



## ROLE OF HERBALS IN ENDODONTICS

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**ABSTRACT**

India has an age-old heritage of traditional herbal medicine. Ayurveda is considered as the science because the ancient Indian system of health care focused views of man and his illness. Advances in the field of alternative medicine have promoted the use of various natural products. Conventional drugs usually provide effect on antibiotic therapy for bacterial infections, but there is an increasing problem of antibiotic resistance and a continuing need for new inventions. Hence, herbal drugs are being preferred over synthetic antibiotics. Triphala and neem are such product which has innumerable benefits in the field of dentistry which has procured appreciable importance in clinical research. Present review will focus on the comprehensive appraisal of Triphala and neem and its several applications in medicine and dentistry.

**KEYWORDS** : TRIPHALA, NEEM.

**Introduction**

Ayurvedic medications have stood the test of time and since time immemorial been used for various ailments. Recently there is renewed interest in use of various ayurvedic drugs for oral and dental health. Ayurveda aims to integrate and balance the body mind and soul. It achieves a state of total wellness, because of its two basic objectives 1) to maintain the health of those who are well and are not suffering from any disease condition. This mainly is achieved through regulating ones diet and nutrition, exercises, hygiene and lifestyle. 2) Cure the diseases of those who are sick and follow up after cure to prevent relapse of diseases. The terms oral health and general health should not be interpreted as separate entities. Oral health is integral to general health, it is said if eyes are the windows to the soul, then mouth is the doorway to health. such ayurvedic herbs are Triphala and neem.

**TRIPHALA**

Triphala is a traditional ayurvedic herbal formulation consisting of the dried fruits of three medicinal plants *Terminalia chebula* Retz. (Haritaki), *Terminalia bellirica* Roxb. (Bibhitaki), and *Emblia officinalis* (EO) Gaertn. (Amalaki) and also known as "three myrobalans." Triphala means "three" (tri) "fruits" (phala). (1)

**MAIN CHEMICAL CONSTITUENTS OF TRIPHALA****Tannins**

"Tannin" is a general descriptive name for a group of polymeric phenolic substances capable of tanning leather or precipitating gelatin from solution, a property known as astringency. (2) One of their molecular actions is to complex with proteins through so-called non-specific forces such as hydrogen-bonding and hydrophobic effects, as well as by covalent bond formation. Thus, their mode of anti-microbial action may be related to their ability to inactivate microbial adhesins, enzymes, and cell envelope transport proteins.

**Quinones**

Quinones are aromatic rings with two ketone substitutions. They are ubiquitous in nature and are characteristically highly reactive. The individual redox potential of the particular quinone-hydroquinone

pair is very important in many biological systems. (3) Vitamin K is a complex naphthoquinone with anti-hemorrhagic activity. In addition to providing a source of stable free radicals, quinones are known to complex irreversibly with nucleophilic amino acids in proteins, often leading to inactivation of the protein and loss of function. For that reason, the potential range of quinone anti-microbial effects is great. (4) Probable targets in the microbial cell are surface-exposed adhesins, cell wall polypeptides, and membrane-bound enzymes. Quinones may also render substrates unavailable to the microorganism. (5)

**Flavones, flavonoids, and flavonols**

Flavones are phenolic structures containing one carbonyl group (as opposed to the two carbonyls in quinones). The addition of a 3-hydroxyl group yields a flavonol. Flavonoids are also hydroxylated phenolic substances, but occur as a C6-C3 unit linked to an aromatic ring. Since they are known to be synthesized by plants in response to microbial infection, it should not be surprising that they have been found *in vitro* to be effective anti-microbial substances against a wide array of microorganisms. Their activity is probably due to their ability to complex with extracellular and soluble proteins and to complex with bacterial cell walls. More lipophilic flavonoids may also disrupt microbial membranes. These compounds have been shown to inhibit *Vibrio cholera* O1, *Shigella*, *Streptococcus mutans* *in vitro*. Inhibition of isolated bacterial glucosyltransferases in *S. mutans*, and reduction of fissure caries by about 40% has also been demonstrated. (5)

**Gallic acid**

Gallic acid is a common phyto-constituent present in all three herbs used in Triphala. It is reported to possess hepatoprotective and antioxidant activity. It also suppresses growth of cancer cells. (4)

**Vitamin C**

Fruit juice of *Emblia officinalis* (EO) contains the highest vitamin C (478.56 mg/100 mL) content. The fruit when blended with other fruits boosted their nutritional quality in terms of vitamin C content. Vitamin C in EO accounts for approximately 45-70% of the antioxidant activity. (6) Evidences have been reported for the relation between vitamin C and periodontal disease. Significant gum

bleeding can occur in vitamin C deficiency. Vitamin C along with bioflavonoid helps to speed up the healing process(7)

### Dental implications

#### Anticaries activity

The extract could successfully prevent plaque formation on the surface of the tooth as it inhibited the sucrose-induced adherence and the glucan-induced aggregation, the two processes which foster the colonization of the organism on the surface of the tooth. Thus, the extract of *T. chebula* may be an effective agent in the treatment of carious teeth, owing to its ability to inhibit the growth and accumulation of *S. mutans* on the surface of the tooth. This would prevent the accumulation of acids on the surface of the tooth, and thus the further demineralization and the breakdown of the tooth enamel.(6)

#### Triphala as a root canal irrigant

Primary endodontic infections are caused by oral microorganisms, which are usually opportunistic pathogens that may invade a root canal containing necrotic tissue and establish an infectious process. The number of facultative anaerobic bacteria increases when the root canal remains infected for long periods. *Enterococcus faecalis*, a facultative anaerobic Gram-positive coccus is the most common *Enterococcus* sp. cultured from non-healing endodontic cases. Triphala has shown significant antibacterial activity against 3 and 6 weeks biofilms. The use of herbal alternatives as a root canal irrigant might prove to be advantageous considering the several undesirable characteristics of NaOCl.(8)

#### Antimicrobial and antioxidant effect of Triphala

Antimicrobial and antioxidant effect of Triphala has been proven *in vitro* as it has been shown to inhibit *S. mutans* at concentrations as low as 50 µg/ml. This antiplaque effect probably may be due to the tannic acid in Triphala, which is adsorbed well to the groups on the surface of the bacterial cells, which result in protein denaturation and ultimately to bacterial cell death. The strong antioxidant activity of Triphala may be attributed to *T. bellirica*, which is the most active antioxidant followed by *E. officinalis* and *T. chebula*. The major ingredients of *T. bellirica* are ellagic and gallic-acid; *E. officinalis* has several gallic acid derivatives including epigallocatechin gallate and in *T. chebula*; gallic acid is the major ingredient. The presence of these active ingredients of phenolic nature may be responsible to scavenge the free radicals.(9)

#### Triphala as Antibiotic:

Based on *in vitro* studies, Triphala (a combination of Terminalia chebula, Terminalia bellerica, and Emblica officinalis) may have antibacterial activity against several bacterial isolates, including various species of Pseudomonas, Klebsiella, Clostridium, Shigella, Staphylococcus (including beta-lactamase-producing methicillin-resistant Staphylococcus aureus), Vibrio, Salmonella (including multidrug-resistant Salmonella typhi), Escherichia, Enterobacteria, Corynebacteria, Enterococcus, Bacillus, Proteus, and Helicobacter pylori.

#### Neem (Azadirachta indica)

*Azadirachta indica* commonly known as *Neem*, is an evergreen tree. Since time immemorial it has been used by Indian people for treatment of various diseases due to its medicinal properties. It possesses anti-bacterial, anti-cariogenic, anti-helminthic, anti-diabetic, anti-oxidant, astringent, anti-viral, cytotoxic, and anti-inflammatory activity. Nimbidin, Azadirachtin and nimbinin are active compounds present in *Neem* which are responsible for antibacterial activity. *Neem* bark is used as an active ingredient in a number of toothpastes and toothpowders. *Neem* bark has antibacterial properties, it is quite useful in dentistry for curing gingival problems and maintaining oral health in a natural way. *Neem* twigs are used as oral deodorant, toothache reliever and for cleaning of teeth.

Ecology: *Neem* is drought resistant and can tolerate almost any length of high temperature. Typically this tree is grown in sub-arid to

sub-humid areas, where the annual rainfall varies between 400 mm to 1200 mm. This tree thrives in any types of soil, however, best grown in well drained deep sandy soil. This tree cannot stay alive below 4°C temperatures. At this temperature, leaf shedding is confirmed in addition to premature death.(10)

### Dental applications of Neem

#### Neem as root canal irrigant

Aqueous and ethanolic extract of *Neem* leaf inhibits *S. mutans* and *E. faecalis* which cause root canal failure in endodontic procedure. Its antioxidant and antimicrobial properties makes it a potential agent for root canal irrigation as an alternative to sodium hypochlorite. Literature suggested that the *Neem* (*Azadirachta indica*) leaf extract has significant antimicrobial effect against *E. faecalis* derived from infected root canal samples. The extract was found to be efficacious compared with 2% sodium hypochlorite.(11)

#### Antibacterial activity

*Neem* is a natural antibacterial agent. Various scientific studies have revealed its antibacterial activity. The antimicrobial effects of *Neem* have been reported against *S. mutans* and *S. faecalis*(11) Ethanolic extract of *Neem* leaves and sticks and bark exhibited significant antibacterial activity. Dried chewing sticks of *Neem* showed maximum antibacterial activity against *S. mutans* compared to other dental caries-causing organisms, *S. salivarius*, *S. mitis*, and *S. sanguis*.(12)

#### Anti-candidial activity

Ethanolic and aqueous extract of *Neem* leaf showed significant anti-candidial effect against *C. albicans*.(14) A clinical study demonstrated the effects of the leaf aqueous extract from *Azadirachta indica* (*Neem*) on adhesion, cell surface hydrophobicity and biofilm formation, which may affect the colonization by *Candida albicans*. The results suggest that *Neem* leaves have a potential anti-adhesive effect on the sample studied *in vitro*.(13)

#### Anti-cariogenic activity

*Mango* and *Neem* extract showed antimicrobial activity against *S. mutans*, *S. salivarius*, *S. sanguis* and *S. mitis*. A combination of chewing sticks is found to be beneficial in eradicating the dental caries-causing organism. Chloroform extract of *Neem* leaf inhibited *Streptococcus mutans* and *Streptococcus salivarius* and provides an aid for treating dental caries.(15)

#### Anti-plaque activity

Aqueous extract of *Neem* stick and the gallotannin-enriched extract from *Melaphis chinensis* inhibited insoluble glucan synthesis and results in bacterial aggregation. It reduces the ability of *streptococci* to colonize tooth surfaces.(16) *Neem* oil shows significant antibacterial activity and has been suggested for use in treating dental plaque.(17) Mucoadhesive dental gel containing *Azadirachta indica* is found to be beneficial in reducing the plaque index and salivary bacterial count comparatively better than chlorhexidine gluconate mouthwash.

### Conclusion

Triphala and neem are a novel drug with an array of therapeutic activities gifted by Ayurveda to the world, having a wide spectrum of pharmacological and medicinal activities. This medicinal plants are unique source of various types of compounds having diverse chemical structure. Though, it has a number of pharmacological activities due to the presence of various types of bioactive compounds. It has the potential to treat a variety of human ills with minimal or no side-effects. Hence, further research exploring various therapeutic actions of Triphala and neem should be encouraged in dentistry.

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