

Aloe Vera: Its Uses in the Field Of Medicine and Dentistry

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Abstract: Use of herbal products in preventing and treating the oral and general health conditions is gaining its significance in western countries. It is attributed to its minimal side effects, highly effective treatment. It could be of benefit to low socio-economic level in urban and rural communities. Aloe vera is one of the oldest plants known to be used from thousands of years for medicinal purpose. More than 300 varieties of aloe vera exist, among them Aloe barbadensis variety exhibits excellent medicinal property. Aloe vera is called as universal panacea in Greek. In this article Aloe vera plant, its composition, properties, its clinical uses in field of Medicine and Dentistry are reviewed.

Keywords: Aloe vera, Antimicrobial, Dentistry, Therapeutic, Medicinal use.

I. Introduction

Aloe vera belongs to Liliaceae family. It is used in Ayurvedic, Homeopathic and Allopathic streams of Medicine, and not only tribal community but also most of the people for food and Medicine. The name Aloe vera is derived from the word “Alloeh” meaning “Shining bitter substance” in Arabic, while “vera” means “true” in Latin. It is a perennial succulent plant which develops water storage tissue in leaves to survive in dry areas of low or erratic rainfall. ^[1]The plant is native to southern and eastern Africa and naturalized in Mediterranean region and other countries across globe. The plant is commercially cultivated in Aruba, Bonaire, Haiti, India, South Africa, The United states of America and Venezuela ^[2], while the finest quality of Aloe is grown in desert of southern California. In India, it is found in Rajasthan, Andhra Pradesh, Gujarat, Maharashtra and Tamil Nadu.^[3]This plant has been known by number of names as “wand of heaven”, “heaven’s blessing”, “the silent healer” and also as “lily of desert” as it is commonly seen in tropical environment.

II. History

For millennia: Greece, Egypt, India, Mexico, Japan and China used aloe vera for medicinal purposes in several cultures. History states that Alexander and Christopher Columbus used Aloe vera for treating wounded soldiers.

^[4] Cleopatra used it as part of regular beauty regimes. In the history, according to Hannibal states that war have been fought to obtain control over the growing area in North Africa around 1750 BC.

It was described how the whole leaf of aloe vera was used to treat radiation dermatitis in a modern medical paper that was published in 1934.

In 20th century many papers were published and reports mainly focused on anti-diabetic, antimicrobial and anti-cancer properties of the whole leaf, gel or juice of the plant. ^[5]

Aloe vera and its constituents:

The leaves of Aloe vera plant are very thick and fleshy, green to grayish green in color, with serrated edges.

The leaf has 3 layers:

- The outer layer: It is called Rind and has a protective function, synthesizes carbohydrates and proteins.
- Middle layer: It has a yellow sap which is bitter and contains anthraquinones and glycosides.
- An inner layer: Is clear gel and contains 99% water, the rest is made of amino acids, lipids, sterols and vitamins. ^[6]

Aloe vera consists of more than 75 constituents: minerals, sugars, lignin, vitamins, enzymes, saponins, salicylic acids and amino acids. ^[7-9]

Constituents of aloe vera. [Table 1]^[10]

Anthraquinones	Inorganic compounds
Aloin	Calcium
Barbaloin	Sodium
Isobarbaloin	Zinc
Anthranol	Manganese
Ester of cinnamic acid	Chlorine
Aloe-emodin	Chromium
Emodin	Potassium sorbate
Chrysophanic acid	Copper
Resistannol	Magnesium

<i>Saccharides</i>	Iron
Glucose	<i>Enzymes</i>
Mannose	Cyclo oxygenase
Cellulose	Oxidase
Aldopentose	Lipase
L-rhamnose	Catalase
<i>Vitamins</i>	Amylase
B ₁	Alkaline phosphatase
B ₂	Carboxy peptidase
B ₃	<i>Essential amino acids</i>
Choline	Lysine
Folic acid	Threonine
C	Valine
α-tocopherol	Leucine
β-carotene	Isoleucine
<i>nonessential amino acids</i>	Phenylalanine
Histidine	Methionine
Arginine	<i>Miscellaneous</i>
Hydroxyproline	Cholesterol
Aspartic acid	Triglycerides
Glutamic acid	Steroids
Proline	β-steroids
Glycine	Lignine
Alanine	Uric acid
Tyrosine	Gibberellins
	Lectin like substance
	Salicylic acid
	Arachidonic acid

Aloe vera is available in the form of tooth paste, mouthwashes, gel, juice, tropical spray, as nutritional supplement and antioxidant.

III. Health Benefits Of Aloe Vera

Wound healing property:

Many mechanisms were proposed for the wound healing effects of aloe gel, which includes keeping the epithelial cell migration, rapid maturation of collagen and reduction in inflammation.^[11] Glucomannan, a mannose rich polysaccharide and gibberellins, a growth hormone interacts with growth factor receptor on fibroblast, stimulates its activity and proliferation leading to increased collagen synthesis.^[12,13]

Yagi et al reported that aloe vera contains glycoprotein with cell proliferating-promoting activity. David et al noted that aloe vera gel improved wound healing by increasing blood supply, which increased oxygenation as a result.^[14, 15] Acemannan is one of the main functional components of aloe vera. It accelerates wound healing and reduces radiation induced skin reactions.^[16, 17] It activates macrophages and stimulates the release of fibrogenic cytokines.^[18] It also promotes prolong stimulation of granulation tissue.^[16]

Anticancer property:

Glycoproteins that are present in aloe vera gel have been reported to have antitumor and antiulcer effects and to increase proliferation of normal human dermal cells.^[14, 19, 20]

An induction of glutathione s-transferase and an inhibition of tumor-promoting effects of phorbol myristic acetate have also been reported that suggest a possible benefit of using aloe gel in cancer treatment.^[21, 22]

Aloe vera as an antioxidant:

Aloe vera has nutrients which are very strong antioxidants. Glutathione peroxide activity, superoxide dismutase enzymes and a phenolic antioxidant were found in aloe vera gel which are responsible for these antioxidant effects. Apart from these it also has vitamin A, C and E.^[23]

Antifungal and Antiviral properties:

Agarry et al^[24] reported that aloe gel inhibited the growth of trichophyton mentagrophytes, while the leaf possesses inhibitory effects on both pseudomonas aeruginosa and Candida albicans. Inner leaf gel from aloe was shown to inhibit growth of streptococcus and shigella species invitro.^[25] In contrast, aloe extracts failed to show antibiotic property against xanthomonas species.^[26] Several constituents in aloe vera gel have been shown to be effective antiviral agent. A purified sample of aloe emodin was effective against infectivity of herpes simplex virus type I and type II and it was capable of inactivating all of the viruses, including varicella zoster virus, influenza virus and pseudo rabies virus.^[27] It is also reported that aloe vera juice have anti-inflammatory, anti arthritic activity, antibacterial and hypoglycemic effects.

Anti-aging effect:

Aloe vera has rejuvenating action. It stimulates the fibroblasts that synthesize the collagen and elastin fibers that make the skin more elastic and less wrinkled. One of the main reasons for this lies in the plants unique ability to increase production of human fibroblast cells between six and eight times faster than normal cell production. Its moisturizing effects have also been studied in treatment of dry skin associated with occupational exposure where aloe vera gel gloves improved the skin integrity, decreases the appearance of fine wrinkle and erythema.^[28]

Anti-diabetic property:

Extracts of aloe gum increases glucose tolerance in both normal and diabetic rats^[29] and aloe vera sap taken for 4 to 14 weeks has shown a significant hypoglycemic effect both clinically and experimentally.^[30] In the reviewed trails, no withdrawals or serious adverse reactions were reported. Three patients experienced allergic reactions.^[31-34] All adverse effects were reversible and aloe vera was generally well tolerated.

Drug interactions:

Aloe vera inner gel may significantly increase the absorption of vitamin C and E after oral application.^[35] On ingestion of aloe vera, it might lead to increased hypoglycemia in conjunction with oral anti diabetics or insulin.^[36] Aloe vera gel for systemic application is not recommended in combination with anti-diabetic, diuretic or laxative drugs, sevoflurane or digoxin.^[37] It is used in Ayurvedic formulations as appetite-stimulant, purgative, emmenagogue and antihelminthic, for treating cough, cold, piles, debility, dyspnoea, asthma and jaundice.^[38]

IV. Application Of Aloe Vera In Dentistry

Oral cavity is a breeding ground for many bacteria, if oral hygiene is not maintained properly it may lead to major oral diseases. Aloe vera has many anti-bacterial properties which is said to be very effective in preventing in diseases.

Oral lichen planus:

The efficacy of aloe vera in treating oral lichen planus has been measured by many researchers. In a study, 46 patients with oral lichen planus were randomly divided into two groups. Each group was treated with aloe vera mouth wash and triamcinolone acetonide 0.1% [TA], respectively. The treatment period for both groups was 4 weeks. Patients were evaluated on days 8 and 16 and after completing the treatment course [visit 1-3]. Aloe vera mouthwash is an effective substitute for triamcinolone acetonide in treatment of OLP^[39].

Apthous ulcer:

Acemannan hydrogel accelerates healing of apthous ulcers and reduces pain associated with them.^[40] Acemannan is one of the polysaccharide components in aloe vera that has been used for treatment of oral apthous ulceration in patients who wish to avoid use of steroid medication.

Aloe vera in treatment of primary teeth:

In pulpotomy aloe vera gel is applied to the remaining pulp stumps followed by non-eugenol cements and permanent restoration, it was found to be effective and patient is free of symptoms. There was no evidence of abscess, mobility, pain or swelling, on follow up after 30 days and 60 days.^[41]

Aloe vera in endodontic treatment:

In many cases failure of endodontic treatment is due to persistent or secondary intraradicular infection.^[42] It's been found *Enterococcus faecalis* is associated with failure of root canal therapy. A study conducted by Suresh Chandra concluded that aloe vera show significant zone of inhibition against *E.faecalis*^[43] Aloe vera has been used as a sedative dressing and lubrication of files during biomechanical preparation.^[44] It has been found that aloe vera gel is effective in decontaminating Gutta percha cones within one minute.^[45]

Aloe in Alveolar osteitis:

Poor et al.^[46] compared the incidence of alveolar osteitis in patients treated with either clindamycin soaked gelfoam or salicept patches. The salicept patch is a freeze-dried pledget containing Acemannan hydrogel obtained from clear inner gel of aloe vera. The results suggested that salicept patch significantly reduced the incidence of Alveolar osteitis compared with clindamycin soaked gelfoam.

Gingivitis and periodontitis:

Many studies have been conducted to test the efficacy of aloe vera in treating gingivitis. Mouthwashes containing aloe Vera significantly reduces plaque and gingivitis but when compared with chlorhexidine the effect was less significant. Aloe vera mouth wash is an effective antiplaque agent and with appropriate refinements in taste and shelf life can be affordable herbal substitute for chlorhexidine. ^[47] A recent study highlighted the properties of aloe vera as a medicament in periodontal pocket and concluded that the administration of aloe vera gel resulted in improvement of periodontal condition. Therefore, aloe vera can be used as a local drug delivery system. ^[48]

Oral submucous fibrosis and aloe:

Sudarshan et al. ^[49] carried out a study to compare the efficacy of aloe vera with antioxidants in treatment of oral submucous fibrosis. In this study, 20 subjects with OSMF were included. Patients were divided into two groups; group A received 5mg of aloe vera gel 3 times daily for 3 months and group B received antioxidant capsules twice daily for 3 months. He concluded that aloe vera group showed a better treatment response [reduced burning sensation and enhanced mouth opening] than the antioxidants group. Hence it can be used in effective treatment of OSMF.

Aloe vera as a denture cleanser and adhesive

A small amount of aloe vera placed on the denture will act as an antifungal agent. This can also be used along with soft liners. ^[48] Because of the sticky and viscous nature of gel, a prototype acemannan was formulated into a denture adhesive and evaluated for adhesive strength in both wet and dry conditions; the adhesive also was used to evaluate cytotoxicity to human gingival fibroblasts. In an experiment carried out, it was concluded that acemannan denture adhesive formulation with an initial p^H value of 6.0 was an effective herbal substitute for traditional denture adhesives. ^[50]

V. Contra Indications

Aloe vera is contraindicated in intestinal obstruction, acute inflamed intestinal disease, eg; crohn's disease, ulcerative colitis, appendicitis and undiagnosed abdominal pain. Oral aloe vera is contraindicated in pregnancy as it stimulates uterine contraction and in breast feeding mother it can sometimes cause gastro intestinal distress in the infants. Oral use is also contraindicated in children less than 10 years of age. ^[51]

VI. Side Effects

It can be classified as topical and systemic

Topical: Redness, burning and stinging sensation. It is best to apply it on a small area to test for possible reaction.

Systemic: Diarrhea, red urine, abdominal cramps, hepatitis, dependency of worsening of constipation. Laxative effect may cause electrolyte imbalances. ^[52]

VII. Conclusion

Aloe vera is quite economical. It has a promising role in future of various branches of medicine and dentistry. Research has to be made on effect of aloe vera on properties of restorative materials used in dentistry and long term use of aloe vera on essential microbial flora in oral cavity.

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