Review Article

ALOE VERA AND THE DENTIST

Dr. Jayesh J. Unnithan[1], Dr. Girish Katti[2], Dr. Syed Shahbaz[3], Dr. Sreenivasrao Ghali[4], Dr. Chandrika G. Katti [5]

1. Reader, Dept of Oral Medicine & Radiology, Al Azhar Dental College, Perumpillichira, Thodupuzha.
2. Principal, Professor & HOD, Department of Oral Medicine & Radiology, Al- Badar Dental College & Hospital, Gulbarga, Karnataka. 3. Reader, Department of Oral Medicine & Radiology, Al- Badar Dental College & Hospital, Gulbarga, Karnataka.
4. Reader, Department of Oral Medicine & Radiology, Nanded Rural Dental College & Research Center, Nanded, Maharashtra. 5. Reader, Department of Orthodontics, Al- Badar Dental College & Hospital, Gulbarga, Karnataka.

Abstract

Aloe vera is a succulent medicinal plant of revered historical significance. Its popularity has made it the quintessential component of most beauty products including soaps, creams, lotions and balms. Also known as the 'potted physician' this miracle plant has numerous applications in dentistry. It is a treasure cove packed with vitamins, minerals, sugars, amino acids, enzymes and phenolic compounds. The aloe vera is known for its wound healing, antibacterial, antifungal, antiviral and anti-inflammatory properties. This article intends to throw light on the dental applications of aloe vera.

Keywords: Aloe Vera, Acemannan, Dentistry, Antifungal, SaliCept patches, Antiviral, Vitamins, Natural

Introduction

Aloe vera is a cactus-like plant that belongs to the lily family. Among the 250 different species, only 2 are grown commercially; Aloe Barbadensis Miller and Aloe Aborescens. It is native to northern Africa and grows readily in hot and dry climates.[1] The Aloe vera is a plant of many surprises and is rightly remarked as the 'Miracle Plant' or 'The natural healer'. It has been used since time immemorial for its unique properties that influence health, beauty and skincare. It's also called First Aid Plant, Silent Healer, Potted Physician & the Plant of Life. Other names include Wonder Plant, Dietary Plant, Burn Plant, Single Bible, and Heaven's Blessing.[2-5]

Historical significance

From the Bible's mention of removing Christ from the cross and wrapping his body in aloes and myrrh, we find Aloe Vera mysteriously appearing in every phase of history. History reveals that the ancient Egyptians were considered as the pioneers in using aloe vera. Alexander the Great is said to have captured the Isle of Socotra, where Aloe grew abundantly so that he had plentiful supplies of the plant to help heal his men's battle-wounds. Legend has it that Cleopatra and Nefertiti bathed in Aloe as part of their beauty routine. The father of modern medicine; Galen, used it too in his treatments. A papyrus dating from Pharoah Amen-Hotep's reign in 1552 BC gave no less than twelve different formulae for Aloe Vera preparations used during the preceding two thousand years. It wouldn't be wrong if it's said that Aloe vera had played a very significant role in the Indian freedom struggle. The Great Gandhiji himself has quoted that the Aloe vera was the secret of his sustenance during long lasting fasts. Its use has also been recorded by diverse civilizations including that of Aztec, Greece, Egypt, India, Mexico, Japan, & China.[3] Early users of Aloe Vera discovered that when the jelly contained in the leaf was applied to a wound, it would heal faster – a remarkable feat in a time, way before antibiotic ointments were employed, when the infection of a minor wound would often turn fatal.[4]

Address of correspondence

Dr. Jayesh J. Unnithan
Reader, Dept of Oral Medicine & Radiology,
Al Azhar Dental College,
Perumpillichira, Thodupuzha.
E mail: dr.jayeshunnithan@gmail.com

Quick Response Code

Composition

The aloe vera basically consists of 2 different parts with disparate composition and therapeutic potential; the outer & the inner layers. A collection of specialized cells called pericyclic tubules, found just beneath the outer layer produces a bitter tasting yellow latex (aloin) with powerful laxative actions.[5] It is available commercially to induce systemic catharsis. The parenchymal tissue is what makes up the inner portion of the aloe leaves. It manufactures the aloe vera gel (or mucilage), a clear, bland jelly like substance which contains 99% water. Though the aloe vera, looks quite simple, it is indeed a complex storehouse of innumerable nutrients. The plant contains vitamins A, C, E, thiamine, niacin, riboflavin, choline, and folic acid along with traces of cyanocobalamin. It also contains enzymes such as acid phosphatase, alkaline phosphatase, amylase, lactic dehydrogenase, lipase, and numerous organic compounds such as aloin, barbaloin, and emodin. The aloe consists of 75 different ingredients, including vitamins, minerals, enzymes, sugars, anthraquinones or phenolic compounds, lignin, saponins, sterols, amino acids, and salicylic acid. Minerals include aluminium, sodium, potassium, calcium, magnesium, manganese, copper, zinc, chromium, and iron.[6,7]

Dental applications

Oral Medicine & Radiology

Aphtous stomatitis: Numerous studies suggest that aloe vera, when used in the treatment of aphthous ulcers had significant effects in reducing the size, number, associated pain, and duration of the oral ulcers.[8-10] A double blinded study conducted by Babaee et al using 2% topical aloe vera gel highlights its efficacy in managing minor aphthae.[10] The FDA approval of Aloe vera as an effective treatment alternative in treating oral ulcers offers great promise to patients who would want to avoid steroid medication.[11]

Radiation mucositis: Oral mucositis following radiotherapy is a frequent and inevitable complication observed among head & neck cancer patients. This condition negatively impacts the life of the patient causing unbearable pain, nutritional deficiencies and tendency for infections to set in. Studies suggest that aloe vera when used as a mouthwash, is not only effective in preventing radiation-induced mucositis, but can also combat oral candidiasis in patients undergoing head and neck radiotherapy. This can be attributed to its anti-inflammatory, wound healing, antifungal and immunomodulatory properties.[12,13]

Burning mouth syndrome: This enigmatic entity characterized by burning sensation in the tongue, palate, lips and other mucosal sites can be quite a challenge to treat. The double blinded study conducted in 2013 using a tongue protector in combination with aloe vera offers much hope to clinicians in developing new and effective treatment strategies to manage this condition.[14]

Lichen planus: Aloe vera has managed to become a safer alternative, sans side effects in the 'steroid dominated' management regimen of lichen planus.[15] Several studies have highlighted its efficacy in successfully alleviating the pain, inflammation and burning sensation associated with Lichen planus. Topical application of aloe vera in the form of gels or mouthwashes and its systemic administration in the form of juices has helped to greatly improve the quality of life in patients with this debilitating disease.[16-19]

Oral Submucous Fibrosis: A preliminary study conducted on 20 OSMF patients that compared the potential of aloe vera with lycopene (antioxidant) proved that the 'aloe group' showed better improvement with regards to mouth opening and burning sensation.[20] The aloe vera gel can be effectively employed as a potent adjuvant in the treatment of OSMF and thereby reduce the need for surgical intervention in future.[21]

Fungal infections: Aloe vera leaf extracts and purified protein have demonstrated exceptional antifungal activity in various studies. It has potent antifungal activity against Candida paraprilosis and Candida krusei and can inhibit germ tube formation in Candida albicans [22,23]

Viral infections including CoviD-19: The aloe vera's antiviral potential could be direct (immune stimulation) or indirect (aloe emodin in aloe vera). The anthraquinones contained in the

aloe are considered to hold virucidal potential. Research implies that aloe vera proved effective against enveloped viruses like Hsv1, Hsv2, varicella zoster virus, influenza virus and pseudorabies virus. However unenveloped virus like adenovirus and rhinovirus were not affected.[24,25] Since Sars-CoV-2 is also an enveloped virus, aloe vera would be a potential candidate in the war against the Covid-19 pandemic. However it is too early to tell and further molecular docking studies and clinical trials are necessary to confirm the potential of Aloe vera on COVID-19.[26,27]

Periodontics

Gingivitis: Research suggests that the wound healing and anti inflammatory properties of aloe vera confirms that it is an effective adjunct to mechanical therapy in treating plaque induced gingivitis. These properties can be attributed to a growth substance, mannose-6-phosphate found in aloe vera.[28] Another study by Ajmera et al revealed that rinsing with Aloe vera mouthwash in addition to oral prophylaxis reduced ginival inflammation to a greater extent when compared to scaling alone.[29]

Periodontitis: Studies report that the localized application of Aloe vera gel to periodontal surgical sites promoted faster healing response. Results obtained from various studies were encouraging and it was concluded that subgingival administration of aloe vera gel results in improvement of periodontal condition. Its gel form can be used as a local drug delivery system in periodontal pockets. The acemannan in aloe vera promoted periodontal regeneration by stimulating both soft and hard tissue healing.[30,31]

Oral Surgery

Dry socket: An extensive study conducted by Poor et al suggests that SaliCept patches (containing acemannan hydrogel) had greater efficacy than clindamycin-soaked gelfoam in reducing the incidence of alveolar osteitis.[32] Acemannan also plays a significant role in oral wound healing (acute and chronic). It induces proliferation of gingival fibroblasts and stimulates various growth factors like KGF-1, VEGF and type 1 collagen expressions.[33]

Conservative & Endodontics

Antibacterial: George et al throws light on the natural antimicrobial activity of aloe vera (anthraquinones) on caries causing bacteria when incorporated in a toothpaste/gel which can be used even on sensitive teeth due to the absence of dentrifices. It has been found effective against Streptococcus mutans, Lactobacillus acidophilus, Enterococcus faecalis, Prevotella intermedia, Candida albicans, Peptostreptococcus anaerobius and showed enhanced activity against Streptococcus mitis.[34] It also prevented bacterial contamination of tooth brushes by Streptococcus mutans.[35]

Intracanal medicament: The antimicrobial potential of aloe vera against E.fecalis, the main culprit behind root canal failures, has gathered widespread recognition in its use as an effective intracanal medicament.[36] Furthermore research also suggests that aloe vera gel can decontaminate GP cones in just 1 minute and that it could be used as storage medium for GP cones.[37]

Canal Lubricant: Aloe vera gel is been used as a lubricant and a sedative dressing during biomechanical preparation in root canal treatment[38]

Pedodontics

Primary tooth obturation: Kriplani et al, in her in vitro study involving bacteria isolated from infected root canals of primary teeth concluded that, a combination of Aloe vera and sterile water had superior antimicrobial activity against most of the microorganisms, when compared to combinations of ZOE + Aloe vera, calcium hydroxide + Aloe vera, ZOE, calcium hydroxide, or Metapex .[39]

Pulpotomy: Application of aloe vera gel on remnant pulp stumps following pulpotomy procedure ensured that there was relief of symptoms with no further signs of re-infection on subsequent follow ups.[40]

Prosthodontics

Denture adhesive and cleanser: Aloe vera based denture adhesive formulations provide good adhesive bond strength and is well tolerated (minimal cytotoxicity) by patients who also benefit from its remarkable antifungal and

antimicrobial properties. [41,42]

Dental implants: Aloe vera formulations have also been used around implants to prevent inflammation arising from bacterial contamination. [42]

General dentistry

Disinfection of dental unit waterlines: Studies suggest that the disinfection of dental waterlines (a potential source of microbes) using a solution of aloe vera found significant reduction in microbial contamination when compared to 10% hydrogen peroxide or 5% sodium hypochlorite.[43]

Side effects

Topical application of aloe vera gel could initiate contact dermatitis and hypersensitivity reactions in few. It is not recommended in children, pregnant or lactating women due to propensity for abdominal spasms, pain and diarrhea. Aloe vera gel for systemic application is not recommended in combination with antidiabetic, diuretic, or laxative drugs; sevoflurane; or digoxin. It should not be taken without proper medical advice as there are documented accounts of carcinogenicity, renal dysfunction, hepatic involvement and genotoxicity[44,45]

Conclusion

Aloe vera is no doubt a wonderful natural product with a variety of dental applications. However, further research aimed at determining its safety margin, long term side effects, optimal concentration, application time and effects on the oral cavity need to be undertaken, using a larger sample size. Future research should be directed to further evaluate its antiviral properties as it holds great promise in combating Covid-19.

References

1. Manvitha K, Bidya B. Aloe vera: a wonder plant its history, cultivation and medicinal uses. Journal of Pharmacognosy and Phytochemistry. 2014 Jan 1;2(5):85-8.
2. Skousen MB. Aloe Vera Handbook: The Acient Egyptian Medicine Plant, 2005.
3. Mehta I. History of Aloe vera-(A Magical Plant). IOSR J Humanit Soc Sci. 2017;22:21-4.
4. Hekmatpou D, Mehrabi F, Rahzani K, Aminiyan A. The effect of aloe vera clinical trials on prevention and healing of skin wound: A systematic review. Iranian journal of medical sciences. 2019 Jan;44(1):1.
5. Sajjad A, Subhani Sajjad S. Aloe vera: An ancient herb for modern dentistry—A literature review. Journal of Dental Surgery. 2014;2014.
6. Khanam N, Sharma GK. A critical review on antioxidant and antimicrobial properties of aloe vera L. International Journal of Pharmaceutical Sciences and Research. 2013 Sep 1;4(9):3304.
7. Mangaiyarkarasi SP, Manigandan T, Elumalai M, Cholan PK, Kaur RP. Benefits of Aloe vera in dentistry. Journal of pharmacy & bioallied sciences. 2015 Apr;7(Suppl 1):S255.
8. Garnick JJ, Singh B, Winkley G. Effectiveness of a medicament containing silicon dioxide, aloe, and allantoin on aphthous stomatitis. Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology. 1998 Nov 1;86(5):550-6.
9. Bhalang K, Thunyakitpisal P, Rungsirisatean N. Acemannan, a polysaccharide extracted from Aloe vera, is effective in the treatment of oral aphthous ulceration. The Journal of Alternative and Complementary Medicine. 2013 May 1;19(5):429-34.
10. Babaee N, Zabihi E, Mohseni S, Moghadamnia AA. Evaluation of the therapeutic effects of Aloe vera gel on minor recurrent aphthous stomatitis. Dental research journal. 2012 Jul;9(4):381.
11. Rees TD. Oral ulcers remedy gets FDA clearance. J Am. 1994;39.
12. Worthington HV, Clarkson JE, Bryan G, Furness S, Glenny AM, Littlewood A, McCabe MG, Meyer S, Khalid T. Interventions for preventing oral mucositis for patients with cancer receiving treatment.

Cochrane database of systematic reviews. 2011(4).

13. Ahmadi A. Potential prevention: Aloe vera mouthwash may reduce radiation-induced oral mucositis in head and neck cancer patients. Chinese journal of integrative medicine. 2012 Aug 1;18(8):635-40.
14. López-Jornet P, Camacho-Alonso F, Molino-Pagan D. Prospective, randomized, double-blind, clinical evaluation of A loe vera B arbadensis, applied in combination with a tongue protector to treat burning mouth syndrome. Journal of Oral Pathology & Medicine. 2013 Apr;42(4):295-301.
15. Reddy RL, Reddy RS, Ramesh T, Singh TR, Swapna LA, Laxmi NV. Randomized trial of aloe vera gel vs triamcinolone acetonide ointment in the treatment of oral lichen planus. Quintessence international. 2012 Oct 1;43(9):793-800.
16. Radwan-Oczko M. Topical Application of Drugs Used in Treatment of Oral Lichen Planus Lesions. Adv Clin Exp Med. 2013;22:893-898.
17. Choonhakarn C, Busaracome P, Sripanidkulchai B, Sarakarn P. The efficacy of aloe vera gel in the treatment of oral lichen planus: a randomized controlled trial. British journal of dermatology. 2008 Mar;158(3):573-7.
18. Patil BA, Bhaskar HP, Pol JS, Sodhi A, Madhu AV. Aloe vera as cure for lichen planus. N Y State Dent J. 2013;79:65-8.
19. Hayes SM. Lichen planus--report of successful treatment with aloe vera. General dentistry. 1999;47(3):268-72
20. Sudarshan R, Annigeri RG, Sree Vijayabala G. Aloe vera in the treatment for oral submucous fibrosis–A preliminary study. Journal of oral pathology & medicine. 2012 Nov;41(10):755-61.
21. Alam S, Ali I, Giri KY, Gokkulakrishnan S, Natu SS, Faisal M, Agarwal A, Sharma H. Efficacy of aloe vera gel as an adjuvant treatment of oral submucous fibrosis. Oral Surgery, Oral Medicine, Oral Pathology and Oral Radiology. 2013 Dec 1;116(6):717-24.
22. Bernardes I, Felipe Rodrigues MP, Bacelli GK, Munin E, Alves LP, Costa MS. Aloe vera extract reduces both growth and germ tube formation by Candida albicans. Mycoses. 2012 May;55(3):257-61.
23. Doddanna SJ, Patel S, Sundarrao MA, Veerabhadrappa RS. Antimicrobial activity of plant extracts on Candida albicans: an in vitro study. Indian Journal of Dental Research. 2013 Jul 1;24(4):401-5
24. Sydiskis RJ, Owen DG, Lohr JL, Rosler KH, Blomster RN. Inactivation of enveloped viruses by anthraquinones extracted from plants. Antimicrobial agents and chemotherapy. 1991 Dec 1;35(12):2463-6.
25. H. I. Thomson, PDR for Herbal Medicines, Thomson PDR, Montvale, NJ, USA, 3rd edition, 2004.
26. Mpiana PT, Tshibangu DS, Kilembe JT, Gbolo BZ, Mwanangombo DT, Inkoto CL, Lengbiye EM, Mbadiko CM, Matondo A, Bongo GN, Tshilanda DD. Aloe vera (L.) Burm. F. as a Potential Anti-COVID-19 Plant: A Mini-review of Its Antiviral Activity. European Journal of Medicinal Plants. 2020 May 24:86-93.
27. Mpiana PT, Tshibangu DS, Kilembe JT, Gbolo BZ, Mwanangombo DT, Inkoto CL, Lengbiye EM, Mbadiko CM, Matondo A, Bongo GN, Tshilanda DD. Identification of potential inhibitors of SARS-CoV-2 main protease from Aloe vera compounds: a molecular docking study. Chemical Physics Letters. 2020 Sep 1;754:137751.
28. Davis RH, Donato JJ, Hartman GM, Haas RC. Anti-inflammatory and wound healing activity of a growth substance in Aloe vera. Journal of the American Podiatric Medical Association. 1994 Feb;84(2):77-81.
29. Ajmera N, Chatterjee A, Goyal V. Aloe vera: It's effect on gingivitis. Journal of Indian Society of Periodontology. 2013 Jul;17(4):435-8.
30. Bhat G, Kudva P, Dodwad V. Aloe vera: Nature's soothing healer to periodontal disease. Journal of Indian society of periodontology. 2011 Jul;15(3):205-9.

31. Rieger L, Carson RE. The clinical effects of saline and aloe vera rinses on periodontal surgical sites. Journal-Oklahoma Dental Association. 2002;92(3):40-3.
32. Poor MR, Hall JE, Poor AS. Reduction in the incidence of alveolar osteitis in patients treated with the SaliCept patch, containing cemannan hydrogel. Journal of oral and maxillofacial surgery. 2002 Apr 1;60(4):374-9.
33. Jettanacheawchankit S, Sasithanasate S, Sangvanich P, Banlunara W, Thunyakitpisal P. Acemannan stimulates gingival fibroblast proliferation; expressions of keratinocyte growth factor-1, vascular endothelial growth factor, and type I collagen; and wound healing. Journal of pharmacological sciences. 2009;109(4):525-31.
34. George D, Bhat SS, Antony B. Comparative evaluation of the antimicrobial efficacy of Aloe vera tooth gel and two popular commercial toothpastes: An in vitro study. Gen Dent. 2009 Jan 1;57(3):238-41.
35. Bertolini PF, Biondi Filho O, Pomilio A, Pinheiro SL, Carvalho MS. Antimicrobial capacity of Aloe vera and propolis dentifrice against Streptococcus mutans strains in toothbrushes: an in vitro study. Journal of Applied Oral Science. 2012 Feb;20(1):32-7.
36. Bhardwaj A, Ballal S, Velmurugan N. Comparative evaluation of the antimicrobial activity of natural extracts of Morinda citrifolia, papain and aloe vera (all in gel formulation), 2% chlorhexidine gel and calcium hydroxide, against Enterococcus faecalis: An in vitro study. Journal of conservative dentistry: JCD. 2012 Jul;15(3):293-7.
37. Athiban PP, Borthakur BJ, Ganesan S, Swathika B. Evaluation of antimicrobial efficacy of Aloe vera and its effectiveness in decontaminating gutta percha cones. Journal of conservative dentistry: JCD. 2012 Jul;15(3):246-8.
38. Sudworth R. Philadelphia: Positive Health Publications Ltd; 2002. The use of Aloe Vera in Dentistry.
39. Kriplani R, Thosar N, Baliga MS, Kulkarni P, Shah N, Yeluri R. Comparative evaluation of antimicrobial efficacy of various root canal filling materials along with aloevera used in primary teeth: a microbiological study. Journal of Clinical Pediatric Dentistry. 2013 Apr 1;37(3):257-62.
40. Gupta N, Bhat M, Prabha Devi G. Aloe-Vera: A Nature's Gift to Children. International journal of clinical pediatric dentistry. 2010 May;3(2):87-92
41. Tello CG, Ford P, Iacopino AM. In vitro evaluation of complex carbohydrate denture adhesive formulations. Quintessence international. 1998 Sep 1;29(9):585-93
42. Moore TE. Aloe vera: Its potential use in wound healing and disease control in oral conditions. The International Aloe Science Council. 1996.
43. Pareek S, Nagaraj A, Sharma P, Atri M, Walia S, Naidu S, Yousuf A. Disinfection of dental unit water line using aloe vera: in vitro study. International journal of dentistry. 2013 Jan 1;2013.
44. Tayal E, Sardana D, InduShekar KR, Saraf BG, Sheoran N. Current perspectives on use of Aloe vera in dentistry. European Journal of Medicinal Plants. 2014 Jul 30:1408-19.
45. Guo X, Mei N. Aloe vera: A review of toxicity and adverse clinical effects. Journal of Environmental Science and Health, Part C. 2016 Apr 2;34(2):77-96.