Comprehensive Review on The Evaluation, Therapeutic Efficacy, And Safety Profile of Aloe Vera Gel–Based Shampoos

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Abstract- *Aloe vera is a succulent perennial herb that is a member of the Asphodelaceae family and can withstand drought. Because of its ability to cure wounds and burns, it is also known as the silent healer or the healing plant. Aloe vera is used in many commercial goods and has been used for millennia for its medicinal, skin care, cosmetic, and health benefits. It plays an extensive and long-standing function in indigenous medical systems such as homeopathy, Siddha, Ayurveda, and Unani. Aloe's pharmacologically active components are concentrated in the outer pericyclic tubules, also known as aloe sap or aloe juice, and inner parenchymatous tissue, also known as aloe gel. Aloe vera's bioactive chemicals are highly beneficial for a number of ailments, including burns, rheumatoid arthritis, rheumatic fever, acid reflux, allergic reactions. A stable state of health is linked to the right use and consumption of aloe vera, a plant with functional, antioxidant, and therapeutic qualities that finds several applications in the culinary, pharmaceutical, and cosmetic industries. The current study compiles information about the plant's origin, characteristics, applications, circumstances, and use in the manufacturing of shampoo.*

The aloe vera plant is well-known around the world for its therapeutic qualities and use in gel-based cosmetics including sunscreen, detergent, and shampoo. However, an excess of aloe vera processing waste has been produced as a result of the demand for these gel-based goods. Up to 4,000 kg of aloe vera waste could be produced monthly by an aloe vera gel production business. The waste from aloe vera is currently either used as fertilizer or disposed of in a landfill. Given the detrimental effects of the current waste disposal practices on society and the environment, a sustainable management system for the waste from aloe vera processing should be taken into consideration. The most popular hair treatment for cleaning the hair and scalp is shampooing. The majority of commercially available shampoos, including herbal shampoos, typically contain large amounts of artificial surfactants that irritate the eyes and hair. Nowadays, customers are increasingly using herbal shampoos because they think that these natural products are safe and surfactant-free, yet they only contain a little amount of herbal active ingredients. By looking at a number of sensory and physical factors, All Herbs Shampoo with multi-herbal extracts will be compared to the commercially available synthetic herbal shampoo. As a result, a shampoo was made with extracts of several plants, including Ocimum tenuiflorum (tulsi), Acacia concinna (Sheekakai), Azadirachta indica (Neem), Sapindusmukorossi (Reetha), and Emblica officinalis (Amla).

Keywords- Aloe Vera, Shampoo, anthraquinone, aloevera gel extractor, hairgel, Anti-inflammatory, cosmetic, moisturizers, Production, Safety Efficacy, gel preparation, phytochemicals.

I. INTRODUCTION

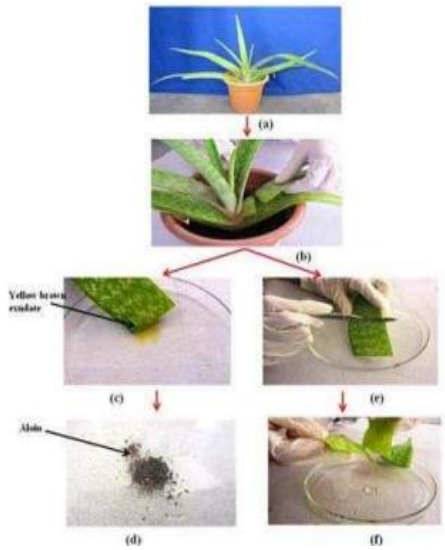
(1) The image shows how aloe gel and the anthraquinone "aloin" are extracted from a six-month-old aloe vera plant (a) and a leaf that has been cut off with a knife (b). The two primary components of aloe leaves are (c) the yellow-brown sap that emerges from the cut area and (d) aloin, a dark brown powder that is one of the secondary metabolites of aloe vera, which is formed upon freeze-drying. Second, (e,f) aloe gel, a crucial component of the majority of cosmetics and medicinal items. The aloe vera gel has a complicated chemical makeup.

Vitamins, enzymes, minerals, carbohydrates, lignin, saponins, salicylic acids, and amino acids are among the 75 potentially active components found in aloe vera (Fig. 4). 27, 2 The specifics are as follows:

Antioxidant vitamins A, C, and E are among the several vitamins found in the plant. Thiamine, niacin, riboflavin, vitamin B12, choline, and folic acid are also present. 28 Free radicals are neutralized by antioxidants.

Biochemical enzymes include amylases, lipases, alkaline phosphatases, cellulases, catalases, and peroxidases. The image shows how aloe gel and the anthraquinone "aloin" are extracted from a six-month-old aloe vera plant (a) and a leaf that has been cut off with a knife (b). The two primary components of aloe leaves are (c) the yellow-brown sap that

emerges from the cut area and (d) aloin, a dark brown powder that is one of the secondary metabolites of aloe vera, which is formed upon freeze-drying. Second, (e,f) aloe gel, a crucial component of the majority of cosmetics and medicinal items. (2).



Aloe Vera is a succulent plant that is a member of the Liliaceae family, which also includes tulips, lilies, hyacinths, onions, garlic, and asparagus. Although this family has many different characteristics and scents, it clearly identifies itself when it is ready to flower. http://www.jomenas.org/The Journal of Middle East and North Africa Sciences 2019; 5(7) 19 A perennial plant with over 250 species that originated in Africa and naturalized in Mexico has a gelatinous, transparent core (pulp) encased in a thin layer of yellow liquid (acíbar) and shielded from the elements by a thin, resilient green outer bark (Machado Inca, 2013). The Ebers Papyri contain the earliest known mentions of aloe vera, and many historical documents from the Egyptians, Greeks, Romans, Algerians, Arabs, Tunisians, Indians, and Chinese, among others, discuss its use for cosmetic and medicinal purposes (Boudreau and Beland, 2006; Surjushe et al., 2008, cited in Domínguez Fernández et al. 2012). The Greek word "aloé" is the source of its name, and the Arabic term "alloeh" means "the bitter bitter substance." The Latin word vera signifies "truth," and the Sanskrit phrase aloe vera relates to the goddess. Depending on a number of variables like location, temperature, and plant nutrition, the bark makes up between 20 and 30 percent of the total weight of the plant and has a green or blue green structure. The central portion of the leaf contains the parenchyma, sometimes referred to as pulp or gel, which makes up 65–80% of the plant's weight (Domínguez Fernández et al., 2012). (3)

As seen in, the aloe vera has a triangular shape with tubular yellow blooms and leaves with white spots. The leaf skin, latex, and gel are the three layers that make up the white-spotted leaves .

The thick green coating known as the leaf skin protects the gel from external harm .Between the leaf skin and the gel is a yellow, bitter layer called latex, which is high in anthraquinones .The parenchyma cells that make up aloe vera gel contain 99% of its water content as well as a variety of phytochemicals .Aloe vera gel is an important product for the industry because of the phytochemical components' therapeutic qualities, which can be used to treat wound healing, digestive problems, inflammation, and diabetes . Aloe vera is now grown for commercial purposes in North America, Europe, Asia Pacific, Latin America, and Africa. However, the excess production of aloe vera solid and liquid waste is a result of the demand for goods based on aloe vera gel. According to Curaloa (The Aloe vera Plantation Curaçao), 4000 kg of aloe vera leaf skin waste are produced monthly in Curaçao during the creation of aloe vera gel-based goods. Nowadays, the skin of aloe vera leaves is either used as fertilizer or as an agricultural waste. Traditionally, agricultural waste is disposed of in landfills or burned, which has detrimental effects on the environment and society by producing greenhouse gases (CH4, NO, and NO2) and contaminating soil and groundwater through leaching. (4)

Because of its abundance of phytochemicals, aloe vera gel is a lucrative product that can be used in the food, cosmetic, and pharmaceutical industries. Aloe vera gel, for instance, is used in the food sector as a natural preservative, dietary supplement, and antibacterial. The gel's moisturizing, anti-aging, and wound-healing properties make it popular in the cosmetics sector. Aloe vera gel is used in the pharmaceutical industry to treat diabetes, cancer, ulcers, and inflammation. Thus, in order to maintain the phytochemical content of the aloe vera gel, the aloe vera industry employs harvesting, washing, filleting, and product processing procedures . Each Aloe vera leaf produces 40%–45% gel, 1.0%–1.5% latex, and 45%–55% leaf skin during the gel extraction process. Thus, 400–450 kg of gel, 10–15 kg of latex, and 440–535 kg of leaf skin are produced for every 1000 kg of aloe vera leaves. Curaloa (The Aloe vera Plantation Curaçao) harvests 8,000 kg of aloe vera leaves every month for gel extraction. Every month, 4000 kg of leaf skin and 2000 L of gel are made from the 8000 kg of leaves. According to Curaloa, cellulosic fibers, which account for up to 20% of the gel created during extraction, are eliminated in the depulper. Regarding the entire leaf processing, Martinez stated that there is a 1.0%–1.5% liquid suspension and 88%–92% liquid suspension for each Aloe vera leaf.

Vitamin C, which has been shown to have antioxidant qualities, was found abundant in the skin of aloe vera leaves. The antioxidant activity of aloe vera leaf skin is higher than that of the flower. According to Lòpez et al., the increased phenolic content of aloe vera leaf skin may be the cause of its enhanced antioxidant action. Phenolic substances, including phenolic acids, flavonoids, chromones, and anthrones, are abundant in the skin of aloe vera leaves. The phenolic concentration and antioxidant capacity of the Aloe vera leaf skin were higher than those of the gel and flowers, according to research on the ethanol and methanol extracts.

Ingredients	Quantity taken for 100 % W/V			Functions
	F1	F2	F3	
Reetha Extract	33 g	35 g	40 g	Natural foaming and cleansing agent
Shikakai Extract	17 g	18 g	20 g	Universal Conditioning agent
Amla Extract	12 g	9 g	4 g	Provides nourishment and black shine to hair
Neem Extract	9 g	10 g	10 g	Anti-dandruff agent and act as preservative
Tulsi Extract	5 g	2 g	2 g	Cures dandruff and hair fall, act as anti oxidants
Aloe vera gel	4 g	2 g	2 g	Moisturizes the scalp and gives smooth shine to hair
Vitamin E	4 g	4 g	2 g	Powerful antioxidant
Gelatine solution (12%)	16 ml	17.5 ml	19.6 ml	Viscosity modifier
Tea Tree Oil	0.2 ml	0.5 ml	0.4 ml	Powerful preservative
Perfume (Marvel 8)	qs	qs	qs	To increase aethetic appeal

Aloe vera gel extractor operation by hand :

As part of a project at Sam Higginbottom Institute of Agriculture, Technology & Sciences (previously A.A. I deemed University), Allahabad, the machine for extracting gel from aloe vera was designed and built. This machine works best with newly picked aloe vera leaves; it is ineffective with leaves that were picked even a day ago because the gel in the leaves builds up and becomes extremely sticky and thick. Two rollers on two shafts, a set of spur gears, an adjustable screw, the main frame, and a wooden-coated grip for manual power transmission make up this extractor. Because mild steel has less slippage than other materials, it was used to make the rollers. The physical characteristic of gel that establishes its purity in relation to double-distilled water and its total soluble solid content is called the gel quality refractive index. The extraction procedure is treated using gel that has the lowest refractive index.

Impurities in the extracted gel are indicated by a higher refractive index.

(5) To assess the aloe vera gel's effectiveness and quality:
We acquired fresh aloe vera leaves from an Allahabad horticultural garden. According to Hani et al. (2012), in manual extraction for medium trimmed Aloe vera leaves (140 to 200 g), the Aloe vera leaves with the highest weight recorded the maximum gel recovery (42.73%), whereas the Aloe vera leaves with the lowest weight recorded the minimum gel recovery (29.18%). We weighed and cleaned the leaves. The leaves were introduced using feeding rollers once the extractor was turned on. To remove the gel without crushing the leaves, the rollers on the worm shaft moved, crushed, and pressed the leaves in the pressing chamber. This succulent plant, which belongs to the genus Aloe, is found all over the world and is regarded as an invasive species in many places. Originating from the Arabian Peninsula, this evergreen

perennial grows wild in desert, tropical, and semi-arid regions worldwide. It can reach a maximum length of 30 to 50 cm and a minimum width of 10 cm. (6)

Analysis of the Aloe Vera gel shampoo's physicochemical properties

Evaluation Test	
Color	Mint green
Transparency	Clear
Odor	Good
Ph	5.7
Solid contents	22 to 27%
Foam ability	Stable
Wetting ability	Wetting ability - 90sec
Surface tension	30 to 37 dynes/cm
Viscosity	96.71 to 96.82%
HLB Value	20

As conditioners with a lower concentration of active ingredients, combing emulsions were developed. These days, they are viewed as comb-complementing moisturizing chemicals that have the same impact on hair as conditioners. Even hours after washing, they make hairstyles easier. Aloe vera has a long history and is mentioned in literature from many different cultures. Its name most likely comes from the Arabic word alloe, which refers to a bright, bitter material. Aloe vera was first recorded on a clay surface in Mesopotamia around 2100 B.C. It was referred to as "the plant of immortality" in ancient Egypt, and Cleopatra might have used it to treat her skin and hair.Conditioners are cationic emulsions that add volume, sheen, and softness to hair while also making it easier to handle. They strengthen hair, smooth cuticles, and lessen friction while brushing wet hair, which makes it easier for the comb to go through the hair and prevents further mechanical damage. Daily hair washing adds to the dryness of the hair strands. A fantastic tool for restoring hair volume and shine is hair conditioner. (7)

Aloe vera is a type of succulent plant belonging to the Aloe genus. It is found all across the world and is regarded as an invasive species in many places. Your hair can be strengthened by the numerous minerals and active compounds found in aloe vera. It is high in vitamins A, B12, C, and E and contains fatty acids and amino acids. These help maintain healthy hair follicles and manage oily hair.

re 11 Weighing Aloevera Gel

Most likely, shampoos are utilized as cosmetics. In our daily lives, we utilize this hair care product to clean our hair and scalp. Shampoos are most likely utilized as beautifying agents and a viscous solution of detergents containing suitable additives preservatives and active ingredients. Usually applied to damp hair, it is massaged into the hair before being rinsed off with water. Shampoo is used to get rid of filth that has accumulated on the hair. There are several synthetic shampoos on the market today, both medicated and non-medicated, but herbal shampoo has gained popularity because it is natural, safer, and has no negative side effects, which is driving up consumer demand.(8).

Preparation ofAloe vera gel- • At first, we collected Aloe vera leaves. • After collection, peel it in a Beaker. • Then grinded the aloe vera in grinder. • After grinding, transfer the grinded aloe vera into the beaker for use.The most commercialized aloe species is A. vera, and the processing of the leaf pulp has grown to be a significant global industry. It is utilized in the food sector to make functional foods and as an ingredient in other food products, such as gel-based health drinks and beverages. It has served as a foundation material for the manufacture of creams, lotions, soaps, shampoos, face cleansers, and other items in the cosmetic and toiletry sector.

Although more than 75 active components from the inner gel have been found, the therapeutic effects of each individual component have not been adequately connected, despite the fact that A. vera has been utilized for millennia for its restorative and therapeutic qualities The polysaccharides in the inner leaf parenchymatous tissue have been implicated in many of the medicinal effects of aloe leaf extracts, but it is thought that these biological activities should be ascribed to the combined action of the compounds present rather than to a single chemical substance.(9)

Aloe barbadensis Miller, a succulent plant with 420 species in the Liliaceae family, is the biological source of aloe vera gel, which is made from dried latex. The Arabic term "alloeh" and the Latin word "Vera" are the sources of the name aloe vera. It is widely used to cure a variety of ailments and is also very well-liked for skin care and cosmetic purposes. The middle layer of aloe vera, or yellow layer latex, contains glycosides and anthraquinones, while the inner gel is composed of 99% water, amino acids, sterols, lipids, and vitamins.Plant collection Fresh aloe vera leaves were gathered at KGRDCP and RI, Karjat's botanical park.(10)

Extracting:

To remove all of the yellow sap, the aloe leaves were cleansed and left upright in a beaker for 15 to 20 minutes. To create liquid foam, the aloe leaf pulp was gathered and ground in a mixer. To get rid of any leftover particles, this liquid was filtered. The homogeneous gel was then formed by boiling it at 70°C, which also eliminated any leftover yellow sap that might have been present.

Aloe Vera Aloe Vera Extract

Growing to a height of 60 to 100 centimeters (24 to 39 inches), aloe vera is a stemless or extremely short-stemmed plant that spreads via offsets Some types have white flecks on the upper and lower stem surfaces, and the leaves are thick, meaty, and green to grey-green [Phytochemicals include acetylated mannans, polymannans, anthraquinone Cglycosides, anthrones, and other anthraquinones including emodin and other lectins are found in aloe vera leaves and are being investigated for potential bioactivity Aloe vera helps to prevent skin ulcers and promotes skin integrity, hydration, and erythema reduction.(11)

A CHEMICAL CONSTITUENT'S ASPECTS:

i. Vitamins: Aloe contains the antioxidant vitamins A (beta carotene), C, and E. It also contains choline, vitamin B12, and folic acid, which are naturalized free radicals.

ii. Lignine: This cellulose material, which is present in the gel, has the ability to penetrate human skin but no proven therapeutic benefits.

iii. Minerals: Manganese, sodium, magnesium, zinc, chrome, iron, copper, calcium—which is necessary for healthy bone and tooth density—and other minerals are found in aloe vera.

iv. Saponins: When combined and stirred with water, these produce soapy lathers. It has antiseptic qualities. They have been utilized in foaming agents and detergents.

v. Aloin: Aloin is a skin tonic that helps prevent acne. Additionally, it is utilized to calm the skin.

vi. Anthraquinone: Various types of anthraquinones are present in the sap of Aloe vera: Isobarbaloin, Anthracene, Emodin, Easter of cinnamonicacid, Barbaloin, anthranol, Chryphanic, Resistannol, Aloetic acid and Ethereal oil. They contain powerful antifungal, antibacterial and antiviral properties. vii. Fatty acids: It provides 4 plant steroids cholesterol, beta- sisosterol, campesterol and lupeol. The have anti-inflammatory action and lupeol also possesses antiseptic and analgesic properties.

Viii.Sugar: It gives monosaccharides (glucose and fructose) and polysaccharides, glucomannas/ polymannose. These are obtain from the mucilage layer of the plant and are known as mucopolysaccharides.Glycoprotein with anti allergic properties called alprogen and anti-inflammatory compound.

Aloe vera gel shampoo reviews generally highlight its benefits for hair and scalp health, particularly for dry or damaged hair and itchy scalps. While some studies suggest positive effects on hair growth and dandruff reduction, more clinical evidence is needed to definitively prove these claims. The shampoo is often praised for its moisturizing, soothing, and conditioning properties, as well as its potential to reduce hair breakage (12).

Recent development or current status:

For millennia, the aloe vera plant has been primarily utilized as a medical condiment throughout. Aloe vera functions as an antioxidant and has antimicrobial qualities. Additionally, the factory aids in the prevention of wrinkles, the junking of dental shrines, the treatment of mouth ulcers, and the mending of injuries and becks. These days, aloe vera is used to treat conditions including Burning Syndrome, Lichen Planus, obturation of primary teeth, prevention of dry sockets, pulpotomy of primary teeth, and intracanal medication.

This report also studies being competitive script of some of the crucial players of aloeveraexcerptsrequest which includes profiling of Lily of the Desert, Aloe granges, Terry Laboratories, CalminoGroupAB etc. The profiling enfolds crucial information of the companies which comprises of business overview, products and services, crucial financials and recent news and developments. Conclusively, the report named “Global Aloe- Vera Extract Market Outlook 2021”, analyses the overall aloe- vera excerpt Assiduity to help new entrants to understand the details of the request. In addition to that, this report also guides being players looking for expansion and major investors looking for investment in global Aloe- vera excerpt request in near future. The most widely sold aloe species is aloe vera, and the processing of the leaf pulp has grown to be a significant global industry. It has been utilized in the food business to make functional foods and as an ingredient in various food products, such as gel-containing beverages and health drinks.Plants of Aloe barbadensis were gathered from NDUAT's experimental farm at Kumarganj, Faizabad, grows aromatic and medicinal plants. A chopper was used to clean, dry, and cut the collected aloe vera leaves into tiny pieces.

The aloe vera plant's three leaves were picked, their peels were taken off, and the total gel content was gathered in each petridish separately.Aloe vera gel. It is used as a tonic for liver problems, poor digestive function, and anemia in India. Aloe vera is utilized as a component of functional foods, primarily in the creation of tea and other healthful beverages.Aloe vera is utilized as a component of functional foods, mostly for health improvement tea and other liquids and beverages. (13). In addition to having numerous minerals essential to the development and proper operation of every system in the body, aloe vera is one of the few known natural vegetarian sources of vitamin B12. Vitamins A, B12, C, E, zinc, calcium, magnesium, protein, and vital fatty acids are all found in aloe vera.When Aloe vera is used externally, almost no adverse effects are seen. Oral use of Aloe vera may cause colic and diarrhea. have been reported with oral use of aloe vera. The purgative property of the plant may reduce the absorption of other drugs.(14).

Future scope:

Aloe vera is frequently utilized in pharmaceuticals. Here is a basic overview of how aloe vera isused to cure various illnesses.

Constipation Aloe vera is effective in eliminating the microorganisms in the terminal segment of the large intestine and can help treat constipation.

Aloe vera juice has potential applications in the management of inflammatory bowel disease.

Burns: The aloe vera plant has long been thought to provide a comprehensive burn treatment. It is possible to use pure gel for burn therapy, either from a reliable company or from the fresh leaves of a healthy plant.

It should be noted that aloe vera liniment is not utilized because it is designed to generate heat, which could exacerbate the burn. Its lotion is used to treat muscle issues.
Genital Herpes Extract of Aloe vera is used for the treatment of genital herpes]. Aloe vera juice mixed with fruit juice may be taken daily for chronic viral infections.

Seborrheic Dermatitis (Dandruff): Aloe vera lotion is used for treating seborrheic dermatitis. It is also an excellent treatment for the hair care. Aloe vera hair conditioners and shampoos are used widely for the purpose . Osteoarthritis Aloe vera is used topically for osteoarthritis, and sunburns. Pain in the joints and muscles due to arthritis may be treated by using Aloe vera sprays or gels .

Additionally, it lowers hyperglycemic individuals' blood sugar levels. Its juice is consumed twice a day for this reason . Pregnant women frequently suffer from diabetes,

which aloe vera has been shown to be useful in treating. Daily usage of aloe vera can help avoid gestational diabetes.(15)

The natural bioactive ingredients in aloe vera gel shampoo, such as vitamins, minerals, amino acids, and polysaccharides, have drawn a lot of interest from the personal care sector since they support healthy scalps and nourished hair. According to studies, aloe vera has hydrating, anti-inflammatory, and antibacterial qualities that help to improve hair texture, reduce dandruff, and soothe irritated scalps. The gel's high water content helps to hydrate the scalp, and its proteolytic enzymes aid in the regeneration of dead skin cells. Aloe vera's inherent conditioning properties also improve hair's manageability and smoothness without leaving a lot of residue behind. Aloe vera gel formulations are said to be gentler, more environmentally friendly, and appropriate for sensitive skin than traditional chemical-based shampoos. This fits with the current customer preferences for plant-based and sustainable hair care products.

Because aloe vera gel shampoo contains a wealth of bioactive substances like anthraquinones, saponins, and antioxidants, it is becoming more and more acknowledged as a multipurpose hair care product. These ingredients support hair strength and luster while also gently cleaning the scalp. Aloe vera's natural enzymes aid in the breakdown of extra sebum and residue, minimizing scalp accumulation without depleting essential oils. Additionally, its ability to balance pH helps to preserve the natural acidity of the scalp, which promotes a healthy microbiome and lessens discomfort. Aloe vera gel shampoo has been shown to reduce split ends, improve hair elasticity, and shield against environmental damage when used regularly.(16)

Aloe vera gel shampoo is appropriate for a variety of hair types, including delicate and damaged hair, because it provides a mild yet efficient method of hair cleansing. Its all-natural formula, which is high in vitamins, minerals, and amino acids, promotes healthier scalps and thicker, glossier hair. The shampoo's anti-inflammatory and antibacterial qualities help to reduce dandruff and relieve irritation, while its moisturizing qualities aid to retain moisture, decreasing dryness and frizz. Aloe vera gel compositions tend to preserve the scalp's natural pH, avoiding over-drying and shielding the hair cuticle, in contrast to harsh chemical shampoos. Furthermore, herbal compounds' eco-friendliness and biodegradability complement sustainable beauty methods. All things considered, aloe vera gel shampoo exhibits a harmonious fusion of environmental responsibility, nourishment, and cleansing effectiveness.

Aloe vera gel shampoo is prized for its all-natural, plant-based recipe that nourishes and cleanses hair and scalp. Its potent combination of bioactive substances, such as enzymes, polysaccharides, and antioxidants, helps to lessen scalp problems and improve hair texture. Because it improves elasticity and restores moisture, the product is especially helpful for people with dry, brittle, or chemically damaged hair. It is appropriate for daily use because of its gentle washing action, which reduces irritation. Regular use frequently results in smoother, glossier hair, according to users. Additionally, by lowering dependency on artificial chemicals, the shampoo's herbal foundation promotes eco-friendly hair care techniques. All things considered, the aloe vera gel shampoo does admirably in fusing mild cleansing, hydration, and scalp care into a sustainable, user-friendly solution. (17)

Evaluation of Aloe vera Gel:

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Preparation of Aloe vera Gel Shampoo:

Extracting fresh gel from mature aloe vera plants is the first step in making aloe vera gel shampoo. To remove the clear gel, wash the leaves well, cut off the edges, and then cut them open. To guarantee uniform consistency, blend the gel until it's smooth. As the foundation cleanser, mix ½ cup liquid castile soap and ½ cup aloe vera gel in a clean mixing dish. For moisture retention, add 1 teaspoon of vegetable glycerine; for conditioning, add 1 teaspoon of coconut or jojoba oil. Add 5–7 drops of essential oil, like tea tree or lavender, for scent and extra scalp benefits. Mix thoroughly until well combined. To ensure freshness, keep the shampoo in the refrigerator in an airtight container and use it within two to three weeks.

Aloe vera gel shampoo is made by mixing natural cleansing and conditioning ingredients to promote the healthiest possible scalp and hair. 50% fresh aloe vera gel, which has been collected from mature leaves and filtered to remove pulp, makes up the base. Liquid castile soap (30%) is a mild surfactant that gently cleanses without removing natural oils. While conditioning compounds like coconut oil or jojoba oil (5%) enhance softness and manageability, humectants such vegetable glycerine (5%) aid in moisture retention. Essential oils (1–2%), including lavender for calming effects or tea tree for antibacterial action, improve aroma and therapeutic value. To preserve freshness, the remaining proportion is made up of distilled water and natural preservatives like potassium sorbate or vitamin E. To make it compatible with the scalp, the pH is adjusted to 5.0 to 5.5.Fresh aloe vera gel is combined with natural oils, humectants, mild surfactants, and essential oils to make aloe vera gel shampoo, a mild yet potent hair cleanser. (19)

The formulation procedure guarantees that the pH is maintained naturally for freshness and regulated to 5.0–5.5 for scalp compatibility. According to evaluation, the shampoo leaves hair feeling soft, manageable, and irritation-free while offering a gentle cleansing without removing natural oils. Aloe's anti-inflammatory and antibacterial qualities help to balance moisture, reduce dandruff, and reduce inflammation, all of which contribute to the health of the scalp. Frequent use increases shine, minimizes split ends, and improves hair texture. Aloe vera gel shampoo satisfies the growing need for herbal, sustainable hair care products while providing hydration, nourishment, and long-lasting scalp comfort. It is also devoid of harsh chemicals and environmentally friendly. (20)Mature aloe leaves are processed to extract clear gel, which is then combined with plant-based cleansers, mild botanical oils, moisturizing ingredients, and fragrant essential extracts to create aloe vera gel shampoo. To match scalp conditions, the mixture is adjusted to a slightly acidic pH after being mixed until homogenous. According to tests, this shampoo helps preserve natural hydration levels, cleanses hair strands softly, and gets rid of pollutants. Additionally, it has antimicrobial, cooling, and scalp-calming properties that help those with dryness or flaking feel more at ease. Regular use minimizes split ends, strengthens hair fibers, and encourages a glossy, healthy look. With regular care, it provides softness, manageability, and overall hair vitality while appealing to eco-conscious consumers looking for natural grooming solutions because it is devoid of sulphates and other additives.

Market Trends:

The market for aloe vera gel shampoo is expanding steadily due to rising customer desire for personal care products free of chemicals and herbs. More people are turning to plant-based treatments as they become more conscious of the negative impacts of synthetic substances and the health of their scalps. Aloe vera is a key component of both high-end and mass-market hair care products due to its shown therapeutic benefits and adaptability. Combining aloe vera with other botanicals like neem, hibiscus, or tea tree is one example of how innovative formulations are broadening product diversity and drawing in new customers. To achieve sustainability objectives, the future scope includes creating variations that are pH-balanced, biodegradable, and free of preservatives. Aloe vera gel shampoo is a serious competitor

in the natural hair care industries thanks to expanding e-commerce platforms and influencer-driven marketing, which are anticipated to increase worldwide reach.

Limitations and Challenges:

Aloe vera gel shampoo provides many advantages, but there are also some drawbacks that need to be considered. Because fresh aloe gel has a limited shelf life, product stability requires preservation. The user's perception of the cleaning performance may be impacted if natural shampoo formulations generate less lather than chemical-based shampoos. Plant age and environmental factors affect aloe vera gel's consistency, which could result in variations in texture and performance from batch to batch. Sensitive people may experience allergic reactions to some botanical additions or essential oils. Furthermore, it might be difficult and expensive to source clean, pesticide-free aloe vera for large-scale production. Improved extraction procedures, active component standardization, and environmentally friendly preservation processes are required to get around these restrictions and guarantee constant quality and customer satisfaction.

Scientific Basis of Aloe Vera Action :

The abundance of biologically active chemicals in aloe vera gel shampoo contributes to its efficacy. Amino acids support the strength and flexibility of hair, while polysaccharides like acemannan improve moisture retention. Vitamins A, C, and E support healthy scalps by offering antioxidant defence against damage from free radicals. Proteolytic enzymes found in aloe vera also aid in the removal of dead skin cells, unclogging hair follicles and enhancing the absorption of nutrients. It is appropriate for delicate scalps because of its natural saponins, which provide gentle washing without being abrasive. Salicylic acid and other anti-inflammatory drugs help reduce redness and irritation. Minerals like zinc and magnesium promote healthy hair development, while antimicrobial qualities stop the growth of fungi that cause dandruff. Aloe vera gel shampoo is a preventative and therapeutic hair care product because of these qualities.

Conclusion :

In the rapidly changing personal care market of today, aloe vera gel shampoo distinguishes out as a natural, efficient, and environmentally friendly hair care choice. Without the negative effects of harsh synthetic chemicals, its composition uses aloe vera's therapeutic capacity to provide hydration, scalp nourishment, and gentle cleansing. Its antibacterial, anti-inflammatory, and antioxidant qualities are supported by scientific research, which makes it appropriate for a variety of hair types, including damaged and sensitive hair.

The product is more appealing to consumers because of its eco-friendliness and plant-based ingredients, which support global sustainability goals. Improvements in extraction, preservation, and standardization can address drawbacks including short shelf life and possible heterogeneity in gel quality.

Aloe vera gel shampoo has a lot of promise for the future because consumers are choosing more herbal and chemical-free products. Its strong position in both home and foreign markets may be guaranteed by ongoing research, innovative formulations, and focused marketing. In the end, it offers a comprehensive approach to hair health by combining conventional botanical knowledge with contemporary beauty technology.

REFERENCES

[1] Priyanka Sharma, Amit C. Kharkwal a review on Pharmacological properties of Aloe Vera. First edition published on November – December 2014, Page No. 31-37.

[2] Mario Hernandez Garcia, Acela Davila Jimnez (2019), Importance and Production of Aloe Vera Hair Shampoo, Journal of East & North Sciences. https://www.jomenas.org.

[3] Jeltzlin Semerel, Nigel John, Pedro Fardim review on valorization of Aloe Vera, Journal of renewable materials Volume-2.

[4] V. Vaibhav, S. Sakharwade, Development and evaluation of Shampoo Department of Cosmetic Technology, ISSN0974, Volume- 12, Published in 2016.

[5] Gyan Prakash and Dr. Kailash Chandra Yadav International Journal of Agriculture and Food Science operated Aloe Vera Gel extractor. Volume-1, Page No. 14-17.

[6] Dr. S. Manohar Babu, S. Lakshmisavithri, A. Veda Sravanthi, D. Shakeena, R. Selophy formulation and evaluation of Aloe Vera Gel Shampoo, Department of Pharmaceutics Volume-9, Issue 3, 2021, Page No. 172-179.

[7] Flavia Scigliano Dabbur, Maria Krisnelma de Macedo Silva Monteiro, Pre- stability on hair emulsion developed Aloe Vera extract published in April, 2019.

[8] Sushil Kumar Pal, Shashank Tiwari, Sunil Mishra and Sachit Saran of International Journal of Life Science, published in 15th October, 2024.

[9] Josias H, Hamman, Department of Pharmaceutical Sciences published on 8th August, 2008.
[10] Prajwal Jadhav, Shrushti Jagdale, Shravani Kamble, Rupali Yewale, Journal of Pharmacognosy and phytochemistry (Voume-1) Page No. 32-36. https://doi.org/10.227/phyto 2022.
[11] Aisha Saleem, Irum Naureen, Gulnaz Tasleem on Aloe Vera Gel effect on Skin and Pharmacological properties, published on 7th January, 2022. https://saudijournal.com
[12] Dr. Mohd. Wasiullah, Piyush Yadav and Sushil Yadav, review on Aloe Vera the wonder cosmetic journal of Pharmaceutical Research Volume -12, Issue 1.
[13] Chetna Gangwar, Pratibha Singh, Nitin Vikram, International Journal of Microbiology, Volume- 6 Number 11 (2017). http://www.ijcmas.com.
[14] M. IMRAN QADIR, review on medicinal and Cosmatological Important of Aloe Vera International Journal of Natural Therapy 2009, Volume -2 Page No. 21-26
[15] S. Dutta Gupta Cosmetic of Aloe Vera L. Gel medicinal and Aromatic Plant Science and Bio Technology, 68, Page No. 549-561.
[16] Nidhi Singh, Tanveer Alam Ansari and Manali Singh, Journal of Pharmacognosy and Phytochemistry 2019, Volume -3, Page No. 412-418. www.phytojournal.com.
[17] Trie Rizqi Fatmala, FerliSeptiIrwansyash, conditioner from Aloe Vera Scientific Performance Asean Journal for Science in materials (2023) Page No. 159-168.
[18] Popat S. Kumbhar, Ajit B. Patil, Prajakta S. Khopade a review on Aloe Vera and Medicinal Properties. Voume - 4, Issue on 05, 2015.