

Aloe Vera in Oral Diseases: An Update

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Abstract

The word 'Alloe' is an arabic word meaning shining bitter substance while 'Vera' is a latin word meaning true. The botanical name of aloe vera is 'Aloe barbadensis miller' which belongs to family Asphodelaceae (Liliaceae). It is a perennial, succulent, xerophytic, pea-green color shrubby plant which is native of Africa and found in Africa, Northern America, India, Egypt and Sudan. There are more than 300 species of the aloe vera but the aloe barbadensis species exhibits the best medicinal properties. Many in-vitro and in-vivo studies have been conducted for pharmacological actions of aloe vera. The aloe vera is found to have anti-inflammatory, anti-arthritis, antibacterial and hypoglycemic effects. More than 75 active ingredients have been isolated including vitamins, minerals, enzymes, sugars, anthraquinones or phenolic compounds, lignin, saponins, sterols, amino acids and salicylic acid. This article is an insight for scope of aloe vera as medicine in therapeutics of various oral diseases.

Keywords: Medicinal Plants; Liliaceae; Aloe Vera; Oral Diseases; Antibacterial; Medicinal Properties.

Introduction

Aloe vera (*Aloe barbadensis*) is a medicinal succulent plant that belongs to family Asphodelaceae (*Liliaceae*) of genus *Aloe* [1]. The name *Aloe* derives from the Arabic word 'Alloeh' meaning shining bitter substance while 'Vera' Latin means true. There are more than 300 species of the aloe-plant but the aloe barbadensis species exhibits the best medicinal properties. The botanical name of aloe vera is *Aloe barbadensis miller* [2]. Tropical climate and low rainfall areas are favorable areas where aloe vera generally grows amicably. It is a shrubby, perennial, succulent, xerophytic, pea-green color plant [2]. It is called succulent plant because it retains and store water in the stems and leaves [3]. It is a native plant of Africa which is found in dry areas of Africa, Europe, Northern America, India, Egypt and Sudan [4]. Aloe vera is highly resistant to insect, pests and also known

as Arbuscular plants as aloe vera is in symbiotic relation of fungus *Arbuscular mycorrhiza*. The *Arbuscular mycorrhiza* fungus penetrates inside the plant and helps in absorption of potassium and other minerals from the soil [6]. The aloe vera plant is composed of two different parts. The inner portion of the aloe leaves consists of the aloe vera gel, a clear, thin, tasteless, jelly-like material and other part of the plant produces exudates that consist of bitter yellow latex with powerful laxative like actions [6]. The medicine are made from the mucilaginous tissue in the centre of the plant called aloe vera gel however the outer sheath of leaves produces intensely bitter, yellow latex commonly termed as aloes. More than 75 active ingredients from inner gel (aloe vera leaf pulp and exudates) have been identified including vitamins, minerals, enzymes, sugars, anthraquinones or phenolic compounds, lignin, saponins, sterols, amino acids and salicylic acid [7]. The aloe vera gel contains no anthraquinones which are responsible for the strong laxative effects of aloes. The pharmacological actions of aloe vera were studied in-vitro and in-vivo including anti-inflammatory, anti-arthritis, antibacterial and hypoglycemic effects [8].

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Key Messages

This articles explore the use of different parts of aloe vera in treatment of oral diseases. As aloe vera

great therapeutic potential in treatment of gingivitis, dental caries, aphthous ulcer and many more other conditions. This review is an insight in medicinal aspect of aloe vera in oral diseases.

Chemical Constituents and Therapeutic Effect of Aloe Vera

The aloe vera is treasure of many useful chemicals which have great medicinal and therapeutic value. Chemically aloe vera is composed of:

Vitamins

Aloe vera contains vitamin A, C, E, B₁, B₂, B₃ (niacin), B₆, choline, folic acid, alpha-tocopherol and beta-carotene. Aloe vera is also one of the few plants that contain vitamin B₁₂. Vitamins A, C and E are important antioxidant which are essential for fight against toxic free radicals [9].

Anti-Inflammatory Compounds

Aloe vera inhibits the cyclooxygenase pathway and reduces prostaglandin E₂ production from arachidonic acid [10]. Recently, two anti-inflammatory compound C-glucosylchromone and peptidase bradykinase is isolated from aloe vera gel [11]. The peptidase bradykinase decomposes the bradykinin and reduces the pain of inflammatory conditions [12].

Antibacterial Actions

The therapeutic effect of aloe vera gel is reported against both gram-positive and gram-negative bacteria is well established by many studies. The aloe vera gel inhibits the growth of streptococcus pyogenes and streptococcus faecalis however it is found to be bactericidal against pseudomonas aeruginosa [13].

Antiviral Effect

The antiviral effect of aloe vera is either direct or indirect. The direct effect is due to a chemical called aloe emodin. The aloe emodin inactivates many viruses and renders them passive. However the indirect effect is due to stimulation of immune system. Aloe vera is virucidal to many viruses like herpes simplex virus type 1 and type 2, varicella zoster virus, pseudo rabies virus and influenza virus. The virucidal activity of aloe vera is attributed to the anthraquinones extracted from the inner leaf of aloe. The anthraquinones acts directly on the sheath of the sensitive viruses resulting in the prevention of virus adsorption and subsequent replication [14].

Immunomodulating Effects

Aloe vera acts as a immune stimulant. It contains 90% rhodium and iridium in the acemannan. The acemannan is a polysaccharides which increases the white blood cells or macrophages and T cells. The immunomodulation effect of aloe vera is due to activation of macrophage cells which produces nitric oxide and cytokines like tumor necrosis factor, interleukin-1, interleukin-6, and interferon- γ [15].

Antioxidant Property

Aloe vera gel is rich source of antioxidants like glutathione peroxide, superoxide dismutase enzymes and a phenolic antioxidant. These compounds are responsible for antioxidant effects [16].

Antitumor Effect

The glycoproteins (lectins) and polysaccharides which are richly found in aloes have anticancer effects. Many studies have proved the antitumor role of aloe vera gel. The aloe vera gel reduces tumor burden, increases tumor shrinkage and induces tumor necrosis. Thus it increases the survival rates in cancer patients. The mechanism of cancer chemoprevention by aloe vera lies in induction of glutathione S-transferase and phorbolmyristic acetate which induces inhibition of the tumor-promoting effect. However indirectly aloe vera exhibits antitumor effect by stimulation of the anti-tumor immune mechanism of body [17].

Aloe Vera in General Health

Aloe vera is known as the medicinal miracle herb because of its wide variety of beneficial effect on human health. Aloe vera is a good source of essential amino acids which are necessary for smooth functioning of complex enzyme system. Aloe vera is also a rich source of vitamin A, B, C, E, folic acid, calcium, sodium, potassium, magnesium, iron, copper, and zinc. It has antiviral, antibacterial and antifungal properties. Aloe vera is an effective anti-inflammatory agent with analgesic properties. The anti-inflammatory action of aloe vera is attributed to inhibition of the arachidonic acid pathway via cyclooxygenase (COX) inhibiting inflammation. Aloe vera helps in maintaining good skin tone by increasing the activity of fibroblasts. The aloe also has moisturizing effect due to polysaccharide components which provides and sustains moisture in tissues. Many studies have shown that aloe vera helps in healing by increasing the blood supply resulting in increased oxygenation in tissues [7].

Therapeutic Uses of Aloe Vera in Oral Diseases

Aloe vera has great impact on oral diseases due to its medicinal properties. Many studies have been conducted using aloe vera as therapeutic agent in different oral conditions and it is found to have miraculous effect. In dentistry aloe vera is used in periodontal surgery, traumatic injuries to oral tissues, chemical burns, extraction sockets, herpetic viral lesions, aphthous ulcers, canker sores, chronic oral diseases, lichen planus, benign pemphigus, gum diseases associated with AIDS and leukemia migratory glossitis, geographic tongue, burning mouth syndrome, denture stomatitis and dental implants [18].

Oral Lichen Planus

Lichen planus is a chronic inflammatory disorder involving the skin and oral mucosa. Topical application of aloe vera 3 times a day reduces the burning sensation and pain of oral mucosa, helps in healing of the oral lesions and improves the quality of life [19,20]. Though the steroids are mainstay treatment in lichen planus, in long term use aloe vera has added advantage of lesser side effects. In oral lichen planus, topical application of aloe vera have better results than triamcinolone acetonide [21].

Anticariogenic Activity

Rathi S. concluded that Aloe vera gel has strong bactericidal activity against both cariogenic and periodontal bacteria. The concentrated aloe vera gel causes significant growth inhibition against oral bacteria. The mean MIC values for aloe vera gel measured by the micro dilution method against clinical isolates of *S. mutans* was found to be 12.5 µg/ml [22].

Gingivitis

The aloe vera mouthwash is an effective antiplaque agent in comparison to chlorhexidine mouthwash and it can be used as herbal mouthwash [23]. Several studies have been conducted from time to time to evaluate the efficacy of aloe vera in gingivitis. Chandrhas et al concluded that aloe vera mouthwash can be an effective antiplaque agent and can be used as herbal substitute for chlorhexidine [23].

Alveolar Osteitis

Presently special medical bandages also known as Sali Cept Patch are available for intraoral use after tooth extraction. The Sali Cept Patch is a freeze-dried pledget that contains acemannan hydrogel obtained

from the clear inner gel of aloe vera. In 2002, Poor et al found that the incidence of alveolar osteitis was 7.6% with clindamycin-soaked gelfoam as compared to 1.1% in the Sali Cept treated patients. It was concluded that the SaliCept Patch significantly reduces the incidence of alveolar osteitis as compared to clindamycin-soaked gelfoam [24].

Halitosis

Aloe vera is natural anti-fungal and antibacterial agent. It protects oral tissues and strengthens the diseased and swollen gingiva of periodontal diseases which are leading cause of halitosis. Drinking 1/4 cup of pure in the vera gel dissolved in 1/2 cup of water or apple juice helps in reduction of bad breath [25].

Aphthous Ulcer

The several studies have concluded that acemannan hydrogel accelerate the healing of recurrent aphthous ulcers if applied four times a day [26].

Denture Adhesive

Acemannan is a complex mannose carbohydrate which is one of the main constituents of the aloe vera gel. Due to good adhesive properties, it can be used as denture adhesive [27]. The acemannan denture adhesive with pH value of 6.0 can be an effective herbal substitute for traditional denture adhesives [11].

Decontamination of Gutta-Percha Points

Aloe vera gel is proven to be used as a decontaminant which helps in removing the bacteria within a minute [28].

Aloe vera as a Tooth Gel

The aloe vera gel cleanses the teeth and gums. It is also very effective against cariogenic bacteria causing dental caries and subsequently tooth loss. The anthraquinones found in aloe vera helps in healing of wound and have analgesic properties. The aloe vera gel do not have abrasive elements so it is very useful for sensitive teeth and gums. In a study conducted by Stanford university it was concluded that aloe vera tooth gel is more effective than the commercial brands at controlling cavity-causing organisms [23].

Dental Implants

Aloe vera gel placed around dental implants helps

in reducing inflammation by its antimicrobial and anti-inflammatory effects [29].

Toxicity of Aloe Vera

Ingestion of aloe vera is associated with diarrhoea, electrolyte imbalance, kidney dysfunction and conventional drug interactions, contact dermatitis, erythema, and photo toxicity [30]. However these side effects are reported in all patients. It is recommended that pure, stabilized, concentrated and organically grown aloe vera should be used. It is desirable to check for the label of accreditation and seal of approval of 'The International Aloe Science Council' as this seal guarantees the desired necessities [31].

Conclusion

Aloe vera is a promising herb with great therapeutic potential which can be used widely in both dentistry and medicine. In dentistry, the therapeutic potential of aloe vera is well proven by many pharmacological in vivo and in vitro studies. However more clinical research studies are needed to validate and explain the action of acemannan hydrogel in healing of aphthous ulcers and its anti-plaque and anti-gingivitis effect.

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