INTERNATIONAL JOURNAL OF MEDICAL AND APPLIED SCIENCES
eISSN:2320-3137
Earthjournals Publisher
www.earthjournals.in

REVIEW ARTICLE

BENEFICIAL ROLE OF ALOE VERA IN ORAL CAVITY – A REVIEW

Divya Pandya

Post Graduate Student, Hitkarini Dental College and Hospital, Jabalpur, M.P, India

Corresponding author: Dr. Divya Pandya

Publication history: Received on 4/8/2016, Published online 15/08/2016

ABSTRACT:
Aloe vera is one of the plant species which has multiple uses to mankind. It has been widely used for ages as an alternative medicine and also as a cosmetic product. Because of its rejuvenating, soothing and healing properties, it has been used for various medical ailments like skin disorders, arthritis, asthma, digestive and bowel disorders, diabetes and lowering lipid levels in hyper-lipidemic patients and also in oral problems like apthous ulcers, gingivitis and periodontitis, various fungal and viral diseases, lichen planus, submucous fibrosis, pulpotomy of primary teeth and many more. This review article is about the different uses and benefits of aloe vera in field if Dentistry.
Key words: Aloe vera, Dentistry, Herbs, Plant products

INTRODUCTION

Natural products are known to play an important role in Pharmaceutical biology. One of the earliest books on the subject of natural medicine was the Rig Veda, compiled in India between B.C.E. 4500 and B.C.E. 1600. It lists hundreds of plants deemed useful in medicine and is considered as the pioneer for alternative medicine. Natural antimicrobials can be derived from barks, stems, leaves, flowers and fruits of plants, various animal tissues or from microorganisms. The first milestone in Western man's detailed understanding of medicinal plants was the work of Hippocrates (460B.C- 375B.C.), the father of modern medicine. Even today, the World Health Organization estimates that up to 80% of people still rely mainly on traditional medicines. In fact, many of the current drugs either mimic naturally occurring molecules or have structures that are fully or in part derived from natural motives.[1]

HISTORY

The plant aloe vera has a history dating back to biblical time.[2] The name Aloe Vera derives from Arabic word :Alloeh" meaning :Shining bitter substance" while "Vera" in Latin means "True". 2000 years ago, the Greek scientists regarded it as universal panacea. The Egyptians called Aloe "the plant of immortality".[3-6,7,8] The first detailed discussion of Aloe's medicinal value was found in the Papyrus Ebers, an Egyptian document written around B.C.E. 1550. In 2200 B.C., it has been mentioned on Sumerian clay tablets. Ebers Papyrus in 1550 B.C. stated that 12 recipes for mixing *Aloe* with other agents were used to treat human disorders in Egyptian queens Cleopatra and Nefertiti. Both gave importance to *A. vera* as being an important contributor to their beauty. It was extensively traded in the Near East and Asia in 400 B.C. In 333 B.C. the Island of Socotra was

captured by Alexander the great because of its *Aloe* supplies. Later in 68 A.D. Dioscorides wrote a detailed description of *A. vera* and all of its uses. In 200 A.D. *A. vera* became an important part of Roman medicine and became extremely popular in Europe in the centuries to come. In 1500 A.D. it was introduced to the new world by the conquistadors. In 1655 A.D. John Goodyew mentioned about *A. vera* in his book "Dioscorides Medical treatise De Materia Medic."
In 1934, *A. vera* was published in the modern medical paper. It describes how the whole leaf was used to treat radiation dermatitis. Many papers were published in the 20th century describing a wide range of medicinal properties. Reports have mainly focused on the anti-diabetic, anticancer and antimicrobial properties of the whole leaf, gel, or juice of the plant. Many species of *Aloe* have been studied.[4,5,9,10]

Composition of Aloe Vera

Aloe vera looks like a catus but it isn't – the plant is a member of the lily family which includes garlic and onion. The aloe plant is grown in warm tropical areas and cannot survive freezing temperatures. There are many species of aloe grown around the world but the main medicinal one is Aloe vera Barbadensis. Aloe vera a popular herbal remedy used medicinally for thousand years has multiple dental uses. It has been shown to enhance defence mechanisms, and has variety of components to help combat periodontal diseases and other oral conditions. The pharmacologic actions of aloe vera as studied invitro or in animals include anti-inflammatory anti-arthritic, antibacterial, anti-viral and anti-fungal. The Aloe barbadensis plant consists of two different parts, each of which produces substances with completely different compositions and therapeutic properties. The parenchymal tissue makes up the inner portion of the aloe leaves and produces the aloe vera gel (or mucilage), a clear, thin, tasteless, jelly-like material. This tissue is recovered from the leaf by separating the gel from the inner cellular debris. The other part of the plant is a group of specialized cells known as the pericyclic tubules, which occur just beneath
the outer green rind of the leaf. These cells produce an exudate that consists of a bitter yellow latex with powerful laxative-like actions. This exudate, which is not to be confused with the gel/mucilage from the parenchymal leaf tissue—is available commercially. The composition of aloe vera is complex. It consists of 75 different ingredients including vitamins, minerals, enzymes, sugars, anthraquinones or phenolic compounds, lignin, saponins, sterols, amino acids and salicylic acid. The plant contains vitamins A, C and F. Vitamins B (thiamine), niacin, vitamin B2 (riboflavin), choline and folic acid along with traces of vitamin B12. Enzymes such as acid phosphatase, alkaline phosphatise, amylase, lactic dehydrogenase and lipase. When taken orally, these biochemical catalysts, amylase and lipase aid in digestion by breaking down fats and sugars. Yamaguchi et al reported the presence of aluminium, sodium, potassium, calcium, magnesium, manganese, copper, zinc, chromium and iron in the aloe plant. Sheldon MS reported that magnesium lactate inhibits histidine decarboxylase and prevents the formation of histamine from the amino acid, histadine. The prevention of its formation may explain the antipuritic effect of aloe vera. Sugars are derived from the mucilage layer of the plant, surrounding the inner parenchyma or gel. They form 25 per cent of the solid fraction and comprise both mono- and polysaccharides. When taken orally, some of these bind to receptor sites that line the gut and form a barrier, to prevent 'leaky gut syndrome'.

Others are ingested by process of cellular absorption known as pinocytosis. Anthraquinones are the phenolic compounds are found in the aloe vera. The aloes consist of free anthraquinones and their derivatives: Barbaloin, lsobarbaloin, Anthrone-C-glycosides and chromones. In large amounts these compounds exert a strong purgative effect, but in smaller they appear to aid in absorption from the gut, are potent antimicrobial agents and possess powerful analgesic effects. Topically, they can absorb ultra violet light, inhibit tyronase activity, and reduce the formation of melanin and any tendency to hyper-pigmentation. Lignin present in aloe vera is a woody substance, inert in itself, endows topical aloe preparations with their penetrative ability to carry other active ingredients deep into the skin to nourish the dermis. Saponins are soapy substances form 3 percent of the gel and are general cleansers, having antiseptic properties. These act powerfully as anti-microbials against bacteria, viruses, fungi and yeasts. Cholesterol, Campesterol, b. Sisosterol and Lupeol are fatty acids present in aloe vera. These four plant steroids are important anti-inflammatory agents. Salicylic acid is an aspirin-like compound possessing anti-inflammatory and antibacterial properties. Topically, it has a kerolytic effect which helps to debride a wound of necrotic tissue. Amino acids are the building blocks of proteins. Aloe vera gel provides 20 of the 22 necessary amino acids required by the human body and seven of the eight essential amino acids which the body can not synthesize.[2,10-13]

Route of administration

As an external application, it is currently available in the market in the form of gels, extracts, hair oils, deodorant sticks, face powders and tooth pastes.[1,9,12,13] Among all these external uses, the most widely and commonly used form is A.vera gel. As an ingestible natural medicine, A.vera can be taken in the form of juice, capsules, powders, granules, sap, yoghurt, desserts, herbal tea and tablets.[9,12,14]

BIOLOGICAL PROPERTIES OF ALOE VERA

Moisturizing and anti-ageing effect - The aloe gel is a mix of water and polysaccharide component making into a jelly- like consistency. Hence, it can minimize evaporation and prevent drying of tissues. It is thus, used for general itching, psoriasis, acne, eczema. Many cosmetic products also use aloe vera to provide moisturizing effect and to improve the elasticity of skin.[2,4,8-13,15]

Anti-inflammatory effect - Aloe Vera inhibits the cyclooxygenase pathway and reduces prostaglandin E2 production from arachidonic acid. The peptidase brady kinase isolated from Aloe cause break down the bradykinin, an inflammatory substance inducing pain. Thus, aloe vera can be used for skin infections, minor burns, grazes, insect stings etc.[3,4,6-9,11-13,15]

Healing effects - Glucomannan, amannose rich polysaccharide and gebbeerillin (growth hormone), interacts with growth factor receptors on the fibroblast stimulates its activity and proliferate, which in turns significantly increases collagen synthesis, increases cell migration and keeping the wound moist.[2-4,7-9,11-13,15]

Antibacterial, antifungal and antiviral effects - Streptococcus pyogenes and streptococcus faecalis are two microorganisms which have been inhibited by the aloe vera gel. It enhances the wound healing process by eliminating the bacteria which contributes to inflammation. Aloe vera has found to inhibit the growth of Candida albicanas. It has an antiviral effect against herpes simple's virus type 1 and 2 and also against varicella-zoaster, influenza virus and pseudorabiees virus.[2-4,6-9,11-13,15]

Protective effects – Aloe vera gel administered to the skin exposed to UV and gamma radiation will generate an antioxidant protein, metallothionenin in the skin which scavenges hydroxyl radicals and prevent suppression of superoxide dismutase and glutathione peroxidase in the skin. Aloe Vera gel has protective effect against radiation damage to the skin.[3,8,12,15]

Antioxidant effects - Isorabaichromone, feruoylaloesin and p-coumaroylalosin from aloe showed patent free radical and superoxide anion-scavenging activities in an assasy using lipid per oxidation rat liver microsomal system as the free radical generator. It also contains vitamin A, C and E.[4,6,7,12,15]

Immune system effects - Alprogen inhibits calcium influx into the mast cells hence inhibiting the antigen-antibody mediated release of histamine and leukotrine from the mast cells. Acemannan stimulates the synthesis and release of IL-1 and tumor necrosis factor from macrophages which initiates immune attack which results in necrosis and regression of the cancerous cells.[2-4,6-8,15]

Antiseptic effects - Luperol, salicyclic acid, urea, nitrogen, cinnamonic acid, phenols and sulfur present in aloevera have inhibitory action on fungi, bacteria and virus.[3,8,15]

Antitumor effects – An induction of glutathione S-transferase and an inhibition of tumor promoting effect of phorbol myristic acetate has also been reported suggesting possible benefit of using aloe gel in cancer chemotherapy.[2,4,6-9]

Laxative effects – Antraquninones present are latex are potent laxative. It increases intestinal water content, stimulates mucus secretion and increases intestinal persitalsis.[3,4]

GENERAL APPLICATIONS OF ALOE VERA

Aloe vera has multiple uses to mankind. It is used in treatment of following conditions –

1. Skin burns
2. Itch relief
3. Juice to reduce cholesterol and weight management
4. Ulcerative colitis, digestive disorders like ulcers, heartburn, irritable bowel syndrome and constipation
5. Eliminating dandruff and as a scalp conditioner, styling products to fight frizzy hairs
6. Skin moisturizer and hand sanitizer
7. Yeast infection[12]

8. Alkalizes body and helps in detoxification
9. Regulation of blood pressure, improving circulation and oxidation of blood, lowering of cholesterol and making blood less sticky and lowers the risk of cardiovascular diseases
10. Weight loss[14]
11. Diabetes
12. Rheumatoid artheritis[9]

ROLE OF ALOE VERA IN ORAL CAVITY

Aloe vera in dental caries - There exists a strong bactericidal activity of aloe vera gel against cariogenic bacteria. This activity is attributed to a number of pharmacologically active compounds including anthraquinones, aloin, aloe-emodin, aloetic acid, anthracine, aloe mannan, aloeride, antranol, chrysophanic acid, resistanol, and saponin. Aloin and aloe-emodin possess strong antibacterial and antiviral activities. Aloin and aloe-emodin have polyphenolic structures, which can inhibit protein synthesis by bacterial cells, thus explaining their antimicrobial activity. This characteristic may also explain the anti-inflammatory activity of aloe vera gel. Acemanan promotes dentin formation by stimulating primary human dental pulp cell proliferation, differentiation, extracellular matrix formation, and mineralization.[1]

Aloe vera in gingivitis and periodontitis – Aloe vera is a natural product contained in herbal dentifrices for plaque control and gingivitis. Clinical effects of aloe vera showed a significant reduction of gingivitis and plaque accumulation after use of a mouthrinse containing aloe vera.[1] Applications of A.vera tooth gel directly to the site of periodontal surgery along with periodontal dressing or to gum tissues when they have been traumatized with a tooth brush dentrifice abrasion, sharp foods, dental floss and toothpick injuries, have shown improved healing properties.[9] It also reduces swelling of soft tissues and reduces gingival bleeding.[12] Aloe gel does not contain abrasive elements as present in commercial tooth paste.[3,6,7,9,15]The microcirculation of wound is enhanced by aloe, increasing oxygenation. Aloe blocks action of catecholamines, thus increases epithelisation. Aloe vera increases cross linking of collagen. The Type I/ Type III collagen ratio of aloe treated wounds is low, indicating increased Type III collagen. The levels of hyaluronic acid and dermatan sulphate, the main constituents of ground substance are high in aloe treated wounds. Acemmanan acts as a macrophage stimulator. The decrease in gingival index can be attributed to presence of sterols as anti-inflammatory agents and lupeol as an antiseptic analgesic. Existing evidence indicates that aloe vera used in variety of concentrations is effective in shortening the duration of wound healing. Aloe vera penetrates and dilates capillaries to an injured site, which improves healing.[1] George D et al conducted an in-vitro investigation to compare the anti-microbial effectiveness of aloe vera tooth gel with twopopular, commercially available dentrifices and concluded that aloe vera gel demonstrated enhanced antibacterial effect against S.mitis and aloe vera gel and tooth pastes were equally effective against Candida Albicans, Streptococcus mutans, Lactobacillus acidophilus, Enterococcus Faecalis, Prevotella intermedia and Peptostreptococcus anerobius.[16] Virdi et al conducted a randomized single-blind split mouth study on 20 patients with 5 mm periodontal pockets

bilaterally with scaling and root planning (SRP) performed on 1 side and on contralateral side along with SRP aloe vera gel was applied in periodontal pockets and obtained significant improvement in pocket depth and gingival index on the side where aloe vera gel was used with SRP.[17]

Alovera in lichen planus - Acemannan, the major carbohydrate fraction in the gel, is a water-soluble long chain mannose polymer which accelerates wound healing, modulates immune function particularly MMP (Matrix metalloproteinase) activation and production of cytokines. The gel also contains bradykininase, an anti-inflammatory agent, magnesium lactate, which helps prevent itching, and salicylic acid and other antiprostaglandin compounds which relieve inflammation.[1] Topical application of Aloe vera 3 times a day, provides pain relief, improves the oral lesions and quality of life of patients. Pain and burning in oral lichen planus and pruritis on skin can be relieved with the use of Aloe vera juice and topical Aloe vera application. Steroids being the mainstay treatment modality in lichen planus, but is associated with multiple systemic complications which provides Aloe vera an added advantage due to its lesser side effects.[10,15]

Aloe vera in oral submucous fibrosis – Aloe vera reduces the burning sensation and improves mouth opening thereby enhanced the patient's compliance. Aloe vera penetrates and dilates capillaries to an injured site, which improves healing.[1,7,15]

Aloe vera in Endodontics - Elimination of the microorganisms and prevention of re-infection within the pulp canal are the main objectives of the pulp space therapy. Aloe vera is recommended in its application in root canals as a sedative dressing and as a file lubricant.[1] The nerve ends in a root canal are very sensitive. Aloe vera gel greatly helps to lessen its sensitivity. This gel can be placed inside the pulp chambers while broaching to make aloe work in pulp canals. Aloe can also be used as a canal lubricant. During closed dressings cotton pellet with CMCP drops could be added with a drop of aloe vera gel and then sealed with temporary restorations.[3] It contains alloins and barbaloins as main chemical constituents. Its bactericidal activity is found to be less than $Ca(OH)_2$.[1,6,7]

Aloe vera has been successfully used in pulpotomy of primary teeth which relives symptoms and also prevents re-infection.

Aloe vera has proved to be a good obturative material for primary teeth and also as an efficient intracanal medicament because of anthraquinones against E. faecalis in root canals.

Aloe vera has also been found to be effective in disinfection of gutta percha cones.[4-7,10,15]

Aloe vera in apthous ulcer - Aphthous stomatitis is a chronic self limiting condition of the oral cavity. Aloe vera inhibits acute inflammation but unlike steroids it stimulates fibroblast growth to improve wound healing. Acute mouth lesions are improved by direct application in gel form on aphthous ulcers. Aloe vera activates collagen production by way of mannose-6-PO4 binding to receptors of fibroblasts. Also acemanan present in aloe vera accelerates the collagen synthesis. It has been reported that acemannan hydrogel present in aloe gel accelerates the healing of aphthous ulcers and reduces the pain associated with them.[1,6-8,10,15]

Aloe vera and Herpes simplex virus - Topical administration of aloe vera has been widely used for wound healing. Aloe vera has direct antiviral activity against HIV1 by inhibiting glycosylation of glycoproteins. It acts synergistically with AZT or acyclovir by inhibiting the replication of HIV and HSV1.[1,10]

Aloe vera and alveolar ostetitis - Extraction sites heal properly and dry socket formation is prevented when aloe vera is applied on extraction site. Aloe vera consists of glucomannnan and giberrelins which function to stimulate fibroblast to proliferate faster in wound area and to accelerate wound healing with epithelial cell proliferation as well as to prevent infection which could inhibit wound healing. Clinical studies have shown its efficacy in acceleration of wound healing in postderm-abrasion, partial thickness of wounds, and pressure ulcers. Freeze-dried acemannan was also shown to be effective against painful dry socket treatment as a result of dental procedure complications.[1,3,6-8,10,13,15]

Aloe vera and denture adhesive – It is sticky and viscous nature of gel. Acemannan, a complex mannose carbohydrate derived from the aloe vera plant, has an inherent viscosity, which makes it ideal for denture adhesive formulations. It was found that the bonding effect provides an extremely strong and long lasting hold which prevents dentures from slipping and sliding, thus preventing irritations of the mucosa. Aloe Vera – strengthens the gingiva, soothes and alleviates
irritations like denture sores.[1,3-7,10]

Aloe vera in denture cleaner – Aloe vera gel reportedly was bactericidal against Pseudomonas aeruginosa while acemannan prevented it from adhering to human lung epithelial cells in a monolayer culture. A processed aloe vera gel preparation reportedly inhibited the growth of Candida albicans. It acts as an antifungal agent. This can also be used along with soft liners. The saponins which contain glycosides, are soapy substances that have both cleansing and antiseptic properties.[1,3-6]

Aloe vera in denture stomatitis - Stomatitis can occur from leaving dentures in the mouth while sleeping as well as from smoking or vitamin A deficiencies. Although there are several causes of this disorder, a common cause is due to the fungus Candida Albicans. The antimicrobial effects of aloe vera have been attributed to the plant's natural anthraquinones: aloe emodin, aloetic acid, aloin, anthracine, anthranol, barbaloin, chrysophanic acid, ethereal oil, ester of cinnamonic acid, isobarbaloin, and resistannol.[1]

Aloe vera in dental implants - The aloe gel can be used to stimulate bone growth both around and onto the surface of endosseous dental implants placed in sites with extended periimplant osseous defects. Aloe vera can be used around dental implants to control inflammation from bacterial contamination. As it has antimicrobial and healing properties it helps to improve bone-implant interphase and in preventing periimplantitis. Aloe vera inhibits the cyclooxygenase pathway and reduces prostaglandin production from arachidonic acid. Recently, the novel anti-inflammatory compound called C-glucosyl chromone was isolated from gel extracts.[1,3-7]

Aloe vera and halitosis – As aloe vera is an natural antibacterial and antifungal agent. It boosts ability of body to produce collagen to strengthen swollen gums. Pure aloe vera gel taken ¼ cup dissolved in ½ cup water or apple juice provides relief from acid indigestion, a common cause of halitosis.[3-5,13]

Aloe vera in tooth paste and tooth gel - Aloe Vera is added to toothpaste as an essential ingredient. It is known to be a whitening agent for the teeth. It is also rich in Vitamin K and provides natural protection for those susceptible teeth and gums. Aloe vera in tooth gel is used to cleanse teeth and gingiva as effectively as toothpaste. The aloe vera tooth gel does not contain the abrasives found in most tooth pastes and it is less harsh on teeth. It is a great alternative for people with sensitive teeth or gums.[1,3-9,15,16]

Aloe vera in mouth wash - Mechanical plaque control is the most effective method of controlling plaque and gingivitis. Aloe vera in mouthwash is made using natural ingredients and is free from alcohol and saccharin. Also, aloe vera acts as a natural remedy for halitosis that is caused by pathogenic bacteria and fungi as well as halitosis caused due to digestive problems. This is due to the antimicrobial effect of aloe vera. It contains six antimicrobial agents such as lupeol, salicylic acid, urea, nitrogen, cinnamonic acid, phenols and sulfur which have inhibitory action on fungi, bacteria and viruses. It also helps protect the soft tissues of the oral cavity, reducing the likelihood of halitosis.[1] It also prevents radiation induced mucositis by its wound healing and anti-inflammatory mechanism. It reduces oral candidiasis in patients undergoing head and neck radiotherapy due to its antifungal and immunomodulatory properties. 1-3 tablespoon of aloe vera juice can be used as a mouth wash, then swallowed three times daily.[3-7]

Aloe vera in dental floss - Dental floss acts as an interdental mechanical aid to promote plaque removal. The aloe vera containing eco floss helps remove plaque from interdental areas that the toothbrush cannot reach, and thus helps prevent periodontal disease and dental caries. Also the antimicrobial and healing properties add to the flossing effect. The aloe vera containing floss has a smoother finish and is gentle as compared to the organic (beeswax) and synthetic floss (nylon). The commercial studies conducted on the product efficacy have shown better results with aloe vera floss.[1]

Aloe vera in gloves - Dental health-care personnel frequently suffer from occupationally-related dermatitis due to frequent use of gloves and hand hygiene. An innovative dry-coating technology has produced a new concept - an examination glove that gradually delivers aloe vera gel to the skin of the gloved hand. Extensive research indicates that aloe helps reduce inflammation, enhance skin hydration and moisturizes the skin. Aloe vera contains saponins which are soapy substances that have both cleansing and antiseptic properties.[1]

Other uses of aloe vera in dentistry –

1. Disinfectant of irrigation units[10,15]
2. Chemical burns from aspirin
3. Canker sores and cracks occurring at mouth corners
4. Gum abscess

5. Burning mouth syndrome
6. Benign pemphigus, migratory glossitis[2-4]

Side effects

Topical – Redness, burning, stinging sensation and rarely generalized dermatitis in sensitive individuals. Allergic reactions are mostly due to anthraquinones, such as aloin and barbaloin. It is best to apply it to a small area first to test for possible allergic reactions.

Systemic – Abdominal cramps, diarrhea, red urine, hepatitis, dependency or worsening of constipation. Prolonged use has been reported to increase the risk of colorectal cancer. The laxative effect may cause electrolyte imbalances (low potassium levels).[3-5,7,8,12,13,15] Increased hypoglycemia might be seen in conjugation with oral anti diabetics or insulin.[15]

Contraindications and interactions

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.[3-5,7]

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.[3,4,7]

CONCLUSION

The aloe vera is a herb with multiple benefits. It is easy to use and economical to obtain. It has systemic uses along with topical and local uses including in oral cavity. However, safety issues have to be taken in to consideration during long term use.

REFERENCES

1. Mitra R, Kumar V. Unfolding the gift of nature: aloevera in dentistry. IJBAMR. 2015;4(3):94-101
2. Sundarkar P, Govindwar R, Nyamati SB, Alladwar N, Thombre V, Saoni A et al. Use of aloe vera in dentisty. JIAOMR. 2011;23(3):389-91
3. Meena M, Figueiredo NR, Trivedi K. Aloe vera – An update for Dentistry. JODFS.;2(3):1-4
4. Neena IE, Ganesh E, Poornima P, Korishettar R. An ancient herb aloe vera in dentistry: A review. JORR. 2015;7:25-30
5. Mangaiyarkarasi SP, Manigandan T, Elumalai M, Cholan PK, Kaur RP. Benefits of Aloe vera in dentistry. J Pharm Bioallied Sci. 2015;7(Suppl 1):255-59
6. Wadhawan R, Khan SDD, Solanki G, Sabir S. Aloe vera: A boon in dentistry. IJPRR. 2014;4(3):147-51
7. Sarpangala M, Venkatesh D, George AL, Ashwin D, Nawabadkar S. Aloe vera: A potential herb in dentistry. Int J Dent Health Sci. 2016;3(1):183-90

8. Tanwar R, Gupta J, Asif S, Panwar R, Heralgi R. Aloe vera and its uses in dentistry. Indian J Dent Adv. 2011;3(4):656-58
9. Subhash AV, Suneela S, Anuradha CH, Bhavani SN, Babu MSM. The role of Aloe vera in various fields of medicine and dentistry. JOFS. 2014;6(1):5-9
10. Tayal E, Sardana D, InduShekar KR, Saraf BG, Sheoran N. Current perspectives on use of Aloe vera in dentistry. EJMP. 2014;4(12):1408-19
11. Kathuria N, Gupta N, Manisha, Prasad R, Nikita. Biologic effects of Aloe vera gel. Internet J Microbiol. 2010;9(2):1-6
12. Sawai MA. Aloe vera – A miracle herb. IJRID. 2014;4(2):1-7
13. Naroor N, Shenai P, Chatra L, Veena KM, Rao PK, Prabhu RV et al. Aloevera: A boon to dentistry. WJPPS. 2014;3(8):334-40
14. Ameet M, Shubhangi M, Sagar S, Shukla P, Patil I, Hartalkar S. Aloe vera: Novel protagonist in periodontal healing. UJMDS. 2013;1(02):11-16
15. Monica B, Monisha R. Aloe vera in dentistry – a review. IOSR-JDMS. 2014;13(12):18-22
16. George P, Bhat SS, Antony B. Comparative evaluation of the antimicrobial efficacy of aloe vera tooth gel and two popular commercial toothpastes: An in vitro study. General Dentistry. 2009:238-41
17. Virdi HK, Jain S, Sharma S. Effect of locally delivered aloe vera gel as an adjunct to scaling and root planning in the treatment of chronic periodontitis: A clinical study. IJOS. 2012;3(2):84-9

Paper cited as: **Divya Pandya. BENEFICIAL ROLE OF ALOE VERA IN ORAL CAVITY-A REVIEW.International Journal of Medical and Applied Sciences, 5(2), 2016, pp.36-45.**