

Exploring the Potential of Plant-Based Remedies in Periodontal Treatment: A Mini Review

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Abstract

Periodontal diseases pose a significant challenge to oral and general health with their multifactorial etiology and complex pathogenesis. Traditional treatment approaches primarily rely on mechanical debridement and periodontal surgery. However, emerging research has sparked interest in the potential of phytochemicals in natural remedies in periodontics. This mini-review aims to summarize the current scientific evidence on the use of various plant-based remedies in periodontics. Through an examination of herbal extracts, essential oils, plant-based formulations, and other natural products, this mini-review sheds light on their antimicrobial, anti-inflammatory, antioxidant, and immunomodulatory properties. Additionally, the review discusses the potential applications, side effects, limitations, and future perspectives concerning the integration of natural remedies as adjuncts in periodontal care.

Keywords

Periodontal diseases; Natural remedies; Herbal extracts; Essential oils; Plant based remedies; Dentistry; Phytochemicals; Periodontal treatment

Introduction

Periodontal diseases, characterized by inflammation of the supporting structures of the teeth, are among the most prevalent conditions globally [1]. Traditional treatment approaches in periodontics involve mechanical debridement and surgical therapy, sometimes combined with antimicrobial agents [2]. There is a growing interest in investigating the advantages of plant-based remedies. Plants harbor diverse phytochemicals, which have garnered attention due to their favorable impact on human health. Extensive research is underway to unravel the benefits these bioactive compounds may offer [3]. The benefits of adding natural remedies to periodontal therapy include possible reduction of the microbial load, microbiome support, immunomodulation, down-regulation of inflammatory mediators, and oxidation [4–6]. They present fewer adverse effects and are compatible with holistic and integrative approaches promoting well-being and supporting the body's inherent healing abilities. They can enhance the effectiveness of standard interventions, possibly improving treatment outcomes [4,7].

Many patients are increasingly interested in natural and alternative treatment options. By incorporating natural remedies into periodontal treatment, clinicians can enhance patient satisfaction, engagement, and adherence to therapy, as patients feel more involved in their treatment [8]. This mini-review aims to summarize the current scientific evidence regarding natural remedies in the management of gingivitis and periodontitis.

Herbal formulations in periodontal treatment

Plant-based remedies in various formulation types have been investigated in periodontal treatment, including:

1. **Herbal extracts:** Extracts derived from medicinal plants, such as aloe vera, chamomile, or green tea, can be used topically to provide antimicrobial, anti-inflammatory, and antioxidant effects [9–12].
2. **Essential oils:** Obtained from plants like tea tree, clove, or peppermint can be used topically or incorporated into dental products. Many possess medicinal properties, including antimicrobial and anti-inflammatory activity [13,14].
3. **Mouthwashes:** Natural oral rinses can be formulated with herbs, essential oils, or botanical extracts to provide antimicrobial and anti-inflammatory effects [15,16].
4. **Gels and irrigation solutions:** Plant-based gels or solutions containing herbal extracts or botanical ingredients, like aloe vera and curcumin, can be applied to periodontal pockets. They may promote healing, reduce inflammation, alleviate pain, and decrease the bacterial load [14,17–19].
5. **Chewing sticks:** Chewing sticks made from the branches of certain plants, such as *Salvadora persica* (miswak) or *Neem* (*Azadirachta indica*), have been traditionally used for

oral hygiene, particularly in certain parts of Africa, Asia, and the Middle East. Natural compounds are released with antimicrobial properties and can help maintain oral health [20–22].

6. **Toothpaste:** herbal toothpaste can be formulated with various herbal ingredients, such as aloe vera, curcumin, neem, myrrh, or clove. Their effectiveness in maintaining oral health and managing gingivitis has been described as comparable to conventional toothpaste [23,24].

Nature's Solutions in Periodontology: A Focus on Plant-Based Remedies

Some of the most studied plant-based remedies used in periodontal therapy are presented below. A more comprehensive list of medicinal plants explored in periodontology is presented in Table 1.

Green Tea (*Camellia sinensis*)

Green tea is made from the *Camellia sinensis* leaves, and is rich in polyphenols, particularly epigallocatechin-3-gallate (EGCG), which has demonstrated antimicrobial, anti-inflammatory, and antioxidant properties. Green tea extracts have been investigated for their potential to inhibit the growth of periodontal pathogens, reduce inflammation, and promote periodontal tissue healing [25–28]. The subgingival use of green tea catechins during scaling and root planing (SRP) can enhance pocket depth reduction [26]. Positive effects have been reported for different green tea formulations (tea sachets, strips, gel, chewing gum, and toothpaste) in plaque and gingival index, bleeding on probing, and pocket depth reduction [27,28]. Regular green tea consumption can enhance periodontal treatment outcomes [29].

Aloe vera (*Aloe barbadensis*)

Aloe vera (*Aloe barbadensis*) is a succulent plant with a long history of medicinal use. It has become popular due to its anti-inflammatory, antimicrobial, and wound-healing properties. Aloe vera gel contains various bioactive components, including polysaccharides, anthraquinones, vitamins, minerals, and enzymes [23,30]. Furthermore, aloe vera components can inhibit the production of inflammatory cytokines and nitric oxide [31,32]. It stimulates fibroblast proliferation and collagen synthesis, possibly aiding tissue repair and regeneration [32]. Aloe Vera mouthwash has been reported to have comparable effects to chlorhexidine in many studies regarding plaque index without causing tooth discoloration and taste alterations, which are frequently associated with chlorhexidine [30,33–35].

Propolis and bee products

Propolis is a resinous product produced by bees from plant sources. It possesses antimicrobial, anti-inflammatory, and immunomodulatory properties [4]. When combined with SRP, propolis extracts demonstrated the ability to inhibit periodontal pathogens and reduce inflammation, surpassing the effects of traditional treatment alone with rare adverse reactions reported [36]. A systematic review by [37] reported the effectiveness of propolis mouthwash in reducing plaque formation and improving gingival inflammation [37]. Existing in vitro and in vivo evidence indicates that propolis has the potential

to benefit periodontal therapy [4,36,37]. Honey and royal jelly also present antimicrobial activity against periodontal pathogens in vitro [38]. Purified bee venom presents anti-inflammatory effects in vitro, reducing induced periodontal bone loss in animals [39,40]. The evidence supporting the use of royal jelly, bee venom, and honey in periodontics is limited, but their promising efficacy requires further investigation.

Curcumin (*Curcuma longa*)

The active compound in the turmeric root is curcumin (*Curcuma longa*). It exhibits potent anti-inflammatory and antioxidant effects [41]. In the context of periodontal disease, studies report its potential to inhibit tissue destruction, modulate the immune response, lower periodontal pathogen counts, and reduce gingival inflammation combined with non-surgical treatment [23,42–44]. Curcumin gel holds promise in gingivitis and periodontitis treatment thanks to its antiplaque and anti-inflammatory properties and rare side effects. Additionally, patients seem to prefer turmeric gel over chlorhexidine gel [45,46]. Animal studies indicate that modified curcumin, owing to its increased bioavailability, has the potential to yield more substantial clinical enhancements when used in periodontal treatment [47].

Tea Tree Oil and Other Essential Oils

Essential oils have been investigated for their potential effects on periodontal health. Some commonly studied essential oils include tea tree, eucalyptus, peppermint, clove, and thyme oil. Tea tree oil is extracted from the *Melaleuca alternifolia* plant, presenting robust anti-inflammatory and antimicrobial properties. The use of tea tree oil irrigating solution in non-surgical periodontal treatment of patients with stage 2 periodontitis improved clinical parameters and reduced matrix metalloproteinase-8 (MMP-8) levels in the gingival crevicular fluid up to 6 months after treatment.[19] However, an unpleasant taste was reported in the tea tree oil group [19]. The clinical effects of tea tree oil gel have been investigated in a systematic review by [6]. Tea tree oil gel reduced periodontal inflammation similarly to chlorhexidine but was less effective at controlling biofilm formation [6]. Another systematic review of clinical trials found that mouthwashes containing 0.2% to 0.5% tea tree oil reduced dental plaque, and subgingival application of a 5% gel enhanced the outcomes of SRP [14].

Herbal & Natural Products	Scientific Name	Main Active Ingredients	Form	Properties	Summary of Research Findings
Magnolia bark	<i>Magnolia spp.</i>	Magnolol Honokiol	Gel Toothpaste Gum Oral rinse	Antioxidant Anti-inflammatory Antispasmodic Antimicrobial	In vitro: improved wound healing and inflammation; antimicrobial effect on periodontopathogens Chewing gum and mouthwash: reduced gingival inflammation in clinical studies.

Chamomile	<i>Matricaria chamomilla</i>	Terpenoids Coumarins Flavonoids Spiroether	Oral rinse Toothpaste	Anti-inflammatory Antimicrobial	Essential oil: antibacterial against periodontal pathogens. In vitro, animal and clinical studies: reduced plaque and gingival index.
Green tea	<i>Camellia sinensis</i>	Epigallocatechin-3 gallate (EGCG) Epicatechin-3-gallate (ECG)	Gel Toothpaste Gum Oral rinse Strips	Anti-inflammatory Antiplaque Anti-carcinogenic Antimicrobial Antioxidant	In vitro, animal and human studies: tendency to improve immune response and inflammation, optimizing periodontal health as an adjunctive therapy.
Pomegranate	<i>Punica granatum</i>	Flavonoids, anthocyanins, punicalic acid, ellagitannins, alkaloids	Gel Lozenge Oral rinse Chip	Antiatherogenic Antihypertensive Anti-inflammatory Antiplaque	In vitro: inactivation of Pg and Aa Gel and mouthwash: reduced gingivitis similar to CHX. Chip: improved clinical periodontal results.
Baikal Skullcap Root	<i>Scutellaria baicalensis</i>	Baicalin	Gel Rinse Toothpaste	Antibacterial Regulation of inflammatory mediators, MMPs, innate immune response	In vitro and animal studies: antimicrobial against periodontal pathogens, inhibition of collagenases, decrease in inflammatory mediators, promotion of osteogenesis.
Calamus rhizome	<i>Acorus calamus</i>	β -asarone monoterpene quinone sesquiterpene phenylpropanoid	Essential oil Liquid extract Mouthwash	Adaptogenic Antibacterial Antioxidant Anti-inflammatory	Clinical studies: calamus rhizome and other herbs had positive effects as adjuncts to SRP.
Peppermint	<i>Mentha piperita</i>	Menthol Methyl salicylate	Essential oil Mouthwash	Antimicrobial Anti-inflammatory Antioxidant	In vitro studies: antibacterial and antiplaque. Clinical studies: mouthwash reduced plaque and gingival indexes in gingivitis combined with SRP.

Oak bark	<i>Quercus spp</i>	Tannins Phenolic acids	Gel	Antibacterial Anti-inflammatory	In vitro: gel combined with aloe vera had anti-lipoxygenase and antimicrobial activity.
Sage	<i>Salvia officinalis</i> <i>Salvia sclarea</i>	Carnosol, rosmarinic acid, carnosic acid, terpenes	Gel Toothpaste Essential oil Oral rinse	Antioxidant Anti-inflammatory	In vitro: moderate antibacterial effect against periodontal bacteria exposed to the extract.
Aloe vera	<i>Asphodelaceae spp.</i> <i>Aloe barbadensis</i>	Aloe-emodin, aloin, aloesin, amodin, and acemannan vitamins, minerals, enzymes	Gel Oral rinse Toothpaste Mouthwash	Wound healing Immunomodulatory Anti-inflammatory Antioxidant Antimicrobial	Systematic reviews: aloe vera mouthwash, gel, and toothpaste can reduce gingival inflammation and improve periodontal parameters combined with SRP.
Blackberry	<i>Rubus fruticosus</i>	Epicatechin, ellagic acid, quercetin, hyperoside	Extract	Anti-inflammatory Antioxidant Antiviral	In vitro: antibacterial activity against periodontopathogens.
Cranberry	<i>Vaccinium macrocarpon</i>	Anthocyanins, proanthocyanidins, quercetin	Extract	Antiadhesive, Antibacterial Inhibition Of Collagenase, Proteinase	In vitro: inhibition of NF-κB and MMP-3, and periodontopathogens.
Pepper-rosmarin or Lippia Sidoides	<i>Verbenaceae spp.</i>	Thymol Carvacrol Eugenol	Gel Essential oil Mouthwash	Antimicrobial	Animal studies: gel reduced myeloperoxidase, TNF-α, IL-1β, and alveolar bone loss in rats Clinical studies: mouthwash shows comparable results to CHX.
Resveratrol	<i>Resveratrol</i>	Resveratrol	Nanoparticles	Anti-inflammatory Antioxidant	In vitro: nanoparticles showed anti-inflammatory effects.
Calendula	<i>Calendula officinalis</i>	Quercetin Triterpenoid	Oral rinse Toothpaste	Anti-inflammatory Antioxidant,	Clinical study: calendula oral rinse improved inflammation, plaque index

				Antimicrobial, Wound healing	and bleeding in gingivitis patients.
Curcumin/ Turmeric	<i>Curcuma longa</i>	Curcumin	Gel Mouthwash Irrigating solution	Anti-inflammatory Antioxidant Antimicrobial, Anti-tumor Antispasmodic Wound healing	Clinical studies: mouthwash, gel, and irrigating solution reduced plaque and gingival inflammation combined with SRP. Gel used on palatal donor sites for gingival grafts lowered postoperative pain.
Basil	<i>Ocimum spp.</i>	Terpenes Phenylpropanoids	Mouthwash Gel Toothpaste	Anti-inflammatory Antioxidant	Clinical studies: mouthwash presented antiplaque and antiinflammatory effects. Lower plaque and gingival indexes observed after use of herbal toothpaste.
Neem tree	<i>Azadirachta indica</i>	Azadirachtin, nimbolin, nimbin, nimbidin, nimbidol, salannin, quercetin	Chewing stick Mouthwash	Anti-inflammatory Antipyretic, Analgesic Immunostimulant Hypoglycaemic Antimicrobial Anticarcinogenic Antioxidant	Clinical study: 3-week use of neem improved gingival inflammation and plaque index.
Oregano	<i>Origanum vulgare</i>	Carvacrol	Mouthwash	Anti-inflammatory Antioxidant Antimicrobial Anti-Osteoclastic Anti-Diabetic	In vitro and animal studies: potential to improve gingival inflammation.
Frankincense	<i>Boswellia spp.</i>	Boswellic acids	Essential oil Gel Extract Mouthwash Chewing gum	Antimicrobial Anti-inflammatory Immune Modulator Wound Healing	In vitro and animal studies: potential to improve gingival inflammation. Clinical studies: few have confirmed anti-inflammatory effect.
Lemon	<i>Citrus limon</i>	Naringenin Hesperidin	Essential oil	Antimicrobial Anti-inflammatory Antioxidant Osteogenic Collagen Stimulator	In vitro and animal studies: osteogenic and anti-inflammatory potential.
Clove	<i>Syzygium aromaticum</i>	Eugenol	Essential oil Mouthwash	Antimicrobial Anti-	In vitro: effective against periodontal pathogens.

	<i>m</i>		Toothpaste	Inflammatory Antiplaque	
Cinnamon	<i>Cinnamomum spp.</i>	Cinnamaldehyde	Essential oil Extract	Antimicrobial Anti- Inflammatory Antioxidant Antiplaque	In vitro: effective against periodontal pathogens. Animal studies: suppressed dysbiosis, improved inflammatory response in ligature-induced periodontitis in rats. Clinical studies: lower gingival inflammation and plaque index in gingivitis patients after 4 weeks.
Rosemary	<i>Salvia rosmarinus</i>	Abietane diterpenes, carnosol, carnosic acid, ursolic acid	Essential oil Extract	Antimicrobial Anti- Inflammatory Antioxidant Antiplaque Immune Modulator	In vitro and animal studies: antiplaque and anti-inflammatory properties. Clinical studies: polyherbal mouthwash after SRP improved periodontal status, decreased bacterial levels in gingivitis patients.
Eucalyptus	<i>Eucalyptus</i>	Cineole, alpha-pinene	Essential oil Extract Chewing gum	Antiseptic Antioxidant Analgesic Immune Stimulator	In vitro: antibacterial properties against periodontal pathogens. Clinical studies: chewing gum improved plaque index, bleeding, and inflammation in gingivitis patients.
Ginger	<i>Zingiber officinale</i>	Gingerols, shogaols, zingerone, paradol, gingerenone, galanin, gingerdiols, gingerdiones	Mouthwash Tablets Extract	Antimicrobial Anti- Inflammatory Antioxidant Analgesic	In vitro and animal studies: ginger extract reduced MMP and IL-8 expression from gingival fibroblasts. Shogaol reduced induced periodontitis in mice. Clinical studies: ginger tablets as effective as NSAIDs in reducing pain after surgical and non-surgical periodontal treatment.
Elderberry	<i>Sambucus nigra</i>	Anthocyanins, flavonols, phenolic acids	Mouthwash Extract Patch	Antimicrobial Anti- Inflammatory Antioxidant	In vitro: reduced inflammation linked to periodontal pathogens. Clinical studies: herbal patch containing <i>Centella asiatica</i> , <i>Echinacea purpurea</i> and

					Sambucus nigra promotes wound healing, reducing inflammation.
Gum arabic	<i>Acacia arabica</i>	Tannins, cyanogenic glycosides, oxidases, peroxidases and pectinases	Gel Extract	Antimicrobial Anti-Inflammatory	Clinical studies: antiplaque and anti-inflammatory properties in gingivitis and periodontitis patients when combined with SRP.
Cashew tree	<i>Anacardium occidentale</i> Linn.	Cardanol Cardol	Extract Gel	Antimicrobial Anti-Inflammatory	Animal studies: decreased periodontal inflammation in rats. Clinical studies: reduced dental plaque and gingival inflammation in gingivitis patients.
Lemongrass	<i>Cymbopogon</i>	Citral Geraniol	Gel Dressing	Antimicrobial Anti-Inflammatory	Animal study: dressing improved gingival wound healing in rats. Clinical studies: topical gel combined with SRP as effective as doxycycline in reducing bacterial counts and gingival inflammation.
Suriname cherry or pitanga	<i>Eugenia uniflora</i>	Galli acid, ellagic acid, myricitrin	Toothpaste Extract	Antimicrobial Anti-inflammatory	In vitro: anti-inflammatory effects on gingival fibroblasts. Clinical study: toothpaste showed anti-gingivitis properties in children aged 10-12 years
Tea tree	<i>Melaleuca alternifolia</i>	Terpinolene, α -terpineol, α -pinene	Mouthwash Gel Irrigation	Antimicrobial Anti-inflammatory	Clinical studies: mouthwash has antiplaque properties; gel may be beneficial as adjunct to SRP.
Centella	<i>Centella asiatica</i>	Asiaticoside	Gel Patch Extract	Antimicrobial Anti-inflammatory Osteogenic	Clinical studies: patch containing Centella asiatica, Echinacea purpurea and Sambucus nigra promoted wound healing, reducing inflammation in periodontitis patients. Extract of centella

					and pomegranate beneficial combined with SRP.
Echinacea	<i>Echinacea purpurea</i>	Caffeic acid Alkamides	Toothpaste Patch	Antimicrobial Anti- Inflammatory Antioxidant	Clinical studies: polyherbal toothpaste can reduce inflammation in gingivitis patients. Patch containing Centella asiatica, Echinacea purpurea and Sambucus nigra promoted wound healing, reducing inflammation in periodontitis patients.
Garlic	<i>Allium sativum</i>	Allicin	Gel Mouthwash Tables	Anti- Inflammatory Antimicrobial Antioxidant	In vitro antimicrobial action against <i>P. gingivalis</i> and <i>A. actinomycetemcomitans</i> . Clinical improvement in plaque index and gingival inflammation.
Bee products	Propolis Honey Royal jelly Bee venom	Hydrogen peroxide, flavonoids, organic essential oils, organic compounds, vitamins, enzymes	Injectable liquid Dressing Mouthwash Strips	Anti- Inflammatory Antimicrobial Wound Healing Moisture Retention Barrier Formation	Propolis gel may reduce plaque, inflammation, and gingival bleeding. The other bee products seem promising but require more

Table 1: Overview of natural remedies investigated in the context of periodontal treatment.

Polyherbal Formulations

Polyherbal formulations contain multiple herbal extracts or essential oils used as therapeutic adjuvants in managing periodontal conditions. Their primary advantage is the synergistic effects of the multiple natural components.[48] Polyherbal mouthwashes in periodontal care may include a variety of herbal extracts such as tea tree oil, eucalyptus oil, peppermint oil, clove oil, neem extract, myrrh extract, and others. Each herb may contribute its own antimicrobial, anti-inflammatory, or wound-healing properties to the formulation.[16] Oral rinses are the most studied polyherbal formulations in periodontics.

Various polyherbal mouthwashes present similar clinical efficacy in reducing plaque formation, gingival

inflammation, and the growth of periodontal pathogens to enhance the benefits of scaling and root planning when compared to chlorhexidine with rare side effects [16,23,48–50].

In an in vitro study assessing the antimicrobial properties of Desplac[®], a gel composed of Green Tea, Aloe Vera, Propolis, Calendul, and Cranberry. Desplac[®] hindered the formation of biofilms and disrupted existing ones, decreasing *Tannerella forsythia* levels [17].

A polyherbal oral recovery kit including oral rinse, gel, and spray has been studied for oral lesions, and postoperative use to reduce infection, pain, swelling, and discomfort, thus possibly improving wound healing after periodontal and implant surgery, as well as tooth extractions [5,51]. This novel recovery kit (VEGA Oral Care Recovery Kit, StellaLife) contains 16 active ingredients recognized in the Homeopathic Pharmacopeia of the United States (HPUS). It has gained popularity as more evidence supporting its biocompatibility and analgesic properties continues to accumulate. It has the potential to reduce the US opioid crisis [5,51–53].

Mechanisms of Action of Plant-Based Remedies

Antimicrobial Effects: Numerous natural remedies can inhibit periodontal pathogens' growth. Various herbal extracts and essential oils can inhibit bacterial growth. Their antimicrobial properties can help control bacterial overgrowth and reduce the risk of disease progression [4,13,15,17].

Anti-inflammatory and Immunomodulatory Properties: various natural remedies possess anti-inflammatory and immunomodulatory properties. Herbal extracts like curcumin and green tea polyphenols can inhibit pro-inflammatory mediators and enzymes, modulating the immune response and potentially attenuating periodontal inflammation [26,28,29,45,47].

Antioxidant Activity: The ability to scavenge free radicals and reduce oxidative damage has been reported for different medicinal herbs and plants. Incorporating these natural antioxidants into periodontal therapy may help mitigate tissue destruction and promote healing [11,25,48].

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 (Table 1) [17,23,25,26,30,37,38,47].

1. Non-surgical periodontal treatment: plant-based adjuncts can promote immunomodulation, reduction of bacteria in periodontal tissues, plaque inhibition, improvement in gingival index, pocket depth, and periodontal wound healing. Ultimately, natural remedies can support a healthy microbiome, improve oral hygiene, enhance the outcomes of SRP, and possibly reduce the need for surgery.

2. Surgical periodontal treatment: plant-based remedies are biocompatible and can promote wound healing and tissue regeneration, optimizing surgical outcomes.
3. Maintenance: As adjuncts to regular oral hygiene practices, these remedies may help control plaque formation and pathogenic bacteria, lowering the risk of disease recurrence. Plant-based formulations should not replace adequate brushing, flossing, and professional dental care [4,23].

Safety Considerations, Limitations, and Challenges

Natural remedies are typically associated with fewer side effects than conventional medications. Nevertheless, adverse reactions can occur, particularly if misused or used excessively [54]. Their safety should be evaluated on a case-by-case basis. The lack of regulation and standardization in the production and labeling can pose challenges in ensuring the safety and quality of plant-based formulations [55]. When considering the integration of these remedies into periodontal treatment protocols, it is essential to exercise caution regarding potential allergies in susceptible individuals, usage during pregnancy and breastfeeding, individual factors such as pre-existing health conditions, and interactions with other medications. These precautions can ensure the safety and appropriate utilization of these remedies within personalized patient care [9,55,56].

Future Perspectives

Natural remedies have gained attention due to their potential benefits and fewer side effects [4,5,23,57]. Plant-based formulations offer alternative approaches to improve treatment outcomes with a low risk of adverse reactions. Targeted delivery systems, such as nanoparticles or bioadhesive formulations, may improve the local release of natural compounds, likely increasing their bioavailability and efficacy [57,58]. Future efforts should focus on standardizing guidelines, regulations, and quality standards. Educating patients about the appropriate use, potential limitations, and adjunctive nature of these remedies can foster acceptance and informed decision-making. More rigorous research is necessary to establish the long-term efficacy, safety, potential side effects, and optimal dosage to ensure consistent therapeutic effects.[5] More robust evidence will help integrate these therapies into evidence-based practice [5,16,48].

Conclusion

Natural remedies show promise and should be used under the guidance of dental professionals without replacing regular oral hygiene practices or professional care. The present mini-review highlights the potential of natural remedies as adjunctive therapies in the management of periodontal diseases. While substantial evidence supports their antimicrobial, anti-inflammatory, antioxidant, and immunomodulatory effects, further research is warranted to establish their long-term efficacy and safety profiles. By integrating natural remedies into periodontal care, clinicians can potentially enhance treatment outcomes and provide a more holistic approach to oral health.

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