

REVIEW ARTICLES

GO GREEN PERIODONTICS

ABSTRACT

There are many ways to treat and manage periodontal diseases, one among them is the natural remedy of using herbs in prevention and treatment of periodontal diseases. Various herbal products and their extracts such as aloe vera, neem, turmeric, green tea, etc., have been used as herbal remedies for the treatment of periodontal diseases. Our paper provides a review of potent herbal remedies being used worldwide for the treatment and prevention of periodontal diseases.

Key words: Herbal remedies, Periodontal diseases, Non-surgical therapy

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INTRODUCTION

Periodontitis is an inflammatory disorder which is caused by microorganisms such as *Porphyromonas gingivalis*, *Aggregatibacter actinomycetemcomitans* and many other organisms which results in the destruction of supporting periodontal tissues resulting in bone loss and loosening of teeth. The prime aim of the periodontal therapy is to restore the lost, form, function, esthetics and comfort. The treatment of periodontitis mainly involves the non-surgical and surgical periodontal therapy. The non-surgical periodontal therapy mainly involves scaling and root planing with antibiotic prophylaxis which can alter the progression of periodontal disease and reduce the bacterial count.¹

As the periodontal diseases are associated with bacterial infections, antibacterial treatment seems to be an appropriate method of improving the condition of the inflamed tissues. As the antibiotics are systemically administered, the drug is distributed throughout the body, which is not required and can lead to toxicity.² To minimize these problems associated with systemic antibiotics, the local drug delivery system was introduced which can deliver the drugs for a constant and prolonged time period locally. The antibiotics are delivered locally in the form of fibers, strips and compacts, films, microparticles, gels and nanoparticles. In the recent days because of the increasing antibiotic resistance, herbal forms of medicines were developed to treat the periodontal disease. During the last decade, extracts or oils of medicinal plants with antimicrobial and anti-inflammatory activity have been used for prevention of various oral infections. More recently herbosomes – herbal medicinal system for treating periodontal disease has been reviewed by Nimbekar et al in 2012.³ Herbosomes are recently introduced herbal formulations that are better absorbed and as a result produce better bioavailability and actions than the conventional botanical extracts.

Herbal drugs in management of periodontal disease:

Acacia Catechu wild:

Widely used in Ayurveda for many diseases and mainly for skin diseases. *A. catechu* commonly known as Black khair and commercially used to

obtain Kattha in North India. The bark of this plant has strong antioxidant, astringent, anti-inflammatory, anti-bacterial and antifungal properties. *A. catechu* is used as mouthwash for mouth, gum and throat disease like gingivitis, stomatitis.⁴

Aloe Vera Miller:

Aloe vera is *Aloe barbadensis* Miller. The species is frequently used in herbal medicine and cosmetics. Traditionally, Aloe was used topically to heal wounds, skin diseases and orally as a laxative. It is also used in conditions including diabetes, asthma, epilepsy and osteoarthritis.⁵

Aloe vera is a perennial plant belonging to the *Aloeaceae* family. Aloe vera has anti-inflammatory properties, anti-ulcer activity and an astringent effect and may have the ability to reduce scars and enhance wound healing. The aloe vera plant contains anthraquinone glycosides, polysaccharides, aloeresins, glucomannans, and b-sitosterol. Polysaccharides, especially the acetylated mannans from aloe vera, plays a key role in immunomodulation.

Aloe vera is used in plaque control to reduce gingivitis and periodontitis.⁶

Villalobos et al observed a significant reduction in plaque and gingivitis after 30-days use of mouthrinse containing aloe vera with tooth brushing.⁷ Okyar et al reported that treatment with aloe vera increased antioxidant enzymes and reduced lipid peroxidation.⁸

Azadirachata indica (Neem)

Neem tree (*A. indica*) was described as early as in 1830 by De Jussieu.⁹ It belongs to *Meliaceae* family. Every part of the tree has been used in traditional medicine for household remedy.^{10,11} Bioactive compounds in neem includes nimbidin, nimbolide, gedunin, and mahmoodin. Nimbidin has anti-inflammatory, anti-arthritic, antipyretic, hypoglycemic, and anti-bacterial property.^{12,13} It is active against *Klebsiella*, *Staphylococcus* and *Serratia* species. It is also active against *Streptococcus mutans* and *Streptococcus faecalis*.

Chatterjee et al¹⁴ reported antigingivitis and

antiplaque effect of neem mouth rinse on plaque induced gingivitis and found that *A. indica*-based mouth rinse is equally efficacious with fewer side effects as compared to chlorhexidine and may be used as an adjunct therapy in treating plaque induced gingivitis. In addition it can be used in the form of gel and strips as local drug delivery.

Curcuma Longa (Turmeric)

Turmeric (haldi), a rhizome of *Curcuma longa*, is a flavourful yellow-orange spice. Its plant is 3 feet in height and has lance-shaped leaves and spikes of yellow flowers that grow in a fleshy rhizome or in underground stem. An orange pulp inside the rhizome constitutes the source of turmeric medicinal powder. Components of turmeric are commonly named curcuminoids, which includes curcumin, demethoxycurcumin and bisdemethoxycurcumin.¹⁵

The active constituent of turmeric is known as curcumin. It has a wide range of therapeutic actions such as antioxidant, anti-inflammatory, hepatoprotective, antimicrobial, anti-platelet aggregation and antimutagenic.¹⁶

As a topical application - Applying a paste made from 1 tsp of turmeric with ½ tsp of salt and ½ tsp of mustard oil provides relief from gingivitis and periodontitis. It is recommended to rub the teeth and gums with this paste twice daily.¹⁷

A study by Waghmare et al.¹⁸ concluded that turmeric mouthwash can be effectively used as an adjunct to mechanical plaque control methods in prevention of plaque and gingivitis. The effect of turmeric observed may be because of its anti-inflammatory action. There was a reduction in total microbial count with the use of turmeric as mouth wash. Behal et al.¹⁹ used turmeric gel as an adjunct to scaling and root planing and found a significant reduction in the trypsin-like enzyme activity of "red complex" microorganisms. Suhag et al.²⁰ used turmeric as subgingival irrigant and found a better resolution of inflammation than chlorhexidine and saline irrigation.

Matricaria Chamomile (Camomile)

Chamomile or camomile is a common name for sev-

eral daisy-like plants of the family Asteraceae. Chamomile flowers are also used as anti-inflammatory.²¹

Saderi et al in 2005 conducted a study to evaluate the antimicrobial effects of Chamomile extract and essential oil on clinically isolated *Porphyromonas gingivalis* from Periodontitis and they found that they had antibacterial activity against *P.gingivalis*, suggesting the potential use of Chamomile in natural mouthwash to control of *P.gingivalis* induced periodontitis.²²

Pourabbas et al.²³ studied the effect of German Chamomile(GC) mouthwash on dental plaque and gingival inflammation. They reported that GC mouthwash resulted in the reduction in the plaque and gingival index scores, which were significantly better than the control rinse. The anti-inflammatory effect of GC mouth rinse is because of the salicylic acid in the form of a methyl ester. They further reviewed that the other constituents which are found in whole plant chamomile extract are flavonoids, including apigenin, chamazulene and α -bisabolol. The flavones act as anti-inflammatory agents due to interfering with the arachidonic acid pathway. The GC extract also promotes wound healing by decreasing the inflammatory responses and accelerating granulation and regeneration of the tissues on topical application.

Eucalyptus Extract²⁴

Eucalyptus is a native to Australia and is a widely planted genus. *Eucalyptus globulus* is a representative of *Eucalyptus* species. Its leaf is used for medicinal purposes and as a food source. They possess antibacterial activity against various bacteria, including oral bacteria. 60% ethanol from the *E.globulus* leaf exerts antibacterial activity against periodontopathic bacteria like *porphyromonas gingivalis* and *prevotella intermedia*.

Macrocarpals, are polyphenols which are unique to eucalyptus and are major components of ethanol extracts of *E.globulus* leaf exerts antibacterial and antiviral activities, antagonism of thromboxane A2 and leukotriene D4. Macrocarpals A, B, C, D, H, I, and J and eucalypton were isolated in the mid-

1990s. Macrocarpals A, B, and C inhibit the activity of virulence factors of *P.gingivalis*, including Arg- and Lys-specific cysteine proteinases, as well as adhesion of the organism to saliva-coated hydroxyapatite beads. So these are considered as the primary antibacterial agents against cariogenic and periodontopathic bacteria.

A study done by Nagata et al.²⁵ found that Eucalyptus extract may improve the condition of the oral health. This study revealed that subjects who chewed eucalyptus containing chewing gum found relief from the disease symptoms such as less gingival bleeding, improved pocket depth and reduced plaque accumulation.

Green tea:

Green tea is extracted from the leaves of *Camellia sinensis*, which is shrub-like, plant.²⁶ Tea is reported to contain nearly 4000 bioactive compounds of which one third is contributed by polyphenols.²⁷ Polyphenols found in tea are mostly flavonoids and catechins. The catechins are thought to be responsible for the health benefits that have traditionally been attributed to tea, especially green tea. Major catechins are epicatechin gallate (ECG), epicatechin (EC), epigallocatechin (EGC) and epigallocatechin gallate (EGCG). The most active and abundant catechin in green tea is epigallocatechin-3-gallate (EGCG).²⁸

Green tea catechin inhibit the growth of *P.gingivalis*, *Prevotella intermedia* and *Prevotella nigrescens* and adherence of *P.gingivalis* on to human buccal epithelial cells.²⁹ EGCG, ECG and gallic acid, 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. The combined use of mechanical treatment and the application of green tea catechin using a slow-release local delivery system was effective in improving the periodontal status.³⁰ Nakagawa et al reported that EGCG inhibited osteoclast formation in a co-culture of primary osteoclastic cells and bone marrow cells, and it induced apoptotic cell death of

osteoclast in a dose-dependent manner suggesting the role of green tea in the prevention of bone resorption.³¹ EGCG prevents alveolar bone resorption by inhibiting the expression of MMP-9 in osteoblasts and formation of osteoclast. Hattarki et al.³² conducted a split mouth study, in which green tea catechin was used as local drug delivery and they found that the catechin reduced all the clinical parameters and microbiological analysis, it significantly reduced the red complex organisms in the study group suggesting the bactericidal and anti-inflammatory activity of green tea catechin.

Oxidative stress plays an important role in the pathogenesis of periodontal disease as well as many other disorders, and it is believed that antioxidants can defend against inflammatory diseases.³³ Antimicrobial polyphenols in green tea can improve bad breath by suppressing the periodontopathic bacteria from producing methyl mercaptan, an important volatile sulphur compound which is the main source for halitosis.³⁴

Propolis:

Propolis, also called as bee glue, is a natural resinous substance collected by honey bees (*Apis mellifera* L.) from plant buds and bark exudates and mixed with other substances. Its chemical constituents comprises of approximately 55% resinous compounds and balsam, 30% beeswax, 10% ethereal and aromatic oils, and 5% bee pollen. Bioflavonols are the key contributors to propolis properties. Propolis was found to be rich in vitamins A, B1, B2, B3, biotin and 14 of the 15 minerals that the human body requires for normal function.³⁵

Flavonoids are compounds which have antibacterial, antifungal, antiviral, antioxidant, and anti-inflammatory properties. Propolis has been found to be very effective against gram positive and gram negative bacteria, yeast and virus.³⁶

Murray investigated the effectiveness of a propolis containing mouthrinse in the inhibition of plaque formation concluded that propolis containing mouthrinse was marginally better than negative control.³⁷

Tea tree oil:

Tea tree oil is derived from the paper bark tea tree, which is part of the family Myrtaceae. Tea tree oil is the essential oil containing many components like monoterpene and sesquiterpene hydrocarbons and their alcohols. Tea tree oil is now used around the world in many cosmetic, medicinal and dental products (e.g., natural toothpastes). The main components of tea tree oil are also found in other common essential oils.³⁸

Tea tree oil shares a similar range of antimicrobial activity with chlorhexidine (CHX), although their mechanisms of action differ. They both have antibacterial, antiviral and antifungal properties. Tea tree oil has the potential to be a therapeutic agent in chronic gingivitis and periodontitis. Mouthwashes containing tea tree oil reduce gingival inflammation. It also helps in controlling halitosis and plaque formation.³⁹

Tulsi:

Botanical name is *Ocimum sanctum*. It possess many medicinal properties such as expectorant, analgesic, anti-cancer, anti-asthmatic, antiemetic, anti-diabetic, hepato-protective, hypotensive, hypolipidemic and antistress agents.²⁴

Dried, powdered tulsi leaves can be mixed with mustard oil to make a paste and used as tooth paste.⁴⁰ Its anti-inflammatory property helps in treating gingivitis and periodontitis.⁴¹

Bloodroot:

Because of its natural alkaloids, bloodroot can impair the growth of bacteria responsible for periodontal disease. Bloodroot is included in oral health products such as toothpaste and mouthwashes, as it can reduce the inflammation and prevent bacteria from deepening the periodontal pockets.¹

Lotus leaf:

Traditionally, in Chinese medicine the lotus leaf has been used for treating gingival inflammation. An extract of lotus leaves have demonstrated significant antibacterial activity against some of the periodontopathogens. Quercetin in a lotus leaves

extract may be responsible for antibacterial activity.⁴²

Fruit extracts in the management of periodontal disease:

Craneberry juice components have the ability to reverse and inhibit the coaggregation of oral bacteria responsible for plaque formation and periodontitis.⁴³ Blackberry extract concentrations exhibit antimicrobial properties against important periodontal pathogens as well as *Streptococcus mutans*. It has the potential to be used as an antibacterial topical agent for the prevention and control of periodontitis as well as dental caries. Incorporation of blackberry extract in oral-release devices, such as chewing gum, is a long-term goal.⁴⁴

CONCLUSION:

In the future, herbs will be a major source of new chemicals and raw materials for the pharmaceutical industry. It is important to correlate the ancient literature of traditional plants with the etiology of periodontal disease so that the active ingredients of these herbs can be used in the management of periodontal disease. The interest in herbal products globally in the recent years is because of its low cost, ease of availability and safety. The herb–drug interactions has to be considered which is a potential hazard and can lead to deleterious effects. These herbal remedies hold a promising future in periodontal therapy.

REFERENCES

1. Reddy PD, Sathyanarayana T, Swarnalatha, Purushothaman M. Local drug delivery of herbs in treatment of periodontitis. *JITPS*. 2010;1:245-51.
2. Kumar P, Ansari SH, Ali J. Herbal remedies for the treatment of periodontal diseases- a patent review. *Recent Pat Drug Deliv Formul*. 2009;3:221-8.
3. Nimbekar T, Wanjari B, Bais Y. Herbosomes – herbal medicinal system for the management of periodontal disease. *Int J of Biomed & Adv Res*. 2012;3:468-72

4. Negi BS, Dave BP. In vitro antimicrobial activity of *Acacia catechu* and its phytochemical analysis. *Indian J Microbiol* 2010;50:369-74.
5. Vogler BK, Ernst E. Aloe vera: a systematic review of its clinical effectiveness. *Br J Gen Pract* 1999;49:823-8.
6. Reynolds T, Dweck AC. Aloe vera leaf gel: A review update. *J Ethnopharmacol* 1999;68:3-37.
7. Villalobos OJ, Salazar CR, Sa´nchez GR. Effect of a mouthwash made of Aloe vera on plaque and gingival inflammation (in Spanish). *Acta Odontol Venez* 2001;39:16-24.
8. Okyar A, Can A, Akev N, Baktir G, Su˘tlu˘pınar N. Effect of Aloe vera leaves on blood glucose level in type I and type II diabetic rat models. *Phytother Res* 2001;15:157-161
9. Chatterjee A, Pakrashi SC. *The Treatise on Indian Medicinal Plants, Volume 2.* Publications & Information Directorate, 1992. 1994;3:76.
10. Chopra RN, Nayer SL, Chopra IC. *Glossary of Indian Medicinal plants.* New Delhi: CSIR; 1956.
11. Drabu S, Khatri S, Babu S. *Neem: Healer of All Ailments.* *Res J Pharm Biol Chem Sci.*2012;3:120–6.
12. Biswas K, Chattopadhyay I, Banerjee RK, Bandyopadhyay U. Biological activities and medicinal properties of neem (*Azadirachta indica*) *Cur Scien.* 2002;8:1336–45.
13. Marsh PD. Host defences and microbial homeostasis: role of microbial interactions. *J Dent Res.*1989;68:1567–75.
14. 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.
15. Monika Nagpal and Shaveta Sood. Role of curcumin in systemic and oral health: An overview. *J Nat Sci Biol Med* 2013;4:3-7.
16. Chaturvedi TP. Uses of turmeric in dentistry: an update. *Indian J Dent Res.* 2009;20:107-9.
17. Cikrikci S, Mozioglu E, Yilmaz H. Biological activity of curcuminoids isolated from *Curcuma longa*. *Rec Nat Prod* 2008;2:19-24.
18. Waghmare PF, Chaudhari AU, Karhadkar VM, Jamkhande AS. Comparative evaluation of turmeric and chlorhexidine gluconate mouthwash in prevention of plaque formation and gingivitis: A clinical and microbiological study. *J Contemp Dent Pract.* 2011;1:221-4.
19. Behal R, Mali MA, Gilda SS, Paradkar AR. Evaluation of local drug delivery system containing 2% whole turmeric gel used as an adjunct to scaling and root planning in chronic periodontitis: A clinical and microbiological study. *J Indian Soc Periodontol.* 2011;15:35–8.
20. Suhag A, Dixit J, Dhan P. Role of curcumin as a subgingival irrigant: a pilot study. *Perio* 2007;4:115-21.
21. Amsterdam JD, Li Y, Soeller I, Rockwell K, Mao JJ, Shults J. A randomized, double-blind, placebo-controlled trial of oral matricaria recutita (chamomile) extract therapy of generalized anxiety disorder. *J Clin Psychopharmacol* 2009;29:378-82.
22. Saderi H, Owlia P, Hosseini A, Semiyari H. Antimicrobial effects of Chamomile extract and essential oil on clinically isolated *Porphyromonas gingivalis* from Periodontitis. *Acta Hort.* 680, ISHS 2005.
23. Pourabbas R, Delazar A, Chitsaz MT. The effect of German Chamomile mouthwash on dental plaque and gingival inflammation. *IJPR* 2005;2:105-9.
24. Agrawal N, Gupta R, Gupta I, Mehrotra V, Roopa DA. *Herbcraft: A boon to the periodontal therapy.* *Int J Dent Health Sci* 2014;1:47-62.
25. Nagata H, Inagaki Y, Tanaka M, et al. Effect of eucalyptus extract chewing gum on

periodontal health: a double-masked, randomized trial. *J Periodontol.* 2008;79:1378-1385.

26. Cabrera C, Artacho R, Giménez R. Beneficial Effects of Green Tea--A Review. *J Am Coll Nutr* 2006;25:79-99.
27. Mahmood T, Akhtar N, Khan BA. The morphology, characteristics, and medicinal properties of *Camellia sinensis*' tea. *J Med Plants Res.* 2010;4:2028-33.
28. Arab H, Maroofian A, Golestani S, Shafae H, Sohrabi K, Forouzanfar A. Review of the therapeutic effects of *Camellia sinensis* (green tea) on oral and periodontal health. *J Med Plants Res.* 2011;5:5465-69.
29. Sakanaka S, Aizawa M, Kim M, Yamamoto T. Inhibitory effects of green tea polyphenols on growth and cellular adherence of an oral bacterium, *Porphyromonas gingivalis*. *Biosci. Biotech. Biochem.* 1996;60:745-49.
30. 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 Periodont Res* 2002;37:433-8.
31. Nakagawa H, Wachi M, Woo JT, Kato M, Kasai S, Takahashi F, et al. Fenton reaction is primarily involved in a mechanism of (-)-epigallocatechin-3-gallate to induce osteoclastic cell death. *Biochem Biophys Res Commun* 2002;292:94-101.
32. Hattarki SA, Pushpa SP, Bhat K. Evaluation of the efficacy of green tea catechins as an adjunct to scaling and root planing in the management of chronic periodontitis using PCR analysis: A clinical and microbiological study. *J Indian Soc Periodontol.* 2013;17:204-9.
33. Coimbra S, Castro E, Rocha-Pereira P, Rebelo I, Rocha S, Santos-Silva A. The effect of green tea in oxidative stress. *Clin Nutr.* 2006;25:790-6.
34. Ui M, Yasuda H, Shibata M, Maruyama T, Horita H, Hara T, Yasuda T. Effect of tea catechins for halitosis and their application in chewing gum. *Nippon Shokuhin Kogyo Gakkaishi*, 1991;38:1098-1102.
35. Gebaraa EC, Pustiglioni AN, de Lima LA, Mayer MP. Propolis extract as an adjuvant to periodontal treatment. *Oral Health Prev Dent* 2003;1:29-35.
36. Kosalec1 SL, Pepeljnjak S, Bakmaz M. Flavonoid analysis and antimicrobial activity of commercially available propolis products. *Acta Pharma* 2005;55:423-30.
37. Murray MC, Worthington HV, Blinkhom AS. A study to investigate the effect of a propolis-containing mouthrinse on the inhibition of de novo plaque formation. *J Clin Periodontol* 1997;24:796-8.
38. Walsh LJ, Longstaff J. The antimicrobial effects of an essential oil on selected oral pathogens. *Periodontology* 1987;8:11-15.
39. Soukoulis S, Hirsch R The effects of a tea tree oil-containing gel on plaque and chronic gingivitis. *Aust Dent J.* 2004. *Aust Dent J.* 2004;49:78-83.
40. P Prakash, Neelu Gupta. Therapeutic uses of *ocimum sanctum* linn (tulsi) with a note on eugenol and its pharmacological action: A short review. *Indian J Physiol Pharmacol.* 2005;49:125-31.
41. Sen P. Therapeutic potential of Tulsi: from experience to facts. *Drugs News and views* 1993;1:15-21.
42. Li M, Xu Z. Quercetin in a lotus leaf extract may be responsible for antibacterial activity. *Arch Pharm Res.* 2008;31:640-4.
43. Weiss EI, Lev-Dor R, Kashamn Y, Goldhar J, Sharon N, Ofek I. Inhibiting interspecies coaggregation of plaque bacteria with a cranberry juice constituent. *J Am Dent Assoc* 1998;129:1719-23.
44. González OA, Escamilla C, Danaher RJ, Dai J, Ebersole JL, Mumper RJ, Miller CS. Antibacterial effects of blackberry extract target periodontopathogens. *J Periodont Res* 2013;48:80-86.