

# A REVIEW ARTICLE ON : ALOE VERA AND ITS MEDICINAL USES

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## ABSTRACT

*Aloe vera has been used for over five thousand years. Throughout history, it has been considered a magical plant, almost a panacea, capable of remedying many of mankind's ailments. It is only in the last 20 years, after a series of proven research, that we can highlight the characteristics of this plant, whose secrets have been hidden behind a blanket of botanical and pharmacological puzzles that only today begin to yield some answers. The Aloe vera plant and its clinical uses are briefly reviewed in this article.*

*Aloe vera, a succulent plant that grows in arid and subtropical climates is best known for its medicinal properties and is used in Ayurvedic, Homoeopathic and Allopathic streams of medicine. It has been in use for a long time by people of varied cultures and traditional uses include applications to reduce perspiration, oral dosing for diabetes and to get rid of a range of gastrointestinal ailments. It is also used to treat burn wounds, minor cuts, genital herpes, and seborrheic dermatitis. The leaves of this wonderful medicinal plant contain numerous vitamins, minerals, natural sugars, enzymes, amino acids, and as well rich in various bioactive compounds that exhibit emollient, purgative, anti-inflammatory, antioxidant, antimicrobial, anti-helmenthic, antifungal, aphrodisiac, antiseptic and cosmetic values. Many cosmetic industries widely use this plant owing to its healing and nourishing properties.*

**Keywords:** *Aloe vera, Medicinal Uses, bioactive compounds, Cosmetic industries, Antioxidant, Unani medicine.*

## INTRODUCTION (3,4,5)

Medicinal plants are occupying prominent position in pharmacological sector owing to their rich wealth of bioactive compounds. Majority of the new antibiotics introduced in the market are obtained from natural sources<sup>1</sup>. Medicinal plants would be the best source for obtaining a variety of drugs according to WHO<sup>2</sup>. The succulent plant, Aloe vera, belonging to the family Alliaceous grows to a height of 60 - 100 cm (24-39 inches), matures in 4 - 6 years survives for a period of nearly 50 years under favorable conditions. Among more than 500 species of Aloe genus, Aloe vera (L.) Burm. f. syn. Aloe barbadensis Miller is most biologically active.

The leaves of Aloe vera are succulent, erect, and form a dense rosette. The gel made from the leaves have innumerable applications and the plant is mainly cultivated worldwide, primarily as a crop for "Aloe gel". As per the report given by the Kew Gardens, England's royal botanical center of excellence, Aloe vera has been used for centuries and is currently more popular than ever. As per the Egyptians Aloe is "the plant of immortality." Now a day's, Aloe vera is widely used in Food. It is also approved by the FDA as a flavoring agent & as a food supplement. It is also a main ingredient in many herbal remedies. Even many cosmetic products that are prepared are based on Aloe products.

## CLASSIFICATION OF ALOE VERA

<b>Kingdom</b>	<b>Plantae</b>
Clade	Angiosperms
Clade	Monocots
Order	Asparagales
Family	Asphodelaceae
Subfamily	Asphodeloideae
Genus	Aloe
Species	A. vera

## HISTORY (6,7)

Aloe vera plant has been used for centuries & is well known for its health, medicinal, beauty, and skincare properties. The name Aloe vera is derived from the Arabic word 'Alloeh' meaning 'shining bitter substance' and 'vera' in Latin means 'true'. 2000 years ago only Aloe vera was considered as the universal panacea by the Greek scientists. The earliest recorded human use of Aloe vera comes from the Ebers Papyrus; an Egyptian medical record i.e. is from the 16th century BC. Ancient Egyptians considered Aloe vera as the plant of immortality (as per the literature published in the Indian Journal of Dermatology). There are also recorded evidences that the plant has been in use for many centuries in countries like China, Japan, India, Greece, Egypt, Mexico, and Japan<sup>8</sup>. Egyptian queens, Nefertiti and Cleopatra used the leaves of this plant as part of their regular beauty regimes. Alexander the Great and Christopher Columbus also used it to treat the wounds of their soldiers. Aloe is used as a tonic for the female reproductive system. According to Ayurveda, Aloe is said to have alliterative, tonic, rejuvenating, purgative, and vulnerary actions. Aloe is also believed to give good solution to all the three Ayurveda constitutions, Vatta, Pitta and Kapha. It is mainly used as a remedy for constipation, colic, skin diseases, worm infestations and infections in traditional Indian medicine. It is also used as a laxative, antihelminthic, for haemorrhoid treatment, and as a uterine stimulant (menstrual regulator). Aloe extract is also topically used to treat eczema or psoriasis, in combination with liquorice root. Aloe is also used as food. People in Tamil Nadu, India often prepare a curry using A. vera which is taken along with Indian bread (nan bread) or rice.

## CHEMICAL CONSTITUENTS. (8,9)

Aloe is made up of a vast range of compounds which can be divided into three large groups. The first group, complex sugars (among which acemannan stands out), are inside the leaves gel and have an immunostimulating action. Next are the anthraquinones, contained in the outermost part of the skin, with a strong laxative action. Last of all are several substances with a wide array of actions such as minerals, vitamins, essential, non-essential and semi-essential amino acids, organic acids, phospholipids, enzymes, lignin and saponins.

CHEMICAL COMPONENTS	HEALTH BENEFITS
Alprogen	Anti-allergic
C-glycosyl	Anti-inflammatory
Chromone	Anti-inflammatory

Brady kinase	Anti-inflammatory
Brady kinase	Analgesic
Salicylic acid	Anti-inflammatory

## ACTIVE COMPONENTS OF ALOE VERA WITH THEIR PROPERTIES (10)

Aloe vera is known to contain around 75 potentially active constituents: vitamins, enzymes, minerals, sugars, lignin, saponins, salicylic acids and amino acids. More than 75 active ingredients from inner gel have been identified including vitamins, minerals, enzymes, sugars, anthraquinones or phenolic compounds, lignin, saponins, sterols, amino acids, and salicylic acid. Active ingredients of Aloe vera leaf pulp and exudates.

## BOTANY OF ALOE VERA. (11,12,13)

Aloe vera is a spiky cactus like xerophytes. It is a clump forming perennial plant with thick fibrous root which produces large basal leaves, usually 12–16 per plant, weighing up to 1.5 kg when mature. The plant matures when it is about 4 years old and has a life span of about 12 years. The leaves are up to 0.5 m long and 8–10 cm across at the base, tapering to a point, with saw-like teeth along their margins. In a transverse section, the plant shows a slightly concave appearance on the adaxial surface and distinctly convex appearance on the lower abaxial surface (33). The leaves are covered with thick cuticle, beneath which epidermis and mesophyll are present. Later is differentiated in upper chlorenchyma and lower parenchyma, as the rosette mature, successive leaves have fewer whitish spots and grey-greenish in color (23). The plant can be harvested every 6–8 weeks by removing 3–4 leaves per plant. Red, yellow, purple or pale striped flowers are present most of the year growing in a long raceme at the top of the flower stalk which originates from the centre of the basal leaves. The flower stalk grows up to 1.5 m in height. The fruit is a triangular capsule containing numerous seeds. The plant is practically disease free, occasionally black spots may occur on upper surface because of fungal infection or soft rotting may damage whole plant. The causal organism for soft rotting is a bacterium. Frost is another enemy of aloe vera plant and it cannot survive in frost conditions (33). Smoking in field during frost nights is one measure practiced by farmers to protect the plantation from frost. There are over 550 species of aloe grown world over. However, only two species are grown commercially i.e. Aloe barbadensis Miller (Aloe vera) and Aloe aborecens Miller. There are at least two other species that have medicinal properties namely Aloe perry baker and Aloe ferox. Most aloe vera plants are non-toxic but a few are extremely poisonous containing a hemlock like substance (9). Aloe variegata is a dwarf species which is only a few centimeters in diameter and is a popular house plant.

## PHOTOCHEMISTRY OF ALOE VERA. (14,15)

There are as many as 200 different types of molecules in aloe vera. The aloe vera leaf gel contains about 98% water (11). The total solid content of aloe vera gel is 0.66% and soluble solids are 0.56% with some seasonal fluctuation. On dry matter basis aloe gel consists of polysaccharides (55%), sugars (17%), minerals (16%), proteins (7%), lipids (4%) and phenolic compounds (1%). The aloe vera gel contains many vitamins including the important antioxidant vitamins A, C and E. Vitamin B1 (thiamine), niacin, Vitamin B2 (riboflavin), choline and folic acid are also present (48). Some authors also suggested the presence of vitamins B12 (cyanocobalamin) in trace amounts which is normally available in animal source. Carbohydrates are derived from mucilage layer of the plant under the rind, surrounding the inner parenchyma or gel. They comprise both mono and polysaccharides. The most important are the long chain polysaccharides, comprising glucose and mannose, known as the glucomannans [ $\beta$  (1, 4) - linked acetylated mannan]. Xylose, rhamnose, galactose and arabinose are also present in trace amounts along with lupeol (a triterpenoid), cholesterol, campesterol and  $\beta$ -sitosterol. Structural studies on aloe vera gel polysaccharides have

shown that the gel is composed of at least four different partially acetylated glucomannans, being linear polymers with no branching and having 1,4 glycosidic linkages with glucose and mannose in the ratio of 1:2:8. The viscosity of gel reduces upon hydrolysis of these sugars. When taken orally some of the sugars bind to receptor sites that line the gut and form a barrier, possibly helping to prevent 'leaky gut syndrome'.



**Fig.1 Aloe barbadensis**



**Fig.2 Aloe arborescens**

### **PROCESSING OF ALOE VERA. (16,17,.18,19)**

Aloe vera gel derived from the leaf pulp of the plant has become a big industry worldwide due to its application in the food industry. It is utilized in functional foods especially for the preparation of health drinks with no laxative effects. It is also used in other food products including milk, ice cream, confectionery, etc. Aloe vera gel is also used as flavoring component and preservative in some food. Thus, a simple and efficient processing technique needs to be developed especially for the aloe beverage industry to improve product quality and safety by preserving the bioactive chemicals naturally present in the intact aloe vera leaf. Recently, a glycoprotein with anti-allergic properties, called alprogen was isolated from aloe gel. In addition, a novel anti-inflammatory compounds, C-glycosyl chromones, has also been isolated from aloe gel. Saponins are the soapy substances, form 3% of the gel and are general cleansers, having antiseptic properties.

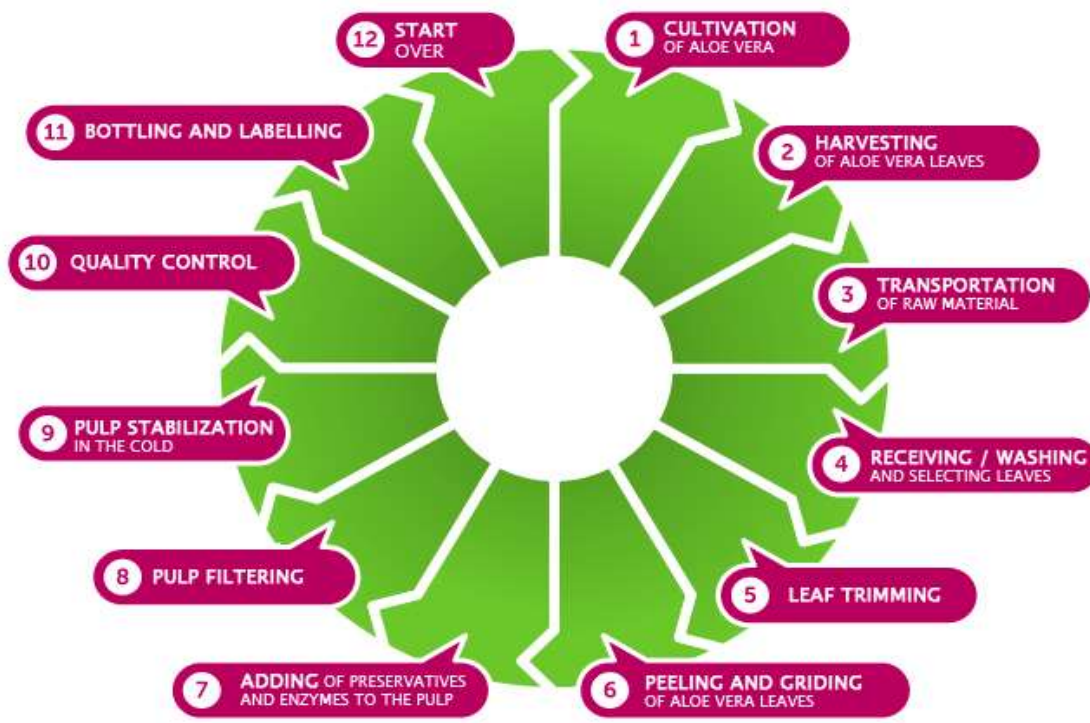


Fig.3 Process in industry

#### **THERAPEUTIC ACTION OF ALOEVERA. (20,21,22)**

Aloe vera by inhibiting the cyclooxygenase pathway reduces the production of prostaglandin E2 from arachidonic acid. A novel anti-inflammatory compound called C-glucosyl chromone was also isolated from Aloe gel extracts recently. Langmead et al.<sup>18</sup> reported Anti-inflammatory effects of Aloe vera gel in human colorectal mucosa in vitro. Reuter reported the anti-inflammatory potential of Aloe vera gel (97.5%) in the ultraviolet erythema test. Lee et al. reported anti-inflammatory activity of Aloe vera adventitious root extracts through the alteration of primary and secondary metabolites via salicylic acid elicitation.

#### **EFFECT ON THE IMMUNE SYSTEM. (23,24,25,26)**

Alprogen, an anti-allergic compound of Aloe vera inhibits calcium influx into mast cells, thereby inhibiting the antigen-antibody-mediated release of various mediators like histamine, serotonin, SRSA, leukotrienes etc. from mast cells. Acemannan stimulates the synthesis and release of interleukin-1 (IL-1) and tumor necrosis factor from macrophages in mice that had previously been implanted with murine sarcoma cells, which in turn initiated an immune attack that resulted in necrosis and regression of the cancerous cells. Several low molecular constituents from Aloe vera gel are also capable of inhibiting the release of reactive oxygen free radicals from activated human neutrophils<sup>24</sup>. Madan et al. reported Immunomodulatory properties of Aloe vera gel in mice. Im et al.<sup>26</sup> reported optimal molecular size of modified Aloe polysaccharides with maximum immunomodulatory activity. Zhang et al. reported antioxidative and immunomodulatory properties of two novel dihydrocoumarins from Aloe vera.

#### **LAXATIVE EFFECT. (27)**

The Anthraquinones present in latex acts as potent laxatives. They do so by increasing intestinal water content, by stimulating mucus secretion and as well by increasing intestinal peristalsis.

**ANTIVIRAL ACTIVITY. (28)**

The antiviral activities of Aloe extracts may be due to indirect or direct effects. Indirectly they show these effects by stimulating the immune system and directly by anthraquinones. The anthraquinone aloin inactivates various enveloped viruses such as Herpes simplex, Varicella zoster and Influenza.

**ANTITUMOR ACTIVITY. (29,30,31)**

In a study polysaccharide fraction of Aloe has shown to inhibit the binding of benzopyrene to primary rat hepatocytes, thereby preventing the formation of potentially cancer-initiating benzopyrene-DNA adduct. Another study reported the induction of glutathione S-transferase and as well inhibition of the tumor-promoting effects of phorbol myristate acetate suggesting the possible role of Aloe gel in cancer chemoprevention. Saini reported anti-tumor activity of Aloe vera against DMBA/croton oil-induced skin papillomagenesis in Swiss albino mice. El-Shemy et al.<sup>33</sup> reported antitumor properties and modulation of antioxidant enzymes activity of aloe vera leaf.

**ANTI BACTERIAL AND ANTI FUNGAL ACTIVITIES. (32,33,34,35)**

Extracts from Aloe vera were found to have anti-bacterial and anti-fungal activities.

**EFFECTS ON SKIN EXPOSURE TO UV AND GAMMA RADIATION. (36)**

Aloe vera gel has been reported to have a protective effect against radiation damage to the skin<sup>46,15</sup>. Though exact role is not known, but following the administration of Aloe vera gel, metallothionein, an antioxidant protein is generated in the skin, which scavenges free radicals and prevents suppression of superoxide dismutase and glutathione peroxidase, the antioxidant enzymes in the skin. Studies reveal that administration of Aloe prevents UV-induced suppression of delayed type hypersensitivity by reducing the production and release of skin keratinocyte-derived immunosuppressive cytokines such as interleukin-10 (IL-10).

**MOISTURIZING AND ANTI-AGING EFFECT. (37)**

Aloe is rich in mucopolysaccharides which help in binding moisture to the skin. Aloe stimulates fibroblasts to produce collagen and elastin fibers thereby making the skin more elastic and less wrinkled. It also has cohesive effects on the superficial flaking epidermal cells by sticking them together, which softens the skin. The amino acids present in Aloe gel also soften hardened skin cells. Zinc present in the gel acts as an astringent & tightens the pores. Aloe vera gel gloves improved the skin integrity, decreased appearance of fine wrinkles and erythema in the treatment of dry skin associated with occupational exposure indicating its moisturizing effect. The gel also has anti-acne effect.

**ANTISEPTIC EFFECT. (38)**

The Antiseptic effect of Aloe vera is mainly due to the presence of antiseptic agent's viz., Lupeol, salicylic Acid, urea nitrogen, cinnamonic acid, phenols and sulfur. They all exhibit inhibitory action against fungi, bacteria and viruses.

**HEALING PROPERTIES. (39)**

Topical and oral Aloe vera administration stimulates the activity and proliferation of fibroblasts which in turn significantly increases collagen synthesis. This action is due to the presence of Glucomannan, a mannose-rich polysaccharide, and gibberellin, a growth hormone that interacts with growth factor receptors on the fibroblast

thereby stimulating its activity and proliferation<sup>40</sup>. Studies also showed that Aloe gel not only increases collagen content of the wound but also changes collagen composition (more type III) and increases the degree of collagen cross linking. This accelerates wound contraction and increases the breaking strength of resulting scar tissue<sup>41</sup>.

### DRUG HERB INTERACTION. (40)

Increase the actions of cardiac glycosides and Antiarrhythmic drugs, thiazide diuretics, loop diuretics, liquorice and hours apart from all medications. A study reported that Aloe vera preparations improved the absorption of both vitamins C and E.

### CONCLUSION

The wonder and miraculous herb, Aloe vera, has proven for its wide range of applications in the treatment of many ailments. Though the plant is well known for its medicinal values<sup>62-69</sup> but controlled clinical trials are required to prove and evaluate its real efficacy. Aloe vera and its preparations have been widely used as a medicine since ancient times. Now, various researches have been conducted to prove the efficacy of Aloe vera in various health problems. In spite of the reporting of these positive benefits of the plant, most of the Aloe vera research studies are of small scale in nature. So, more and better trial data are needed to define the clinical effectiveness of this popular herbal remedy more precisely.

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