HERBAL PERIODONTOLOGY- A REVIEW

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ABSTRACT:

Since ancient times, herbs have been used for the treatment of various diseases. Additionally, medicinal herbs have their own traditional values in different tribes. Over the last decade herbal medications is turning out to be a popular form of therapy due to their wide spectrum of biological and medicinal activities, natural ingredients, lower costs, and higher safety margin. There are number of traditional herbal remedies for the treatment and management of diseases related to the oral cavity. The aim of the present article is to review the use of traditional herbal medicines in the management of periodontal diseases.

KEYWORDS: medicinal herbs, periodontitis, phytoconstituents, antioxidants, anti-inflammatory, antimicrobial.

INTRODUCTION:

Natural products have been used for several years in folk medicine. Herbal drugs are the drugs which are of plant origin and are used to treat diseases to attain or maintain the condition of improved health.[1] Plants play an important role in curing diseases especially in East region countries. Ayurvedic medicine (Ayurveda = the science of life) has its roots, grounded deep in India and is being used here since times immemorial. Many developed countries such as Europe, United States and Japan have also been attracted towards Herbal medicine.[2] These medicines

are not only used for the treatment of systemic diseases, but also an effective alternative to antibiotics in the prevention and therapeutic strategies for oral infections too.[3]

Periodontal disease is a chronic bacterial infection characterized by persistent inflammation, connective tissue breakdown and alveolar bone destruction.[4] Progression of periodontal disease is a combined effect of bacteria and host which include the presence of periodontopathic bacteria and high levels of proinflammatory cytokines.[5] Due to its multifactorial etiology and complex disease process, the treatment of periodontitis still remains a formidable task. Herbal remedies have potentially demonstrated antimicrobial, antioxidant, antiseptic, anti-inflammatory, and anti-collagenase effects. Therefore, this review focuses on the various herbs used in the treatment of periodontitis.

Green tea:

'Tea' made from buds and leaf of the plant *Camellia sinenis* is the second most consumed beverage in the world.[6] Green tea is 'non-fermented' (produced by drying and steaming the fresh leaves to inactivate the polyphenol oxidase and thus, non oxidation occurs). It can be considered an important dietary source of polyphenols, particularly flavonoids. The main flavonoids present in green tea include Catechin, gallocatechin, epicatechin, epigallocatechin, epicatechin gallate (ECg), and epigallocatechin gallate (EGCg). catechins (flavan-3-ols).

Catechins of green tea are found to be effective against periodontal pathogens. *In vitro* studies showed that catechin inhibit the growth of *P. gingivalis*, *Prevotella intermedia* and *Prevotella nigrescens*.[7,8] It is also observed that both ECg and EGCg inhibited *P. gingivalis* derived collagenase activity. Components in green tea indirectly function as antioxidants through 1) inhibition of the redoxsensitive transcription factors; 2) inhibition of 'pro-oxidant' enzymes, such as inducible nitric oxide synthase, lipoxygenases, cyclooxygenases and xanthine oxidase; and 3) induction of antioxidant enzymes, such as glutathione-S-transferases and superoxide dismutases. There are various reports about the use of green tea in various forms in the management of periodontitis. Studies on the usage of green tea as a dentifrice and a local drug delivery system have observed an improvement in the periodontal status of the patients suffering from chronic periodontitis. [9]

Triphala:

Triphala is well known preparation used in ayurvedic medicine. Its major components consists of Amalaki (*Emblica officinalis*), Haritaki (*Terminalia chebula*) and Bahera (*Terminalia belerica*). Antioxidant property of these components are effective against protection of gingival cells from free radical scavenging. Anticollagenase activity of Triphala have shown inhibition of collagenases derived from polymorphonuclear leukocytes which are responsible for connective tissue destruction in periodontal disease. It can also inhibit dental biofilm formation. A clinical

trial has demonstrated Triphala mouthwash to be as efficacious as 0.2% chlorhexidine in its antiplaque and anti-inflammatory activities.[10]

Rubia cordifolia:

Chinese Pharmacopoeia officially listed roots of *Rubia cordifolia* as it has been used in Chinese traditional medicine for centuries. The major and index component, Mollugin have shown several pharmacological effects. The studies showed that mollugin significantly inhibit the release of nitric oxide (NO), interleukin IL -1β and IL-6 and stimulates the release of tumor necrosis factor TNF-α in lipopolysaccharide LPS-stimulated RAW264.7 macrophages and thus posses anti-inflammatory activity.[11] Mollugin inhibit RANKL-induced osteoclast differentiation and bone resorbing activity of mature osteoclasts.

Ginkgo biloba:

Ginkgo is a genus of nonflowering plants whose leaves contain two bioactive substances i.e terpene and several flavonoids. Terpen compounds reduce nitric oxide synthesis in macrophages, thus acting as anti-inflammatory mediators while flavonoids act as anti-inflammatory and antioxidant substances. In a ligature-induced periodontitis rat model, systemic administration of Ginkgo biloba extract (28-56 mg/kg/day) resulted in reduced osteoclastic counts, decreased inflammation and induced osteoblastic activity. [12]

Psidium guajava:

The leaves and bark of P. guajava tree have long history of medicinal uses, that is still employed today. It contains important phytoconstituents such as tannins, triterpenes, flavonoid: quercetin, pentacyclic triterpenoid: guajanoic acid, saponins, carotenoids, lectins, leucocyanidin, ellagic acid, amritoside, betasitosterol, uvaol, oleanolic acid and ursolic acid. Different parts of guava plant like roots, barks, leaves, can be used as they possess antioxidant, astringent,[13] antibiotic properties.[14] The decoction of the root bark is recommended as a mouthwash and decoction of leaves is an effective gargle for bleeding gums.[15]

Sumac:

Sumac is the common name for a genus (Rhus) that contains over 250 individual species of flowering plants in the family Anacardiaceae and are found in temperate and tropical regions worldwide. Sumac extracts possess following properties like antifibrogenic, antifungal, antiinflammatory, antimalarial, antimicrobial, antimutagenic, antioxidant, antithrombin, antitumorigenic, antiviral, cytotoxic, hypoglycaemic, and leukopenic.[16] Sumac extracts have the potential to reduce alveolar bone loss by affecting serum total oxidant status (TOS) and oxidative stress index (OSI) levels in periodontal disease in rats.[17]

Piperine:

Plants such as black pepper (Piper nigrum) and long pepper (Piper longum) contain piperine which is an alkaloid. Piperine is a potent inhibitor of production of nitric oxide (NO), tumor necrosis factor-a (TNF-a) and also it is free radical scavenger. [18] Another study on rat periodontitis model revealed that piperine has anti-inflammatory action and can inhibit alveolar bone loss, and collagen fiber breakdown.[19]

Aloe vera:

Aloe vera is the most popular herb used in traditional medicine. Plant contains natural anthraquinones like aloe emodin, aloetic acid, aloin, anthracine, anthranol, barbaloin, chrysophanic acid, ethereal oil, ester of cinnamonic acid, isobarbaloin, and resistannol. In low concentration these anthraquinones show antimicrobial, antifungal, antiviral activity. In studies, it is observed that aloe vera gel used as a local drug delivery system in periodontal pockets shows improvement in the periodontal condition.[20]

Frankincense extract:

A resin-like extract of *Bowsellia* species called as Frankincense possess Boswellic acid and is used since ancient time in India. Studies showed that administration of 0.1 g of Frankincense extract or 0.2 g of its powder led to a significant decrease in various gingival and plaque scores due to its anti-inflammatory and antibacterial effects.[21]

Turmeric*:*

Turmeric (Haldi) is the most commonly used traditional medicine in India after injury because of its antiseptic property. Along with that it also possess as properties like anti-inflammatory, antioxidant, immunostimulant enabling its use in dentistry. Studies showed that 0.1% turmeric mouthwash can be used as an antiplaque agent as an adjunct to mechanical plaque control for prevention of plaque and gingivitis.[22]

Ginger, the rhizome of Zingiber officinale:

The edible portion of the ginger plant is used as a spice and its the root portion are used for medicinal purposes for centuries. Ginger extract is commonly used for the treatment of headache, spastic colon, nausea, motion sickness, joint pain. Compounds in ginger are now being investigated as a novel class of anti-inflammatory compounds as it inhibits arachidonic acid metabolism via the cyclooxygenase and lipoxygenase pathways.[23]

Neem:

Neem (*Azadirachta indica)* , a Meliaceae family tree, has been used in India for several decades for the treatment of several diseases in medicine and dentistry. The anti inflammatory action of neem happens due to inhibition of prostaglandin E and 5 HT. “Azadiachtin” content in neem shows antibacterial action by destroying bacterial cell walls and thus inevitably inhibiting

the growth of bacteria. A study showed that there is a significant reduction of gingival bleeding, and plaque indices and improvement in periodontal health over a period of 21 days following administration of neem.[24]

Meswak (Salvadora persica):

Herbal chewing sticks, commonly known as Meswak, are among the ancient and traditional oral hygiene aids popular in India, Pakistan most of the Arabian countries, and several African countries. Meswak is a pencil-sized stick 15 to 20 cm long with a diameter of 1 to 1.5 cm from *Arak* (*Salvadora persica*) also called as the Toothbrush tree. Studies showed comparable effects of meswak with a conventional dentifrice in maintaining oral hygiene.[25]

Tulsi (Ocimum sanctum):

Use of phytomedicine for oral disorders such as dental caries and periodontal disease, has also been well practiced in traditional medicine of Indian, Egyptian, Greek, and Chinese civilizations. Out of these medicinal herbs *Ocimum sanctum* commonly called as Tulsi is called as "Queen of Herbs." Tulsi has long been recognized as possessing antioxidant properties, as a COX2 inhibitor. Studies showed that 5% and 10% concentrations of tulsi extract can inhibit growth of periodontal pathogens like *A. actinomycetemcomitans.*[26] Its astringent properties also help the gums. Tulsi is an excellent mouth freshener and oral disinfectant. Phytoconstituents isolated from various parts of the plant include eugenol, palmitric acid, vallinin, galic acid, Vitamin A, Vitamin C are responsible for preventing dental caries, plaque, and bad breath, etc.

Clove:

Use of clove in relieving tooth ache is a traditional remedy since ancient times. Clove oil containing eugenol has been used in dentistry for many years. Its germicidal properties make it very effective against sore gums and mouth ulcers. Gargling with diluted clove oil helps in easing throat pain and irritation. The characteristic smell of clove oil also helps to eliminate bad breath.[27]

Garlic (Allium sativum):

Garlic, a member of the onion family, has been used throughout history for a variety of medicinal uses. Allicin and other thiosulfinates in garlic have been reported to inhibit the growth of various gram-positive and gram-negative bacteria in the oral cavity. It is thought that toothpaste or mouthwash containing optimum concentration of garlic extract might be useful for prevention of dental caries.[28]

Curry leaf tree (Murraya koenigii spreng):

Curry leaves are used daily as an ingredient in Indian cuisine. Its broad antimicrobial effects are due to volatile essential oils such as sesquiterpenes and monoterpene present in fresh

curry leaves. It also contains chlorophyll that is proposed as an anticariogenic agent and also helps to reduce halitosis.[29]

Cinnamon zeylanicum:

Cinnamon is the most common spice used in Indian cuisine. It has antimicrobial property. Hence it can be used as an antiseptic in toothpaste, mouthwash or chewing gum for prevention of dental caries as it is highly active against streptococcus mutans.[30]

Eucalyptus (Globulus labill)

Eucalyptus globulus, also known as Blue Gum is used as medicinal herb in Chinese, Indian Ayurvedic, Greek, and other European styles of medicine since thousands of years. Also used as a perfume, ingredient in cosmetics, a flavouring agent and in industrial solvents. The leaves contain flavonoids and tannins; flavonoids are plant-based antioxidants, and tannins may help to reduce inflammation. Studies showed that chewing gum containing eucalyptus extract improves gingival health, decreases bleeding during probing, and reduces periodontal diseases.[31]

Lippia sidoid:

Lippia sidoides popularly known as pepper-rosmarin, is an aromatic and medicinal plant species of the family Verbenaceae. The major constituents of the essential oil of *L.sidoides* are thymol and carvacrol, which are responsible for the remarkable inhibitory activity against microorganisms. Studies have shown that the gel preparation containing 10% *L. sidoides* essential oil has been found to be an efficient herbal antiplaque and antigingivitis agent.[32]

Septilin:

Septilin is a herbal immune modulators. As host modulation has paved its way in the periodontology, different products such as *Septilin* can be used to manage periodontitis. Studies have shown that the use of Septilin in patients with chronic periodontitis have reduced Gingival index, Gingival bleeding index, as well as salivary tumour necrosis factor and improved the periodontal health.[33]

Berberis vulgaris

Berberis vulgaris is commonly called as Jaundice berry and has many active alkaloids in it. Alkaloids like oxyacanthine, colunbamine, berberine are known for its antimicrobial and antiviral effects. A study showed that barberry dental gel effectively controls microbial plaque and gingivitis in school-aged children.[34]

***Myristica fragrans*:**

Myristica fragrans, commonly known as nutmeg has been used as a spice and flavouring agent in the food industry and domestic use since ages. Due to its complex structural molecules, it is shown to have many medicinal properties. It has anti-microbial, anti-inflammatory, anti-

collagenolytic, anti-oxidant effect. Hence, in proper dosage, nutmeg can be used as an adjunct to treat periodontitis.[35]

Mimusops elengi

Mimusops elengi commonly known as "Indian meddler tree "or "Bakul tree" is used as medicinal herb in India since ages. M.elengi contains variety of active phyto constituents and thus posses various kinds of biological and pharmacological activities. It possess different activities like antibacterial, antifungal, free radial scavenging and antiviral effect. It has an astringent property. It has also known to be used in treating gingival diseases and dental pain since ages. The bark extract showed in vitro antimicrobial activity against Staphylococcus aureus, S. mutans, S.salivarius, S. sangius, Lactobacillus acidophilus and Candida albicans. [36]

Pomegranate (Punica granatum):

The pomegranate (*Punica granatum*) is a fruit-bearing deciduous shrub/small tree. Its active components, include polyphenolic flavonoids which are believed to prevent gingivitis through a number of mechanisms including reduction of oxidative stress in the oral cavity, direct antioxidant activity; anti-inflammatory effects, antibacterial activity and direct removal of plaque from the teeth.[37]

Lemon grass (Cymbopogon Citratus):

Citronellol Geraniol is the active ingredient present in this grass which is responsible for its anti-bacterial, astringent, anti-fungal, anti-oxidant, anti-septic, anti-inflammatory properties. In an in vitro study it has been demonstrated that the essential oil in lemon grass has significant anti-microbial potential against oral microorganisms S.mutans, P.intermedia and P. gingivalis .[38]

CONCLUSION:

Herbal medicines possess a wide array of biological properties such as antimicrobial, antioxidant and anti-inflammatory effects. The natural phytochemicals present in these herbs aid in suppressing the alveolar bone loss and thus preventing further progression of periodontitis. Use of herbal extracts in the form of dentifrice, medicated gel, local drug delivery systems proved to be efficient in preventing and treating periodontal disease. Hence, this review gives a brief explanation of pharmacologically active herbal plants found to be useful in the prevention, treatment and maintenance of various dental diseases.

REFERENCES:

1) Chaturvedi TP. Uses of turmeric in dentistry: An update. Indian J Dent Res 2009;20:107-9.
2) Hartzell JF, Zysk KG. Health, science, and the spirit: Veda and Āyurveda in the Western world. J Altern Complement Med 1995;1:297-301.

3) Singh J, Kumar A, Budhiraja S, Hooda A. Ethnomedicine: Use in dental caries. Braz J Oral Sci 2007;6:21.
4) Armitage GC. Development of a classification system for periodontal diseases and conditions. Ann Periodontol. 1999;4(1):1-6.
5) Page RC, Offenbacher S, Schroeder HE, Seymour GJ, Kornman KS. Advances in the pathogenesis of periodontitis: summary of developments, clinical implications and future directions. Periodontol 2000. 1997;14(1):216-48.
6) Rietveld A, Wiseman S: Antioxidant effects of tea: Evidence from human clinical trials. J Nutr 133:3275–3284, 2003.
7) Asahi Y, Noiri Y, Miura J, Maezono H, Yamaguchi M, Yamamoto R, *et al.* Effects of the tea catechin epigallocatechin gallate on *Porphyromonas gingivalis* biofilms. J Appl Microbiol 2014;116:1164-71
8) Araghizadeh A, Kohanteb J, Fani MM. Inhibitory activity of green tea (*Camellia sinensis*) extract on some clinically isolated cariogenic and periodontopathic bacteria. Med Princ Pract 2013;22:368-72.
9) Hirasawa M, Takada K, Makimura M, Otake S. Improvement of periodontal status by green tea catechin using a local delivery system: A clinical pilot study. J Periodontal Res 2002;37:433-8.
10) Naiktari RS, Gaonkar P, Gurav AN, Khiste SV. A randomized clinical trial to evaluate and compare the efficacy of triphala mouthwash with 0.2% chlorhexidine in hospitalized patients with periodontal diseases. J Periodontal Implant Sci 2014;44:134-40.
11) Zhu ZG, Jin H, Yu PJ, Tian YX, Zhang JJ, Wu SG. Mollugin inhibits the inflammatory response in lipopolysaccharide-stimulated RAW264.7 macrophages by blocking the Janus kinase-signal transducers and activators of transcription signaling pathway. Biol Pharm Bull 2013;36:399-406.
12) Sezer U, Kara MI, Erciyas K, Ozdemir H, Üstün K, Ozer H, *et al.* Protective effects of *Ginkgo biloba* extract on ligature-induced periodontitis in rats. Acta Odontol Scand 2013;71:38-44.
13) Gutierrez RM, Mitchell S, Solis RV, Psidium guajava: a review of its traditional uses, phytochemistry and pharmacology, J Ethnopharmacol, 2008, 117(1), 1-27.
14) Heinrich M. Plants as antidiarrhoeals in medicine and diet. Proceedings from a Joint Meeting of the Society for Economic Botany and the International Society London, Royal Botanic Gardens, Kew, UK; 1998. P. 17-30.
15) Mittal P, Gupta V, Kaur G, Garg AK, Singh A. Phytochemistry and pharmacological activities of *Psidium guajava*: A review. Int J Pharm Sci Res 2010;1:9-19.
16) Rayne S, Mazza G. Biological activities of extracts from sumac (Rhus spp.): A review. Plant Foods Hum Nutr 2007;62:165-75.
17) Saglam M, Köseoglu S, Hatipoglu M, Esen HH, Köksal E. Effect of sumac extract on serum oxidative status, RANKL/OPG system and alveolar bone loss in experimental periodontitis in rats. J Appl Oral Sci 2015;23:33-41.

18) Pradeep CR, Kuttan G. Effect of piperine on the inhibition of nitric oxide (NO) and TNF-alpha production. Immunopharmacol Immunotoxicol 2003;25:337-46.
19) Dong Y, Huihui Z, Li C. Piperine inhibit inflammation, alveolar bone loss and collagen fibers breakdown in a rat periodontitis model. J Periodontal Res 2015;50:758-65.
20) Bhat G, Kudva P, Dodwad V. *Aloe vera*: Nature's soothing healer to periodontal disease. J Indian Soc Periodontol 2011;15:205-9.
21) Khosravi Samani M, Mahmoodian H, Moghadamnia A, Poorsattar Bejeh Mir A, Chitsazan M. The effect of Frankincense in the treatment of moderate plaque-induced gingivitis: A double blinded randomized clinical trial. Daru 2011;19:288-94.
22) Mali AM, Behal R, Gilda SS. Comparative evaluation of 0.1% turmeric mouthwash with 0.2% chlorhexidine gluconate in prevention of plaque and gingivitis: A clinical and microbiological study. J Indian Soc Periodontol 2012;16:386-91.
23) Anti Inflammatory and Analgesic Effect of Ginger Powder in Dental Pain Model-Full Text View – Clinical Trials.
24) Chatterjee A, Saluja M, Singh N, Kandwal A. To evaluate the antigingivitis and antipalque effect of an *Azadirachta indica* (neem) mouthrinse on plaque induced gingivitis: A double-blind, randomized, controlled trial. J Indian Soc Periodontol 2011;15:398-401.
25) Gupta P, Agarwal N, Anup N, Manujunath BC, Bhalla A. Evaluating the anti-plaque efficacy of meswak (*Salvadora persica*) containing dentifrice: A triple blind controlled trial. J Pharm Bioallied Sci 2012;4:282-5.
26) Mallikarjun S, Rao A, Rajesh G, Shenoy R, Pai M. Antimicrobial efficacy of Tulsi leaf (*Ocimum sanctum*) extract on periodontal pathogens: An *in vitro* study. J Indian Soc Periodontol 2016;20:145-50.
27) Health Benefits of Clove Oil, Organic Facts. Available from: http://www.organicfacts.net/organic-oils/natural-essential-oils/health-benefits-of-clove-oil.html.
28) Prabhakar AR, Ahuja V, Basappa N. Effect of curry leaves, garlic and tea tree oil on *Streptococcus mutans* and *Lactobacilli* in children: A clinical and microbiological study. Pesqui Bras Odontopediatria Clín Integr 2010;9:259-63.
29) Math MV, Balasubramaniam P. Curry leaves. Br Dent J 2004;197:519.
30) Fani MM, Kohanteb J. Inhibitory activity of *Cinnamomum zeylanicum* and eucalyptus globulus oils on *Streptococcus mutans*, *Staphylococcus aureus*, and *Candida* species isolated from patients with oral infections. J Dent Shiraz Univ Med Sci 2011;11:14-22.
31) Motamayel FA, Hassanpour S, Alikhani MY, Poorolajal J, Salehi J. Antibacterial effect of eucalyptus (*globulus labill*) and garlic (*Alliu sativum*) extracts on oral Cariogenic bacteria. J Microbiol Res Rev 2013;1:12-17.
32) Pereira SL, Praxedes YC, Bastos TC, Alencar PN, da Costa FN. Clinical effect of a gel containing *Lippia sidoides* on plaque and gingivitis control. Eur J Dent 2013;7:28-34.

33) Shetty S, Bose A, Sridharan S, Satyanarayana A, Rahul A. A clinico-biochemical evaluation of the role of a herbal (Ayurvedic) immunomodulator in chronic periodontal disease: A pilot study. Oral Health Dent Manag 2013;12:95-104.
34) Makarem A, Khalili N, Asodeh R. Efficacy Of barberry aqueous extracts dental gel on control of plaque and gingivitis. Acta Med Iran 2007;45:90-4.
35) Jangid K., Jayakumar ND., Varghese SS., Achievable therapeutic effects of myristica fragrans (nutmeg) on periodontitis-A short review. Int J Pharm Pharm Sci 2014;6(5):591-4.
36) Prabhat A, Navneet, Avnish C. Evaluation of antimicrobial activity of six medicinal plants against dental pathogens. Report opinion 2010;2(6):37-42.
37) Dhalkari C., Wagatkar J. and Ingle K. Herbal remedies in periodontics. IJIRR.2016; 3(2):1884-86.
38) Ruchika ghoyal, Meena K Anand. Antibacterial effect of lemon grass oil on oral microorganisms: an in vitro study. J pharma and scientific innovation.2013;2(2):41-43.