



PLANT BASED EXTRACTS IN PERIODONTAL THERAPY - DENTISTRY & AYURVEDA REVIEW

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Abstract: The understanding of the etiology and pathogenesis of periodontal diseases is continuously evolving and, in the management, and control of the disease. Current management of periodontal diseases, centers, primarily on non-specific reduction of the microbial load by mechanical debridement and adjunctive use of antimicrobial agents. However, with increased awareness of the deleterious effects of synthetic antimicrobials, the management has now shifted on naturally occurring plant derived agents. Phytotherapeutic agents are safe, cost effective and efficient antimicrobials and their utility as adjuncts in prevention and treatment of periodontal diseases looks promising. So this review aims to summarize the current scientific evidence on the use of various plant-based remedies in periodontics. Additionally, the review discusses about the potential applications, antimicrobial, anti-inflammatory, antioxidant and immunomodulatory properties and future perspectives concerning the integration of natural remedies as adjuncts in periodontal care.

Keywords: Periodontal diseases, microbial load, natural remedies, herbal drugs, Phytotherapy

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BACKGROUND

Periodontal diseases, which are characterized by inflammation of the tooth's supporting structures, are among the most common conditions worldwide¹. Traditional periodontal treatment methods include mechanical debridement and surgical therapy, which are sometimes combined with antimicrobial agents ¹. There is growing interest in researching the benefits of plant-based remedies. Plants contain a wide range of phytochemicals, which have gained attention due to their positive impact on human health. The advantages of incorporating natural remedies into periodontal therapy include possible microbial load reduction, microbiome support, immunomodulation, down-regulation of inflammatory mediators, and oxidation ². They have the potential to improve treatment outcomes by increasing the effectiveness of standard interventions.

Natural remedies can help clinicians improve patient satisfaction, engagement, and adherence to therapy by making patients feel more involved in their treatment. The purpose of

this review is to summarize the current scientific evidence on natural remedies for gingivitis and management of periodontitis

Periodontal Therapy

Periodontal therapy aims to cure inflamed tissue, reduce the number of pathogenic bacteria and eliminate the diseased pockets. Mechanical therapy, chemotherapy and systemic administration of antibiotics are some of the clinical methods being utilized currently. Conventional therapy includes scaling – removal of the calculus and the plaque, curettage clearing the inflamed soft tissue, and root planning - removal of necrotic tissues on the root surface. Periodontal diseases are associated with bacterial infections; therefore antibacterial treatment seems to be an appropriate method of improving the condition of the inflamed tissues.

Antimicrobial Therapy and its Limitations

Systemic administration of antibiotics is the distribution of drug throughout the body, which is not required and it can also give rise to toxicity problems. The use of a local drug delivery system is one method of minimizing the distribution of therapeutic agents in the body.

Many antibacterial agents are applied directly to the mouth to treat periodontal diseases. Local delivery systems include mouth rinses, irrigating solutions, and sustained release devices. Fibers (hollow and monolithic), strips and compacts, films, microparticles, gels, and nanoparticles have all been used as periodontal local delivery devices for the targeted delivery of antimicrobial agents. Despite the fact that several chemical agents are commercially available, they can alter oral microbiota and cause unwanted systemic side effects such as vomiting, diarrhoea, tooth staining, and gastro intestinal problems. A systematic review by **Bell**³ in 2014 on effects of antibiotic consumption on antibiotic resistance Review demonstrated that antibiotic consumption is associated with the development of antibiotic resistance. Increased consumption of antibiotics may not only produce greater resistance at the individual patient level but may also produce greater resistance at the community, country, and regional levels, which can harm individual patients. Another review by **Onakpoya**⁴ in 2018 overviewed the adverse effects of antimicrobial therapy on a long term use. Results of several studies showed that long term use of antimicrobial therapy results in systemic side effects.

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

Benefits of Herbal Drugs:

Herbal drugs have a long history of use, as well as high patient tolerance and acceptance. They are a renewable resource, ensuring long-term supplies of lower-cost medicines for the world's growing population. Medicinal plants are readily available in developing countries with diverse agroclimatic, cultural, and ethnic biodiversity, such as India.

Mode of Action of Phytotherapeutic Agents

Plant compounds can be a powerful and dominant tool to combat an inflammation caused by local irritating factors such as periodontitis. Herbs owe their properties to biologically active compounds they contain like flavonoids, coumarins, glycosides, phenolic acids, resins, phytoesters, choline, carotenoids, tannins, vitamins, mineral salts (magnesium, iron, lithium) and essential oils. The most popular are flavonoids and essential oils.

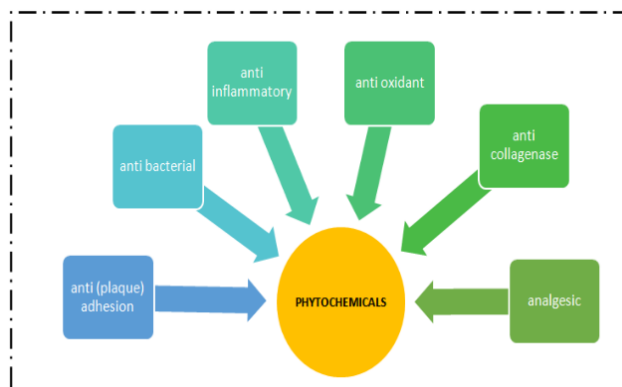


Figure 1. Mode of

Phytotherapeutic Agents

Action of

MECHANISMS OF ACTION OF PLANT-BASED REMEDIES

Anti Oxidant and Anti-Inflammatory Role of Phytochemicals:

Oxidative stress is a major cause of cell damage linked to the onset and progression of periodontitis. Numerous studies have shown that periodontitis patients have significantly lower total antioxidant capacity than healthy controls or subjects who have received periodontal therapy^{6,21,34}. Exogenous antioxidants are now being used to treat periodontal disease as a result of these findings. The majority of phytochemicals are powerful antioxidants. They work by scavenging free radicals and preventing oxidative stress. As a result, herbal antioxidant remedies have recently been used as an adjunctive therapy.

Phytochemicals with Activity against Bacteria:

Natural antibiotics, phytochemicals (flavonoids) are said to be effective against oncogenic viruses and carcinogens. Some essential oils have antimicrobial activity against microorganisms that are resistant to synthetic antibiotics. So microorganisms cannot develop resistance to essential oils⁵.

Phytochemicals Inhibiting Plaque Formation:

The phytochemicals inhibit bacterial adhesion to the tooth surface or the synthesis of exopolysaccharide. A variety of phytochemicals has bactericidal effects on the periodontal microbiome, inhibit bacterial adhesion to tooth surfaces, and inhibit glucan production.

HERBAL FORMULATIONS IN PERIODONTAL TREATMENT

Plant-based remedies in a variety of formulations have been studied for periodontal treatment, including³:

1. **Herbal extracts:** Topically applied extracts derived from medicinal plants such as aloe vera, chamomile or green tea can provide antimicrobial, anti-inflammatory, and antioxidant effects.
2. **Essential oils:** Essential oils derived from plants such as tea tree, clove or peppermint can be applied topically or incorporated into dental products to provide antimicrobial and anti-inflammatory properties.
3. **Mouthwashes:** To provide antimicrobial and anti-inflammatory effects, natural oral rinses can be formulated with herbs, essential oils or extracts.
4. **Gels and irrigation solutions:** Plant-based gels or solutions containing herbal extracts or ingredients such as aloe vera and curcumin can be applied to periodontal pockets. They may promote healing, reduce inflammation, relieve pain and reduce bacterial load.
5. **Chewing sticks:** Chewing sticks made from the branches of certain plants, such as *Salvadorapersica* (miswak) or *Neem* (*Azadirachtaindica*) have traditionally been used for oral hygiene, particularly in certain parts of Africa, Asia and in Middle East countries ⁴ which contains antimicrobial properties.
6. **Toothpaste:** Herbal toothpaste can be made with a variety of herbal ingredients such as aloe vera, curcumin, neem, myrrh, or clove.

HERBALS EVALUATED AS AN ADJUNCTS TO PERIODONTAL THERAPY THROUGH CLINICAL TRIALS

Propolis

A study by **zarch et al in 2021** ⁷ did a clinical trial to analyse the effect of propolis on clinical parameters and salivary levels of MMP 8 levels. Results demonstrated that propolis extract are successful adjunct to SRP for treating deep periodontal pockets. A study by **Deore et al** ¹⁰ investigated the adjunctive effect of propolis to SRP in reducing periodontal inflammation. Results demonstrated that there was much reduction in clinical attachment level and CRP in test group which shows that propolis may be a promising adjunct to SRP and may aid in improving periodontal treatment outcomes.

Neem

A clinical trial by **Samuels et al** ¹² examined the anti inflammatory effects of neem on gingival inflammation. The findings of this study suggested that neem has the potential to mitigate the host inflammatory response to plaque and reduce the levels of gingival inflammation by reducing the scores of gingival index, plaque index and number of bleeding sites. A Clinical trial by **Ganvir et al** ¹¹ in 2021 evaluated the effect of *Azadirachta indica* (Neem) Chip and Soft Tissue Diode Lasers as a Supplement to Phase I Periodontal Therapy in Localized Chronic Moderate Periodontitis. Results demonstrated that Neem and soft tissue diode laser therapy as LDD being adjuncts to SRP are more efficient in improving chronic periodontitis parameters such as plaque index, gingivitis index, probing pocket depths, and relative clinical attachment levels vs. SRP alone in a short term of one month

Aloe Vera

A study by **Moghaddam et al**³ in 2017 evaluated the Clinical Effects of Local Application of Aloe vera Gel as an Adjunct to Scaling and Root Planning in Patients with Chronic Periodontitis. Results demonstrated that SRP combined with aloe vera as adjunctive therapy resulted in significant improvements of severe periodontitis (Significant reduction of GI and PD). Another study by **Kurian et al**² 2018 did a Comparative evaluation of subgingivally-delivered 1% metformin and Aloe vera gel in the treatment of intrabony defects in chronic periodontitis patients. Results demonstrated that Local delivery of 1% metformin and Aloe vera gel stimulates a significant PPD reduction, CAL gain, and improved bone fill and regeneration when compared with placebo gel. Results were significantly better with the use of 1% Metformin gel than Aloe vera gel.

Tulsi

A study by **Apurva et al**⁵ in 2021 determined the efficacy of curcumin and Tulsi extracts as local drugs in periodontal pocket reduction. Results demonstrated that both the herbs were effective in improving periodontal parameters and may develop as an alternative to currently used LDD agents in near future. Another study by **Saranya et al**⁸ in 2019 evaluated the Efficacy of 10% Tulsi Gel as Local Drug Delivery Agent Adjunct to Scaling and Root Planing in Chronic Periodontitis. They stated that 10% Tulsi gel showed desired effects on *Porphyromonas gingivalis*, statistically significant changes in the clinical parameters. Thus Tulsi gel can be used as an adjunct to the treatment of chronic periodontitis

Triphala

Triphala has been used as a mouthrinse in gingivitis and periodontitis patients. Triphala consists of three medicinal plants *Embolia officinalis*, *Terminalia chebula* and *Terminalia bellirica*. Triphala presented an antiplaque efficacy similar to that of CHX and was more effective in inhibiting plaque formation with lesser or no side effects. **Jagadish et al.**⁶ conducted a study to determine the effect of Triphala on dental biofilms. They concluded that Triphala had potent antioxidant and antimicrobial activity and inhibited the growth of *Streptococcus mutans* and Gram positive cocci involved in plaque formation when it was adsorbed on the tooth surface. **Tandon et al**¹² suggested the use of triphala mouthwash for preventing the development of incipient lesions. In a double-blind, randomized, multicenter clinical trial that aimed to compare the efficacy of Triphala mouthwash with 0.2% CHX in hospitalized patients suffering from periodontal disease, by **Naiktari et al.**¹⁴ They reported that both CHX and Triphala are efficient antiplaque and antigingivitis agents. A study by Bajaj et al stated that Triphala as a mouthwash showed significant reduction in periodontal indices when compared to scaling and root planing alone, but no significant difference was noted between the Triphala and the CHX groups.

OTHER PLANT BASED REMEDIES EVALUATED FOR THEIR POTENTIAL USE IN PERIODONTAL THERAPY

The following are some of the most researched plant-based remedies used in periodontal therapy.

Camellia sinensis (Green Tea)

Green tea is made from the leaves of the *Camellia sinensis* plant and is high in polyphenols, especially epigallocatechin-3-gallate (EGCG), which has antimicrobial, anti-inflammatory, and antioxidant properties. Green tea extracts have been studied for their ability to inhibit periodontal pathogen growth, reduce inflammation, and promote periodontal tissue healing. Green tea catechins applied subgingivally during scaling and root planing (SRP) can improve pocket depth reduction. Different green tea formulations (tea sachets, strips, gel, chewing gum, and toothpaste) have been shown to reduce plaque and gingival index, bleeding on probing, and pocket depth ⁵.

Aloe barbadensis (Aloe Vera)

Aloe vera (*Aloe barbadensis*) is a succulent plant that has been used medicinally for centuries. Its anti-inflammatory, antimicrobial, and wound-healing properties have made it popular. Polysaccharides, anthraquinones, vitamins, minerals, and enzymes are among the bioactive components found in aloe vera gel ⁶. Aloe vera components can also inhibit the production of inflammatory cytokines and nitric oxide. It increases fibroblast proliferation and collagen synthesis, which may help with tissue repair and regeneration. In Various studies, aloe vera mouthwash was found to have similar effects to chlorhexidine in terms of plaque index without causing tooth discoloration or taste changes, which are frequently associated with chlorhexidine ⁵⁻⁷.



Figure 2. Aloe Vera

Bee Products and Propolis

Propolis is a resinous substance made by bees from plant sources. It is antimicrobial, anti-inflammatory and immunomodulatory in nature. Propolis extracts demonstrated the ability to inhibit periodontal pathogens and reduce inflammation when combined with SRP. A systematic review found that propolis mouthwash reduced plaque formation and improved gingival inflammation ⁷. Existing in vitro and in vivo evidence suggests that propolis may benefit periodontal therapy. In vitro, honey and royal jelly have antimicrobial activity against periodontal pathogens ⁸. In vitro, purified bee venom has anti-inflammatory effects, reducing induced periodontal bone loss in animals ⁹.

Punica granatum (Punica Granatum)

Punicic acid, the main component of pomegranate fatty acids, is an excellent anti-inflammatory compound with the ability to suppress prostaglandin production. Pomegranate fruit extract inhibits matrix metalloproteinases (MMPs) expression as well as IL-1-induced tissue destruction. Apart from the mechanisms mentioned above, it is also said to be immunoregulatory¹⁰. These extracts can scavenge free radicals and lower macrophage oxidative stress and lipid peroxidation. Pomegranate may be a good source of compounds that can act as a defense against pathogenic bacteria and prevent the development of antibiotic resistance¹¹.

Guava (Psidium guajava)

The paste of tender guava leaves has traditionally been used to maintain oral hygiene. Guava has antibacterial activity against Gram positive and Gram negative bacteria (due primarily to flavonoids, guaijaverin, and quercetin). Because of the presence of tannins, the bark has antibacterial properties. Quercetin¹² has demonstrated excellent antibacterial activity against key periodontal pathogens, which is most likely due to its ability to disrupt membranes and inactivate extracellular proteins by forming irreversible complexes. Guava extract has been shown to inhibit the growth, adherence, and co-aggregation of dental plaque bacteria in vitro¹³. As a result, guava, as an excellent antibacterial and antiplaque agent, may be a useful supplement to standard periodontal treatment.



Figure 3. Guava

Curcumin (Curcuma longa)

Curcumin (*Curcuma longa*) is the active ingredient in turmeric root. It has strong anti-inflammatory and antioxidant properties. In the context of periodontal disease, studies show that when combined with non-surgical treatment, it has the potential to inhibit tissue destruction, modulate the immune response, lower periodontal pathogen counts and reduce gingival inflammation¹⁴. Animal studies show that modified curcumin, due to its increased bioavailability, has the potential to produce more significant clinical benefits when used in periodontal treatment¹⁵.

Allium sativum (Garlic)

Garlic is an essential component of whole food or herb because these are complete entities that provide many sulfur-containing and other phytochemicals that can have antioxidant and other bioactivity. Antimicrobial activity of *Allivum sativum* aqueous extracts will act against gram positive and gram negative bacterial species (*Escherichia*, *Salmonella*, *Staphylococcus*, *Klebsiella*, *Proteus*, *Clostridium*, and *Mycobacterium*). Bakri ¹⁶ and Douglas ¹⁷ investigated the inhibition of *Porphyromonas gingivalis* by an aqueous extract of garlic. They discovered that it inhibited the growth of *P. gingivalis* by 92.7%.

Tulsi (Ocimum sanctum):

Tulsi leaves are very effective in treating common oral infections. A few raw leaves can also be helpful to maintain oral hygiene. Carracrol and Tetpene are antibacterial agents found in this plant. Antibacterial properties are also provided by sesquiterpene b caryophyllene. Tulsi leaves that have been sun-dried and powdered can be used to brush teeth. It can also be mixed with mustard oil to make a paste and used as toothpaste. Tulsi has also been shown to be effective in treating halitosis. Its anti-inflammatory properties make it an effective treatment for gingivitis and periodontitis, and it can be used to massage gingiva in periodontitis conditions ¹⁸. Tulsi contains vitamins A and C, as well as calcium, zinc and other minerals. It also contains chlorophyll and a variety of phytonutrients. These nutrient deficiencies have been linked to a variety of oral diseases ¹⁸.



Figure 4 : Tulsi

Triphala

Triphala ("three fruits"), an Indian herb, has been discovered to be a complete body cleanser. *Terminalia chebula* (chebulic myrobalan), *Terminalia bellirica* (beleric myrobalan), and *Phyllanthus emblica* (emblic myrobalan) are among the fruits. Their beneficial effects include antibacterial and antiviral properties, as well as a variety of other health benefits. A study by Groppo et al evaluated the inhibitory activity of triphala on PMN-type matrix metalloproteinase (MMP-9) in patients with chronic periodontitis. Results demonstrated that MMP activity was significantly reduced when the drugs were used ¹⁹. A clinical trial by Pai RM et al in 2004 was conducted to compare the effects of triphala as a mouthwash to chlorhexidine in patients with chronic generalized periodontitis. The author concluded that triphala as a mouthwash reduces periodontal indices significantly more than scaling and root planing alone ²⁰, but there was no significant difference observed between Triphala and Chlorhexidine groups.

Mango Leaf (Mangifera indica)

It is used as a brushing material and is found in some toothpastes. Mango leaves contain mangiferin, as well as anthocyanins, ascorbic and phenolic acids, all of which have antibacterial properties. Mangiferin (2C, Beta D-Glucopyranosyll, 3, 6, 7 tetra hydroxylxanthone) has anti-inflammatory, diuretic, cholerectic, and cardiogenic properties. Srinivasan et al ²¹ investigated mangiferin's antibacterial activity at various concentrations and compared it to penicillin G and streptomycin. Mangiferin was found to be effective against streptococci, staphylococci, pneumococci, and Lactobacillus acidophilus organisms.

Tea Tree Oil and Other Essential Oils

The effects of essential oils on periodontal health have been researched. Tea tree, eucalyptus, peppermint, clove, and thyme oil are some of the most commonly studied essential oils. Tea tree oil is derived from the Melaleuca alternifolia plant and is anti-inflammatory and antimicrobial in nature. Tea tree oil irrigating solution improved clinical parameters and reduced matrix metalloproteinase-8 (MMP-8) levels in gingival crevicular fluid up to 6 months after treatment in patients with stage 2 periodontitis ²². According to a systematic review of clinical trials by Shah et al in 2015, mouthwashes containing 0.2% to 0.5% tea tree oil reduced dental plaque accumulation and subgingival application of a 5% gel improved SRP outcomes ²³.

Neem (Azadirachta indica)

Neem has been widely used to clean teeth and maintain gingival health in India and South Asia. Periodontal disease was traditionally treated by brushing teeth with neem twigs and chewing its leaves ⁷. According to a review of the literature by Abdollahzadeh, S.H et al in 2011, Azadirachta indica extract is a potent inhibitor of microorganisms that cause infectious diseases in the mouth ²⁴. It also aids in the reduction of dental plaque index. The leaves of the neem tree are said to remove toxins, purify the blood, and prevent free radical damage in the human body and it also has anti-inflammatory, astringent, antiviral and antiseptic properties ²⁵.



Figure 5. Neem

Arack (Salvadora persica)

It is also known as the "Oriental Toothbrush Tree." This tree's roots, twigs, and stems have been used as an oral hygiene tool. Organic components such as pyrrolidine, pyrrole and piperidine derivatives, glycosides such as salvadoside and salvadoraside, and flavinoids such as kaempferol, quercetin, and others were discovered. A study by Buggapati et al in 2016 stated that the antibacterial and gum stimulating effect could be attributed to the high levels of sodium and potassium chloride, organic sulphur and presence of an alkaloid ²⁶.

Chamomile (Matricaria recutita)

Chamomile is commonly used to treat periodontal diseases. Its flowers have 1-2% volatile oils that contain alpha-bisabolol, alpha-bisabolol oxides A and B, and matricin. It also contains bioflavonoids such as apigenin, luteolin, and quercetin. These ingredients have anti-inflammatory properties. Saderi et al. in 2012 conducted a study to evaluate the antimicrobial effects of Chamomile flower head extract and essential oil against *P. gingivalis* ²⁷. According to the study findings, Chamomile has potential benefits as a mouthwash for the treatment and prevention of periodontitis.

Lemon Grass Oil (Cymbopogon citrates)

It is an aromatic grass that grows quickly. Lemon grass essential oil is derived from *Cymbopogon citrates* and is well-known around the world for its anti-inflammatory, antimicrobial and antiseptic properties ²⁸. Citral, geraniol, neral, bmyrcene, citronellal, limonene, linalool, terpineol, and dipeptene have all been identified as oil constituents of *C. citratus*. According to Niban's research ²⁹, antioxidant levels were lower before treatment, but increased after the nonsurgical treatment with lemongrass oil mouthwash. They proposed that it could be used as an adjunct to nonsurgical periodontal therapy.

Centella asiatica (Apiaceae)

Centella asiatica is a herb with many branches that contains active principles such as Vallarine, Asiaticoside, Sitosterol, Tannin, and Oxy-asiaticoside. *Centella asiatica* and *Punica granatum* are medicinal plants known to promote tissue healing and modulate host responses. An innovative preparation derived from two herbal extracts (*Centella asiatica* and *Punica granatum*) in the form of biodegradable chips was used as a subgingival device in conjunction with scaling and root planning ³⁰. The combined herbal preparation efficacy on maintenance patients were compared to standard supportive periodontal therapy. The results showed that adjunctive local delivery of *C. asiatica* extracts in combination with *P. granatum* significantly improved clinical signs of chronic periodontitis in patients on maintenance therapy ¹⁹.

Elder Flower (Sambucus nigra)

Sambucus nigra is an elder species complex native to most of Europe. The ability of aqueous extracts of elder flower (*Sambucus nigra*) to inhibit the proinflammatory activity of major virulence factors from the periodontal pathogens (*Porphyromonas gingivalis* and *Actinobacillus actinomycetemcomitans*) was investigated in a clinical trial by Kala BS et al in 2015 ³¹. Results suggested that Elder flower extract was found to effectively inhibit all pro-inflammatory activities tested. According to study findings, elder flower extract has anti-inflammatory properties that could be used therapeutically to control inflammation in human periodontitis.

General Benefits of Plant-Based Remedies in Non-Surgical Periodontal Treatment

Natural formulations can help improve periodontal therapy outcomes based on their numerous medicinal properties ³²

1. Non-surgical periodontal treatment: plant-based adjuncts can promote immunomodulation, bacteria reduction in periodontal tissues, plaque inhibition, gingival index improvement, pocket depth reduction and periodontal wound healing ³³. A Natural remedy can help to maintain a healthy microbiome, improve oral hygiene, improve SRP outcomes and possibly reduce the need for surgery.

2. Surgical periodontal therapy: plant-based remedies are biocompatible and can promote wound healing and tissue regeneration, thereby improving surgical outcomes ³⁴.

3. Maintenance: When used in conjunction with regular oral hygiene practices, these remedies may aid in the control of plaque formation and pathogenic bacteria, lowering the risk of disease recurrence ³⁵.

Table 1. Overview of natural remedies, main active component and their properties ³⁶.

Herbal products	Main active ingredients	Antioxidant properties	Anti inflammatory properties	Antimicrobial properties	Authors
Bee products	Hydrogen peroxide, flavonoids, vitamins and enzymes		(✓)	(✓)	Anarthe et al
Garlic	Allicin	(✓)	(✓)	(✓)	Prabhu et al
Echinacea	Caffeic acid alkamides	(✓)	(✓)	(✓)	Cortez et al
Tea tree	Terpinole, alpha-terpineol		(✓)	(✓)	Cindy et al
Lemongrass	Citral Geraniol		(✓)	(✓)	Ramesh et al
Cashew tree	Cardanol cardol		(✓)	(✓)	Mare et al
Elderberry	Flavonols, phenolic acids	(✓)	(✓)	(✓)	Bansal et al
Ginger	Gingerols, Zingerone	(✓)	(✓)	(✓)	Suhag et al
Eucalyptus	Cineole, a-pinene	(✓)			Vanka et al
Cinnamon	Cinnamal dehyde	(✓)	(✓)	(✓)	Biswas et al
Clove	Eugenol		(✓)	(✓)	Agarwal et al
Lemon	Hesperidin	(✓)	(✓)	(✓)	Salgado et al
Neem tree	Azadirachtin, Nimbolinin, nimbin	(✓)	(✓)	(✓)	Viana et al
Tumeric	curcumin	(✓)	(✓)	(✓)	Desai et al
cranberry	Anthocyanins, proanthoc yanidins			(✓)	Khorana et al
Aloe vera	Aloe – emodin, aloin, aloesin	(✓)	(✓)	(✓)	Bhat et al

Pomegranate	Flavonoids, anthocyanins, alkaloids		(✓)		Hirasawa et al
Green tea	Epigallocatechin-3 gallate (EGCG)	(✓)	(✓)	(✓)	Tarro et al

FUTURE PERSPECTIVES

Natural remedies have gained popularity because of their potential benefits and lack of side effects. Plant-based formulations provide alternatives for improving treatment outcomes while reducing the risk of adverse reactions. Targeted delivery systems, such as nanoparticles or bio-adhesive formulations, may improve natural compound local release, potentially increasing bioavailability and efficacy³⁷. Educating patients on the proper use, limitations, and adjunctive nature of these remedies aids in patient acceptance and informed decision-making. More research is needed to establish long-term efficacy, safety, potential side effects, and optimal dosage to ensure consistent therapeutic effects, which will aid in the implementation of these therapies into evidence-based practice.

CONCLUSION

Natural remedies as an adjunctive therapy show good results and should be used under the supervision of dental professionals, not in place of regular oral hygiene or professional care. The current review emphasizes the potential for natural remedies to be used as adjunctive therapies in the treatment of periodontal diseases. While there is substantial evidence that natural remedies have antimicrobial, anti-inflammatory, antioxidant and immunomodulatory properties more research is needed to determine their long-term efficacy and safety profiles. Clinicians can potentially improve the treatment outcomes and provide a more holistic approach to oral health by incorporating natural remedies into periodontal care.

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