Review Article

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ALOE VERA: A POTENTIAL HERB IN DENTISTRY

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ABSTRACT:

In India, plant products and plant-derived drugs have been used therapeutically for centuries. Aloe Vera is one such plant that has been gaining popularity in the present scenario in dentistry. The name Aloe Vera is derived from the Arabic word “Alloeh” meaning “shining bitter substance,” while “vera” in Latin means “true”. This review will summarize the historical aspect, chemical, pharmacological action and dental application of Aloe Vera.

Keywords: Aloe Vera, Acemannan, Dentistry

INTRODUCTION:

Herbs having medicinal properties play a heedful role in ailments of various chronic diseases. Phytotherapy, also known as phytomedicine, has been an integral part of Eastern and Western Medicine since 2000 B.C.[1] Herbal medications are prepared from natural chemicals derived from a plant in a specific concentration. Plant extracts represent a continuous effort to find new compound against pathogens.[2] According to World Health Organisation, medicinal plants would be the best source for obtaining a variety of drugs.[3] The natural phytochemicals isolated from medicinal plants used in traditional medicine have been considered useful alternatives to synthetic drug and are widely used for prevention and treatment of oral diseases.[4] Among the various currently available herbal agents the most popular and currently receiving a lot of scientific attention is Aloe Vera. The name Aloe Vera is derived from the Arabic word “Alloeh” meaning “shining bitter substance,” while “vera” in Latin means “true”.[5] This review will summarize the historical aspect, chemical, pharmacological action and dental application of Aloe Vera.

History:

The plant Aloe Vera has a history dating back to biblical times. Aloe made its first documented appearance on the world stage in 2200 B.C.E. Aloe Vera has been used for medicinal purposes in several cultures for millennia: Greece, Egypt, India, Mexico, Japan and China. Egyptian queens Nefertiti and Cleopatra used it as part of their regular beauty regimes. The Ebers Papyrus dated from 1552 B.C.E. documents 12 different formulas for mixing aloe with various agents to create internal and external remedies.

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Alexander the Great, and Christopher Columbus used it to treat soldiers' wounds. The first reference to Aloe Vera in English was a translation by John Goodyew in A.D. 1655 of Dioscorides' Medical treatise De Materia Medica.[5] Aloe Vera was first cultivated for pharmaceutical distribution in 1920.[6]

Properties of Aloe Vera: It belongs to Asphodelaceae (Liliaceae) family; Its Botanical Name(s) are Aloe barbadensis, Aloe indica, Aloe arbados, Aloe Vera. Popular Name(s) are Aloe, Aloe Vera, Indian Alces, Kumari, Ghirita, Gawarpaltra, Barbados aloe, Curacao aloe and Lu hui etc.

It is a shrubby or arborescent, perennial, xerophytic, succulent, pea- green color plant. This plant is highly resistant to insect pests and comes under 'Arbuscular plants' which has the fungus Arbuscular Mycorrhiza on the surface. This fungus penetrates inside and helps in absorption of potassium and other minerals from the soil. It grows mainly in the dry regions of Africa, Asia, Europe and America. In India, it is found in Rajasthan, Andhra Pradesh, Gujarat, Maharashtra and Tamil Nadu. [7]

Anatomy

The plant has triangular, fleshy leaves with serrated edges, yellow tubular flowers and fruits that contain numerous seeds. Each leaf is composed of three layers: 1) An inner clear gel that contains 99% water and rest is made of glucomannans, amino acids, lipids, sterols and vitamins. 2) The middle layer of latex which is the bitter yellow sap and contains anthraquinones and glycosides. 3) The outer thick layer of 15–20 cells called as rind which has protective function and synthesizes carbohydrates and proteins. Inside the rind are vascular bundles responsible for transportation of substances such as water (xylem) and starch (phloem).[8]

Chemical Constituents: Aloe contains two classes of Aloins: (1) nataloins, which yield picric and oxalic acids with nitric acid, and do not give a red coloration with nitric acid; and (2) barbaloins, which yield aloetic acid ($C_7H_2N_3O_5$), chrysammic acid ($C_7H_2N_2O_6$), picric and oxalic acids with nitric acid, being reddened by the acid. This second group may be divided into a-barbaloins, obtained from Barbados aloes, and reddened in the cold, and b-barbaloins, obtained from Socotrine and Zanzibar aloes, reddened by ordinary nitric acid only when warmed or by fuming acid in the cold. Nataloin forms bright yellow scales. Barbaloin forms yellow prismatic crystals.[9] Table-1 shows the chemical constituents of Aloe Vera with their activity. [9-12]

Pharmacological Action:

Wound healing property: Glucomannan, a mannose-rich polysaccharide and gibberellin, a growth hormone, interacts with growth factor receptors on the fibroblast, thereby stimulating its activity and proliferation, which in turn significantly increases collagen synthesis after topical and oral Aloe Vera application.[13]

In vitro and in vivo studies conducted by Davis et al[14] showed healing with fibroblast proliferation. Wound healing by means of growth factors such as gibberellins, auxin and mannose phosphate, which bind to insulin-like growth factor receptor to improve healing, is also seen. Yagi et al[15] stated

presence of glycoprotein with cell proliferation improves healing.

Anti-inflammatory property: Aloe Vera has shown to inhibit the cyclooxygenase pathway and reduces prostaglandin E2. C-glucosyl chromone an anti-inflammatory compound and peptidase bradykinase was isolated from the gel of Aloe Vera.[16]

Antibacterial Property: The inner gel of Aloe Vera acts against both Gram-positive and Gram-negative bacteria. Hegger et al [17] showed its antibacterial properties against Streptococcus pyogens, Streptococcus faecalis. Aloe Vera gel reportedly was bactericidal against Pseudomonas aeruginosa.[18]

Antifungal Property: A processed Aloe Vera gel preparation reportedly inhibited the growth of Candida albicans. The purified Aloe protein has been found to exhibit effective activity against Candida paraprilosis, Candida krusei and Candida albicans.[19]

Antiviral Property: Aloe emodin and Anthraquinones extracted from the inner leaf in Aloe Vera makes it virucidal to Herpes simplex virus type 1 and type 2, Varicella zoster virus, pseudo rabies virus and influenza virus according to the research of Thomson.[20] Fractions of Aloe Vera gel containing lectins directly inhibited the cytomegalovirus proliferation in cell culture, perhaps by interfering with protein synthesis.[21]

Immunomodulating Effects: Aloe Vera, a great immune stimulant, contains 90% rhodium and iridium (trace minerals) in the acemannan which is one of the polysaccharides which dramatically increases the white blood cells or macrophages and T cells.[22,23]

Antioxidant Property: Glutathione peroxide activity, superoxide dismutase enzymes and a phenolic antioxidant present in Aloe Vera gel, were responsible for antioxidant effects. Free radical components Vitamins A, C and E get rid of the toxins and carcinogenic properties in our bodies.[24]

Antitumor Effect: studies have shown that the glycoproteins (lectins) and polysaccharides present in Aloe Vera have anticancer effects. Different studies indicated antitumor activity for Aloe Vera gel in terms of reduced tumor burden, tumor shrinkage, tumor necrosis, and prolonged survival rates.[25]

Uses in dentistry:

Apthous Stomatitis: Aloe Vera oral gel is effective in decreasing the recurrent apthous stomatitis patient's pain score and wound size. It also decreases the wound healing period. Direct application of the gel on acute mouth lesions show tremendous improvement.[26] Acemannan, which is one of the polysaccharide components in Aloe Vera, accelerates the healing of aphthous ulcers and reduces the pain associated with them. US Food and Drug Administration has also found a derivative of Aloe Vera an effective treatment alternative in treating oral ulcers.[27]

Oral lichen planus: Clinical study conducted on oral lichen planus patients by Choonakaran C et al found Aloe Vera gel was effective in improving clinical and symptomatological improvement. The efficacy of Aloe Vera gel in the treatment of oral lichen planus: a randomized controlled trial.[28]

Oral submucous fibrosis: Aloe Vera gel is effective in case of osmf when compared with antioxidant better improvement in mouth opening and reduction of burning symptoms was found.[29]

Burning mouth syndrome : Burning mouth syndrome is the most common among woman in middle aged to elderly aged groups. Clinical studies have confirmed the potential of topical Aloe Vera gel in combination with tongue protector (glycerine) showed an improvement in burning mouth symptoms.[30]

Alveolar Osteitis: SaliCept Patch, a special medical bandage a freeze-dried pledget that contains Acemannan Hydrogel obtained from the clear inner gel of Aloe Vera. It has shown improved healing & formation of blood clot when placed in extraction sockets.[31]

Denture Adhesive: Acemannan have good adhesive properties. It is this property that led to the production of prototype acemannan denture adhesives. 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.[32]

Anticariogenic Activity: Aloe Vera gel exerted strong bactericidal activity against both cariogenic and periodontopathic bacteria. Undiluted Aloe Vera gel produced significant growth inhibition zones against all of the oral bacteria tested.[33]

Aloe Vera in Endodontics: It has been used in root canal treatment as a sedative dressing and file lubrication during biomechanical preparation. Aloe Vera has proved a good antibacterial (because of anthraquinones) against E. Faecalis if used in root canals. Antibacterial efficacy of Aloe Vera extract on resistant antimicrobial strains in endodontics .[34,35] Aloe Vera gel has been found to be effective in decontaminating GP cones within one minute.[36]

Pulpotomy of primary tooth: Aloe Vera gel was found to be effective when it was applied to the remaining pulp stumps followed by non eugenol cements and permanent restoration. There was no evidence of abscess, mobility, pain or swelling was found.[37]

Obturation of primary teeth: Aloe Vera with sterile water found to have maximum antimicrobial activity when compared with calcium hydroxide, iodoform (metapex) and Vaseline (control).[38]

Aloe Vera in periodontal disease: 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.[39] Aloe Vera when used at full strength reduced accumulated plaque significantly. It is extremely helpful in the treatment of gingivitis and periodontitis. Local drug delivery of Aloe Vera gel results in improvement of periodontal condition.[40] Aloe Vera tooth gel has shown to reduce sensitivity.[41] Noskova used Aloe Vera to treat early stages of periodontitis and got good results. The treatment of periodontitis by injections of aloe extract and their influence on the phosphorus-calcium metabolism.[42]

Dental Implants: Aloe Vera gel placed around dental implants is found effective to reduce inflammation. Aloe Vera reduces inflammation by its antimicrobial & anti-inflammatory effects.[43]

Aloe Vera As A toothpaste: Eventhough the Aloe Vera tooth gel has no added fluoride content as compared to commercially available toothpaste it still exerts almost an equal amount of antimicrobial activity.[44] It is a better alternative for people with sensitive teeth or gums since it contains less abrasives.[45] Studies using Aloe Vera in toothpastes have shown that Aloe Vera tooth gel and the toothpastes were equally effective against Candida albicans, Streptococcus mutans, Lactobacillus acidophilus, Enterococcus faecalis, Prevotella intermedia and Peptostreptococcus anaerobius. Aloe Vera tooth gel demonstrated enhanced antibacterial effect against S. Mitis.[44]

Aloe Vera as A Mouthwash: Aloe Vera Mouthwash prevents radiation-induced mucositis by its wound healing and anti-inflammatory mechanism.[46] It reduce 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, then swallowed, three time daily.[47]

Side effects: On topical application it may cause redness, burning, stinging sensation and rarely generalized dermatitis in sensitive individuals. It is preferred to apply it to a small area first to test for possible allergic reaction. Aloe Vera when taken orally may cause abdominal cramps, diarrhoea, red urine, hepatitis, dependency or worsening of constipation. Prolonged use has been reported to increase the risk of colorectal cancer. Laxative effect may cause electrolyte imbalances (low potassium levels).[7]

Contraindications: Contact dermatitis and hypersensitivity reactions after topical applications of Aloe Vera gel have been noted in some cases. Hence it is contraindicated in cases of known allergy to plants in the Liliaceae family. Oral use of Aloe Vera in children under 10 years of age is contraindicated.

Aloe should not be used during pregnancy or lactation except under medical supervision. Aloe Vera gel for systemic application is not recommended in combination with antidiabetic, diuretic, or laxative drugs; sevoflurane; or digoxin. In diabetic patients, increased hypoglycemia might be seen in conjunction with oral antidiabetics or insulin.

Application of aloe to skin may increase the absorption of steroid creams such as hydrocortisone. It reduces the effectiveness and may increases the adverse effects of digoxin and digitoxin, due to its potassium lowering effect. Combined use of Aloe Vera and furosemide may increase the risk of potassium depletion. It decreases the blood sugar levels and, thus, may interact with oral hypoglycaemic drugs and insulin.[7]

CONCLUSION:

Aloe Vera is a potential herb for many oral problems. Since it is quite economical; it will markedly reduce medical cost to the patients. Since its gaining popularity nowadays Extensive research on its healing properties,

antibacterial, anti-inflammatory properties and releasing pattern as a local drug delivery system in the field of dentistry is required. Researchers should be encouraged to conduct controlled studies to prove the effectiveness and safety of this kind of natural dental products.

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