 meters when grown in cultivation and 10 to 15 meters in the wild. It is a member of theaceae family.

Leaves:
The light green, short-stalked, coriaceous, alternating, lanceolate, serrate-edged leaves can vary in length from 5 to 30 cm and breadth from around 4 cm. The underside of the leaves can be either glabrous or hairy. While immature leaves are pubescent, brilliant green, glossy, and frequently hairy on the underside, mature leaves are smooth, leathery, and bright green in color with multiple stems.The leaf's base is straight, and its elliptic blade has an obtuse end.When the leaves are young, they are smooth with a few fine hairs on the bottom; however, as they become older, the hairs get fewer and eventually disappear.

Flower:
White, fragrant flowers with a diameter of 2.5 to 4 cm can be found alone or in clusters of two or four. Flowers generate a brownish red capsule and many stamens with yellow anthers.

Fruit:
Fruit is a smooth, spherical, trigonous, threecelled capsule that has been flattened. Each capsule contains a single, small-sized seed.

Chemical constituents:
Its primary constituents include Catechin,flavonoids, tannins, lignins, phenolic acids such as gallic acid, ascorbic acid, minerals,alkaloids such asmethylxanthines and volatile oils. Polyphenols, which include catechins such epicatechin gallate (EGCG), epicatechin (EGC), epicatechin-3-gallate, and epicatechin (EC), which make up around one third of the content of green tea. In addition to these polyphenols, there are other carotenoids including quinic acid, trigalloylglucose, chlorogenic acids, and flavonoids and their glycosidic derivatives. Magnesium or aluminum minerals are also present in green tea.

Therapeutic uses:
Green tea has been shown in several epidemiological studies to offer protection against cancer, cardiovascular, and neurological diseases. Green tea's health advantages have also been validated by animal studies on cancer chemoprevention, hypercholesterolemia, artherosclerosis, Parkinson's disease, Alzheimer's disease, and other aging-related ailments.

Weight loss and obesity:
Epigallocatechin gallate (EGCG), a catechin found in green tea, may aid in weight loss in obese individuals. Oral green tea drinking may offer protection against obesity-related conditions like diabetes, hypertension, and atherosclerosis, according to a number of studies.

Cancer:
The most well-known and well researched use of green tea is cancerchemoprevention. Nevertheless, the outcomes of epidemiological research on people are mixed. Although some studies have linked drinking green tea to a lower incidence and recurrence of cancer, others have found no connection at all.

Cardiovascular diseases
In Japanese communities, drinking green tea has been linked to a lower incidence of coronary artery disease. It is also believed that green tea's antioxidant activity contributes to its preventive effects against cardiovascular illnesses.

Microbial diseases

For many years, green tea has been linked to a reduction in tooth cavities. On the other hand, EGCG has lately drawn a lot of interest for its impact on multidrug-resistant Staphylococcus aureus infections and the suppression of HIV infection. It has been shown that EGCG inhibits HIV reverse transcriptase and interferes with the viral envelope's ability to attach, hence limiting HIV-1 replication. [11]

Aloe Vera

Taxonomic classification:

a. Kingdom	Plantae
b. Phylum	Tracheophyte
c. Class	Magnoliopsida
d. Order	Asparagales
e. Family	asphodelaceae or Liliaceae
f. Genus	Aloe
g. Species	aloe vera

The luscious plant of Aloe vera is utilized in complementary and alternative medicine. Approximately 420 varieties of Aloe vera are widely used in Indian medicine to cure a wide range of ailments. Due to the plant's therapeutic properties as well as its benefits for skincare, health, and beauty, it has become far more popular thanother plants. The Arabic term "Alloeh," which means "shining bitter substance," is where the name Aloe originated, and the Latin word "vera," that means "true" .It has been widely utilized for a while in a number of cultures, including Egypt, Greece, Mexico, India, China, and Japan. [12]

Morphological evaluation:

Aloe Vera leaves have serrated edges and a lance-shaped form. The leaves are thick and fleshy. It is a perennial evergreen plant with a succulent appearance. It has a small stem. Its height ranges from 60 to 100 cm. Its thick, fleshy leaves can range in color from green to grey-green. The edges of its leaves are serrated, and it has tiny white teeth. Spots on immature aloe vera leave range in color from pale green to white. The patches go away as the Aloe Vera ages. Due to hereditary considerations, some species, however, will not lose their spots. The plant's leaves are divided into three layers: the inner layer contains 99% water and 1% biological material. The middle layer is made of latex and contains sap that is yellow in color. Theouter most layer which covers the entire plant and is composed of 15 to 20 cells, is the thickest. The Aloe vera blossoms are 2-3 cm long and have a trumpet or tube shape. The blossom has a yellow to orange color. At the end of the shaft, the flowers are hanging down. The roots fibrous and short and can grow to a length of 30 to 40 cm. The fruits of the plant have a triangle form and are packed full of seeds. The leaves are arranged in rosette shapes. A significant amount of pulp can be found in the leaf parenchyma. The base has a width of 10 cm. Dry capsules are used to store seeds. Its plant lacks a calyx. The roots spread in the ground but don't go very deep and create an arbuscular mycorrhiza. [13]

Chemical constituents:

Aloe Vera plant contain anthracene glycosides, barbaloin or aloin and C glycosides, isobarbaloin, aloe emodin, aloesone, aloinosides A and B, aloetic acid, homonataloin, resins

Therapeutic uses:

Advantages for overall wellbeing

Aloe Vera is used in the culinary, pharmaceutical, and cosmetic industries.The slimy tissue found in each leaf is what gives the leaves their thickness. The "gel" that consumers often

identify with aloe vera products is this tissue that is packed with water. The majority of the plant's advantageous bioactive components, including as vitamins, minerals, amino acids, and antioxidants, are present in the gel.[14]

Antioxidant andantibacterialproperties:
Aloe vera gel is a rich source of potent antioxidants that are part of the polyphenols, a broad class of chemicals. These polyphenols and a number of other substances found in aloe vera aid in preventing the growth dependable source of some bacteria that can infect people. Aloe vera is well-known for having antiviral, antibacterial, and antiseptic qualities. This is one reason it could aid in the healing of wounds and the treatment of skin issues. [15]

Wound healing:
Aloe Vera is most frequently applied topically to the skin as a topical medication as opposed to being ingested. As a matter of fact, it has been used for a very long time to treat burns, especially sunburns. As early as 1810–1820, AloeVera preparations were listed as a skin protectant in the United States Pharmacopoeia. According to studies, it works well as a topical treatment for burns of the first and second degrees. [14]

Lessens dental plaque:
Gum disease and tooth decay are extremely common health issues. Reducing the amount of plaque or bacterial bio-films that accumulate on the teeth is one of the best strategies to avoid these diseases. Aloe Vera mouthwash and gel is a successful natural substitute for mouthwashes made with chemicals, according to trusted Source. It is a reliable source for eliminating Candida albicans, a type of yeast that grows in the mouth. [16]

Decreases the level ofblood sugar:
Aloe Vera is sometimes used as a diabetic remedy. This is because it might increase sensitivity to insulin and aid in better control of blood sugar. [17]

Stimulator of hair growth:
Most research on aloe Vera's hair benefits has focused on its effects on seborrhoeic dermatitis, a skin ailment that typically affects the face and scalp and results in a reddish rash covered in crusty, yellow-white scaling. According to a study, aloe vera considerably lessens the symptoms in terms of itching, scaling and afflicted area size. This highlights the possibility of aloe vera in stimulating hair development. [14]

Smooth out wrinkles andenhanceskin:
Topical aloe vera gel appears to have some potential benefits in delaying skin aging. Aloe vera may alleviate dry skin disorders by enhancing skin integrity and assisting the skin in retaining moisture. . It might smooth out wrinkles and enhance skin. [14]

Anti-inflammatoryproperties:
Aloe vera has anti-inflammatory properties via reducing the formation of prostaglandin E2 from arachidonic acid and inhibiting the cyclooxygenase pathway. C-glucosyl chromone, a new anti-inflammatory molecule, was recently extracted from gel extracts. [18]

Microbial and environmental triggers in Dandruff Pathogenesis:
Numerous commensal microbes can live in human skin, and dysbiosis of the skin microbiome contributes to a number of inflammatory skin illnesses. In humans, dandruff (DF) is a mild form of seborrheic dermatitis with a greater incidence of 17% to 50%. It is characterized by

moderate inflammatory reactions that might occasionally include mild erythema and a-typical scalp flaking.[19]
The fungus Malassezia is suspected to play a significant part in the illness known as dandruff of the scalp. [20] As seen in multiple populations worldwide, dandruff-affected scalp areas also exhibit a dysregulated microbiome, distinguished by a reduced prevalence of Cutibacterium acnes and an increased abundance of Malassezia restricta and Staphylococcus spp. [21]
The nature of dandruff is non-inflammatory. It is still unknown what exactly causes the normal physiological spectrum of scaling to turn into dandruff. [22] The skin, which is home to a wide range of microbial populations, keeps a careful balance necessary for good health. It has been established that changes in the microbial populations on the skin are related to the etiology of dandruff. [19] A cluster of corneocytes known as a "dandruff scale" separates from the stratum corneum's surface while maintaining a high degree of cohesiveness among them. It is commonly known that dandruff has a non-microbial source. It is known that prolonged exposure to sunlight can result in scalp desquamation. Dandruff can also be somewhat caused by minor scalp irritation from over-shampooing, frequent combing, using specific cosmetic products, dust, and grime. [22] The relevance of sebum lipoperoxidation in the initiation and maintenance of dandruff is highlighted by the recent establishment of squalene monohydroperoxide and malondialdehyde as biomarkers of dandruff-affected scalps, despite the fact that its exact mechanism of action is uncertain. The results of this study demonstrate that M. restricta mediates sebum peroxidation which results in the synthesis of malondialdehyde and squalene
monohydroperoxide. [23]

Herbal alternative and Sulphate free shampoo as hair care and antidandruff products:
Herbal medications or their preparations provide a good substitute for synthetic medications. The usage of natural products in cosmetics has dramatically increased during the last few decades. There are a lot of herbal shampoos in the market these days that include plant extracts and essential oils, among other herbal ingredients. Many plants are frequently utilized in shampoos because they are said to have positive impact on hair. [24] The following preparation contains rosemary leaves and curry leaves possess antidandruff properties.*Rosemarinus officinalis*possesses potent antidandruff properties and is found to be a good lead for antidandruff hair care products. In a study Rosemaryleaves were tested against Malassezia furfur which is the causative agent of pityriasis versicolorand is also associated with seborrheic dermatitis and dandruff formation; the results indicated that the extract had antidandruff activity. [25] Curry leaveson the other hand have a reputation for conditioning and growth stimulating agent for hair. [26] Aloe Vera that contain the anti-inflammatory effect and relieve the inflammation of scalp. Aloe vera gel's anti-inflammatory properties not only reduce pain and discomfort but also hasten the healing process. The effects of acetylated mannan based polysaccaride in Aloe gel are similar to mannose6-phosphate's anti-inflammatory properties. Aloe vera also reduces inflammation by preventing prostaglandin formation through inhibition of the cyclooxygenase pathway. A study has shown that the chloroform and aqueous extracts of Aloe vera have anti-edema effects by lowering the amount of neutrophils in the peritoneal cavity.[28]

Anatomy and physiology of hair:
As protective appendages on the body, hair is generated from the ectoderm of the skin and is regarded an accessory structure of the integument, along with sweat glands, sebaceous glands, and nails [29]. Because they begin in the epidermis during embryonic development, they are often referred to as epidermal derivatives. Every hair has three cyclical periods of growth.

Anagen phase, also known as the growth phase, can last anywhere from two to eight years. Normally, around 80% of hair is in the anagen phase. The catagen phase (also known as involution) lasts for 10 to 14 days during which time hair transitions to the next phase and growth activity rises. Telogen (Resting Phase): During this phase, hair transitions into a resting condition. The period of time of this phase is 90–100 days. Generally speaking, 50–100 hairs randomly fall out each day. Alopecia or hair loss can be detected by a rise of more than 100 hairs per six; this condition may only last temporarily. [30]

Hair fall:
"Effluvium" is the term for increased daily hair loss; "alopecia" is the term for apparent hairlessness.

Types of hair fall:
Following are the types of hair fall.

Androgenetic alopecia:
Up to 70% of males and 40% of women may experience androgenetic alopecia, the most prevalent kind of hair loss. In genetically susceptible parts of the scalp, histological analysis revealed reduced size of terminal hair follicles.reduction in the thickness of hair shafts and shortening of the hair development phases. Hair loss in men often exhibits receding temporal hairlines and hair loss in the area of the whorl at the rear of the head (known as the Norwood-Hamilton type); in women, widespread midline thinning is seen on top of the scalp (known as the Ludwig type). [31]

Alopecia areata:
Alopecia areata, sometimes called "baldness in a circle," is a condition that frequently manifests itself suddenly. It first affects a circular area of the scalp before spreading in a centrifugal or multilocular pattern. This illness is somewhat genetically based. When alopecia areata affects the whole scalp, it is called alopecia areata totalis, and when it covers the entire body, it is called alopecia areata universalis. When alopecia areata first appears, it causes dramatic, sporadic hair loss. At a lifetime incidence of 1% to 2%, alopecia areata ranks third in terms of hair loss prevalence, after androgenetic and diffuse alopecia. [31]

Folliculitis decalvans:
Folliculitis decalvans is a scalp condition that can be difficult to treat in both men and women.The scalp's epidermis and hair follicles are destroyed as a result of the intense granulocytic inflammation that characterizes it.An excessive inflammatory response and staphylococcal bacteria are both contributing elements to the pathophysiology of this disease. Upon inspection, regions are found to be atrophic and scarred, with an inflammatory red border. Hair tufts, including five to twenty hairs, are frequently observed at the margins of lesions.They aid in the spread of inflammation as the staphylococci's site of entry. [31]

Lichen planusfollicularis:
Tiny bald patches on the scalp are a common symptom of the permanent, atrophying alopecia caused by T cells in the autoimmune disease lichen planus, which damages hair follicles. [30]

Frontal fibrosingalopecia:

The hair loss pattern is similar to that of androgenetic alopecia in males. erythema and hyperkeratosis are common around the hairline.The condition is not frequently restricted to the frontal lobes. [30]

Telogen effluvium:
Telogen effluvium (TE) is the loss of normal club hairs due to a disturbance in the hair cycle. Kligman postulated in 1961 that hair loss occurs when follicles behave identically, resulting in premature anagen termination, regardless of the cause. The true incidence is uncertain since many cases are asymptomatic. [30]

Sulphate free shampoo as aprevention and treatment ofhair fall:
Shampoos are most likely used for cosmetics. This hair care product is intended to clean the scalp and hair in everyday living. Shampoos, a viscous solution of detergents with additives, preservatives, and active substances, are commonly used for beautifying purposes. To use, apply to damp hair, massage it in, and rinse with water. Shampoo removes debris from the hair without removing excess sebum.[30] Herbal shampoos have gained popularity due to their natural origin, safety, and lack of side effects, despite the availability of synthetic shampoos in the market. The presence of natural ingredients not only protect but also repair and eliminate the cause of hair damage as it also devoid sulphates.[32] Their antibacterial properties minimize scalp infections; prevent premature greying, and conditions hair. Antioxidant ingredients including vitamin A, C, E, and folic acid, together with minerals like iron, are advantageous for hair.
[33]

Minimizes premature ageing and thinning of the hair:
Curry leaves prevent premature graying and help keep hair black. [33] They contain a lot of proteins and beta-carotene, both of which aid to cease hair thinning and loss. Since proteins are the building blocks of hair and are essential for hair development, proteins are required for hair growth. They also have a high amount of amino acids that help to build hair fiber. [33]

Method ofpreparation:
- Take 250ml of water in a beaker and add 20gm of rosemary, curry leaves and green tea leaves in it.
- Let it boil for 4-5 minutes and prepare extract.
- In another beaker, add 10ml glycerine and 20ml aloe vera gel in shampoo-base and mix thoroughly.
- Now add the extract in shampoo base and mix thoroughly.
- Transfer the prepared sulphate free shampoo in the bottle (packaging container) and label it.

2. CONCLUSION

The present paper offers a thorough investigation on the composition and therapeutic advantages of shampoo without sulphates. These shampoos provide a milder yet efficient cleansing solution for the scalp and hair by substituting surfactantsfrom natural substances like rosemary, curry leaves, green tea, and aloe vera. Proteins, vitamins, and antioxidant-rich substances are included due to their potential to nourish, protect, and cleanse the hair and scalp. The study emphasizes on their many advantages of sulphate free shampoos on enhancing hair health and treating common issues like irritation and dryness, is a big step towards contemporary hair care.

3. DISCUSSION

The exploration of ingredients such as green tea leaves, Rosemary, Aloe Vera and Curry Leaves underscores their significant roles not only in culinary practices but also in medicinal and cosmetic realms.Understanding the morphological characters and taxonomical classification of these ingredients provides an understanding of their biological significance and potential. The chemical constituents present in these ingredients play pivotal roles in mediating various physiological processes including oxidative stress, modulation of inflammatory pathways, enhancement of cognitivefunction etc. Additional investigation and study of these components may yield important new understandings of their modes of action and increase the range of supplementary and alternative medical applications for which they are used.
Sulfate-free shampoos offer a natural and effective solution for various scalp and hair issues, particularly dandruff and hair fall. With the inclusion of herbal ingredients enhanced benefits can be achieved which can serve a comprehensive solution for maintaining healthy hair.

Acknowledgment
None to acknowledge.

Conflict of interest
There is no any conflict of interest in carrying this research work.

Findings
This research received no external funding or financial support.

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