

Periodontal activity of *Aloe vera*: A Review

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ABSTRACT

Aloe vera is well known for its marvellous medicinal properties. *Aloe vera* has been used in dentistry for its wound-healing effects, gingivitis, plaque control, curing oral mucosal lesions and periodontal activity. *Aloe vera* may also reduce the pain and duration of oral ulcers while speeding healing. Products of the plant are used in the treatment of various ailments. A periodontal disease is an oral infection. With the increasing incidence of periodontal diseases and development of antibiotic resistance, the alternative, safe, effective, and economical products is the need of the time. *Aloe vera* is a medicinal plant which has the greater medicinal value and enormous properties for curing and preventing oral diseases like Periodontitis, gingivitis, mouth ulcers etc. An attempt has been made to review the periodontal activity of Aloe Vera.

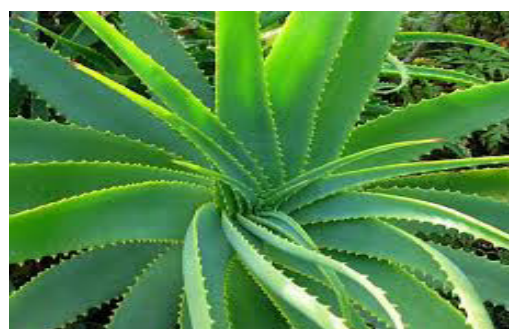
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1. INTRODUCTION

Aloe vera plant has been known and used for centuries for its health, beauty, medicinal and skin care properties. The name *Aloe vera* is derived from the Arabic word "Alloeh" meaning "shining bitter substance," while "vera" in Latin means "true." 2000 years ago, the Greek scientists regarded *Aloe vera* as the universal panacea. The botanical name of is *Aloe barbadensis miller*. The plant can grow up to 4 feet tall, and its tough, fleshy, spear like leaves can grow up to 36 inches long. It belongs to Asphodelaceae [1].

It produces two substances, gel and latex, which are used for medicines [2-30].

Aloe vera gel is the clear, jelly-like substance found in the inner part of the *Aloe vera* plant leaf. *Aloe vera* latex comes from just under the plant's skin and is yellow in colour. *Aloe vera* contains 99.3 percent water and 0.7 percent non aqueous constituents, such as glycoproteins and polysaccharides etc. Glycoproteins speed the healing process by stopping pain and inflammation, while polysaccharides stimulate skin growth and repair. These substances may also stimulate the immune system. Recent advances in the field of dentistry have promoted the use of various herbal and natural products for the treatment of various oral diseases and conditions. *Aloe vera* is one such product exhibiting periodontal activity.



The periodontal disease is a major public health problem, which affects up to 90% of the worldwide population. Gingivitis always precedes periodontal disease. The main characteristic of periodontal disease is destruction of supporting tissue of the tooth. The main etiological factor is microbial oral biofilm. Periodontal pathogens are:

Aggregatibacteractino mycetem comitans, Porphyromonasgingivalis, Prevotella intermedia, Treponema denticolaetc. Aggregatibacteractino-mycetem comitans commonly associated with this disease, especially in young adults. Some new studies demonstrate that Herpes viruses can be involved in pathogenesis of periodontal disease. Periodontal inflammation is followed by release of bacterialleucotoxins, collagenases, fibrinolysins, and other proteases. Increased leukocyte infiltration and changes in vascular permeabilityhave always been present in periodontal tissues inflammation.

Antibiotics (tetracyclines and metronidazole), antiseptics (chlorhexidine), phenols, oils, and herbal compounds have been in usesince 1980. [9,12-15,17,19,20,25]

Periodontitis is an infectious inflammatory disease. Bacteria modulate the inflammatory response and alter the diversity of periodontal disease. In recent years, various host-response modulation therapies and local drug therapies have been developed to block the pathways responsible for periodontal tissue breakdown [10].

The mouth is a breeding ground for bacteria which can be a major problem if preventative measures are not taken than these bacteria can attack the teeth and gums, and can lead to bad breath, gingivitis, stomatitis and peridontitis. Aloe vera, however, has many anti-bacteria qualities that is why it is said to be very effective in fighting the bacteria and preventing these problems. It is extremely helpful in the treatment of gum diseases. It reduces swelling of the soft tissues and consequently this reduces the bleeding of the gums. It exhibits strong antiseptic action in gum pockets where normal cleaning is difficult. Apersistent immune response to chronic infections in the mouth is believed to play a major role in gum destruction. Researchers found Actino bacillus mycetem comitans and Porphyromonasgingivalis, these bacteria sapper to cause aggressive periodontal disease which causes multiple deep pockets in the gum, associated with resistance to standard treatments for gum disease. *P.gingivalis* produce an enzymes called as arginine specific cysteine proteinase, that may disrupt the immune system and lead to subsequent periodontal connective tissue destruction.

1.1. Specific applications of *Aloe vera* in Dentistry [3,6,8,29]

There are several uses of *Aloe vera* in dental practice:

- Periodontal surgery.

- Applications to the gingival tissues when they have been traumatized or scratched by toothbrush-dentifrice abrasion, sharp foods, dental floss, and toothpick injuries.
- Chemical burns from accidents with aspirin.
- Extraction sockets.
- Acute mouth lesions such as herpetic viral lesions, aphthous ulcers & cracks occurring at the corners of our lips.
- Periodontal & gingival abscesses are soothed by the applications as well.
- Chronic oral diseases Lichen Planus and Benign Pemphigus, gingiva problems associated with AIDS and Leukemia.
- Migratory glossitis, geographic tongue and Burning Mouth Syndrome.
- Denture patients with sore ridges and ill-fitting dentures.
- Dental implants.
- Aloe vera can also be used around dental implants to control inflammation caused by bacterial contamination [1,23].

Use of aloe vera is beneficial in many oral conditions. Due to its anti-bacterial qualities it is effective in fighting the bacteria and preventing bad breath, gingivitis, stomatitis and periodontitis. Aloe Vera has been shown to enhance defense mechanisms, and it has a variety of components to help combat periodontal disease and other oral conditions.

Periodontal diseases represent the most common diseases of adults as well as one third of the children's population. Periodontal disease is a chronic, degenerative disease of parodontium which is made of gingiva, periodontal ligament, cementum and alveolar bone. Periodontal disease develops from a pre-existing gingivitis. The main etiological factor for development of periodontal disease is dental plaque or oral biofilm in association with anaerobic bacteria.

Aloe vera, however, has many anti-bacteria qualities that is why it is said to be very effective in fighting the bacteria and preventing these problems. It is extremely helpful in the treatment of gum diseases. It reduces swelling of the soft tissues and consequently this reduces the bleeding of the gums. It exhibits strong antiseptic action in gum pockets where normal cleaning is difficult. Its antifungal properties help greatly in the management of denture stomatitis. Cracked and split corners of the mouth are also subject to fungal infection and this can be cured by Aloe. Its antiviral properties help in the treatment of cold

sores (Herpes simplex) and shingles (Herpes zoster). It is a powerful healing promoter and when inserted into extraction sockets is very beneficial. It can be used in any surgical wound. It has a use in root canal treatment as a sedative dressing, healing promoter and file lubricant. Aloe vera can be used around dental implants to control inflammation from bacteria contamination. An extract from aloe vera has been shown to be beneficial and some dentists recommend 1-3 tablespoon of aloe vera juice to be used as a mouthwash [16].

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 are used in formulations.

1.2. Mechanism of action of Aloe Vera

Anti-inflammatory activity of Aloe vera inhibits the cyclooxygenase pathway and reduces prostaglandin E2 production from arachidonic acid. Recently, the novel anti-inflammatory compound called Cglucosylchromone was isolated from gel extracts. In addition, the peptidase

bradykinase was isolated from Aloe and shown to break down the bradykinin, an inflammatory substance that induces pain.[26]

Antibacterial Property of Aloe vera shows inhibition of *Streptococcus pyogenes* and *Streptococcus faecalis*. Aloe vera gel reportedly was bactericidal against *Pseudomonas aeruginosa* while acemannan prevented it from adhering to human lung epithelial cells in a monolayer culture.[27]

Aloe vera shows antifungal property: A processed aloe vera gel preparation reportedly inhibited the growth of *Candida albicans*. The purified Aloe protein has been found to exhibit potent antifungal activity against *Candida paraprulosis*, *Candida krusei* and *Candida albicans*.

Healing properties: Countless studies have demonstrated the healing powers of aloe vera gel. A 1996 study reported that a high molecular weight polypeptide constituent from the gel demonstrated a healing effect on excisional wounds in rats.

Glucomannan, a mannose-rich polysaccharide and gibberellin, a growth hormone, interact with growth factor receptors

Table - 1: Chemical composition of aloe vera

Anthraquinones	Inorganic	Saccharides	Enzymes
Aloin	Calcium	Cellulose	Oxidase
Barnaloin	Sodium	Glucose	Amylase
Iaobarnaloin	Chlorine	Mannose	Catalase
Anthranol	Manganese	L-Rhamnose	Lipase
Aloetic acid	Magnesium	Aldopentose	Alkaline phosphatase
Anthracene	Zinc		
Ester of cinnamic acid	Copper		
Aloe-emodin	Chromium		
Emodin	Potassium		
Chrysophanic acid	Sorbate		
Ethereal oil			
Resistannol			
Vitamins	Essential amino acids	Nonessential amino acids	Miscellaneous
Vitamin B ₁	Lysine	Histidine	Cholesterol
Vitamin B ₂	Threonine	Arginine	Triglycerides
Vitamin B ₆	Valine	Hydroxyproline	Steroids
Choline	Methionine	Aspartic acid	Beta- sitosterol
Folic acid	Leucine	Glutamic acid	Lignins
Vitamin C	Isoleucine	Proline	Uric acid
Alpha-tocopherol	Phenylalanine	Glycerine	Gibberellins
Beta carotene		Alanine	Lectin like substance
		Tyrosine	Salicylic acid

on the fibroblast, thereby stimulating its activity and proliferation, which in turn significantly oral *Aloe vera* application. In 1991, Thompson reported that topical application of the aloe vera-derived allatonin gel stimulated fibroblastic activity and collagen proliferation reported that Aloe vera gel contains a glycoprotein with cell proliferating-promoting activity.

Aloe vera when used at a full strength reduced accumulated plaque significantly.

It is extremely helpful in the treatment of gingivitis and periodontitis. Aloe Vera greatly reduces the instances of gingival bleeding due to its soothing & healing properties, reduces swelling and soft tissue edema. Hence it helps to restore gums to health. Aloe vera mouthwash can be an effective antiplaque agent and with appropriate refinements in taste and shelf life can be an affordable herbal substitute for chlorhexidine. Chlorhexidine, sodium hypochlorite, cetylpyridinium chloride and amine fluoride are widely used as mouthwashes immediate hypersensitivity reactions, toxicity, tooth staining and other side effects have been reported due to use at various times. Moreover, it has been reported that chlorhexidine and sodium hypochlorite are cytotoxic to human periodontal ligament cells, inhibit protein synthesis, and affect mitochondrial activity, thus, having detrimental effects on vital tissues. Subgingival administration of aloe vera gel results in improvement of periodontal condition. Aloe vera tooth gel tends to be less harsh on teeth, as it does not contain the abrasive elements typically found in commercial toothpaste; it is a great alternative for people with sensitive teeth or gums. Aloe vera can be applied directly to the sites of periodontal surgery along with periodontal dressing or to gum tissues when they have been traumatized by toothbrush dentifrice abrasion, sharp foods, dental floss and toothpick injuries.^[11,13,18,21,22,28]

1.3. Dental Products of Aloe vera

Denture Adhesive

Acemannan, a complex mannose carbohydrate, which is one of the main ingredients of the aloe vera gel was found to have good adhesive properties.

It is this property that led to the production of prototype acemannan denture adhesives. These new denture adhesive formulations were evaluated for pH changes, cytotoxicity to human gingival fibroblasts and adhesive strength in both dry and wet conditions. In an experiment carried out, it was concluded that acemannan denture adhesive formulation with an initial pH value of 6.0 was an effective

herbal substitute for traditional denture adhesives.

Dental Implants

Aloe vera gel placed around dental implants is found effective to reduce inflammation.

Aloe Vera as a Mouthwash: Mouthwash prevents radiation-induced mucositis by its wound healing and anti-inflammatory mechanism. It also reduces oral candidiasis of patients undergoing head and neck radiotherapy due to its antifungal and immunomodulatory properties.

It is recommended that 1-3 tablespoon of aloe vera juice be used as a mouthwash, and then swallowed three times daily.

Aloe vera as toothpaste: Periodontal disease eventually leads to the loss of your teeth and leaving you with few options which are very costly and painful. Toothpaste plays a very important role in gum health and declination of your periodontal disease. Use of Aloe Vera toothpaste can help to solve this problem. Aloe vera product containing 1,400 ppm fluoride effects leads to fantastic results when treating gum disorders and periodontal disease.^[24]

1.4. Aloe vera as a local drug delivery agent in the treatment of Periodontitis

A study on Aloe vera and highlights its property when used as a medicament in the periodontal pocket. A total number of 15 subjects were evaluated for clinical parameters like plaque index, gingival index, probing pocket depth at baseline, followed by Scaling and Root Planing (SRP). Test site comprised of SRP followed by intra-pocket placement of Aloe vera gel, which was compared with the control site in which only SRP was done, and clinical parameters were compared between the two sites at one month and three months from baseline. Results exhibited encouraging findings in clinical parameters of the role of Aloe vera gel as a drug for local delivery. It concluded that sublingual administration of Aloe vera gel results in improvement of periodontal condition. Aloe vera gel can be used as a local drug delivery system in periodontal pockets^[5]. Aloe vera used in pocket area has significant reduction in pocket depth when compared to controls and reduction in gingival index, which can be attributed to its anti-inflammatory, antibacterial, wound-healing properties. Aloe vera has numerous anti-inflammatory agents. Aloe vera had good anti-prostaglandin synthesis properties and compounds inhibiting oxidation of arachidonic acid, which might decrease inflammation.^[2,7]

2. CONCLUSION

Aloe vera highlights its property of periodontitis when used as a medicament in the periodontal pocket. Scientific studies are good enough proof that drug has immense potential as a dental therapeutic. As a footnote, though Aloe vera is a promising herb with its various clinical applications in medicine and dentistry. More clinical research needs to be undertaken especially to validate and explain the action of acemannan hydrogel in accelerating the healing of aphthous ulcers and to validate the efficacy of Aloe gel on plaque and gingivitis, so that it can be established in the field of dentistry. Aloe vera may find a promising role in various branches of dentistry in future. Proper diagnosis, knowledge of the traditional medicine and implementation of that knowledge to the treatment plan are important in ensuring success with this dental therapeutic agent.

3. REFERENCES

- Grindlay D and Reynolds T. The Aloe vera phenomenon: A review of the properties and modern uses of leaf parenchyma gel. **J Ethnopharmacol.** 1986;16:117-51
- Arbaz Sajjad and Samia Subhani Sajjad. Aloe vera: An Ancient Herb for Modern Dentistry - A Literature Review. **Journal of Dental Surgery**, 2014; 1: 6.
- Crosswhite FS and Crosswhite CD. Aloe vera, plant symbolism and the threshing floor. **Desert Plants.** 1984; 6: 43-50.
- Davis RH. Biological activity of *Aloe vera*. **SOFW Journal**, 1993; 119: 646-649.
- Geetha Bhat, Praveen Kudva and Vidya Dodwad. Aloe vera: Nature's soothing healer to periodontal disease. **J Indian Soc Periodontol.** 2011; 15: 205-209.
- Habeeb F, Shakir E and Bradbury F. **Screening methods used to determine the anti-microbial properties of Aloe vera inner gel Methods.** 2007; 42(4): 315-320.
- Jai Deep Mahen Dra, Little Mahendra. **Journal of Clinical and Diagnostic Research.** 2013; 7(10): 2330-2333
- Hegggers JP, Pineless GR and MCRobson Dermaide aloe/*Aloe veragel*, comparison of the antimicrobial effects. **Journal of the American Medical Technologists**, 1979; 41(5): 293-294.
- Kubar A, Saygun I, Ozdemir A, Yapar M and Slots J. Real-time polymerase chain reaction quantification of human cytomegalovirus and Epstein-Barr virus in periodontal pockets and the adjacent gingiva of periodontitis lesions. **J Periodontal Res.** 2005; 40: 97-104.
- Killooy WJ and Polson AM. Controlled local delivery of antimicrobials in the treatment of periodontitis. **Dent Clin North Am.** 1998; 43: 263-83
- Karim B. Effect of Aloe vera Mouthwash on Periodontal Health: Triple Blind Randomized Control Trial, OHDM, 2014; 13(1): 14-19.
- Mandell RL and Socransky SS. A selective medium for *Actinobacillus actinomycetem comitans* and the incidence of the organism in juvenile periodontitis. **J Periodontol**, 1981; 52: 593-59.
- Meena M. Aloe vera An Update for Dentistry. **Journal of dentofacial sciences.** 2013; 2(4): 1-4.
- Michalowicz BS, Ronderos M, Camara-Silva R, Contreras A and Slots J. Human herpes viruses and Porphyromonasgingivalis are associated with juvenile periodontitis. **J Periodontol.** 2000; 71: 981-88.
- Newman MG, Takai HH and Carranza FA. **Carranza's Clinical Periodontology.** WB Saunders Company, Philadelphia, PA. 2006.
- Kathuria N, Gupta N, Manisha R, Prasad and Nikita. Biologic Effects Of Aloe Vera Gel. **The Internet Journal of Microbiology.** 2010; 9: 2.
- Pihlstrom BL, Michalowicz BS and Johnson NW. Periodontal diseases. **Lancet.** 2005; 366: 1809-1820.
- Rathi S. Role of aloe vera in dental practice-a review. **The Pharma Research**, 2013; 10(1):1-5
- Socransky SS and Haffajee AD. Evidence of bacterial etiology:a historical perspective. **Periodontol.** 1994; 5: 7-25.
- Slots J. Herpes viruses, the missing link between gingivitis and periodontitis. **J Int Acad Periodontol.** 2004; 6: 113-19.
- Sambhav J and Rai R. Aloe-Vera: A Boon In Management Of Dental Disease. **Int. J. Pharm. Res. Sci.**, 2014; 2(1): 18-24
- Singla S. Aloe Vera: **Use of Herbal Plant in Dentistry.** 1-2
- Sajjad A. Aloe vera: An Ancient Herbfor Modern Dentistry-A Literature Review. **Journal of Dental Surgery**, 2014: 1-6
- Shinde. **Unique Journal of Medical and Dental Sciences.** 2013; 01(02): 11-16.

25. Taheri JB, Azimi S, Rafeian N, Akhava and Zanjani H. Herbs in dentistry. **Int Dent J.** 2011; 61: 287-296
26. Tanwar R. Aloe Vera and its uses in Dentistry, **Indian J Dent Adv.** 2011; 3(4): 656-8
27. Richard LW. Aloe vera gel: Update for dentistry. **Pharmacology Today.** 2005; 6: 9
28. Tayal E. Current Perspectives on Use of Aloe vera in Dentistry. **European Journal of Medicinal Plants,** 2014; 4(12): 1408-19
29. Vogler BK and Ernst E. Aloe vera, A systematic review of its clinical effectiveness. **British Journal of general practice,** 1999; 49: 823-28.
30. Wynn RL. Aloe vera gel: Update for dentistry. **Gen Dent.** 2005; 53:6-9.