



## ROLE OF SIDDHA SYSTEM OF MEDICINE IN DENTISTRY

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### Abstract:

Siddha medicines which include herbals, metals and minerals are used in dentistry for treatment of various dental disorders. Organic phytochemicals from plants which are used in traditional medicine are believed to be a good substitute to synthetic chemicals. They could offer an effective alternative to antibiotics and represent a promising approach to the prevention and therapeutic strategies for various oral infections. The herbal remedies have an edge over conventional antibiotic treatment that suffer the limitation of low benefit to high risk as compared to herbal treatment that possess high benefit to low-risk ratio. Through several hundred to several thousand years of use, the botanicals in the Siddha System of Medicine have been proven to be safe and effective. The literature shows that several herbal formulations have the capacity to control the production of proinflammatory mediators, thereby managing many inflammatory processes. The use of such herbal anti-inflammatory formulations for a longer period of time was found to be safer than that of chemical anti-inflammatory drugs. The present review highlights the role of Siddha in the management of various oral health problems. The current scientific evidence based review is concentrated on practicable role of Siddha medicine in the management of various oral health problems.

**Keywords:** Siddha medicine, Dental diseases, Dental treatment

## INTRODUCTION

Oral disorders persist to be an utmost health issue worldwide.<sup>[1]</sup> Dental caries and periodontal diseases are the major oral health problems; however; other disorders like oral cancer and oral mucosal lesions are also of notable concern.<sup>[2]</sup> Oral healthiness is inherent to general well-being and links to the quality of life that spreads beyond the functions of the craniofacial complex. Herbs have been used for centuries to prevent and control dental disease. Herbal extracts are effective because they interact with specific chemical receptors within the body. The global need for alternative prevention and treatment options and products for oral diseases that are safe, effective and economical comes from the rise in disease incidence (particularly in developing countries), increased resistance by pathogenic bacteria to currently used antibiotics and chemotherapeutics, opportunistic infections in immune compromised individuals and financial considerations in developing countries. Hence, the search for alternative products continues and natural phytochemicals isolated from plants used in traditional medicine are considered as good alternatives to synthetic chemicals.

Herbal extracts have been successfully used in dentistry as tooth cleaning and antimicrobial plaque agents, for reducing inflammation, preventing release of histamine and as antiseptics, antioxidants, antimicrobials, antifungals, antibacterial, antivirals and analgesics. They also aid in healing and are effective in controlling microbial plaque in gingivitis and periodontitis, thereby improving immunity.

Diseases of the oral cavity were known to the Indians since ancient times and were written in *Pathaartha Guna sinthamani*. It was further classified as *Pal Noigal* and *Palladi Noigal*. Even in ancient times, Indians never liked to use the brushes made of animal hairs. They used wooden twigs called "datun". The wood of the twig always varied according to the time of the year, course and the user's temperament. Similarly, the length of the twig ideally about 6 inches but also varied according to the user's choice. One end of the twig is crushed, liberating an extract which was bitter but having astringent quality. The crushed end resembling like a brush was being used for cleaning the teeth. Aromatic herbs and spices were used for rinsing the mouth.

### CHARACTERISTICS FEATURES OF TWIGS:

- The twigs should be straight and should be taken from live plants.
- There should be no nodes and holes and should not be easily broken.
- The twig should be of little finger thickness and hand span length which is about 9 inches.
- The procedures are to be adopted to maintain oral health which includes Dhandhvaadhanam (Brushing), tongue scrapping and mouth rinsing.

### DHANDHVAADHANAM (BRUSHING):

A Siddha literature explains the procedure of brushing as Dhandhvaadhanam. Ancient peoples used the twigs of specific plants and trees as toothbrushes, and the tradition is still followed in many places. They required no special toothpaste, as the twigs themselves contained medicinal properties required to clean the teeth and keep them healthy. It should not be done while walking or sitting, should be performed while maintaining a specific posture termed as *Kukudasanam* (Hen posture). One end of the twig has to be crushed by chewing. The crushed end resembling like a brush was being used for cleaning the teeth. Chewing the edges of the twigs formed the bristles which prevented the formation of dental plaque. Then the datun should be split longitudinally into two and used for scrapping the tongue. After brushing the mouth should be rinsed for 12 times.

### MATERIALS USED FOR BRUSHING:

“துகனிலை காட்டமிவை தொட்டுத் துலக்கிற்

றுகனிலை காட்டாது தொடத் துகனிலைகள்

மெய்த்துவரை யொத்திருக்கின் மேனாள் வரை முரன்

மெய்த்துவரை யொத்திருக்கு மே”

- பதார்த்த குண சிந்தாமணி

To prevent the diseases of teeth and gum, *Pathaarth Guna Sinthamani* states that the teeth are cleaned with the materials of astringent taste such as powders, leaves and twigs.

#### USES OF SOME TWIGS:

“வேலுக்குப் பல்லிறுகும் வேம்புக்குப் பல் துலங்கும்

பூலுக்குப் போகம் பொழியுங்காண் ஆலுக்குத்

தண்டாரையானுஞ் சாருவனே நாயுருவி

கண்டால் வசீகரமாங் காண்க”

These verse mention the usage of certain twigs specifically mentioned for some conditions.

#### HERBS IN DENTISTRY:

Herbal compounds are recommended in the treatment of serious and purulent gingivitis and mucositis, superficial periodontitis, catarrhal tongue inflammation, toxic oral cavity inflammation, mucosal infections and difficult healing of post-operative wounds. Herbal medications are also administered to soothe oral symptoms of systemic diseases. Plant compound can be a powerful and the dominant drug when an inflammation caused by local irritating factor appears. Most important features of herbal medicament are its anti-inflammatory, antiseptic, analgesic, astringent, edema-reducing, soothing and healing accelerating properties. [3] Herbs owe their healing properties to biologically active compounds they contain. Some of these compounds were isolated or obtained by bio-guided isolation after previously detected characteristic activity of the part of the plant. These compounds are flavonoids, coumarin and iridoid glycosides, phenolic acids, resins, triterpenes, phytoesters, choline, carotenoids, tannins, vitamins and mineral salts (magnesium, iron, lithium) and essential oils. The most popular are flavonoids and essential oils. [4, 5] The natural products derived from medicinal plants such as neem, thulasi, amla etc., have proven to be abundant source of biologically active compounds, many of which have become the basis for the development of new lead chemicals for pharmaceuticals. As there are approximately 500000 plant species occurring worldwide, of which only 1% has been phytochemical investigated, there is great potential for discovering novel bioactive compounds from these sources. Some of the herbs used for oral disease are:

### **AAL (*FICUS BENGHALENSIS*)**

According to Gadhikar et al., four extracts(i.e. aqueous, petroleum ether; chloroform and acetone) of areal roots of *Ficus benghalensis* species has been screened for its antibacterial potential against seven strains of oral bacteria i.e Lactobacillus rhamnosus Streptococcus mutans, Staphylococcus aureus, Actinomyces viscosus, Bacillus subtilis Escherichia coli and Staphylococcus epidermidis by disc diffusion method. *Ficus benghalensis* showed maximum inhibition for bacterial species L. rhamnosus, S. mutans, B. subtilis, S. epidermidis, E. coli, S. aureus while extract showed 0% activity against A. viscosusm respectively.[6]

According to I. Kannan et al., the methanol and chloroform extracts of *Ficus bengalensis* exhibits antibacterial activity against both the bacteria Streptococcus mutans and Actinomyces viscosus. However the activity is excellent for chloroform extract against both the bacteria. The antibacterial activity is attributed to the various phytochemicals that are present in the extract. *Ficus bengalensis* Linn. is rich in sterols and flavanols .These phytochemicals are attributed to the plant's antibacterial activity. [7]

### **VEMBU (*AZADIRACHTA INDICA*)**

Dried chewing sticks of Neem showed maximum antibacterial activity against S. mutans compared to other dental caries-causing organisms like S. salivarius, S. mitis, and S. sanguinis. [8]Ethanollic and aqueous extract of Neem leaf showed significant anti-candidial effect against C. albicans.[9] Aqueous extract of Neem stick and the gallotannin-enriched extract from *Melaphis chinensis* inhibited insoluble glucan synthesis and results in bacterial aggregation. It reduces the ability of streptococci to colonize tooth surfaces.[10]

Muco adhesive dental gel containing *Azadirachta indica* is found to be beneficial in reducing the plaque index and salivary bacterial count comparatively better than chlorhexidine gluconate mouthwash.[11] Ethanollic leaf extract of *Azadirachta indica* shows significant antibacterial activity against selected acidogenic oral bacteria causing dental plaque in fixed orthodontic appliance patients. The study evaluated the anti-plaque activity of the extract against S. mutans, S. sanguis, and S. mitis. The extract did not inhibit L. acidophilus when tested. [12]

Botelho *et al.*, and Behl *et al.*, in their experiments and trials concluded that *Azadirachta indica* is highly efficacious in the treatment of periodontal disease thus exhibiting its biocompatibility with human periodontal fibroblast.<sup>[13]</sup> Anti-bacterial, antifungal, antiviral, antioxidant, anti-inflammatory, analgesic, immune stimulant properties of neem are well-established. Anti-plaque activity of neem stick was demonstrated by Bandyopadhyay *et al.* It has both mechanical as well as chemotherapeutic antiplaque agents. Presence of gallotannins during the early stages of plaque formation could effectively reduce number of bacteria responsible for periodontitis. Furthermore, the mouth rinse prepared from neem leaves has shown efficacy in treatment of periodontitis.<sup>[14]</sup>

#### **VEL (*ACACIA NILOTICA*):**

*Streptococcus mutans* is generally considered the main oral pathogen responsible for dental caries, the fact that *A. nilotica* inhibited the growth of *Streptococcus mutans* provides some scientific rationale for the use of this plant for the treatment of dental caries.<sup>[15]</sup>

Barks extracts of *Acacia nilotica* possess a lower zone of inhibitory activity as compared to the leaf extracts while pod extract of *Acacia nilotica* showed highest zone of inhibition against all test microorganism as compare to leaf extract and bark extract of *Acacia nilotica*. All the three extracts of *Acacia nilotica* shows highest antimicrobial potential against the *Streptococcus sanguinis* is followed by *Streptococcus salivarius* and lowest antimicrobial potential against *Lactobacillus acidophilus*. Also the highest antimicrobial potential of *Acacia nilotica* is observed in the pod extract followed by leaf extract and bark extract against *Lactobacillus acidophilus*, *Streptococcus sanguinis*, *Streptococcus salivarius*, *Aggregatibacter actinomycetemcomitans*. The Minimum Inhibitory Concentration values showed that pod extract was more effective than leaf extract and bark extract against all tested microorganism. <sup>[16]</sup>

#### **NAAYURIVI (*ACHYRANTHES ASPERA*)**

Extracts of the leaves and callus of this plant in various solvents have been reported to show antimicrobial activity. Prabhat *et al.* reported that methanolic extracts possess

antimicrobial activity while Khan et al. reported that the ethanol and chloroform extracts of the seeds of *A. aspera* show mild-to-moderate antibiotic activity against *Bacillus subtilis*, *E. coli*, and *Pseudomonas aeruginosa*. Jebashree et al. demonstrated the anticariogenic activity of *A. aspera* by using ethyl acetate extracts of *A. aspera*, which showed high antibacterial activity against *S. mutans* than other solvent extracts. However, in the present study, aqueous extract of *A. aspera* was used, which is most easy and safe to obtain and showed a marked antibacterial activity.<sup>[17]</sup>

The antibacterial activity of *A. aspera* can be attributed to the alkanoids and tannins. Tannin is a phenolic compound which is soluble in water and it could be one of the components responsible for the antibacterial activity. Aqueous extract of *A. aspera* which is most easy and safe to obtain has proved to have potent antibacterial property.<sup>[18]</sup>

#### **NAAVAL (*SYZYGIUM CUMINI*)**

The aqueous, methanolic, hexane and ethyl acetate extract of leaves of *S. cumini* exhibited the antimicrobial activity against dental caries causing strains.<sup>[19]</sup> Namba *et al.*, have studied aqueous, methanolic and methanol-water (1:1) extracts of the bark were able to suppress plaque formation in-vitro. All were active against *Streptococcus mutans* at 260, 120 and 380 µg per ml respectively <sup>[20]</sup> *Syzygium cumini* (L.) extract possess potential antibacterial and antifungal activity.<sup>[21]</sup>

#### **AGATHI (*SESBANIA GRANDIFLORA*)**

*S. grandiflora* should be a potential candidate for antibacterial toothpaste or mouthwash solution active constituent based upon both pharmacological and economic perspectives. <sup>[22]</sup>

#### **NELLI (*EMBLICA OFFICINALIS*)**

Lemon solution is a natural source of citric acid (Ph 1.68) with lower acidity. Because of its wide anti-bacterial efficiency (including *Enterococcus faecalis*), a freshly prepared lemon solution is recommended as a root canal medicament. It has an antioxidant as well as astringent property which have been proven to be effective in the treatment of toothache, gingival inflammations, aphthous stomatitis and other types of mouth ulcers. <sup>[23]</sup>

### **NOTCHI (*VITEX NEGUNDO*)**

The antimicrobial activity of essential oil of *Vitex negundo* Linn leaves was tested against pathogenic microorganisms such as *S. aureus*, *E. coli*, *K. pneumoniae*, *B. subtilis*, *M. luteus* and *Candida albicans* and compared with the standard the essential oil showed good antimicrobial activity [24] The antimicrobial activity of the plant is mainly due to the presence of essential oils, flavonoids, terpenoids, alkaloids, tanins, saponins and other natural polyphenolic compounds or free hydroxyl groups in plant extracts. Presence of flavonoids, terpenoids and tannins in *Vitex negundo* has been detected in various studies. [25]

### **ATHTHI (*FICUS RACEMOSA*)**

Ethanol extract of *F. religiosa* showed feeble antimicrobial activity toward primary plaque colonizers and periodontal pathogens only at 48 hours. [26] *F. religiosa* contains several phyto constituents like  $\beta$ -sitosterol-D-glucoside, vitamin K, n-octacosanol, kaempferol, quercetin, and myricetin. The plant has been studied for their various pharmacological activities like antibacterial, antifungal, anticonvulsant, immunomodulatory, antioxidant, anthelmintic, and wound healing activities. [27]

### **KIRAMBU (*SYZYGIUM AROMATICUM*)**

Clove oil is commonly used to relieve pain of dental canes. Eugenol is considered as an active component (including beta caryophyllene). Eugenol is also widely used in conjunction with root canal therapy, temporary fillings and general gum pain, dental abscesses and in other gum diseases [28]

The health benefits of clove oil can be attributed to its antimicrobial, antifungal, antiseptic, antiviral, aphrodisiac and stimulating properties. The oil is used for treating a variety of health disorders including toothaches, indigestion, cough, asthma, headache, and stress and blood impurities. Clove is rich in minerals such as calcium, hydrochloric acid, iron, phosphorus, sodium, potassium, and vitamin A and vitamin C. The most prominent use of clove oil is in dental care. The germicidal properties of the oil make it very effective for relieving dental pain, tooth ache, sore gums and mouth ulcers. Clove oil contains the compound eugenol, which has been used in dentistry since numerous years. Gargles with



diluted clove oil help in easing the throat. The characteristic smell of clove oil helps removing bad breath. As a result, clove oil is added to numerous dental products and medications, including, mouth washes, and tooth pastes. Dentists also mix clove oil with zinc oxide and prepare a white filling material as a temporary alternative to root canal.<sup>[29]</sup>

### **POONDU (*ALLIUM SATIVUM*)**

A study done by A Jamil et al concluded that garlic, allicin extract has a potential use for prevention and treatment of periodontal disease. In their study they found that allicin was found to inhibit growth of all tested bacteria (*P. gingivalis*, *Fusobacterium nucleatum*, *Actinobacillus*, *Aggregatibacter actinomycetemcomitans*, *Streptococcus mutans*, *S. sobrinus*, *Escherichia coli*, and *Actinomyces viscosus*). Allicin was also found to be a potent irreversible inhibitor of the *P. gingivalis* proteases. Allicin was also found capable of killing *S. mutans* growth in biofilm. <sup>[30]</sup>

In a study, garlic extract containing the major antimicrobial component, allicin, was found active toward Gram-negative pathogens but less active against Gram-positive bacteria. The extract almost completely inhibited trypsin like protease activity (implicated in the pathogenesis of periodontitis) of *P. gingivalis*. Taken together, these observations suggest that garlic extract or allicin may be of therapeutic use against periodontal diseases.<sup>[31]</sup>

### **KAASUKATTI (*ACACIA CATECHU*)**

*Acacia catechu* is species of fabaceae. Its extracts are used for the purpose of gargling to treat diseases of gingiva. *Acacia catechu* is highly precious for its powerful astringent and antioxidant activities. The bark, wood, fruits, gum and flowering tops of *Acacia catechu* are used for medicinal purpose. Used externally as a powder by itself, it arrests the bleeding in gums. The decoction is an effective gargle in sore throat, cough and hoarseness of voice, stomatitis, halitosis, dental caries and cavities. <sup>[32]</sup> The antibacterial activity of the extracts at different concentrations was screened by disc diffusion technique and the zone of inhibition was measured in mm diameter. The *Acacia catechu* bark extract was more effective against *Streptococcus sanguinis* with a zone of inhibition of 24 mm

diameter (at conc. 1000 µg/ml) with *Streptococcus mutans* the zone size was found to be 22 mm diameter. [33]

*Acacia catechu* heartwood extract is highly active on oral pathogens and can be applied in dental practice in the field of periodontics to treat dental caries, gingivitis, mouth sores and Endodontics to eradicate *Enterococcus faecalis* which is found in infected root canal possibly causes root canal failure. [34, 35]

The ethanolic leaf and bark extract of *Acacia catechu* exhibited a high degree of activity against the organism tested when compared to aqueous and acetone extract. *Acacia catechu* ethanolic leaf and bark extract showed no growth at a concentration of 1mg/ml, 5mg/ml and 10mg/ml whereas, the acetone bark, leaf and aqueous leaf extract of *Acacia catechu* showed no growth at a concentration of 5mg/ml and 10mg/ml, the aqueous bark extract of *Acacia catechu* exhibited no growth at a concentration of 1mg/ml, 5mg/ml and 10mg/ml respectively. The antibacterial activity of the leaf and bark extract of *Acacia catechu* is an indication of its broad spectrum antibacterial potential which may be helpful in eradicating *E. faecalis* for the management of Root canal failure that occurs frequently during Endodontic procedure. [36]

## GREEN TEA

Green tea catechin inhibits the growth of *P. gingivalis*, *Prevotella intermedia* and *Prevotella nigrescens* and adherence of *P. gingivalis* on to human buccal epithelial cells. [37] Green tea catechins with steric structures of 3-galloyl radical, EGCG, ECG and gallic catechin gallate, which are major tea polyphenols, inhibit production of toxic end metabolites of *P. gingivalis*. A study showed that green tea catechin, EGCG and ECG inhibit the activity of *P. gingivalis*-derived collagenase. [38]

In an *in vitro* study, toothpaste, mints and green tea strongly inhibited volatile sulphur compounds (VSCs) production in a saliva-putrefaction system. Therefore, it was concluded that green tea was very effective in reducing oral malodor temporarily because of its disinfectant and deodorant activities. [39] The three dependent variables, namely probing depth (PD), clinical attachment loss (CAL), and bleeding on probing (BOP) as well as plaque index (PI) and gingival index (GI) showed statistically significant reductions

following introduction of green tea as a conjunct oral hygiene measure in study group as compared to control group. [40]

### **TURMERIC (*CURCUMA LONGA*)**

There are many uses of turmeric in dentistry. The active component is curcumin. Turmeric can be used in relief of pain, gingivitis, periodontitis, as colorant in pit and fissure sealant, in dental plaque detection, etc., it is suggested that turmeric extracts can be extensively used in the treatment of potentially malignant lesions in oral cavity. It effectively inhibits metastasis of melanoma cells and may be especially useful in deactivating the carcinogens in cigarette smoke and chewing tobacco. [41]

The effect of hydroalcoholic extract of *Achyranthes aspera* root (AAR) and *Terminalia arjuna* bark (TAB) on the aero tolerant capacities of *Streptococcus mutans* was examined. AAR and TAB extracts were found to inhibit the prime antioxidant enzymes like manganese superoxide dismutase (MnSOD), NADH oxidases, and glutathione peroxidase (GPx), altering the aero tolerant responses in *S. mutans*. Consequently, *S. mutans* are unable to withstand the oxidative stress and thus are made more susceptible to the antimicrobial activity. [42]

### **KARUVEL (*ACACIA ARABICA*)**

The application of *Acacia arabica* containing toothpaste showed considerable reductions in plaque accumulation and gingival inflammation. Reductions in the PI (plaque index) median scores show there was higher reduction of plaque in the test group than in the control group. The anti-inflammatory property of *Acacia arabica* may be responsible for the significant reductions in gingival index (GI) scores. A significant reduction in bleeding on probing index (BOP%) was observed in the test group using the *Acacia Arabica* containing toothpaste in comparison with the control group. This reduction in bleeding may be due to astringent and anti-inflammatory effects of *Acacia arabica*. [43]

The triple blind placebo controlled randomized clinical trial provides evidence for improvement in clinical parameters through adjunctive use of AA containing gel in mild to moderate chronic periodontitis patients. Significant probing pocket depth reduction and Clinical attachment level (CAL) gain was observed with adjunctive use of AA gel. Secondary

parameters of plaque control and BOP showed better outcomes in AA gel group compared to scaling and root planning (SRP) alone. [44]

#### **ARASU (*FICUS RELIGIOSA*)**

*F. religiosa* showed feeble antimicrobial activity only at 48 h for primary plaque colonizers and periodontal pathogens (ZOI =  $2.6 \pm 0.54$  mm and  $3.6 \pm 0.54$  mm, respectively) and no activity at 24 and 72 h. The ethanolic extract of *F. religiosa* showed feeble antimicrobial activity toward primary plaque colonizers and periodontal pathogens only at 48 hours. This feeble antimicrobial activity of *F. religiosa* may be attributed to that fact that some of the medicinal plants do not yield their medicinal compounds to ethanolic extraction.[45]

#### **KOIYA (*PSIDIUM GUAVA*)**

The paste of tender leaves of guava has been traditionally used to maintain oral hygiene. Guava has shown antibacterial activity against both Gram-positive and Gram negative bacteria. The antimicrobial activity of guava is mainly attributed to flavonoids, guaijaverin and quercetin the bark has exhibited antibacterial properties due to the presence of tannins. [46] Quercetin has shown excellent antibacterial actions against periodontal pathogens *Aggregatibacter actinomycetemcomitans* (Aa), *Porphyromonas gingivalis* (Pg), *Prevotella intermedia* (Pi), *Fusobacterium nucleatum* (Fn).[47,48] It has shown inhibitory actions against *Streptococcus mutans* (S.mutans), *Streptococcus sanguinis* (S.sanguinis) and *Actinomyces* species.[47] The antibacterial action of quercetin is probably due to the disruption of membrane and inactivation of extracellular proteins by forming irreversible complexes. [48] Guaijaverin from leaves of guava has potential as an antiplaque agent due to its bacteriostatic property by inhibiting the growth of S.mutans and *Staphylococcus aureus* (S. aureus). [49] Guaijaverin decreases the hydrophobicity, one of the most important initial factors for the oral pathogenic bacteria to adhere to the tooth surface. This action is possibly because guava extracts binds to the cell surface proteins reducing the overall cell hydrophobicity and hence guava may have potential for development as a natural antiplaque agent. Guava and Piper beetle extracts have shown bacteriostatic effect on the primary colonizers of teeth during plaque formation

*S.sanguinis*, *Streptococcus mitis* (*S.mitis*) and *Actinomyces*. [50] *S.mitis* and *S.sanguinis* showed lesser adherence to the experimental pellicle treated with guava extracts when compared with untreated pellicle due to the ability of guava to disrupt the pellicle preventing adherence of bacteria.

Mouthwash containing aqueous extract of the leaves was highly active against *S. aureus* and *Escherichia coli* (*E. coli*) which could be contributed to the presence of bioactive compounds. Mouth rinse containing guava leaf extract had a profound effect on gingivitis.<sup>[51]</sup> The aqueous extracts of *P. beetle* and guava were found to have antiplaque activity by their effect on ultrastructure of plaque bacteria by interfering with normal growth cycle and development, reducing the adhering capacity of the acquired pellicle which forms on the surface of tooth during early plaque formation, diminishing the cell surface hydrophobicity of bacteria which are required to assist the adherence process. The cytotoxic property of guava would be of added value for the use of guava as adjuncts in the development of oral health care products. Guava extract has demonstrated in vitro antiplaque actions by inhibiting growth, adherence and co-aggregation of dental plaque bacteria. Guava extracts may inhibit plaque development without disrupting homeostasis of the oral cavity.<sup>[52]</sup> Thus, guava an excellent antibacterial and antiplaque agent may be a good adjunct to the mainstream periodontal treatment.<sup>[46]</sup>

#### **ELANTHAI (*ZIZIPHUS JUJUBE*)**

Jujube leaf extracts showed anti-biofilm activity against *Streptococcus mutans*. A significant anti-biofilm bioactivity against *Streptococcus mutans*, a causative agent of human dental caries, was detected for the aqueous leaf extract and its bio-guided separation resulted in the identification of the lupane triterpenoid aliphatic acid as the main anti-biofilm metabolite. The results herein presented further promote the consumption of jujube leaf infusion as a healthy antioxidant bedtime beverage, and associate it to an unreported anti-caries activity.<sup>[53]</sup>

#### **CONCLUSION**

Dental caries, one of the globally affecting diseases of the oral cavity is still prevalent in today's era despite knowledge of most advanced sciences and technologies in dental

practice. There has been constant effort to focus on interception and correction of this disease entity but today our horizon has broadened the approach and goal remains to prevent the disease process rather than to correct it. Medicinal plants have been documented for prevention and cure of many systemic diseases since ancient times. With advancements in science and scientific procedures it is now known that plants have potential curative action for oral diseases such as dental caries. The usage of these herbal extracts in clinical practice can miraculously benefit the overall health of the patient. With complete understanding of the dental caries our approach should be based on prevention of disease process. One way to attain it is going herbal.

The use of herbal extracts in various forms is entirely consistent with the primary health-care principles. These aid in healing and are effective in controlling microbial plaque in gingivitis and periodontitis. Studies for assessment of safety and efficacy of herbal remedies are in its infancy. Herbal remedies are expected to be widely used in future. Researchers should be encouraged to conduct controlled studies to prove the effectiveness and safety of natural dental products. The low toxicity and low cost of these herbs should encourage further investigation leading to a better understanding on traditional Siddha medicine and their application to oral health. Moreover, health educators must consider the challenge to ensure that people participate in making decisions about the herbal medicine to protect the public health. Therefore, the purpose of this review is to present some recent examples of traditional medicinal plant extracts or phytochemicals that have been shown to inhibit the growth of oral pathogens, reduce the development of dental plaque, and reduce the symptoms of oral diseases.

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