Scholars Journal of Dental Sciences (SJDS) **ISSN 2394-496X (Online)**
Sch. J. Dent. Sci., 2015; 2(8):449-453 **ISSN 2394-4951 (Print)**

(An International Publisher for Academic and Scientific Resources)
www.saspublishers.com DOI: 10.36347/sjds.2015.v02i08.006

Review Article

Medicinal Plants in Dentistry: A Review

Saju Abraham[1]*
[1]Assistant Professor, Department of Botany, Newman College, Thodupuzha, Idukki, Kerala

***Corresponding author**
Saju Abraham
Email: drsajuabraham@gmail.com

Abstract: The utilization of medicinal plants in dentistry represents a promising and burgeoning field of research, bridging traditional ethnobotanical knowledge with modern scientific inquiry in the pursuit of novel, cost-effective and biocompatible therapeutic agents. The rising prevalence of oral diseases, coupled with the challenges of antibiotic resistance and the adverse effects associated with available chemotherapeutic agents, has catalyzed a renewed interest in natural alternatives for the prevention and management of a wide spectrum of dental pathologies. The paper examines the application of various medicinal plants and their bioactive phytochemical constituents in dental care. The therapeutic potential of these botanicals is vast, with demonstrated efficacy spanning anti-inflammatory, analgesic, antimicrobial, antioxidant and antiplaque activities. Specific plant extracts, such as those from *Aloe vera*, turmeric (*Curcuma longa*), green tea (*Camellia sinensis*), neem (*Azadirachta indica*), clove (*Syzygium aromaticum*) and licorice root (*Glycyrrhiza glabra*) are commonly used in various combinations. Their applications are diverse, including their use as ingredients in toothpastes and mouthwashes for controlling dental plaque and gingivitis, as intracanal medicaments in endodontics, as agents to promote wound healing following oral surgical procedures, and as natural anticariogenic compounds that inhibit the growth of cariogenic bacteria. The mechanisms of action are attributed to a complex synergy of their chemical components, such as alkaloids, flavonoids, tannins and terpenoids, which can interfere with microbial adhesion and biofilm formation, modulate the host inflammatory response and scavenge free radicals. In conclusion, the rich repository of medicinal plants offers a valuable and largely untapped resource for developing complementary and alternative strategies in preventive and therapeutic dentistry. Their integration into mainstream dental practice holds significant potential for improving oral health outcomes, particularly as part of a minimally invasive and holistic treatment philosophy.
Keywords: Phytotherapy, Oral Health, Bioactive Compounds, Antimicrobial Activity.

INTRODUCTION

Oral diseases, particularly dental caries and periodontal diseases, remain among the most prevalent infectious conditions affecting human populations worldwide (Darout, 2014). Despite advances in modern dentistry and oral health care, the global burden of oral disease continues to escalate, especially in developing nations where access to dental services remains limited. The prevalence of dental caries in school-aged children approaches lion part and the majority of adults are similarly affected. Oral health is integral to general well-being and quality of life, extending beyond the mere functions of the craniofacial complex. Poor oral health has been significantly linked to chronic systemic conditions, including diabetes, cardiovascular diseases, rheumatoid arthritis, osteoporosis, and pregnancy complications (Palombo, 2011). The oral cavity harbors more than 750 bacterial species, approximately 50% of which remain unidentified. Among these, several species play critical roles in oral diseases. The development of dental caries primarily involves acidogenic and aciduric Gram-positive bacteria, particularly mutans streptococci (*Streptococcus mutans* and *S. sobrinus*), lactobacilli, and actinomycetes, which metabolize sucrose to organic acids that dissolve calcium phosphate in teeth. Periodontal diseases, in contrast, are associated with anaerobic Gram-negative bacteria such as *Porphyromonas gingivalis*, *Actinobacillus* species, *Prevotella* species, and *Fusobacterium* species (Petersen *et al.,* 2005).

The global need for alternative prevention and treatment options for oral diseases stems from multiple factors: rising disease incidence particularly in developing countries, increased bacterial resistance to currently used antibiotics and chemotherapeutics, opportunistic infections in immunocompromised individuals and financial constraints in resource-limited settings (Laxminarayan *et al.,* 2013). While several commercial agents are available, these chemicals can alter oral microbiota and produce undesirable side effects. Other antibacterial agents used in oral disease prevention and treatment, such as cetylpyridinium chloride, chlorhexidine, amine fluorides and ethanol

(commonly found in mouthwashes), have been reported to exhibit toxicity, cause tooth staining, or, in the case of ethanol, have been linked to oral cancer (Eliot *et al.,* 2013; Eslami *et al.,* 2015). Medicinal plants have served as traditional treatments for numerous human diseases for thousands of years and continue to be used as the primary source of medicine in rural areas of developing countries, where approximately 80% of the population relies on traditional medicines for health care (Pan *et al.,* 2014). Natural products derived from medicinal plants have proven to be abundant sources of biologically active compounds, many of which have formed the basis for developing new lead chemicals for pharmaceuticals. Thus, the paper examines the application of various medicinal plants and their bioactive phytochemical constituents in dental care.

Medicinal plants in dental health

The intricate relationship between medicinal plants and dental health is a witness to the enduring wisdom of traditional healing systems, now increasingly validated by modern science. For centuries, cultures worldwide have turned to the natural pharmacy of the earth to combat oral pathogens, soothe inflammation and promote healing within the mouth (van der Weijden *et al.,* 1998; Lee *et al.,* 2004). This ancient knowledge offers a complementary approach to contemporary dentistry, highlighting natural compounds that can effectively address a range of dental diseases, from common caries to more complex periodontal issues. The primary cause of most dental ailments is the buildup of bacterial plaque. Many medicinal plants possess powerful antimicrobial and antibacterial properties that directly target these harmful microbes. For instance, *Azadirachta indica* has demonstrated remarkable efficacy in reducing plaque-forming bacteria (Lekshmi *et al.,* 2012). Its twigs have been used as natural toothbrushes for generations and extracts from its leaves and seeds are common ingredients in modern toothpastes and mouthwashes. Similarly, *Glycyrrhiza glabra* contains compounds that inhibit the growth of *Streptococcus mutans*, a key bacterium responsible for tooth decay (Ajagannanavar *et al.,* 2014).

Beyond fighting bacteria, inflammation is a central feature of gingivitis and periodontitis. Several plants offer potent anti-inflammatory benefits. *Curcuma longa* is a prime example, as it has strong anti-inflammatory and antioxidant actions which help to reduce the swelling, redness and bleeding associated with gum disease (Farjana *et al.,* 2014). *Syzygium aromaticum* prized for its essential oil, eugenol which provides powerful analgesic and antiseptic effects, making the clove oil a time-honoured solution for relieving toothache and disinfecting oral cavities (Agrawal *et al.,* 2014). Furthermore, the astringent and healing properties of many plants contribute to overall oral tissue integrity. The mechanism behind these benefits often lies in the complex phytochemistry of the plants, which contain a diverse array of bioactive compounds like flavonoids, tannins and essential oils which work synergistically to disrupt bacterial cell membranes, neutralize harmful free radicals and modulate the body's inflammatory response.

Phytochemical constituents and mechanisms of action

` Medicinal plants employed in dentistry contain diverse bioactive compounds that exert direct effects against oral pathogens and inflammation. The major classes of phytochemicals with dental therapeutic applications include phenolic compounds, essential oils, alkaloids, flavonoids, terpenoids, and sugar alcohols. Medicinal plants utilized in dentistry can be categorized by their primary functions:

- **Antibacterial and Antifungal actions**: Prevent and treat dental caries and periodontal disease
- **Anti-inflammatory effects**: Control gingivitis, periodontitis and oral mucosal lesions
- **Analgesic and wound healing properties**: Soothe toothaches and promote oral wound healing
- **Astringency and styptic actions**: Reduce bleeding and control minor oral hemorrhage.

Phenolic compounds demonstrate antimicrobial and anti-inflammatory properties and are present in clove and eucalyptus. Essential oils, found in peppermint, thyme and basil, provide antiseptic and anti-inflammatory effects. Alkaloids exhibit analgesic and healing properties, as exemplified by bloodroot. Flavonoids and terpenoids possess antioxidant and healing properties and are present in chamomile and calendula. These constituents inhibit the growth of key oral pathogens including *Streptococcus mutans*, *Porphyromonas gingivalis* and *Candida albicans*, reduce plaque formation, calm gingival inflammation and promote tissue repair. The mechanisms of action are multifaceted and include direct growth inhibition (bactericidal or bacteriostatic effects), inhibition of biofilm formation and bacterial adhesion, suppression of acid production and acid tolerance, inhibition of enzyme activity, cellular disruption, interference with specific metabolites and modulation of the oral environment (Madiyal *et al.,* 2014). Table 1 depicts list of major medicinal plants used in treating various dental diseases. Table 2 represent the antibacterial activity of purified phytochemicals.

Table 1: List of major medicinal plants used in treating various dental diseases

No.	Plant	Usage
1.	*Achillea millefolium*	Leaves Chewed to relieve tooth ache; mouth freshener
2.	*Achyranthes aspera*	Stem used as toothbrush, ash of the plant is used as tooth powder; to relieve pyorrhea and toothache
3.	*Agave americana*	Whole plant - toothache
4.	*Agave sisalana*	Leaf juice applied with honey on tongue
5.	*Ageratum conyzoides*	Leaves used for mouth ulcer
6.	*Allium sativum*	Raw consumption or extract effective against *Candida albicans*
7.	*Amaranthus viridis*	Toothache
8.	*Azadirachta indica*	Strong antibacterial and anti-biofilm properties which inhibit plaque formation
9.	*Barleria prionitis*	Root & leaves are chewed to relieve from tooth decay
10.	*Buchanania lanzan*	Gum is used to cure tooth ache
11.	*Commiphora myrrha*	Powerful astringent and anti-inflammatory that helps heal mouth ulcers and soothe inflamed gums
12.	*Caesulia axillaris*	Roots are chewed to cure mouth ulcers
13.	*Centipeda minima*	Plant paste used for tooth decay
14.	*Cuminum cyminum*	Seeds are chewed together with a little sugar for ulcers in mouth
15.	*Curcuma longa*	Effective in managing periodontitis and preventing plaque
16.	*Cymbopogon citratus*	Effective against various *Candida* species
17.	*Dicoma tomentosa*	Root and branch are used as tooth brush
18.	*Elephantopus scaber*	Root paste with pepper powder used as toothpaste
19.	*Emilia sonchifolia*	Juice of leaves is applied to treat toothache
20.	*Ferula asafoetida*	Root extract is used as tooth ache
21.	*Gynocardia odorata*	Leaves are used for tooth decay
22.	*Justicia diffusa*	Leaves are boiled with gingelly oil applied for tooth ache
23.	*Mangifera indica*	Toothbrush of small stem is used to cure toothache; latex is applied to relieve gingivitis
24.	*Mentha piperita*	Relieve minor oral pain
25.	*Plumeria acutifolia*	Latex used for mouth ulcer
26.	*Plumeria obtuse*	Latex is used as a mouth wash, and used to cure mouth ulcer
27.	*Psidium guajava*	Effective against dental caries, plaque and gum disease
28.	*Punica granatum*	The peel and fruit have significant activity against dental plaque and candidal infections
29.	*Rhus parviflora*	Cleaning teeth
30.	*Salvadora persica*	Releases antimicrobial compounds while chewing which are effective for plaque control and gingival health
31.	*Saussurea costus*	Tuber decoction used for tooth ache
32.	*Spilanthes acmella*	Flowers are crushed and applied on the site of toothache
33.	*Syzygium aromaticum*	Topical application of clove oil for toothache
34.	*Tabernaemontana divaricate*	Latex applied to prevent cavity formation
35.	*Thevetia peruviana*	Latex is put in cavities to cure tooth ache
36.	*Wrightia tinctoria*	Leaf paste is applied on aching teeth to get relief from toothache

Table 2: Antibacterial activity of purified phytochemicals

No.	Phytochemicals	Plant	References
1.	Flavonoids and other polyphenols • Artocarpin • Artocarpesin	*Artocarpus heterophyllus*	Sato *et al.*, 1996
	• Flavonone phytoalexins	*Sophora exigua*	Tsuchiya *et al.,* 1994
	• Erycristagallin	*Erythrina variegata*	Sato *et al.,* 2003
	• Isopanduratin A	*Kaempferia pandurate*	Hwang *et al.,* 2004
	• Macelignan	*Myristica fragrans*	Chung *et al.,* 2006
2.	Terpens • Bakuchiol	*Psoralea corylifolia*	Katsura *et al.,* 2001
	• Sagittine A-D	*Sagittaria sagittifolia*	Liu *et al.,* 2006
	• Xanthorrhizol	*Curcuma xanthorrhiza*	Hwang *et al.,* 2000
3.	Alkaloids • Berberine	*Coptidis rhizoma*	Hu *et al.,* 2000

In conclusion, the journey of medicinal plants from ancient herbal compendiums to modern dental research underscores a timeless truth: nature holds profound solutions for human ailments, including those affecting oral health too. The rich pharmacopeia of plants with their demonstrated antimicrobial, anti-inflammatory, analgesic and wound-healing properties, presents a compelling case for their integration into contemporary oral hygiene practices. This is not a call to regress to a pre-scientific era but an invitation to advance into a more holistic and sustainable future of dentistry. The scientific validation of these botanicals demystifies traditional wisdom, revealing mechanisms of action such as the biofilm disruption or inhibition that align with established pharmacological principles (Nagpal and Sood, 2013). This synergy between tradition and science offers a powerful paradigm. For populations with limited access to conventional dental care, these plants can serve as a vital, accessible and cost-effective first line of defense against common issues like plaque, gingivitis and minor toothaches, empowering individuals to take charge of their oral well-being.

CONCLUSION

Medicinal plants hold tremendous potential as adjuncts and alternatives in dental care. The efficacy of plant extracts in managing oral and dental disorders are well established like miswak (*Salvadora persica*), neem (*Azadirachta indica*), clove (*Syzygium aromaticum*), garlic (*Allium sativum*) and pomegranate (*Punica granatum*). All these plants ahave have demonstrated antimicrobial, anti-inflammatory, antiplaque and wound-healing properties. These plant-based therapies offer several advantages including accessibility, cultural acceptability, lower cost and fewer side effects compared to synthetic alternatives. Integrating traditional knowledge with rigorous scientific investigation provides a compelling pathway forward, fostering deeper understanding of herbal remedies as viable alternatives to conventional dental interventions. This approach has particular relevance for resource-constrained settings and populations with limited access to modern dental care. Thus, exploring synergistic combinations of multiple plant extracts to maximize therapeutic efficacy while minimizing the development of antimicrobial resistance are then need of the hour. The convergence of ethnomedicine, phytochemistry and modern clinical science offers promising opportunities to harness the full benefits of medicinal plants in dentistry.

REFERENCES

- Agrawal, M., Agrawal, S., Rastogi, R., Singh, P., Adyanthaya, B.R.., Gupta, H.L. 2014. A review on uses of clove in oral and general health. *Indian Journal of Research in Pharmacy and Biotechnology*. 2(4):1321-1324.
- Ajagannanavar, S.L., Battur, H., Shamarao, S., Sivakumar, V., Patil, P.U., Shanavas, P. 2014. Effect of aqueous and alcoholic licorice (*Glycyrrhiza glabra*) root extract against Streptococcus mutans and Lactobacillus acidophilus in comparison to chlorhexidine: An *in vitro* study. *J. Int. Oral Health.* 6(4):29-34.
- Chung, J.Y., Choo, J.H., Lee, M.H., & Hwang, J.K. 2006. Anticariogenic activity of macelignan isolated from Myristica fragrans (nutmeg) against *Streptococcus mutans. Phytomedicine*. 13(4):261-266.
- Darout, I.A. 2014. Oral diseases, particularly dental caries and periodontal diseases, remain among the most prevalent infectious conditions affecting human populations worldwide. *J. Dent. Oral. Hyg.* 6(5):51-57.
- Eliot, M.N., Michaud, D.S., Langevin, S.M., McClean, M.D., Kelsey, K.T. 2013. Periodontal disease and mouthwash use are risk factors for head and neck squamous cell carcinoma. *Cancer Causes Control*. 24(7):1315-1322.

- Eslami, N., Ahrari, F., Rajabi, O., Zamani, R. 2015. The staining effect of different mouthwashes containing nanoparticles on dental enamel. *J. Clin Exp Dent*. 7(4):e457-461. doi: 10.4317/jced.52199.
- Farjana, H.N., Chandrasekaran, S.C., Gita, B. 2014. Effect of oral curcuma gel in gingivitis management - a pilot study. *J. Clin. Diagn. Res*. 8(12):ZC08-10.
- Hu, J.P., Takahashi, N., Yamada, T. 2000. *Coptidis rhizoma* inhibits growth and proteases of oral bacteria. *Oral Dis*. 6(5):297-302.
- Hwang, J.K., Shim, J.S., Pyun, Y.R. 2000. Antibacterial activity of xanthorrhizol from Curcuma xanthorrhiza against oral pathogens. *Fitoterapia*. 71(3):321-323.
- Hwang, J-K., Chung, J-Y., Baek, N-I. and Park, J-H. 2004. Isopanduratin A from Kaempferia pandurata as an active antibacterial agent against cariogenic Streptococcus mutans. *International Journal of Antimicrobial Agents*. 23:377-81.
- Katsura, H., Tsukiyama, R.-I., Suzuki, A. and Kobayashi, M. 2001. In vitro antimicrobial activities of bakuchiol against oral microorganisms. *Antimicrobial Agents and Chemotherapy*. 45(11):3009-3013.
- Laxminarayan, R., Duse, A., Wattal, C., Zaidi, A.K.M., Wertheim, H.F.L., Sumpradit, N., Vlieghe, E., Hara, G.L., Gould, I.M., Goossens, H., Greko, C., So, A.D., Bigdeli, M., Tomson, G., Woodhouse, W., Ombaka, E., Peralta, A.Q., Qamar, F.Z., Mir, F., Kariuki, S., Bhutta, Z.A., Coates, A., Bergstrom, R., Wright, G.D., Brown, E.D., Cars, O. 2013. Antibiotic resistance-the need for global solutions. *Lancet Infect Dis*. 13: 1057-1098.
- Lee, S.S., Zhang, W. and Li, Y. 2004. The antimicrobial potential of 14 natural herbal dentifrices: results of an in vitro diffusion. *Journal of the American Dental Association.* 135(8):1133-1141.
- Lekshmi, P., Sowmia, N., Viveka, S., Brindha, J., Jeeva, S. 2012. The inhibiting effect of *Azadirachta indica* against dental pathogens. *Asian J Plant Sci Res*. 2(1):6-10.
- Liu, X.T., Pan, Q., Shi, Y., Williams, I.D., Sung, H.H., Zhang, Q., Liang, J.Y., Ip, N.Y., Min, Z.D. 2006. Ent-rosane and labdane diterpenoids from Sagittaria sagittifolia and their antibacterial activity against three oral pathogens. *J Nat Prod*. 69(2):255-260.
- Madiyal, A., Ajila, V., Babu, S.G., Hedge, S., Keshavaiah, H., Alva, P.M. 2014. Role of phytochemicals in oral potentially malignant disorders: A review. *Journal of Health and Allied Sciences*. 04(04):120-125.
- Nagpal, M. and Sood, S. 2013. Role of curcumin in systemic and oral health: An overview. *J Nat Sci Biol Med.* 4(1):3-7.
- Palombo, E.A. 2011. Traditional Medicinal Plant Extracts and Natural Products with Activity against Oral Bacteria: Potential Application in the Prevention and Treatment of Oral Diseases. *Evid Based Complement Alternat Med*. 2011:680354. doi: 10.1093/ecam/nep067.
- Pan, S-Y., Litscher, G., Gao, S-H., Zhou, S-F., Yu, Z-L., Chen, H-Q., Zhang, S-F., Tang, M-K., Sun, J-N., Ko, K.M. 2014. Historical Perspective of Traditional Indigenous Medical Practices: The Current Renaissance and Conservation of Herbal Resources. *Evidence-Based Complementary and Alternative Medicine*. 2014:525340. http://dx.doi.org/10.1155/2014/525340.
- Petersen, P.E., Bourgeois, D., Ogawa, H., Estupinan-Day, S., Ndiaye, C. 2005. The global burden of oral diseases and risks to oral health. *Bulletin of the World Health Organization*. 83(9):661-669.
- Sato, M., Fujiwara, S., Tsuchiya, H., Fujii, T., Iinuma, M., Tosa, H. and Ohkawa, Y. 1996. Flavones with antibacterial activity against cariogenic bacteria. *Journal of Ethnopharmacology*. 542-3):171-176.
- Sato, M., Tanaka, H., Fujiwara, S., Hirata, M., Yamaguchi, R., Etoh, H., Tokuda, C. 2003. Antibacterial property of isoflavonoids isolated from *Erythrina variegata* against cariogenic oral bacteria. *Phytomedicine*. 10(5):427-433.
- Tsuchiya, H., Sato, M., Iinuma, M., Yokoyama, J., Ohyama, M., Tanaka, T., Takase, I., Namikawa, I. 1994. Inhibition of the growth of cariogenic bacteria *in vitro* by plant flavanones. *Experientia*. 50(9):846-849.
- van der Weijden, G.A., Timmer, C.J., Timmerman, M.F., Reijerse, E., Mantel, M.S. and vanderVelden, U. 1998. The effect of herbal extracts in an experimental mouthrinse on established plaque and gingivitis. *Journal of Clinical Periodontology*. 25(5):399-403.