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ALOE VERA PHYTOCHEMICAL CONSTITUENTS AND MEDICINAL PROPERTIES: REVIEW

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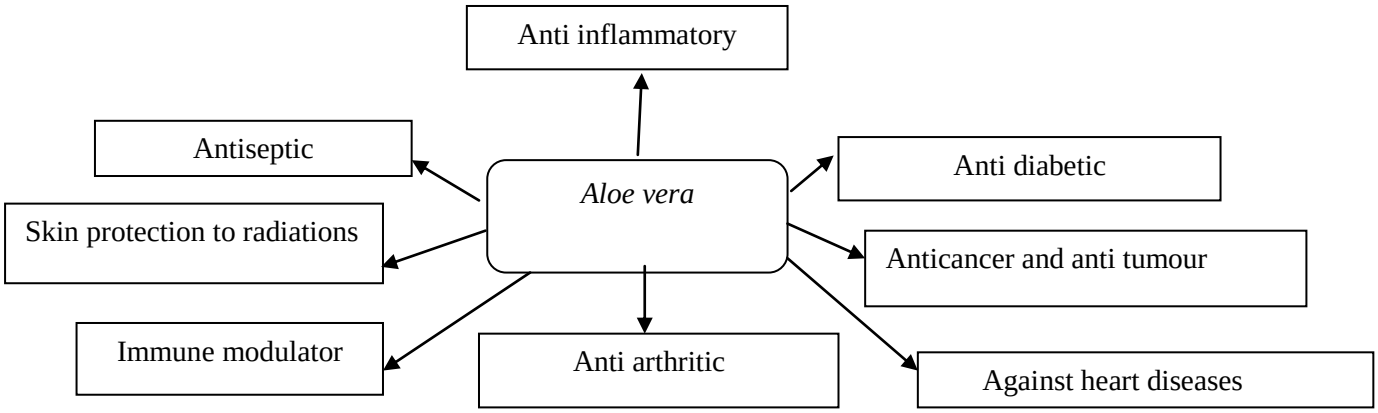
ABSTRACT

Aloe vera (AV), a tropical plant belonging to family Liliaceae, explains its potential use against life saving ailments such as diabetes, rheumatoid arthritis, heart diseases and cancer. It also find its wide applications as anti inflammatory, antiseptic, immunomodulation, cosmetic, and as nutritional supplement and hence used widely in cases of metabolic disorders, and skin related problems. The various chemical constituents such as the anthraquinones, amino acids, enzymes, harmones, Steroids, minerals, sugars, salicylic acid, saponins, vitamins present in aloe supply a rich source of properties for modulating and treating various local diseases and disorders. The article also encompasses the actual mechanism by which *Aloe vera* performs its varied roles. The active uses of Aloe such as in burns and incisions, anti diabetic, anti cancer, immunomodulation, antiarthritic, anti acne, were studied by using approapriate models *in vivo*. The processing of aloe gel is explained as a part of study for formulation development and marketing.



KEYWORDS: *Aloe vera*, metabolic disorders, cancer, immunomodulation, invivo model studies, gel preparation.

INTRODUCTION

Worldwide, there is a need to search novel therapies and drugs suitable for treatment and prevention certain diseases or disorders such as cancer, diabetes, HIV, leprosy. As such, the use of plants as a natural resource of bioactive phytochemical compounds may be useful for developing novel formulations and strategies to enhance life quality. It is documented that some plant extract containing phytochemical and bioactive compounds show anticancer, antioxidant, antibacterial and antiviral activities. Phytochemical composition and biomedical properties of *Aloe vera*, a tropical plant, explain its probable use intended for ornamental, dietary and applications in medical science. *Aloe vera* leaves are rich in numerous compounds, nutrients and polysaccharides. Nowadays, a small number of studies have been investigating the potential of plant-derived compounds to slab androgenic activities, which were androgen-dependent genes. The soy isoflavone, biochanin A, shows the decreased testosterone-induced production of PSA in the LNCaP prostate cancer cell line, through directive of a catabolic enzyme.[1] Resveratrol was found in red wine shows estrogenic and anti-estrogenic activity[2, 3] and along with the transcription of both androgen receptor (AR) and PSA genes in this cell line.[4]

Aloe vera has been used externally to treat different skin conditions such as burns, eczema and cuts. It has antibiotic and antiseptic properties which make it highly valuable in treating cuts and abrasions. It is assumed that sap from *Aloe vera* eases pain and reduces inflammation. It is usually used to treat burns, fatal oak, poison sumac infections, also eczemas. It might be used in grooming hair gel and works especially well for curly or fuzzy hair.[5] It is widely used for making makeup, soaps, sunscreens, moisturizers, shampoos and lotions. *Aloe vera* gel is useful for dry skin conditions, especially eczema around the eyes. Its saps can assist some people in ulcerative colitis, an inflammatory bowel disease.[6] Its mixture has been marketed for some diseases and disorders such as coughs, wounds, ulcers, gastritis, Diabetes, Cancer, headaches, arthritis, immune-system deficiencies, and many other conditions. Still, it is commonly used as laxative. The leaf is used medicinal purpose,[7] the lower leaf is slice open and the gel obtained is useful on the affected area of the skin. Aloe (*Aloe vera*) is an important and traditional medicinal plant belonging to the family Liliaceae. It is native to Africa and Mediterranean countries. It is reported to grow wild in the islands

and dry tracts of India. It is a robust perpetual tropical plant that can be cultivated in drought flat areas and is one of the crops whose potential is yet to be exploited, despite being identified as 'a new plant resource with the most promising prospects in the world. In India, it is spread in the wild, along the coast of southern India.[8]

Synonym

Aloe barbadensis Miller, *Aloe chinensis* Bak., *Aloe elongata* Murray, *Aloe indica* Royle, *A. officinalis* Forsk., *A. perfoliata* L., *A. rubescens* DC, *A. vera* L. var. lit-toralis König ex Bak., *A. vera* L. var. chinensis Berger, *A. vulgaris* Lam. Most formularies and reference books regard Aloe barbadensis Mill. as the correct species name, and *Aloe vera* (L.) Burm. f. as a synonym. According to International Rules of Botanical Nomenclature (IRBN), *Aloe vera* (L.) Burm f. is the legitimate name for this species.[9]

Taxonomic Treatment

Taxonomy

Kingdom: Plantae

Order: Asparagales

Family: Asphodelaceae

Genus: Aloe

Species: *Aloe vera, Aloe barbadensis, Aloe indica, Aloe Barbados*

Popular Name(s): Aloe, *Aloe vera*, Indian *Alces, Kumari, Ghirita, Gawarpaltra, Barbados aloe, Curacao aloe and Lu hui* etc.

Description

This succulent perennial herb has triangular, sessile stem, shallow root system, and fleshy serrated leaves arranged in rosette having 30 - 50 cm length and 10 cm breadth at the base; colour pea-green. The bright yellow tubular flowers, length 25 - 35 cm, axillary spike and stamens are frequently projected beyond the perianth tube and fruits contain many seeds.[10]

***Aloe vera* contains the following compounds**

Acids - antimicrobial, anti-helminitic

Amino Acids - required for repair and growth.

Enzymes - catalysts enabling chemical reactions to take place.

Lectin - anti-tumour effects.

Lipids - principle structural components of living cells.

Minerals - calcium, magnesium, potassium and sodium etc…

Lactates and Salicylates - analgesic properties.

Phenolics - mild antiseptics and antimicrobials.

Polysaccharides - long chain sugars broken down to smaller ones via enzymes.

Urea-Nitrogen - pain killing effect.

Vitamins - contains recognized vitamins.

Contra-indications/Precautions - Not recommended during pregnancy.

Phytochemical Constituents

Aloe is biochemically composite species that include more than 300 plants containing many geographically active substances. Aloe contain two types of Aloins: (1) nataloins, which yield picric and oxalic acids with nitric acid, and do not give a red coloration with nitric acid; and (2) barbaloins, which yield aloetic acid (C7H2N3O5), chrysammic acid (C7H2N2O6), picric and oxalic acids with nitric acid, being reddened by the acid. The subsequent group may be divided into a-barbaloins, obtained from Barbados aloes, and reddened in the cold, and b barbaloins, obtained from Socotrine and Zanzibar aloes, reddened by ordinary nitric acid only when warmed or by fuming acid in the cold. Nataloin forms bright yellow scales. Barbaloin forms yellow prismatic crystals. Aloe products containing polysaccharides, chromones, anthraquinones and other compounds have been used for clinical implications as anti-

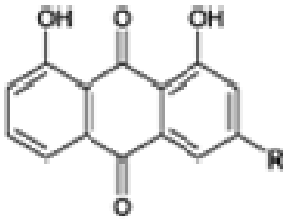
inflammatory[11, 12] anti-tumor, anti-gastric ulcer, anti-diabetic, anti-tyrosinase[13] and antioxidant activity.[14]

The plant products produce different antiseptic agents like, salicylic acid, lupeol, urea, nitrogen, cinnamonic acid, sulphur and phenols. All of these substances are known as antiseptics because they kill or control mold, bacteria, fungus and viruses, illumination why plant has the ability to eliminate many internal and external infections. Lupeol and salicylic acid present in the juice is especially effective against pains. It contains at least three anti-inflammatory fatty acids, cholesterol, and β-sitosterol. These are very efficient in treatment of burns, cuts, abrasions, allergic reactions, rheumatic fever, dyspepsia, ulcers, other inflammatory condition of the digestive system and other internal organs, including the stomach, small intestine, colon, liver, kidney and pancreas. β-sitosterol is also a powerful anti-cholesterol agent which helps to lower harmful cholesterol levels and helping to clear its many benefits for About 23 polypeptides are present in Aloe juice which helps to control a broad spectrum of immune system diseases and disorders. The polypeptids plus the anti-tumor agents, Aloe emodin and Aloe lectins, are now also used in treatment of cancer.[15]

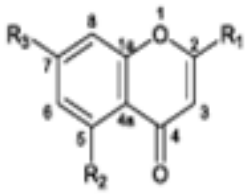
Table1. Chemical composition and properties of *Aloe vera*[16]

Constituents	Number and identification	Properties and activity
Amino acids	Provides 20 of the 22 required amino acids and 7 of the 8 essential ones	Basic building blocks of proteins in the body and muscle tissues
Anthraquinones	Provides Aloe emodin, Aloetic acid, alovin, anthracine	Analgesic, antibacterial
Enzymes	Anthranol, barbaloin, chrysophanic acid, smodin, ethereal oil, ester of cinnamonic acid, isobarbaloin, resistannol	Antifungal and antiviral activity but toxic at high concentrations
Hormones	Auxins and gibberellins	Wound healing and anti-inflammatory
Minerals	Calcium, chromium, copper, iron, manganese, potassium, sodium and zinc	Essential for good health
Salicyclic acid	Aspirin like compounds	Analgesic
Saponins	Glycosides	Cleansing and antiseptic
Steroids	Cholesterol, campesterol, lupeol, sistosterol	Anti-inflammatory agents, lupeol has Antiseptic and analgesic properties
Sugars	Monosaccharides: Glucose and Fructose Polysaccharides: Glucomannans/polymannose	Anti-viral, immune modulating activity of acemannan
Vitamins	A, B, C, E, choline, B12, folic acid	Antioxidant (A, C, E), neutralises free radicals

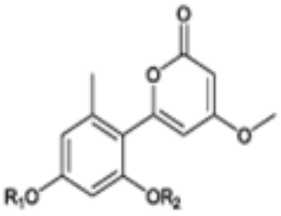
Active Ingredients in *Aloe vera*



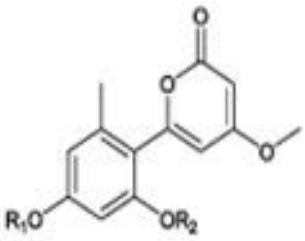
1: R=Me
2: R=CH_2OH



3: R_1=Me, R_2=Me, R_3=OH
4: R_1=Me, R_2=CH_2OH, R_3=OMe
5: R_1=CH_2OH, R_2=OH, R_3=OMe
7: R_1=Me, R_2=CH_2OH, R_3=OH



8: R_1=R_2=H
10: R_1=H, R_2=X
19: R_1=R_2=β-D-glucosyl
21: R_1=β-D-glucosyl, R_2=X



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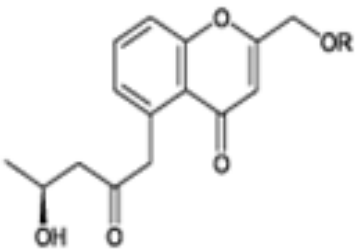
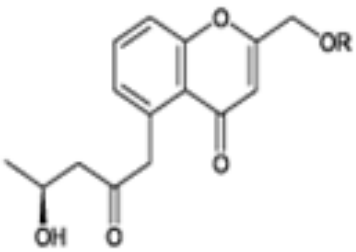
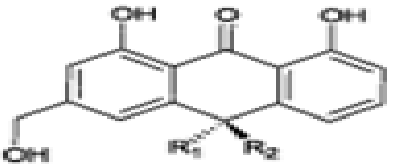


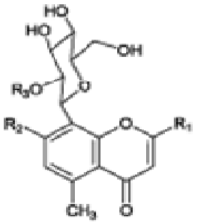
9: R=H
20: R=β-D-glucosyl

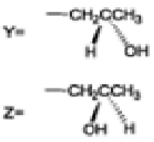


9: R=H
20: R=β-D-glucosyl



11: R_1=β-D-glucosyl, R_2=OH
12: R_1=OH, R_2=β-D-glucosyl
14: R_1=β-D-glucosyl, R_2=H
15: R_1=H, R_2=β-D-glucosyl





13: R_1=Y, R_2=OMe, R_3=p-(*E*)-coumaroyl
16: R_1=CH_2COCH_3, R_2=OH, R_3=H
17: R_1=Z, R_2=OH, R_3=H
18: R_1=Y, R_2=OMe, R_3=H

Therapeutics potential and Medicinal Properties of *Aloe vera*

Aloe vera L. extracts shows Antimicrobial activity. It is used the treatment of pimples, acne and mouth ulcers. It has also been used to control bleeding, itching of piles and relief from arthritic pain. The Chinese use the plant juice as a mild laxative wash for piles, abscesses and scabies. In the Philippines, it is used to treat dysentry and pain in the kidneys. It also used as aperients, anthelmintic, carminative, deob-struent, stomachic and diuretic. Juice is used in skin care medicine, amenorrhea, dyspepsia, burns, colic, hepatopathy, splenopathy, constipation, span menorrhea, abdominal tumors, dropsy carbuncles, sciatica, lumbago and flatu-lence. From the juice of this plant aloe product is made which is used for helminthiasis

in children and is a purgative, anthelmintic and emmenagogue. A number of glycoprotein present in *Aloe vera* gel has been reported to have anti-tumor and antiulcer effects and to increase proliferation of normal human dermal cells.[17-19] Gel is useful in ulcerative colitis and pressure ulcers, respectively.[20, 21] Traditionally, *Aloe vera* gel is used both, topically (treat-ment of wounds, minor burns, and skin irritations) and internally to treat constipation, coughs, ulcers, diabetes, headaches, arthritis, immune-system deficiencies.[22,23]

Health Benefits

Burns and incisions

Aloe gel or its different components tested for its efficacy on inflammation a number of tests have been used, frequently in next of kin to some sort of deliberate wounding. These need to be illustrious from clinical trials where the injuries already exist and are treated more or less systematically by a number of putative therapeutic agents. The earliest experimentation related to skin burns and arose in relation to clinical observations, going back to the 1930s. It was relieved that the aloe or its components used for wound healing and in burns.[24]

A synergism was illustrious between the gel and the cream base used. somewhere else, fractional depth of burns were pragmatic to cure more rapidly when treated with aloe gel, compared with vaseline, both growth of epithelial cells and organization of fibro-vascular and collagen tissue being stimulated.[25]

Irritating compounds producing oedema

Experimental production of swelling, caused by fluid accumulation in a tissue (Oedema) initiated by irritating compounds has been used as an inflammatory model with the mouse ear or rat hind paw as subjects. Croton oil, a powerful irritant, was applied to the right ear with the left remaining as control. Inflammation was measured by weighing a tissue punch sample and was shown to decrease after topical application of aloe gel. A subsequent trial demonstrated an even greater decrease when the gel was combined with a corticosteroid.[26]

Increases energy levels

Aloe vera juice increases energy levels and helps to maintain a healthy body weight.[27]

Helps in digestion

Aloe vera juice allows the body to cleanse the digestive system. It stimulate the bowels to move and helps with elimination if a person is constipated. And if you have diarrhoea, it will help slow it down.[27]

Decreases inflammation and rheumatism

Inflammation is a tissue reaction by the body to injury and typically follows burns or other skin insults. It is classically characterized by swelling (tumor), pain (dolor), redness (rubor) and heat (calor) as well as loss of function.[28] Pain is a complex reaction following the release of short peptides and prostaglandins. *Aloe vera* helps to strengthen joint flexibility and helps in the regeneration of body cells. It strengthens joint muscles, which is usefull to reduce pain and inflammation in weakened or aged joints.[27]

Anti-cancer activity

Similar effects of the commercial polysaccharide fraction Acemannan™, an acetylated mannan from A. 6era, against tumour growth were later noted. Growth of a murine sarcoma implanted in mice, showed regression after acemannan treatment[29], probably through an immune attack. Injection of mice with acemannan inhibited the growth of murine sarcoma cells implanted subsequently and decreased mortality by about 40%.[30] In a very recent study, carcinogenesis by DNA adduct formation was shown to be inhibited by a polysaccharide-rich aloe gel fraction in an in vitro rat hepatocyte model.[31] Aloe polysaccharides show evidence of anticancer effects by motivating immune response during activation of macrophages.[32] Aloe-emodin induces apoptosis in T24 human bladder cancer cells.[33-37]

Anti-diabetic activity

Diabetes mellitus is a disorder of carbohydrate metabolism characterized by lowered insulin secretion. It is a syndrome with both hereditary and environmental factors and has been classified into a number of types or groups, among which are the insulin-dependent and non-insulin dependent types. It is evident that causes, symptoms and treatments are varied and need to be carefully distinguished.

An early clinical trial in India where over 3000 ‘mildly’ diabetic patients were fed with bread incorporating aloe gel, demonstrated a reduction in blood sugar levels in over 90% of the cases.[38] A survey of patients in Texas showed that 17% of those of Mexican origin used A. 6era in an unspecified way, presumably with satisfaction.[39] Dried aloe exudates has been used in Arabia in diabetes treatment. Administration to non-insulin dependent human patients in a small trial resulted in a sustained lowering of blood sugar levels.[40] Decreased wound healing associated with diabetes is a likely subject of aloe gel treatment. It was demonstrated that in rats an *A. vera* gel preparation injected subcutaneously promoted diabetic wound

healing, reduced abnormal sensitivity to pain and reduced oedema induced by mustard.[41] In a following study, both *A. vera* gel and surprisingly, gibberellic acid, were reported as having almost equal inflammation- reducing properties in chemically induced diabetic mice.[42] In a later trial both excision and incision wounds in chemically induced diabetic rats healed more rapidly after both oral and topical applications of aloe gel. Collagen and hexosamine levels were higher during the early part of healing. [43] It would seem that at least two processes are being described in these reports. The first results in lowering of blood glucose levels and involves either a leaf exudate component or a glycoprotein and the second results in wound healing, recalling the classic effects of gel polysaccharides.

Improve immunity

It is particularly beneficial for those who have chronic immune disorders like polysaccharides since the polysaccharides in *Aloe vera* juice stimulate macrophages, the white blood cells that fight.[27] The special effects of processed *Aloe vera* gel (PAG) on cyclophosphamide (CP) - induced immunotoxicity were examined in mice. Intraperitoneal injection of CP significantly reduced the total number of lymphocytes and erythrocytes in the blood. Oral administration of PAG quickly restored CP-induced lymphopenia and erythropenia in a dose-dependent manner. PAG-derived polysaccharides directly activated Peyer's patch cells isolated from normal mice to produce cytokines including interleukin (IL) -6, IL-12, interferon-γ, granulocyte-CSF, and granulocyte-macrophage-CSF. The cytokines produced by polysaccharide-stimulated Peyer's patch cells had potent proliferation-inducing activity of mouse bone marrow cells. In addition, oral administration of PAG restored IgA secretion in the intestine after CP treatment. These results indicated that PAG could be an effective immunemodulator and that it could prevent CP-induced immunotoxic side effects.[44] It may have a direct inhibitory effect on microbes and also selectively modulates cells of the immune system.[45, 46] *A. vera* contains antiseptic agents such as lupeol, salicylic acid, urea nitrogen, cinnamonic acid, phenols and sulfur. They all have inhibitory action on fungi, bacteria and viruses. Cellular cytotoxicity: Human embryonic kidney cells were utilized to determine the effectiveness of *A. vera* gel on cellular longevity. The cellular death rate was found to be reduced by 2/3 rd when cultured with *A. vera* gel.[47]

Heart Disease and Atherosclerosis

Coronary heart disease is one of the major causes of death in the world. It is caused by the accumulation of blood lipids and fats in the lining of coronary arteries. Several investigations

in animals and human models have established the beneficial properties of *Aloe vera* gel by lowering the deposition of fatty materials in medium- and large-sized arteries as well as in coronary arteries of heart. *Aloe vera* gel active fraction, rich in glucommannan when fed in a preclinical trial showed lowering effects of total cholesterol, triglyceride level, phospholipid level, non esterified fatty acid. These results supported the positive hygienic effects of aloe gel for prevention of coronary artery problems by regulating fat metabolism in humans [48]. *Aloe vera* gel when used as beverage in combination with "isabgol" as the fiber source displayed salubrious effects on metabolism when tested by oral consumption in 5000 patients. *Aloe vera* beverage was found to control lipid metabolism by decreasing total cholesterol, and triglycerides, and increasing HDL cholesterol. Aloe juice decreased angina pectoris frequency and relaxed chest pain caused by deficiency of oxygen supply in the heart.[49]

Antiarthritic Effect

Various types of arthritis, that is, rheumatoid arthritis, adjutant arthritis, and osteoarthritis all have separate symptoms but eventually lead to muscle and joint immobility and distortion. *Aloe vera* juice and gel is found immensely helpful in almost all the arthritis-relieving treatments, as it accelerates cell growth to heal damaged tissue in arthritis.[50] Typical symptoms of arthritis include laboriousness and pain in joints. *Aloe vera* juice contains the anti-inflammatory agent's bradykinin, salicylate and vitamins which reduce stiffness from swollen joints by pressure-releasing effects.[51] These anti-inflammatory agents are thought to absorb the toxic substances produced due to inflammation and reduce swelling. When this swelling is reduced, the arthritis patients can move joints more freely, with less pain. Minerals present in *Aloe vera* juice also contribute to the rapid healing of the affected joints by enzyme stimulation reactions. Glucosamine present in Aloe juice is thought to repair the injured tendons and ligaments produced due to arthritis. *Aloe vera* gel applied directly to the area of pain penetrates the skin to soothen the discomfort.[52] Soap containing *Aloe vera* gel 0.8–1.2 wt by parts is manufactured for relieving muscle fatigue and reduces skin swelling.[53] Acemannan extracted from *Aloe vera* might be considered as a natural biomaterial for bone rejuvenation.[54]

Anti-acne

In this study investigated possible synergistic effect of *Aloe vera* gel on the anti-acne properties of Ocimum gratissimum oil and to compare the activities of both agents singly and

in combinations with the anti-acne agent Dalacin_ – a 1% Clindamycin phosphate solution. The efficacy of the Ocimum oil lotion products increased with increasing aloe gel contents. Products formulated with the undiluted or 50% aloe gels were most active and resolved inflammatory lesions faster than the standard product. The aloe gel alone showed minimal activity. Adverse effect was mild and tolerable. Conclusion: *Aloe vera* gel enhanced the anti-acne properties of Ocimum oil; the oil or its combination with *Aloe vera* gel is more effective than 1% Clindamycin in the treatment of Acne vulgaris.[55]

In Dentistry

Various investigations have proved the effectiveness of *Aloe vera* tooth gel and toothpastes against Streptococcus mutans, Enterococcus faecalis, Candida albicans, Prevotella intermedia, Lactobacillus acidophilus, and Peptostreptococcus anaerobius.[56] In case of Streptococcus mitis, *Aloe vera* tooth gel proved to be of superior antibacterial activity. Hayes, Lichen and Choonhakarn et al. investigated the efficacy of *Aloe vera* juice and gel in the management of oral lichen planus and found that Aloe juice is far more effective than the placebo.[57] Direct application of Aloe gel was found to be more beneficial on herpetic viral lesions. Acemannan hydrogel was reported to quicken the restorative of aphthous ulcers and reduce the pain associated with this ulcer.[58] *Aloe vera* gel is applied directly to gum tissues and spots of periodontal surgery, or areas injured by toothbrush-dentifrice scratches, dental floss, or bone fragments in foods. Withdrawal sites heal quickly and dry socket creation is inhibited on application of *Aloe vera*. Different concentrations of *Aloe vera* tend to shorten the time of wound healing.[59]

Moisturizing and anti-aging effect

A. vera has rejuvenating action. The mode of action of polysaccharide is that they act as moisturizers, stimulates the fibroblasts to replicate faster and smoothens skin. Fibroblasts produce collagen and elastin fibers, so the skin becomes more elastic and less wrinkled. Its moisturizing effects have also been studied in the treatment of dry skin associated with occupational exposure. The study concluded that *A. vera* gel gloves improved the skin integrity, decreased appearance of fine wrinkles and decreased erythema.[60]

Skin Hydration and Antiaging Effects

Aloe vera gel improves skin hydration by means of its humectant mechanism. In an investigation, *Aloe vera* gel displayed moisturizing effect for stratum corneum at all applied concentrations (0.1%, 0.25%, and 0.5%).[61] MPS are associated with the water-holding

capacity of the skin. *Aloe vera* activates fibroblasts which yield collagen and elastin fibers making skin less wrinkled and more elastic.[62] Aloe amino acids also help to soften tough skin cells and the zinc present in it, being astringent, tightens pores.

Psoriasis

Aloe vera is regarded as a safe and alternative treatment to treat psoriasis. In a clinical trial, *Aloe vera* applied topically (0.5% in a hydrophilic cream) was found to be more effective than placebo, without showing any side effects or toxicity.[63] *Aloe vera* cream was also more effective than 0.1% triamcinolone acetonide cream in lessening the symptoms of mild to moderate psoriasis.[64] A topical medicament containing *Aloe vera* extract and variety of oils of plant and animal origin was formulated for the treatment of psoriasis and neurodermatitis.[65, 66]

Antimicrobial

The comparative antimicrobial activities of the gel and leaf of *A. vera* were tested against Staphylococcus aureus, Pseudomonas aeruginosa, Trichophyton mentagraphytes, Trichophyton schoeleinii, Microsporium canis and Candida albicans. Ethanol was used for the extraction of the leaf after obtaining the gel from it. Antimicrobial effect was measured by the appearance of zones of inhibition. Studies using *A. vera* tooth pastes have shown that *A. vera* tooth gel and the toothpastes were equally effective against C. albicans, Streptococcus mutans, Lactobacillus acidophilus, Enterococcus faecalis, Prevotella intermedia and Peptostreptococcus anaerobicus. *A. vera* tooth gel demonstrated enhanced antibacterial effect against S. mutans.[67-69] The anthraquinone inactivates various viruses such as herpes simplex, varicella zoster and influenza.

Role in wound healing

When Aloe is combined with other antimicrobials, a wound heals faster than with the anti-microbial alone, possibly due to its moisturizing capability.[70,71] Glucomannan, a mannose rich polysaccharide and gibberellins, a growth hormone, interacts with growth factor receptors on the fibroblast, thereby stimulating its activity and proliferation which forms increased collagen synthesis after topical and oral *A. vera* administration. This causes accelerated wound contraction leading to increased breaking strength of resulting scar tissue.

Alveolar osteitis

Dry socket (Third molar extraction) Acemannan hydro gel (from clear inner gel of *A. vera*) is used in the treatment procedure. In normal treatment 7.6% develop AO, with Acemannan 1.1% develop AO.[72-74] Dry socket (Third molar extraction) Acemannan hydro gel (from clear inner gel of *A. vera*) is used in the treatment procedure. In normal treatment 7.6% develop AO, with Acemannan 1.1% develop AO.[72-74]

Cosmetic uses of *Aloe vera*

a) *Aloe vera* enhances the production of collagen and elastin that prevents aging of the skin.
b) *Aloe vera* is used in, shampoos, soaps, creams and lotions for beauty purposes.
c) The gel acts as excellent moisturizer, removes dead skin cells and rejuvenates the skin.
d) Also it conditions the damaged hair. All you need to do is mix *Aloe vera* gel and lemon juice.
e) It hastens the skin repair and hydrates your skin resulting in healthy and glowing skin.
f) *Aloe vera* gel lightens the dark spots on the face and reduces the intensity of pigmentation.[75-77]

Processing of *Aloe vera* gel

The beneficial properties of Aloe are dependent on several parameters including the age of the plant, as well as harvesting, preservation, delivery of leaves, and gel processing procedures.[78] After harvesting, the fresh leaves should be processed or frozen immediately to preserve the biological properties of *Aloe vera* and prevent hydrolysis and oxidation of the gel.[79] The proper separation of the gel from the outer cortex is also an important factor. The mechanical extraction of gel is eased by adding a cellulose enzyme. Aloe liquid is passed from activated carbon to eliminate anthraquinones, aloin being the major component having laxative effects.[80] During sterilization step, high-temperature conduct of Aloe gel for extended time reduces its therapeutic value. Processing at elevated temperature favors bacterial elimination but the MPS that are the main active ingredients in aloe, along with some other active constituents are partially deactivated and the efficacy is reduced.[81] Cold-processing procedures involve the use of glucose oxidase or catalase enzymes to prevent aerobic development of microbes. Sterilizing procedure include revealing gel to UV light monitored by ultrafiltration.[82] The stabilization step consists of addition of preservatives and additives like citric acid, sodium benzoate, potassium sorbate, and vitamins C or E.[83] A

properly standardized method for commercial production of Aloe gel goods is important to escape polysaccharides decomposition and for preserving bioactivity of Aloe gel.[84]

Aloe gel constituents

During all these discussions on the pharmaceutical properties of aloes a clear distinction should be made between substances in the colourless, tasteless parenchyma cells, the aloe gel and substances in the bitter exudate from cells associated with vascular bundles in the outer green rind of the leaf. [85] As mentioned above, this distinction has sometimes been clouded by using extracts of the whole leaf or allowing, during preparation of the gel, exudate compounds to infiltrate. The concept of colorized and decolorized gels described above, leads to confusion in ascribing activities to individual components. There may indeed be synergies which would not appear if the fractions were kept separate. In view of the complexities inherent in aloe pharmacology it might be better to be as rigorous as possible in separation, at least initially, and only combine factors at later stages of the investigation.

Route of administration

As an external application, it is currently available in the market in the form of gels, extracts, hair oils, deodorant sticks, face powders and tooth pastes. Among all of these external uses, the most widely and commonly used form is *A. vera* gel as an ingestible natural medicine, *A. vera* can be taken in the form of juice, capsules, powders, granules, sap, yoghurt, desserts, herbal tea and tablets.[86-90]

RESULT AND DISCUSSION

Nowadays traditional and ethnobotonical uses of natural compounds ,especially from plant origin received much attention as they are well tested for their efficacy and generally believed to be safe for human use. Aloe vera has an important place among such plants. This paper has presented a list of medicinal uses of *Aloe vera* in the treatments of various life saving diseases that have spread worldwide. *Aloe vera* is a safe drug but the technology for the production and standardization is a huge issue as also Aloe consists of a large number of active chemical constituents it within itself carries the risk of degradation of the same with heat and time. This review of medicinal information on *Aloe vera* may be helpful for the development of formulations for treating various diseases, and local ailments.

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