

# A Mini Review on Tannins Prospects in Oral Infectious Diseases

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## Abstract

Due to the high cost of treatment, many countries with low or middle incomes are unable to provide services to prevent and treat oral health conditions. Because they are inexpensive, easy to find, and effective, medicinal plants and other herbal products are frequently used to treat infections of the gums and teeth. Various herbal formulations for treating oral infections have been known to traditional medicine, and these formulations are successfully utilized in current treatment. Because they can target a variety of different things and involve complex processes, natural oral health treatments have a lot going for them. They have the potential to balance the oral microbiota, support bacterial communities that are beneficial to oral health, and reduce the amount of bacteria in the mouth.

**Keywords:** Tannins • Flavanoids • Oral infectious diseases

## Introduction

If natural products are not used to direct microbicidal activity against oropathogenic microorganisms, they may decrease microbial virulence, including adhesivity, biofilm production, saccharolytic and proteolytic activity, and microbial metabolism. Another untrue property of common products that are included in the arsenal of treatments for oral irreversible infections is their ability to suppress, kill, or eliminate biofilms. Positive properties include calming, cell-strengthening, and immunomodulatory exercises that aid in repairing and reducing oxidative stress in periodontal tissue. In addition, the treatment of periodontal disease may also require the inhibition of host metalloproteinases. Supportive interventions for periodontal disease treatment include reducing halitosis, reducing gum bleeding, and relieving pain. Enamel must be protected and regenerated to prevent dental caries. Along with the treatment of underlying diseases, improved oral hygiene, and a change in diet and lifestyle, natural products can successfully be incorporated into the complex approach to treating and preventing dental caries and periodontal disease. Traditional European medicinal plants like oak, agrimony, marigold, witch hazel, rose, and many others, according to the European Medicines Agency (EMA), can be used to treat oral infections and inflammations. The primary active compounds that can be found in the aforementioned plants are polyphenols, which are also known as flavonoids or tannins. Antimicrobial, anti-inflammatory, antioxidant, and wound-healing properties are shared by these compounds. However, oral infections and diseases can be effectively treated with a variety of specific or endemic plants and natural products found in traditional medicines in other parts of the world [1-3].

## Literature Review

Flavonoids are produced by plants in response to microbial infection; Because of this, they can kill a wide range of harmful microorganisms. The interaction of flavonoids with the cell membrane's phospholipid bilayer initiates their antibacterial activity. The specific flavonoid's lipophilicity or hydrophilicity determines whether the interaction occurs outside or within the bilayer. Prenyl groups, alkylamino

chains, alkyl chains, and nitrogen or oxygen-containing heterocyclic moieties are examples of lipophilic substituents in the flavonoid structure that are thought to have a stronger antibacterial effect. In conclusion, there are a number of ways in which flavonoids exhibit antibacterial activity: alteration of membrane permeability, inhibition of attachment and biofilm formation, inhibition of energy metabolism, inhibition of nucleic acid synthesis, attenuation of pathogenicity, and inhibition of cell membrane porins. Some flavonoids can reduce antibiotic resistance and improve the efficacy of current antibiotics. It is frequently used as a target for new antibiotics. One of the flavonoid molecular targets is the glucosyltransferase (GTF) synthesis of extracellular glucans, a known virulence factor in the caries pathogenesis. Glucans enhance the pathogenic potential of dental plaque by encouraging the adhesion and accumulation of cariogenic streptococci on the tooth surface.

Some flavonoids have lipophilic chains or chains of varying lengths in their molecule. These prenylated flavonoids effectively inhibited both gram-positive and gram-negative bacteria. In addition, the reaction of the prenyl group with the OH groups in close proximity can result in the formation of a heterocyclic ring. Flavonoids are extremely potent active substances found in medicinal plants. The activity of some flavonoids is comparable to that of common antibiotics because of their antimicrobial and anti-inflammatory properties. Prenylated flavonoids, which are substitutes for flavonoids that are lipophilic, perform particularly well in this circumstance. Numerous flavonoids are capable of preventing biofilm formation and suppressing virulence factors. The most common flavonoids' structures. Additionally, the research demonstrates that the use of flavonoids in conjunction with antibiotics may be able to lessen antibiotic resistance.

Tannins are polyphenolic compounds known for their astringent effects on many biological processes. The intense astringency in the mouth that comes from eating foods high in tannins is caused by the interaction of proteins in the oral mucosa and saliva with tannins, the main players being proteins' histidine parts. Flavonoids and tanins both play similar roles in the body. Tannins have a number of interesting biological effects, including antibacterial and anti-inflammatory properties. Tannins' antibacterial mechanism includes the inhibition of fatty acid biosynthetic pathways, the inhibition of cell wall synthesis and membrane disruption, and iron chelation. Tannins may also influence the gene expression of virulence factors like biofilms, enzymes, adhesins, motility, and toxins and act as quorum sensing inhibitors. Proanthocyanidins (PACs), also known as condensation tannins, are molecules that both attack and defend plants and have numerous beneficial effects on human health. They have antioxidant and antimicrobial effects on a lot of different things. PACs represent the primary compounds of numerous edible fruits and berries. Toothpaste and mouthwash made from plants contain a lot of high-tannin extracts from medicinal plants. The bark of oak trees is closely associated with red wine maturation. It is common knowledge that oak's tannins and other phenolics are extremely beneficial to aged wines. The green tea group had a significantly higher mean

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level of antioxidants measured in plasma and gingival crevicular fluid than the controls. It was demonstrated that green tea significantly slowed down the release of cytokines caused by bacterial endotoxins. Green tea may have some antibacterial properties because it prevents pathogens from adhering to cells. A dentifrice containing green tea catechins was used to effectively treat rats with exploratory periodontal irritation. In comparison to the control dentifrice at 8 weeks, the periodontal lesions had significantly less inflammatory cell infiltration [4-7].

## Discussion

Due to their ability to bind to proteins and other organismal molecules, tannins, which are substances with a high molecular weight, are responsible for the formation of complexes that are not absorbable. However, some may be absorbed as smaller units following degradation. Flavonoids (also known as aglycones) are also poorly soluble due to their lipophilic nature. They are only marginally bioavailable when taken orally. Nano encapsulation and other modern delivery systems that make use of biocompatible and biodegradable materials that are thought to be safe for humans may make flavonoids and tannins more bioaccessible [8].

## Conclusion

The primary polyphenols found in plants are flavonoids and tannins. Both groups are ideal for treating bacterial infections because of their extensive pharmacological activities, which include antibacterial and anti-inflammatory properties. In traditional medicine, extracts from medicinal plants are frequently used to treat wounds and skin or mucosal inflammation. Over the past ten years, research has shown that polyphenols slow the growth of carcinogenic bacteria and modulate bacterial biofilms. The proper role that traditional medicinal plants should play in modern medicine is demonstrated by the significance of the findings from both preclinical and clinical studies. Natural product research continues to play a crucial role in the search for new antimicrobial molecules. In order to combat antibacterial resistance, some polyphenols are regarded as alternatives to standard antibiotics or may be utilized in conjunction with antibiotics. Our review shows that many flavonoids and tannins, either as natural extracts or as single compounds, are effective against the bacteria that cause dental caries, periodontal disease, and other oral infections due to their availability, efficacy, safety, and, ultimately, patient compliance. Prenylated flavonoids, catechins, and procyanidins are among the best.

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## Conflict of Interest

The authors declare that there is no conflict of interest associated with this manuscript.

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