

Antimicrobial efficacy of herbs in endodontics



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ANTIMICROBIAL EFFICACY OF HERBS IN ENDODONTICS

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Abstract

The major objective in root canal treatment is to disinfect the entire root canal system. Although cleaning and shaping and use of antimicrobial medicaments are effective in reducing the bacterial load some bacteria do remain behind and multiply, causing reinfection of the canal. Considering the ineffectiveness, potential side effects and safety concerns of synthetic drugs, the herbal alternatives for endodontic usage might prove to be advantageous.

Key words: Arctium lappa, Acacia Nilotica , Morinda citrifolia , Propolis, Triphala and GTP

INTRODUCTION

Herbal or natural products have been used in dental and medical practice for thousands of years and have become even more popular today due to their high antimicrobial activity, biocompatibility, anti-inflammatory and anti-oxidant properties. ¹

According to WHO herbal medicine is defined as a plant derived material or preparation which contains raw or processed ingredients from one or more plants with therapeutic values. ²

PROPOLIS

Propolis, a natural antibiotic is a resinous yellow brown to dark brown substance that honey bees (*Apis mellifera*) collect from tree buds, sapflows, shrubs or other botanical sources to seal unwanted open spaces in the hive, protecting it from outside contaminants. The main chemical classes present in propolis are flavonoids, phenolics and other various aromatic compounds. Flavonoids are well known plant compounds that have antibacterial, antifungal, antiviral, antioxidant and anti-inflammatory properties.³ It is composed of Resins and balsams 50-70%, Essential oils and wax 30-50%, Pollen 5-10% Aminoacids, minerals, Vit A, B complex, E Bioflavenoid(vit P) Phenols and Aromatic compounds.

Antibacterial activity of propolis is due to presence of flavinoids and caffeic acid. Antioxidant property of propolis which is the protection against gamma radiation could be attributed to its radical scavenging ability which was better than anti-oxidant property of vitamin C. Anti inflammatory property of propolis is due to caffeic acid phenethyl ester(CAPE).⁴ Martin and Pileggi (2004) conducted a study and compared various storage media and it appeared that propolis may be a better alternative to HBSS, milk, or saline in terms of maintaining PDL cell viability after avulsion and storage .⁵

As a pulp capping agent: Propolis also helps in hard tissue bridge formation; this has been attributed to the property of propolis, which has been shown to stimulate various enzyme systems, cell metabolism, circulation and collagen formation Sabir et al. (2005)⁶ - direct pulp capping with propolis flavonoids , in rats may delay dental pulp inflammation and stimulate reparative dentin.
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As an intra-canal medicament Oncag et al. (2008) ⁷ concluded that propolis had good *in vitro* antibacterial activity against *E. faecalis* in the root canals, suggesting that it could be used as an alternative intracanal medicament.

MORINDA CITRIFOLIA

Morinda Citrifolia commercially known as Noni, indigenous to tropical countries and is considered as an important folk medicine. Its juice has a broad range of therapeutic effects including antibacterial, anti-inflammatory, antiviral, antitumor, antihelmenthic, analgesic, hypotensive, anti-inflammatory and immune enhancing effects. ⁸

As irrigant

The use of Morinda Citrifolia juice as an endodontic irrigant might be of interest to patients and endodontic professionals as part of the growing trend to seek natural remedies as part of dental treatment and might be advantageous because it is a biocompatible antioxidant and not likely to cause the severe injuries to patients that might occur through NaOCl accidents. An *in vitro* study compared the effectiveness of MCJ with NaOCl and CHX to remove the smear layer from the root canal walls of instrumented teeth. It was concluded that the efficacy of Morinda Citrifolia was similar to NaOCl in conjunction with EDTA as an intracanal irrigant. ⁹

MCJ contains the antibacterial compounds L-asperuloside and alizarin.

Acetone extracts from MCJ have antibacterial properties. Morinda citrifolia juice is more effective than 2% CHX against *E. faecalis*. MCJ and CHX, not effective used in combination because they neutralize each others

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properties. The antimicrobial activity of 2% CHX gel propolis, Morinda Citrifolia juice and Ca (OH)₂ has been compared on *E. faecalis* infected root canal dentin at two different depths and three intervals. It was concluded that Propolis and Morinda Citrifolia were effective against *E. faecalis* in dentin on extracted teeth. Morinda Citrifolia appears to be the first juice to be identified as a possible alternative to the use of NaOCl as an intracanal irrigant. ¹⁰

ARCTIUM LAPPA

Arctium lappa is a plant brought from Japan and acclimated in Brazil, which is widely used in popular medicine all over the world for its well-known therapeutic applications. It has anti-bacterial and antifungal activity, diuretic, anti-oxidant and anxiolytic action, platelet anti-aggregating effect and HIV-inhibitory action. Its constituents are sterols, tannins, sulfur containing polyacetylene, volatile fatty oils, polysaccharides. Active constituents of Burdock: sesquiterpene lactones, carbohydrate inulin. An in vitro evaluation of antimicrobial activity of Arctium lappa against microorganisms specifically found in endodontic infections showed a great microbial inhibition of Arctium lappa against the tested endodontic pathogens ¹¹.

TRIPHALA

Triphala is one of the well known Indian Ayurvedic herbal formulation consisting of dried and powdered fruits of three medicinal plants namely Terminalia Bellerica, Terminalia Chebula and Emblica officinalis.

E. officinalis has got antimicrobial and cytotoxic effects. *T. chebula* fruit ethanol extract showed a broad spectrum of activity against different bacterial strains like *S. typhi*, *Staphylococcus epidermidis* and *Bacillus subtilis*. *T. bellerica* was found to be highly potential when compared to the other two medicinal plants. Dimethyl Sulphoxide (DMSO) was used as a solvent for Triphala. Triphala showed more potency on *E. faecalis* biofilm. Tannic acid represents the major constituent of the ripe fruit of *T. chebula*, *T. bellerica* and *E. officinalis* which has bacteriostatic and bactericidal properties.¹²

GREEN TEA

Green tea polyphenols (GTPs: Essence and flavours Mysore, India). It is a traditional drink of Japan and China and is prepared from the young shoots of tea plant *Camellia Sinensis*. The anti-oxidative properties is attributed to the ability of the polyphenols contained in the leaves of *Thea chinensis*, especially the gallic catechins, to inactivate free radicals. The antimicrobial activity is due to inhibition of bacterial enzyme gyrase by binding to ATP B sub unit. Green tea exhibits antibacterial activity on *E. faecalis* planktonic cells. It is also found to be a good chelating agent. GTP antioxidant potential is directly related to the combination of aromatic rings and hydroxyl groups that make up the structure. Binding and neutralization of free radicals by the hydroxyl groups leading to destruction and dissolution of bacterial cell wall.

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An in vitro study conducted to evaluate the antimicrobial efficacy of Triphala, GTPs, MTAD, and 5% Sodium Hypochlorite against *E. faecalis* biofilm formed

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on tooth substrate showed maximum antibacterial activity with NaOCl and statistically significant antibacterial activity with Triphala, GTPs and MTAD. NaOCl and MTAD achieved 100% killing of *E. faecalis* at 2 min, whereas triphala & GTP took 6 mins .¹⁴

AZADIRACHTA INDICA:

It is known as Indian neem/margosa tree. This product has been proved to be effective against

E-faecalis and *candida albicans*. Its antioxidant and antimicrobial properties makes it a potential agent for root canal irrigation as an alternative to sodium hypochlorite.¹⁵ The antimicrobial efficacy of 2.5% sodium hypochlorite and 0.2% chlorhexidine gluconate were compared with an experimental irrigant formulated from *Azadirachta indica* and found that Neem irrigant has antimicrobial efficacy and can be considered for endodontic use.¹⁶

ORANGE OIL:

It is oil produced by glands inside the rind of an orange fruit. This is composed mostly of dlimonene. It also has long chain aliphatic hydrocarbon alcohols, aldehydes like octanal and

octanal. It is suggested as an alternative to chloroform or xylene for gutta-percha softening and

also in dissolving endodontic sealers.¹⁷

ALOE VERA GEL:

Aloe leaves contain clear gel and green part of the leaf that surrounds the gel is used to produce

juice or dried substance. It contains aloins and barbadoins as main chemical constituents. Aloe

Vera gel has inhibitory effects on *S-pyogens* and *Efaecalis* because of anthraquinone. Its bactericidal activity is found to be less than Ca (OH)_2 .¹⁸

LEMON SOLUTION:

Lemon solution (pH 2.21) is a natural source of citric acid (pH 1.68) with lower acidity. Citric

acid, a chemical product has some irritating effect compared to natural lemon solution. Fresh lemon solution is used as root canal medicament because of its wide antibacterial efficiency including *E faecalis*.¹⁹

SALVADORA PERSICA SOLUTION (MISWAK-SIWA): Its chewing sticks contain trimethyl amine, salvadorime chloride and fluoride in large amounts. Fifteen percent alcoholic extracts of it has maximum antimicrobial action. It can be used as a substitute for sodium hypochlorite and chlorhexidine as root canal irrigant.^{20, 21}

GERMAN CHAMOMILE:

It is used as a table tea and flower of chamomile plant contain a wide variety of active

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chemical components (chamazolene, capric acid and caprylic acidchlorogenic acid). It is used for

removal of smear layer and found to be more effective than NaOCl .²²

TURMERIC:

Massaging the aching teeth with ground turmeric eliminates pain and swelling.²³

ACACIA NILOTICA:

It is species of Indian and Africans sub continent. Antimicrobial function is believed to be due to tannins, phenolics compounds, essential oil and flavinoids and is effective against *E. faecalis*.²³

SYZIGIUM AROMATICUM/CLOVE TREE:

Essential oil shows antioxidant, antibacterial and anodyne effects.

CONCLUSION

The major advantages of using herbal alternatives are easy availability, cost effectiveness, increased shelf life, low toxicity and lack of microbial resistance reported so far. Herbs are generally safe and friendly to natural tissues, if used with proper knowledge, but they can be harmful if misused. Hence herbs should only be used for treatment procedures that have been established to be effective and with minimal risk involved.

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