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## Herbal Remedies for The Treatment of Periodontitis – A Review

	
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### ABSTRACT

Periodontal disease is one of the world's most serious public health issues, and it has become a widespread cause of tooth loss in the general population. Periodontitis is an immuno-inflammatory disease that damages the soft tissues and bones present around the tooth for support. If left untreated, periodontal diseases can lead to serious health issues. The periodontal treatment aims to eradicate gingival inflammation, eliminate bleeding, reduce periodontal pocket depth, arrest destruction of soft tissue, and bone. The therapeutic approach for periodontitis is to eliminate the bacteria, with the use of chemotherapeutic agents systemically or locally. In recent years, there is an increasing interest in the use of natural antibacterial and antifungal agents, because of the necessity of finding safer treatment against bacterial and fungal infections. Over the last decade, herbal and Ayurvedic drugs have become a subject of world importance, as they possess better therapeutic value and fewer adverse effects as compared to modern medicines. Herbal products are preferred over conventional drugs due to their wide biological activity, higher safety margin, and lower costs. Furthermore, conventional drugs are known to cause various side effects, and continuous intake has resulted in antibiotic resistance. Thus, herbal medicines are being used increasingly as dietary supplements to fight or prevent common diseases. The aim of the present article is to an overall review of the potential herbal remedies widely used for periodontal diseases.

## INTRODUCTION

Periodontal diseases are recognized as one of the major public health problems throughout the world. Periodontitis is a set of inflammatory diseases that affects the periodontium that is the tissues that surround and support the teeth. Bacteria plaque, a sticky, colorless film that constantly forms on teeth is the main cause of periodontal disease.<sup>1</sup> Loss of attachment between the tooth and gums leads to the formation of deep periodontal pockets or lesions which provides the ideal condition for bacterial growth. In recent years a wide range of anti-microbial agents has been evolved to treat periodontitis. Various antimicrobials and chemotherapeutic agents, such as chlorhexidine, triclosan, cetylpyridinium chloride, have been tried and tested in the management of periodontal diseases. Many antibacterial are applied directly to the mouth for the treatment of periodontal diseases through fibers (hollow and monolithic), strips and compacts, films, microparticles, gels, and nanoparticles. Although several chemical agents are commercially available, their undesirable side effects such as vomiting, diarrhea, and tooth staining became a major concern. Hence, the search for alternative products continues, and herbal constituents isolated from plants are considered good alternatives to synthetic chemicals.<sup>2</sup> High beneficial and cost-effectiveness of herbal drugs may become a promising alternative that can be used as an adjunct to periodontal treatment. Due to its good patient acceptance and tolerance their usage is not associated with antibiotic resistance.<sup>3</sup> Due to its multifactorial etiology and complex disease process, the treatment of periodontitis is still a formidable task to dentists. Therefore, herbal remedies have been sought to achieve antimicrobial, antioxidant, antiseptic, anti-inflammatory, and anti-collagenase effects. This review discusses the possible mechanisms by which phytotherapeutic agents could function in the adjunctive treatment of periodontal disease and it gives an overview of the potential of herbal medicine in the management of periodontitis.

### Aloe Vera

*Aloe vera* is a cactus plant belonging to the Asphodelaceae family. Among more than 400 aloe species, *Aloe vera* (Fig.1) is studied for various medical, cosmetic, and nutraceutical purposes. It consists of 75 different ingredients including vitamins, minerals, enzymes, sugars, anthraquinones or phenolic compounds, lignin, saponins, sterols, amino acids, and salicylic acid.<sup>4</sup> The *Aloe vera* leaf consists of 2 different parts: the central mucilaginous part and peripheral bundle sheath cells. The inner portion of the aloe leaves is of parenchymal tissue and produces a clear, thin tasteless jelly-like material called *Aloe vera* gel. This gel

eliminates the bacteria that are involved to cause inflammation through which enhances the wound healing process.<sup>5</sup>

A study carried out by Bhat G exhibited a significant decrease in pocket depth and the relative decrease in gingival and plaque indices and concluded that subgingival administration of Aloe vera gel results in improvement of periodontal condition<sup>6</sup>. Habeba Mahmoud Abdelmonem also proved that subgingival administration of Aloe vera gel in addition to scaling and root planing (SRP) results in improvement of periodontal condition. A study carried out to determine the efficacy of aloe vera mouthwash versus chlorhexidine on plaque and gingivitis revealed Aloe vera was safe and well-tolerated by the patients, with no/or minimal adverse effects as compared to chlorhexidine which showed significant side effects.<sup>7</sup> Ease of availability, no known adverse effects, and cost-effectiveness, make Aloe vera an ideal candidate for plaque control, thereby reducing gingivitis and most likely eventual periodontitis.

### **Acacia catechu Wild**

*Acacia catechu* Wild Fig. 2 is a medium-sized thorny deciduous tree up to 3-15 m height belonging to the sub-family *Mimosoideae* and of the family *Fabaceae*. The diverse pharmacological activities shown by this plant are due to a large number of active chemical constituents like flavonoids, tannins, and many other polyphenols.<sup>8</sup> The extracts of this plant are reported to have various antipyretic, anti-inflammatory, anti-diarrhoeal, hypoglycaemic, hepatoprotective, antioxidant, and antimicrobial activities.<sup>5</sup> *Acacia catechu* leaves extract has been reported to have major components as terpene i.e. camphor (76.40%) and phytol (27.56%) along with other terpenes which account for its high antibacterial and antifungal properties.<sup>9</sup> It has also been used as a mouthwash for sore throat, gingivitis, dental and oral infections. It has been proven to be a potent antimicrobial agent against dental infections as Taxifolin isolated from *Acacia catechu* leaf was showed activity against different bacterial pathogens responsible for Oro dental infections.<sup>10</sup>

## Turmeric

Turmeric is a rhizomatous herbaceous perennial plant that belongs to the family Zingiberaceae. Turmeric consists of orange oblong tubers of 2 or 3 inches in length and one inch in diameter. Chemically, curcumin is a natural polyphenol denominated (1E, 6E)-1,7-bis(4-hydroxy-3-methoxyphenyl)-1,6-heptadiene-3,5-dione which is isolated from the rhizomes of *Curcuma longa*. Due to its immense antimicrobial, antioxidant, astringent, and other useful properties it is quite useful in dentistry.



Figure 1: Aloe vera



Figure 2: Acacia catechu Wild



Figure 3: Turmeric



Figure 4: Neem



In recent years, there has been an increasing interest in curcumin-based treatments as management for many disorders. However, its poor bioavailability, low solubility in aqueous media, instability in body fluids, and elevated degradation rate has limited the therapeutic applications of this drug.<sup>11</sup> Curcumin dental films prepared by solvent casting technique using polymer ethylcellulose, Eudragit RL 100, and HPMC K4M showed better results in the management of periodontitis.<sup>12</sup> Curcumin *in-situ* gel formulations have shown promising results regarding the reduction of probing depth and bleeding index. However, its clinical application was obstructed by its low oral bioavailability, aqueous solubility, and permeability, as well as its rapid metabolic disposition and hydrolytic degradation in neutral and alkaline media.<sup>13</sup>

### **Neem**

*Azadirachta indica* neem is a fast-growing tree that can reach a height of 15–20 meters, and rarely 35–40 meters and it belongs to the family Meliaceae. All parts of the neem tree - leaves, flowers, seeds, fruits, roots, and bark have been used traditionally for the treatment of inflammation, infections, fever, skin diseases, and dental disorders.<sup>14</sup> It has been used widely in the Indian subcontinent for decades of years as a household herb for maintaining healthy periodontium. Neem leaves, barks, or twigs have been incorporated in toothpaste and have proven to be successful in the management of gingivitis and periodontitis.

It inhibits prostaglandin E and 5 HT which accounts for its anti-inflammatory action. The substance named “Azadiachtin” is responsible for antibacterial action which destroys bacterial cell walls and thus inevitably inhibits bacterial growth.<sup>15</sup> Neem chip containing 10% neem oil used effectively as an adjunct to SRP in the treatment of chronic periodontitis and for reduction of microbial load in the subgingival environment.<sup>16</sup>

### **Tulsi**

Tulsi Fig 5 belonging to the family Labiatae, grows in tropical and subtropical belts including India. Tulsi is considered to be the most sacred plant. Tulsi contains a significant amount of Eugenol (1-hydroxy-2-methoxy-4 allylbenzene) thereby it acts as COX-2 inhibitors similar to modern analgesics. Carvacrol and terpene are present in this plant act as antibacterial agents. Its anti-inflammatory property makes it the herbal drug of choice for the management of gingivitis and periodontitis.<sup>17</sup> Its main chemical constituents are rosmarinic acid (a strong

antioxidant), 1,7 - dimethyl, 6-octadien-3-ol, linalool, methyl chavicol, methyl cinnamate, and eugenol.<sup>18</sup>

10% Tulsi gel showed desired effects on *Porphyromonas gingivalis*, statistically significant changes in the clinical parameters, and suggested that it can be used as an adjunct to the treatment of chronic periodontitis. Its mouthwash can be used for treating periodontitis.<sup>19</sup> A study carried out by Manjunathappa et al proved that all the study products i.e., Chlorhexidine(CHX), tulsi extract, and probiotic mouth rinses showed a significant reduction in plaque and gingivitis compared to baseline scores and their effectiveness in reducing gingivitis is in the order Probiotic followed by CHX and tulsi mouth rinses.<sup>20</sup>



Fig 5 Tulsi






Fig 6 Green tea leaves



Fig 7 Piperine



Fig 8 Ginkgo biloba

		
<p>Fig 9 <i>Rubia cordifolia</i> leaves and roots</p>		<p>Fig 10 Pomegranate</p>

### Green tea leaves<sup>21</sup>

Green tea Fig 6 is made from the leaves of *Camellia sinensis* that have undergone minimal oxidation during processing. It contains the highest concentrations of antioxidants called polyphenols. Polyphenols contained in teas are classified as catechins. There are six primary catechin compounds in green tea: Catechin, gallic acid, epicatechin, epigallocatechin, epicatechin gallate (ECg), and epigallocatechin gallate (EGCg). Green tea also contains carotenoids, tocopherols, ascorbic acid, minerals such as zinc, selenium, chromium. Green tea catechins have been observed to have profound effects on periodontal pathogens.

### Piperine<sup>21</sup>

It is an alkaloid that is present in plants such as *Piper nigrum* and *Piper longum* Fig 7. It is shown to have antioxidant and anti-inflammatory properties. Piperine inhibited alveolar bone loss and reformed trabecular microstructures in a dose-dependent manner.

### *Ginkgo biloba*<sup>21</sup>

*G. biloba* (EGb) leaf extract Fig 8 is among the widely used herbal dietary supplement in the US. It is composed of ginkgo flavone glycosides (24%), terpenoids (6%), and less than 5ppm of ginkgolic acid. Its purported biological effects include:

### *Rubia cordifolia*<sup>21</sup>

The roots Fig 9 of this plant have been used in ayurvedic medicine. It also contains an organic compound known as Alizarin, which gives a red color to textile dyes. Mollugin, a

major component of *R. cordifolia* has been shown to possess anti-inflammatory properties. However, further studies are required to use this herbal product as a novel therapeutic approach to treat bone degenerative disorders such as periodontitis, rheumatoid arthritis, and osteoporosis.

### **Pomegranate**

Research showed that pomegranate Fig 10 extract was more effective against the adherence of biofilm microorganisms than a pharmaceutical antifungal when three or four microorganisms were involved. Investigators noted that pomegranate's active components, including polyphenolic flavonoids (e.g., punicalagins and ellagic acid), are believed to prevent gingivitis through several 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. In a study evaluating the effects of pomegranate on gingivitis, results showed a significant reduction in gingival bleeding after using a dentifrice containing the pomegranate extract. Yet in another similar study with a control group, the effect of a gel with a pomegranate extract was tested on a group with experimental gingivitis which hardly mimics the naturally occurring gingivitis.

### **CONCLUSION**

The herbal medicines have been shown to 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 alveolar bone loss, which is the striking feature of periodontitis. Furthermore, the oxidative burden established due to the chronicity of the disease can be alleviated with the antioxidant property of these herbs. Although many studies have shown the potency of herbal medicines as an alternative to conventional therapy, there still lies a void in research concerning the clinical application of these agents in periodontics.<sup>21</sup> Pharmacologically active phytochemicals are found very much useful for the prevention, treatment, and maintenance of periodontal diseases. Particularly antimicrobial activities of these are useful for periodontal diseases. Due to their high benefit and low risk, herbal remedies have an advantage over conventional antibiotic treatment. Although many studies have shown the potency of herbal medicines as an alternative to conventional therapy, still it lags behind research concerning the clinical application of these agents in periodontitis. Standardization and quality assurance of these herbal drugs is a key area to be focused on in



the future. The development of a novel drug delivery system seems to be promising for the treatment of periodontal disease.

Targeted studies to learn the mechanism of action of these herbal treatments are needed in the future.

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