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RESEARCHARTICLE

ALOE *VERA*: A NATURE'S PRODIGY

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ABSTRACT

Aloe vera is a plant that resembles a cactus but is actually a member of the lily family. The Aloe plant comes in more than 300 different types, but *Aloe barbadensis* has the finest medical qualities. It possesses potent antibacterial, fungicidal, virucidal, and antiseptic effects. It stimulates cell development, calms the nervous system, and detoxifies the body. Others offer nutritional assistance, others boost tissues' capacity for regeneration, while yet others have anti-inflammatory effects. Herbal medicine has been utilised extensively around the world and was a crucial component of primary healthcare in many nations, including India. In many parts of the world, especially in underdeveloped nations where traditional medicine is relied upon to preserve human and animal health, using medicinal plants to cure illnesses is an old practise. Taking note of this, the WHO set up a policy pushing its member nations to promote and incorporate traditional medicine within their respective national health care systems. The nutritional, therapeutic, and skin-care benefits of the *aloe vera* plant have been well-known and utilised for generations. *Aloe Vera* is a member of the Xanthorrhoeaceae family and grows to a height of around 60 to 100 cm. It has long, stemless leaves or very short stems. Numerous vitamins, including vitamin B12, vitamin A, vitamin C, vitamin E, and folic acid, may be found in aloe *vera* gel. Fatty acids and sugars are among the key elements found in *aloe vera* gel. In addition to acting as an antibacterial, anti-microbial, anti-ulcer, and anti-inflammatory agent; aloe *vera* , known as the "wonder plant," aids in the relief of conditions including malignancy and diabetes. It is well recognised to actively repair the damaged skin cells that create the outward indications of ageing and can help slow down the development of wrinkles. *Aloe Vera* has been applied topically to treat a variety of skin issues, including burns and wounds. It is credited to its extremely successful, low-side-effect therapy.

INTRODUCTION

Since ancient times, the *aloe vera* plant has been used for its numerous cosmetic and therapeutic benefits. The word "Alloeh" means "shining," and the word "*vera* " means "true," therefore the name. Aloe was known to the Egyptians as "the herb of immortality." Dermatology has made use of the plant in a number of ways. Barbados or Curaçao Aloe are other names for *aloe vera* (Ro *et al*., 2000). Although it originated in Africa, it is now commonplace. It is a bitter plant with se*vera* l medical uses. It comprises more than 75 different substances, many of which have biological activity. Since ancient times, *Aloe vera* has been utilised for medical purposes (Wynn, 2005). Numerous aloe species are still utilised in traditional African and Asian treatments. Mucilaginous gel is used in India to cure asthma, some Africans use it to treat chronic conjunctivitis, and hunters in the Congo spread the gel on their bodies to reduce sweat (Hutter *et al*., 1996). *Aloe vera* gel is a hypertension medication used in Trinidad and Tobago. Aloe has traditionally been used primarily to treat burn wounds, especially to speed up healing and lessen inflammation. According to Dioscorides, the gel can be used to cure psoriasis, itchiness, and oral infections.

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The 1930s writings on aloe *vera* 's positive impact on radiation dermatitis accelerated its usage as a household item in the United States; it is still a frequent plant used for burns and abrasions. *Aloe vera* gel has significant traditional medical use in the West Indies, China, and other Asian countries. As of 2008, Mexico produced around 47% of the aloe sold worldwide, with sales amounting to $123.5 million USD. Despite its widespread use, there is still a dearth of scientific research on *aloe vera* gel. With only a few adverse responses observed, topical use of *aloe vera* gel is thought to be safe. The internal application of this gel for the treatment of type 2 diabetes or other indications like psoriasis are yet unknown. It is used to treat burn wounds and genital herpes, according to scientific investigations. The best use of *aloe vera* gel is still as a skin moisturiser in cosmetics, where it has also been successfully used to heal sunburns. The succulent plant *aloe vera* has thick, fleshy, serrated, lanceolate-shaped leaves that are green to greyish in colour (Chithra *et al*., 1998). By extensively slicing up the bottom leaves, the inner gel of *aloe vera* may be extracted. The gel should be sufficiently clear, tasteless, and devoid of any yellow or leaf skin impurities. Adherence is required by the International Aloe Science Council, a trade group for international aloe growers. The additional formulations include an emulsion with 30% *aloe vera* gel and a hydrophilic cream with 0.5% *aloe vera* gel. The thick outer protective layer has protective properties and is made up of glycosides, anthracene, and hydroxyanthracene derivatives. The

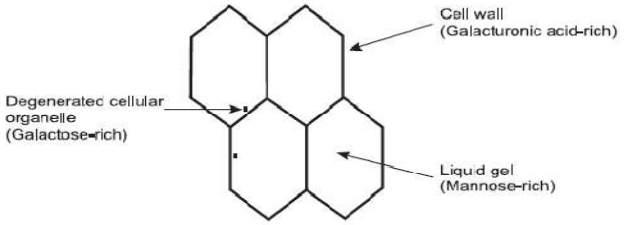
fact that this layer creates all the nutrients makes it extremely crucial (Meena *et al*., 2013).

HISTORICAL BACKGROUND

Worldwide, many nations consider the *aloe vera* plant to be a favoured herb. It has been discussed in se*vera* l literatures and throughout numerous civilizations, dating back to the Greek, Egyptian, and Roman eras. Additionally, works from the Chinese and Indian civilizations have se*vera* l references to it. Throughout historical times, it has been among the most frequently used plants. The usage of *aloe vera* is mentioned in se*vera* l publications from ancient times, including the Bible. The origin of *aloe vera* is a mystery in and of itself since it has been spread so far for commercial purposes around the world that it has frequently been disputed. An multinational team of eminent scientists from the UK, Denmark, Norway, Australia, and Ethiopia attempted to rationally strengthen this case under the direction of Olwen Grace of London's Kew Gardens and Nine Ronsted of the University of Copenhagen. The DNA sample of the Aloe genus that the researcher put together is the largest one that has been created thus far. They used recently obtained nuclear and plastid DNA as well as a sizable number of previously published sequences kept in Gen Bank to try to determine the evolutionary connection between the aloes (Heggers *et al*., 1996).The new research reveals that *Aloe vera* was long ago created in the Arabian Peninsula region based on the well supported evolutionary link with physically similar species. The historically significant early trade routes between Asia and the Mediterranean were blocked through the Arabian Peninsula, where Aloe was particularly well evolved. The usage of *aloe vera* was first documented during the Egyptian times. There are countless examples of Egyptians decorating the walls of ancient temples with drawings of *aloe vera* plants. Many societies, like Egyptians, would have even exalted the plant to the rank of a "godlike" being. Aloe *Vera* 's medicinal benefits have been utilised for generations, garnering it the moniker or synonym "Plant of Immortality." Since the 4th century B.C., when ancient Greek doctors imported aloe from the Indian Ocean island of Socotra, the *aloe vera* plant and its derivative products have been used in medicine and healthcare (Chithra *et al*., 1998). There are se*vera* l tales about how the Egyptian Queens Nefertiti and Cleopatra VII utilised it as a regular medical supply and cosmetic alternative. Aristotle eventually convinced Alexander the Great in 333 B.C. to conquer the island of Socotra in the Indian Ocean in order to obtain the renowned aloe supply that he required to cure his injured soldiers. Only a few adverse responses have been observed while using *aloe vera* gel topically, thus it is generally regarded as safe. Clinical trials have demonstrated the effectiveness of *aloe vera* gel in treating burn wounds, genital herpes, and seborrheic dermatitis, but further indications like psoriasis or internal administration for the treatment of type 2 diabetes are still pending. *Aloe vera* is one of the earliest plants known to have existed, according to history, because of its therapeutic uses. *Aloe vera* was utilised by the ancient Chinese and Egyptians to cure burns, wounds, and fever. According to legend, Alexander the Great invaded the island of Socotra off the coast of Africa on the suggestion of Aristotle in order to g*et aloe vera* supplies to treat his men' wounds (Roberts *et al*., 1995). An adult *aloe vera* plant may grow up to 30 inches tall and have up to 21 leaves when it is 3–4 years old and mature.

BOTANY OF ALOE *VERA*

Aloevera is a prickly cactus resembling xerophytes. This perennial clump-forming plant has huge basal leaves, typically 12–16 per plant that can weigh up to 1.5 kg when mature. It also has a strong fibrous root system. The plant takes around 4 years to reach maturity, and it can live for up to 12 years. The leaves have saw-like teeth along their borders and can be up to 0.5 m long and 8–10 cm broad at the base, tapering to a tip. The plant has a markedly convex look on the lower abaxial surface and a slightly concave appearance on the adaxial surface in a transverse slice (Grindlay and Reynolds 1986). Thick cuticle covers the leaves, which have epidermis and mesophyll below. As the rosette matures, succeeding leaves lose more of their white spots and turn grey-greenish in colour.



Source: (Turner *et al*., 2004)

Figure 1. Schematic representation of *aloevera* leaf pulp structure and its components

Later is differentiated in upper chlorenchyma and lower parenchyma (Eshun and He 2004). Every 6 to 8 weeks, the plant may be harvested by plucking 3 to 4 leaves from each plant. The majority of the year, red, yellow, purple, or light striped flowers may be seen blooming in a long raceme at the top of a flower stalk that emerges from the centre of the basal leaves. The flower stem may reach a height of 1.5 m. The fruit is a triangular capsule with many seeds inside of it. The plant is mostly free of disease, yet on rare black patches due to a fungus infection may appear on the upper surface or soft rotting may harm the entire plant. A bacteria is the responsible organism for soft rotting. Another adversary of *aloe vera* plants is frost, which makes it impossible for it to live (Grindlay and Reynolds 1986). Farmers use smoking in the fields on frosty nights as one kind of frost protection for the plantation. Over 250 different types of aloe are cultivated worldwide. However, only two species—Aloe aborescens and Aloe barbadensis Miller—are raised for economic purposes. Aloe perry baker and Aloe ferox are at least two more species with therapeutic qualities. The majority of*aloevera* plants are non-toxic, however a handful are incredibly dangerous and contain a toxin like hemlock (Atherton 1998). A common indoor plant is the dwarf species of aloe variegates, which has a diameter of only a few centimetres.

Taxonomy

Kingdom- Plantae
Order- Asparagales
Division- Spermatophyte
Subdivision- Angiospermae
Class- Monocotyledoneae
Genus- Aloe
Species- Barbadensis Mill (Nadkarni, 2004)

BENEFITS OF ALOE *VERA*

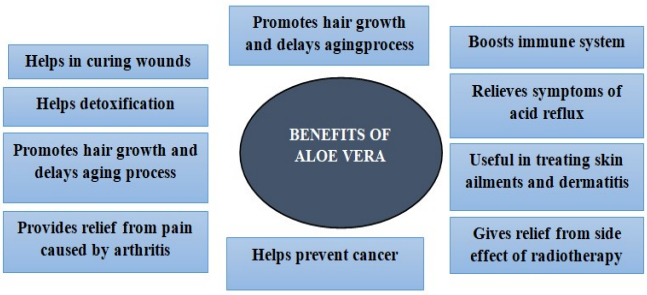


Figure 2. Benefits of aloe *vera*

Cultivation and Collection: More than 250 different species of aloe have been developed worldwide. Nevertheless, only two species are now produced mechanically, with Aloe aborescens and Aloe barbadensis being the most common. The *aloe vera* plant can only grow in warm, tropical regions since it cannot withstand freezing temperatures. It grows steadily to a size of 0.8 m by 1 m and is evergreen. The plants like light (sandy) and medium (loamy) soil, which can produce in nutrient-poor soil if it is completely drained.

The plant leans toward basic (fundamental) soil that is damaging, nonpartisan, and fundamental. In the dark, it cannot produce. It needs clammy or dry soil and can withstand dry spells.

Table 1. Novel components of *aloe vera* along with their health benefits

S.no	Chemical component	Health benefits
1.	Acemannan	Accelerate wound healing, modulate immune system, Antineoplastic and antiviral effects
2.	Alprogen	Anti-allergic
3.	C-glycosylchromone	Anti-inflammatory
4.	Bradykinase	Anti-inflammatory
5.	Magnesium lactate	Anti-allergic
6.	Salicylic acid	Analgesic, anti-inflammatory

Source: Shelton (1991), Peng*et al*. (1991)

These plants are xerophytic. By seed, it may be propagated. After the spinning season, young equalisation is sown beneath the soil in lines spaced 60 metres apart. When takeoffs are needed, neighbouring people gather them by holding their hands over their faces while keeping in mind the prickly takeoff approach. The clears out are cut close to the base, stored in light fuel cans, and transported to a central location for the aloe treatment process. Aloe juice is available in cement cell-like parenchymatouspericycle cells. Applying in a single segment are point cement cells (Thomson, 1970)

ALOE VERA GEL CHEMISTRY

The outside green skin and the interior, white pulp are the two main components of an *aloe vera* leaf. The cell walls and organelles in these pulp or parenchyma tissues are composed of a thick gel and contain 98.5% water (Tizard, 2004). Water makes up 99.5% of the gel. The remaining 0.5-0.6% of the solid fraction is made up of 80% water-soluble substances, including polysaccharides, vitamins, enzymes, amino acids, minerals, and trace elements. Organic acids, phenolic compounds, phytosterols, and other substances are among the non-nutritive substances (Boudreau, 2006). The ratios of the gel's various chemical components are affected by a few seasonal circumstances (Wang, 2007). Instead of any one active ingredient, *Aloe vera* gel's therapeutic qualities are thought to result from the synergistic impact of its heterogeneous chemical makeup (Talmadge 2004).

NUTRITIVE CONSTITUENTS

Carbohydrates: The fraction that contains carbohydrates makes up 25–50% of the fraction's solid component and is the largest fraction (0.25%) of the entire gel composition. It contains polysaccharides, which make up the majority of *Aloevera* gel's dry matter. These comprise fibres, free sugars, and mono- and polysaccharides. The most significant substances are gluco-mannans, which are long-chain linear polysaccharides made up of glucose and mannose subunits and are also known as b (1,4)-linked acetylated mannans. They are in charge of giving the gel its mucilage consistency. The hydrolysis of sugars causes a reduction in gel viscosity. These "carrysin" acemannans function as immunomodulators. They are entirely absorbed and keep their shape in the blood (Kahlon *et al*., 1991; Lorenzetti *et al*., 1964). Pure mannan, acetylated glucomannan, galactan, arabinan, cellulose, xylan, galactogalacturan, arabinogalactan, glucogalactomannan, galacto galacto gluco arabinomannan, etc. are examples of polysaccharides (Turner, 2004; Choi, 2003). Mannose, free glucose, fructose, and galactose are examples of monosaccharides.

Vitamins: Ascorbic acid, carotenoids, tocopherols, vitamin B1 (thiamin), vitamin B2 (riboflavin), vitamin B6, niacin, and folic acid are all present in *aloe vera* gel. Most of them have the potential to be antioxidants (Lawless, 2000). Additionally, trace amounts of vitamin B12 have been found in the gel (Lawless,2000; Atherton 1998).

Enzymes: At least six distinct enzymes may be found in *aloe vera* gel, including cellulose, carboxypeptidase, amylase, bradykinase, oxidase, and catalase (Meadows, 1980). These enzymes aid in the breakdown of fats and carbohydrates in the diet, which aids in digestion and nutritional absorption.

Minerals and Trace Elements: *Aloe vera* gel contains magnesium, calcium, iron, copper, zinc, and chromium. The presence of magnesium lactate in *aloe vera* gel is thought to be responsible for its antiallergic benefits. *Aloe vera* has higher potassium and chloride concentrations than the majority of other plants, but lower sodium concentrations (Wang, 1993). Some of the elements in the mixture are antioxidants and are crucial for the operation of numerous enzymes in various metabolic pathways. In addition to the poisonous elements Pb, B, Sr, Ba, Al, and Cd, important minerals Fe, P, Zn, Cu, Mn, and Ni are also found in trace levels (Sahito, 2003; Yang, 2004).

Proteins and Amino Acids: Aloe species have been shown to have glycoproteins with biological activity (Yagi, 1986; Kodym, 1991). Aloctin A, which has a molecular weight of 18 kDa and consists of 7.5 and 10.5 kDa subunits with an 18% carbohydrate fraction, and Aloctin B, which has a molecular weight of 24 kDa and two 12 kDa subunits with a 50% carbohydrate fraction, have also been isolated as lectins and lectin-like substances (Akev *et al*., 2007). A glycoprotein (Pg21-2b) with cell proliferation-promoting properties was discovered in *aloe vera* gel (Yagi 1997). Seven of the eight necessary amino acids for human consumption are found in the gel. Out of the 22 amino acids that naturally exist, 20 are also present.

NON-NUTRITIVE CONSTITUENTS

Phenolic Compounds: Aloe gel has a 1.25–3 times lower concentration of phenolic chemicals than aloe peels. These polyphenols are in charge of Aloe gel's antioxidant capacity (Loots, 2007). The phenolic chemicals known as anthraquinones, which are found in *aloe vera* latex (a yellow exudate), are produced through the oxidation of low molecular weight aloin, a glycoside derivative of aloe-emodin. This yellow exudate frequently contaminates the gel during gel extraction and, when consumed in greater doses, causes gastrointestinal discomfort, laxative effects, and diarrhoea. However, when present in smaller amounts in the processed gel, anthrones have significant antibacterial, analgesic, and antiviral potential and help in the absorption of food from the stomach. Aloin A and B are the two that are most significant. Others present include aloe-emodin,aloesin, and aloeresin(Loots, 2007; Paez, 2000].

Organic Acids: Salicylic acid, lactic, acetic, malic, and succinic acids are a few of them. Salicylic acid has strong anti-inflammatory and antibacterial effects. The greatest content of malic acid is utilised as a benchmark for commercial aloe products (G. Luta, 2005). If succinic acid or lactic acid is found, it is created as a result of an enzymatic or biological change to the gel (IASC, 2004).

Phytosterols: Lupeol, cholesterol, b-sitosterol, and campesterol are a few of them. They have anti-inflammatory characteristics (Atherton 1998).

Other Compounds: Other substances found in the gel include volatile substances, long-chain esters, and aliphatic hydrocarbons (aldehydes, ketones, acids, etc.) (Loots, 2007)

GEL CONSTITUENTS

The *Aloe vera* gel's chemical makeup is intricate. 75 potentially active ingredients, including vitamins, enzymes, minerals, sugars, lignin, saponins, salicylic acids, and amino acids, are found in *aloe vera* (Atherton, 1998; Vogler 1999)

Vitamins: Numerous vitamins, including antioxidant vitamins A, C, and E, are present in the plant. Thiamine, niacin, riboflavin, vitamin B12, choline, and folic acid are also present (Coats, 1978). Free radicals are neutralised by antioxidants.

Enzymes: The biological enzymes amylases, lipases, alkaline phophatases, cellulases, catalases, and peroxidases aid in digestion by liquefying fats and carbohydrates. By inactivating bradykinins, carboxy peptidases and bradykinases have an anti-inflammatory impact. (Surjushe *et al*., 2008; Joseph *et al*., 2010) The anti-tumor properties of lectins (Kumar *et al*., 2010).

Minerals: The aloe plant contains a variety of minerals, including sodium, potassium, calcium, magnesium, selenium, manganese, copper, zinc, chromium, and iron. These minerals are crucial for the proper operation of enzymes that are engaged in different metabolic processes. Not all of these are antioxidants (Surjushe *et al*., 2008).

Sugars: Under the rind of the leaf, in the mucilaginous layer of the plant, lie sugars. It contains both polysaccharides (such as fructose and glucose) and monosaccharides (glucomannose and polymannose). The polysaccharides modulate the immune system. An excellent moisturiser, glumannan is utilised in cosmetic goods (Chandegara *et al*., 2013).

Anthraquinones: Under the exterior green rind, in the bitter reddish yellow exudates, are anthraquinones and its derivatives, including barbaloin, aloeemodin-9-anthrone, isobarbaloin, anthrone-C-glycosides, and chromones. These are phenolic substances, which have historically been used as laxatives. When present in high amounts, these substances have a severe purgative action, but when present in lesser amounts, they appear to facilitate stomach absorption. They also act as potent antibacterial agents and analgesics (Joseph *et al*., 2010).

Sterols: Cholesterol, campesterol, -sitosterol, and lupeol are some of them. All of them have anti-inflammatory effects, and lupeol has antibacterial and analgesic qualities as well (Coats, 1978; Surjushe *et al*., 2008)

Hormones: Gibberellins and auxins that promote wound healing and have anti-inflammatory properties.

Salicylic acid: This substance resembles aspirin and has anti-inflammatory and antibacterial effects.

Amino acids: The amino acids needed for development and repair are present in *aloe vera* gel. It contains 7 of the 8 essential amino acids and 20 of the 22 non-essential amino acids (Joseph *et al*., 2010).

Lignin: It is an inert chemical that, when added to topical therapies, improves the other medicines' ability to penetrate the skin (Surjushe *et al*., 2008).

Saponins: These are the soapy compounds that are both purifying and sterile (Surjushe *et al*., 2008).

ALOE JUICE AND ITS FOOD APPLICATIONS

Processing aloe juice using a historical technique using a sharp knife, the lower inch of the leaf base, the tapering tip (2-4 in.) of the leaf top, the small, sharp spines along the leaf border, the top and bottom rind, and any rind sections with remaining mucilage are removed. For further processing, the aloe leaf's fillet and mucilage are removed. The mucilage layer, which serves as the site of the beneficial elements' production, has the highest amounts of the possibly helpful aloe compounds. The storage cells (cellulose-reinforced hexagons) of the fillet receive the mucilage layer material once it has been synthesised (Ramachandra and Srinivasa Rao, 2008). The fillet of *aloe vera* gel is put to the pulper after being cleaned with deionized water. The pulper is equipped with a refrigeration system that maintains the extracted juice at a cooler temperature to avoid decomposition. To decant, the *aloe vera* juice is transported to a holding tank and maintained there for 24 hours. For the purpose of maintaining the bioactivity of *aloe vera 's* delicate components, the holding tank is also cooled. The technology for processing whole leaves was created in the 1980s in the USA and has since undergone continual refinement thanks to the contributions of many individuals (HomcareIberica 1983; Maughan 1984; Coats 1994).

In order to assure product rich in bioactive components, the technique uses cold treatment. The leaf's base and tip are eliminated during this operation. To create a soup-like consistency, the leaf is divided into parts and processed into particle slurry in a Fiz Mill (Model D6 Make Arnold equipment business, Ohio). The material is next subjected to cellulase enzyme treatment, which dissolves the fillet's hexagonal shape and releases the components of the cell. Using a juice press or a series of coarse screening filters, the rind particles are eliminated. This liquid is then poured into a sizable holding tank made of sterilised stainless steel. The tank is connected to a depulping extractor once it has been full. The big pulp and rind particles produced by the first grinding operation are removed by this equipment. To eliminate aloin and aloe emodin as well as any minute remnants of leaves, sand, or other particles, the aloe liquid is now run through a series of filters. For this, a press filter is employed. Aloin and aloe emodin are absorbed by the carbon-coated plates of the press filter. The filter press is used to continuously feed aloe juice through until the aloin and aloe emodin are eliminated. After entering a second holding tank, the filtered product is sent through a press filter made of five-micron filter paper. It's now time to stabilise the aloe juice. This method can provide *aloe vera* juice with three times as many bioactive ingredients as the standard hand filleting method (Ramachandra and Srinivasa Rao 2008). The use of *aloe vera* juice in food products is widespread. Examples include the production of ready-to-drink, health, soft, laxative, *aloe vera* lemon juice, sherbet, aloe sports drink with electrolyte, diet drink with soluble fibre, hangover drink with B vitamin, amino acids, and acetaminophen, healthy vegetable juice mix, tropical fruit juice with *aloe vera* , *aloe vera* yoghurts, alo (Grindlay and Reynolds 1986; Ang *et al*. 1996; Hastuti 1999; Singh and Singh 2009; Eshun and He 2004; Hamman 2008; Fresh *aloe vera* leaves were used to create a healthy be*vera* ge by Wei *et al*. in 2004.

After being cleaned, pulped, sterilised, and filtered, the leaves were combined with various quantities of Dangshen, Maidong, and Chinese herbs. The stability of colour and gelatinoids in *aloe vera* juice was studied in relation to the effects of processing conditions, such as temperature, pH, sucrose, vitamin C, and citric acid, and it was found that while vitamin C and sodium chloride at low concentrations improved stability, increasing sucrose and citric acid concentrations had a negative impact. Acetobactor sp. was used by Do-sang *et al*. (1999) to create vinegar from *aloe vera* juice. *Aloe vera* yoghurt with lactic acid bacteria (single or mixed strains of Lactobacillus bulgaricus and Streptococcus thermophilus) was created by Lee and Hand-Yoon in 1997, and when it was compared to milk yoghurt made with dried skim milk, it was discovered that the quality retention of the *aloe vera* yoghurt at 5 °C for 15 days was superior.

Aloe concentrates and its food applications: Aloe juice may be vacuum-concentrated without losing any biological activity. The concentration procedure must be carried out under a 125 mm Hg vacuum at a temperature below 50 °C and must not last more than 2 minutes since a greater vacuum and temperature would result in a loss of the bioactive ingredients' efficiency (Ramachandra and Srinivasa Rao 2008). *Aloe vera* concentrate is concentrated to provide the required consistency for use in different food applications, such as squash, jam, and jellies. Aloe concentrate can also be used with juice, water, or tea.

Aloe powder and its food applications: The pure intact *aloe vera* gel fillets are first cleaned in the dehydration procedure to get rid of any aloin residue. The fillets are then put in a humidity chamber with the proper temperature and relative humidity maintained (Ramachandra and SrinivasaRao, 2008). The fillets are dried here by hot air being pushed over them. After that, this substance is powdered and packaged (Ramachandra and SrinivasaRao, 2008). Using a cutting-edge, patented technique called Qmatrixdrying; aloe may be dried while retaining all of its natural flavour, colour, and bioactivity. In terms of quality, it is equivalent to freeze drying, but without the large operational costs. To get dried gel fillet during freeze drying, gel fillet is lyophilized at 88 °C and 0.01 mm Hg pressure for 65 h. Aloe that has a moisture level below 4% is then processed to create powder.

Using concentrated *aloe vera* gel that has undergone reverse osmosis and ultrafiltration, Qian (2002) created freeze-dried powder. *Aloe vera* leaves were chopped into small pieces, blended in a mixer, and dried in a tray dryer at 50 °C for 12 hours by Gautam and Awasthi (2007). The dry material is subsequently processed in a mixer grinder to create powder. *Aloe vera* powder can be added to ice cream, lassi, curd, and other foods. Aloe powder has also been used in the preparation ofyoghurts (Lee and Choi 1994; Seoshin *et al.* 1995)

Safety aspects of *aloe vera* products: Two parties within the scientific community disagree on the safety of *aloe vera* products. According to one organisation, *aloe vera* is perfectly safe to consume. While the opposing party advises using it carefully and cautiously to prevent contaminating the aloin with the yellow exudates since aloin has been linked to cancer and DNA damage (Lachenmeier *et al*. 2005). On the contrary, researchers have shown that anthroquinones, such as aloin, found in *aloe vera* leaves, are advantageous in a variety of ways when taken in moderation, but the definition of moderation is ambiguous (Sydiskis *et al*. 1991). *Aloe vera* gel is reportedly safe for external use, allergies are uncommon, and harmful drug interactions have not been recorded. Aloe should not be used internally by anybody experiencing gastrointestinal discomfort, appendicitis, or intestinal blockage, or when pregnant, nursing, or while a kid (Kemper and Chiou 1999). After administering *aloe vera* gel to a patient suffering from stasis dermatitis, a case of widespread dermatitis has been documented. Following dermabrasion, some patients who used *aloe vera* gel topically reported experiencing facial burning and developing dermatitis (Hunter and Frumkin 1991). Aloe gel used orally has the potential to be contaminated with anthraquinones, which might result in symptoms including diarrhoea and cramping. Henoch- Schonleinpurpura (HSP), a systemic vasculitis that most frequently affects youngsters who are infrequently exposed to medications or other environmental variables, is purportedly linked to the use of aloe *vera* . Consuming Aloe barbdensis components may increase the risk of developing acute hepatitis. *Aloe vera* gel consumption has also been linked to urticaria and an intense bullous allergic response (Morrow *et al*. 1980). Studies on mice showed that therapeutic levels had no acute toxicity, but that excessive doses resulted in a reduction in the central nervous system's (CNS) function (Shah *et al*. 1989). Red cell count decreased under continuous therapy, and there was considerable sperm destruction (Shah *et al*. 1989). A comprehensive study on the impact of large dosages of *aloe vera* over extended periods of time on red cell count and sperm destruction does not yet exist in people (Vogler and Ernst 1999).

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CONCLUSION

Due to its anti-inflammatory, antibacterial, and wound-healing characteristics, *aloe vera* has long been used to treat digestive issues as well as skin injuries (burns, wounds, insect bites, and eczemas). The goal of research on this medicinal plant has been to confirm its historical applications, understand its mode of action, and pinpoint the chemicals that are responsible for these effects. *Aloe vera* and its active components have also been studied for novel properties, with particular emphasis on its prospective effects as a cytotoxic, antitumoral, anticancer, and antidiabetic drug. The majority of pharmacological research has been conducted in vitro and in vivo over the past six years. Antimicrobial, anti-inflammatory, cytotoxic, antitumor, anticancer, and skin protective actions have been researched the most in in vitro experiments. It should be mentioned thata number of in vitro studies assess Aloe *vera* 's preventive effects in bone illnesses including osteoporosis. The results on bone protection are encouraging, but more research with humans and experimental animals is required.

Studies conducted in vivo are intended to assess the effects of cytotoxicity, antitumor and anticancer activity, and skin protection activity. Clinical studies are few compared to in vitro and in vivo testing, and they concentrate on skin and digestive protection. It would be interesting to research the therapeutic impact of pertinent metabolites in various human illnesses and pathologies because these clinical studies have only been undertaken with *aloe vera* and not with its separated chemicals. In the last six years, research has concentrated on aloe-emodin, aloin, aloesin, amodin, and acemannan, which are some of the main active chemicals. Aloe-emodin and aloin have received the greatest research attention of these. Aloe-emodin has shown promise as an antibacterial, antidiabetic, cytotoxic, cardio protective, bone protective, anti-inflammatory, and skin protective chemical. Aloin was effective in cancer and cardiovascular disorders, as well as in inflammatory processes and bone ailments (in vitro investigations).

SUGGESTIONS FOR FUTURE RESEARCHES

Aloe vera being a plant of medicinal importance there has been less researches on uses of different parts of plant also toxins present in the plants may be harmful for human health researches can be carried forward for eliminating such toxins. Edible food coating can also be done for food with less shelf life. Also *aloe vera* and its medicinal properties needs to be investigated further.

REFERENCES

1. Ahlawat, K. S., &Khatkar, B. S. (2011). Processing, food applications and safety of aloe vera products: a review. *Journal of food science and technology*, *48*(5), 525-533.
2. Ang, N. U., Intaphan, P., &Saengo, E. (1996). Development of orange aloe vera jam. In *Proceeding of the 13th Rajamangala institute of technology annual conference: Food science and home economics Lampang (Thailand)* (pp. 39-45).
3. Chandegara, V. K., &Varshney, A. K. (2013). Aloe vera L. processing and products: A review. *Int. J. Med. Aromat. Plants*, *3*(4), 492-506.
4. Chithra, P., Sajithlal, G. B., &Chandrakasan, G. (1998). Influence of Aloe vera on collagen characteristics in healing dermal wounds in rats. *Molecular and cellular biochemistry*, *181*(1), 71-76.
5. Chithra, P., Sajithlal, G. B., &Chandrakasan, G. (1998). Influence of Aloe vera on the glycosaminoglycans in the matrix of healing dermal wounds in rats. *Journal of ethnopharmacology*, *59*(3), 179-186.
6. Coats BC, The Silent Healer, A Modern Study of Aloe vera, Texas, Garland, 1979.
7. Coats, B. C. (1994). *U.S. Patent No. 5,356,811*. Washington, DC: U.S. Patent and Trademark Office.
8. Do-Sang L, Ryu II, Kap-Sang L, Yang-See S, Seung-Ho C (1999) Optimisation in the preparation of aloe vinegar by Acetobactor sp. and inhibitory effect against lipase activity. HangukNongwhahakHoechi 42:105–110.
9. Eshun, K., & He, Q. (2004). Aloe vera: a valuable ingredient for the food, pharmaceutical and cosmetic industries—a review. *Critical reviews in food science and nutrition*, *44*(2), 91-96.
10. G. Luta, B.H. McAnalley, Glycosci. Nutr. 6 (2005) 1–12.
11. Gautam, S., &Awasthi, P. (2007). Nutrient composition and physico-chemical characteristics of Aloe vera (Aloe barbadensis) powder. *Journal of Food Science and Technology-Mysore*, *44*(2), 224-225.
12. Ghannam N, Kingston M, Al-Meshaal IA, Tariq M, Parman NS, Woodhouse N (1986) The antidiabetic activity of aloe: preliminary clinical and experimental observation. Horm Res 24 (4):288–294.
13. Grindlay D, Reynolds T (1986) The aloe vera phenomenon: a review of the properties and modern uses of the leaf parenchyma gel. J Ethnopharmacol 16:117–151.
14. Gupta K V, Malhotra S, Pharmacological attribute of Aloe vera: Revalidation through experimental and clinical studies, Ayu, 2012; 33(2):193-6.

15. Hastuti S (1999) Fresh beverage from aloe vera. ButetinI lmiahInstiper (Indonesia) 6:39–45.
16. Heggers, J.P., et al., Beneficial effect of Aloe on wound healing in an excisional wound model. The Journal of Alternative and Complementary Medicine, 1996; 2(2): 271-277.
17. HomcareIberica SA (1983) Stabilization of a clear gel from aloe vera leaves. Span ES 502 307. Patent of Introduction
18. Hunter D, Frumkin A (1991) Adverse reaction to Vit E and aloe vera preparations after dermabration and chemical peel. Cutis 47 (3):193–195.
19. Hutter, J.A., et al., Antiinflammatory C-glucosylchromone from Aloe barbadensis. Journal of natural products, 1996; 59(5): 541-543.
20. International Aloe Science Council (IASC), http://www.iasc.org/certcriteria.html, 2004.
21. J. H. Hamman, "Composition and applications of Aloe vera leaf gel," Molecules, vol. 13, no. 8, pp. 1599–1616, 2008.
22. J. Lawless, J. Allan, Aloe Vera—Natural Wonder Cure, Harper Collins Publishers, Hammersmith, London, 2000.
23. J. Talmadge, J. Chavez, L. Jacobs, C. Munger, T. Chinnah, J.T. Chow, D. Williamson, K. Yates, Int. Immunopharmacol. 4 (2004) 1757–1773.
24. J.B. Kahlon, M.C. Kemp, R.H. Carpenter, B.H. McAnaUey, H.R. McDaniel, Mol. Biothermy 3 (1991) 127–135.
25. Joseph B, Raj SJ, Pharmacognostic and phytochemical properties of Aloe veralinn –an overview, International Journal of Pharmaceutical Sciences Review and Research, 4(2), 2010, 106-110.
26. Kemper KJ, Chiou V (1999) Aloe vera. Longwood herbal task and The Center for Holistic Pediatric Education and Research http:// www.longwoodherbal.org/aloe/aloe.pdf. Accessed 4 October 2010.
27. Kodym, A. (1991). The main chemical-components contained in fresh leaves and in a dry extract from 3 years old aloe-arborescens mill grown in hothouses. *Pharmazie*, *46*(3), 217-219.
28. Kumar KPS, Bhowmik D, Chiranjib and Biswajit , Aloe vera: A Potential Herb and its Medicinal Importance, Journal of Chemistry and Pharmaceutical Research, 2(1), 2010, 21-29.
29. L.J. Lorenzetti, R. Salisbury, J.L. Beal, J.N. Baldwin, J. Pharm. Soc. 53 (1964) 1287–1290.
30. Lachenmeier K, Kuepper U, Musshoff F, MadeaB RH, Lachenmeier DW (2005) Quality control of aloe vera beverages. Electronic J Environ Agric Food Chem 4(4):1033–1042.
31. Lee EH, Choi SD (1994) Studies on the manufacture of aloe yoghurt. J AgricTechnol Res Institute Chinju University (Korea Republic) 7:55–59.
32. Lee J, Hand-Yoon YH (1997) Characteristics of aloe vera suspended liquid yoghurt inoculated with Lactobacillus Casei YIT 9018. Korean J Animal Sci 39:93–100.
33. Loots, D. T., van der Westhuizen, F. H., &Botes, L. (2007). Aloe ferox leaf gel phytochemical content, antioxidant capacity, and possible health benefits. *Journal of agricultural and food chemistry*, *55*(17), 6891-6896.
34. Lu, J. J., Bao, J. L., Wu, G. S., Xu, W. S., Huang, M. Q., Chen, X. P., & Wang, Y. T. (2013). Quinones derived from plant secondary metabolites as anti-cancer agents. *Anti-Cancer Agents in Medicinal Chemistry (Formerly Current Medicinal Chemistry-Anti-Cancer Agents)*, *13*(3), 456-463..
35. M.D. Boudreau, F.A. Beland, J. Environ. Sci. Health C 24 (2006) 103–154.
36. Maughan RG (1984) Methods to increase colour fastness of stabilized aloe vera. US Patent 4 465 629.
37. MeenaM, Figueiredo NR, Trivedi K. Aloe vera – An Update for Dentistry. Journal of Dentofacial Sciences 2013; 2(4):1-4.
38. Morrow DM, Rappaport MJ, Strick RA (1980) Hypersensitivity to aloe. Arch Dermatol 116:106–1065.
39. N. Akev, G. Turkay, A. Can, A. Gurel, F. Yildiz, H. Yardibi, E.E. Ekiz, H. Uzun, Phytother. Res. 21 (2007) 1070–1075.
40. NadkarniKM. Indian plants and Drugs. New Delhi; srishti book Distributors, 2004 p.28-29PMid:15129907.
41. Ni, Y.; Turner, D.; Yates, K.M.; Tizard, I. Isolation and characterisation of structural components of Aloe vera L. leaf pulp. Int. Immunopharmacol. 2004, 4, 1745-1755.
42. P. Atherton, Br. J. Phytother. 4 (1998) 176–183.
43. Peng SY, Norman J, Curtin G, Corrier D, Mc Daniel HR, Busbee D (1991) Decreased mortality of Norman murine sarcoma in mice treated with the immunomodulator, Acemannan. MolBiother 3:79–87.
44. Qian H (2002) Study on the technology of aloe gel freeze dried powder. Food Fermentation Industry 28:49–52.
45. R.H Thomson, Naturally occurring Quinines, 2nd edition, Academy Press, London, 1971.
46. Ramachandra CT, SrinivasaRao P (2008) Processing of aloe vera leaf gel: a review. Am J AgrilBiolSci 3(2):502–510.
47. Ro, J.Y., et al., Inhibitory mechanism of aloe single component (Alprogen) on mediator release in guinea pig lung mast cells activated with specific antigen-antibody reactions. Journal of Pharmacology and experimental therapeutics, 2000; 292(1): 114-121.
48. Roberts, D.B. and E.L. Travis, Acemannan-containing wound dressing gel reduces radiation-induced skin reactions in C3H mice. International Journal of Radiation Oncology* Biology* Physics, 1995; 32(4): 1047-1052.
49. S. Choi, M.H. Chung, Semin. Integr. Med. 1 (2003) 53–62.
50. S.R. Sahito, T.G. Kazi, G.H. Kazi, M.A. Memon, Q. Shaikh, M.A. Jakhrani, G.Q. Shar, J. Chem. Soc. Pak. 25 (2003) 201–205.
51. Seoshin Y, Lee KS, Lee JS, Lee CH (1995) Preparation of yoghurt added with Aloe vera and its quality characteristics. J Korean Soc Food Nutr 24:254–260.
52. Shah AH, Qureshi S, Tariq M, Ageel AM (1989) Toxicity studies on six plants used in the traditional Arab system of medicine. Phytother Res 3:25–29.
53. Shelton M (1991) Aloe vera, its chemical and therapeutic properties. Int J Dermatol 30:679–683.
54. Singh A, Singh AK (2009) Optimization of processing variables for the preparation of herbal bread using Aloe vera gel. J Food SciTechnol 46(4):335–338.
55. SurjusheA, Vasani R, Saple DG, Aloe Vera: A short review, Indian Journal of Dermatology, 53(4), 2008, 163-166.
56. Sydiskis RJ, Owen DG, Lohr JL, Rosler KHA, Blomster RN (1991) Inactivation of enveloped viruses by anthraquinones extracted from plants. Antimicrob Agents Chemother 35(12):2463–2466
57. T.P. Meadows, Cosmet. Toiletries 95 (1980) 51–56.
58. VoglerB, Ernst E, Aloe vera: a systematic review of its clinical effectiveness, British Journal of General Practice, 49(447), 1999, 823–828.
59. Vogler BK, Ernst E (1999) Aloe vera: a systematic review of its clinical effectiveness. Br J Gen Pract 49:823–828.
60. Vogler, B. K., & Ernst, E. (1999). Aloe vera: a systematic review of its clinical effectiveness. *British journal of general practice*, *49*(447), 823-828.
61. Wei L, Chuncheng Y, Huafeng Z, Rugang Y (2004) Preparation of aloe-herbs health beverage. Food Sci China 25:207–209.
62. Wynn RL. Aloe vera gel: Update for dentistry. Pharmacol Today 2005;53:6–9. Gen Dent. 2005;53:6–9.
63. Y. Ni, I.R. Tizard, Y. Ni, I.R. Tizard, in: T. Reynolds (Ed.), Aloes the Genus Aloe, CRC Press, Boca Raton, FL, 2004, pp. 111–126.
64. Y. Yang, X.Y. Hou, S.J. Wang, Q.L. Jia, Z. Li, Z.K. Guo, Spectrosc. Spect. Anal. 24 (2004) 1672–1675.
65. Yagi, A., Egusa, T., Arase, M., Tanabe, M., & Tsuji, H. (1997). Isolation and characterization of the glycoprotein fraction with a proliferation-promoting activity on human and hamster cells in vitro from Aloe vera gel. *PlantaMedica*, *63*(01), 18-21.
66. Yagi, A., Nishimura, H., Shida, T., &Nishioka, I. (1986). Structure determination of polysaccharides in Aloe arborescens var. natalensis. *PlantaMedica*, *52*(03), 213-218.

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