



Review Article

TRIPHALA: ENVISIONING ITS ROLE IN DENTISTRY

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ABSTRACT

Triphala is an important rasayana drug, used since time immemorial and described in the Ayurveda as a “tridoshic rasayana” (Charka 1500 BC), having balancing and rejuvenating effects on the three constitutional elements that govern human life (vata, pitta, and kapha). The synergy of the three “fruits” (Amalaki - *Phyllanthus emblica*, Bibhitaki - *Terminalia bellerica*, and Haritaki - *Terminalia chebula*) produces the tonifying, detoxifying, mildly antiseptic, rejuvenative and laxative effects of this classic formulation. Such a wide array of actions of triphala is supposed to be because of the 47 tannins and 35 phytochemicals which have been so far isolated from it. In Ayurveda, Triphala holds a paramount position as, naturally; many illnesses require first to be treated with purificatory therapy. In recent times, Triphala is being widely studied and researched in the dental arena for its anti-caries, antioxidant, anti-collagenase, and anti-microbial activities. This review on Triphala throws an inclusive limelight on the properties of Triphala and its numerous applications in dentistry.

Key words: *Phyllanthus emblica*, *Terminalia bellerica*, *Terminalia chebula*, *Triphala*, *herbal*, *dentistry*

INTRODUCTION

The knock of Ayurveda on the doors of science is resonating with each passing day. The term “Ayurveda” is a tatpurusha compound of the word āyus signifying “life” or “life principle” and the word veda which denotes the “system of knowledge”. Ayurveda originated more than 3000 years ago from the youngest of Vedas, The Atharva Veda, and is considered to be the mother of healing systems in India by many scholars. It promotes the use of herbal compounds, special diets and other unique health practices. As per WHO’s estimates, almost 80% of the population in the developing countries depend upon traditional medicine for their primary health care needs and around 85% of these traditional medicines implicate the use of plant extracts or herbs.¹

Triphala, meaning ‘three’[tri] ‘fruits’[phala], is a traditional ayurvedic herbal formulation. The synergy of three “fruits”, Amalaki- *Emblica officinalis*, Bibhitaki- *Terminalia bellerica*, Haritaki – *Terminalia chebula* in equal proportions provide the classical combination of Triphala. The traditional Indian texts, the Charak Samhita and Susruta Samhita which date back to 1500 B.C. describe the recipe for this traditional herbal supplement. There is a folk saying in India which says, “No Mother? Do not worry so long as you have Triphala”. The proficiency behind triphala's many benefits comes from the individual herbs which constitute the formula.

INGREDIENTS OF TRIPHALA

Amalaki (*Emblica officinalis*)

Amalaki or Indian gooseberry consists of fresh fruit pulp of *Emblica officinalis*, a small or medium sized tree found in mixed deciduous forests. Its fruit is globose, 2.5-3.5 cm in diameter, fleshy, green when tender, changes to light yellow or pink in colour when mature and tastes sour and astringent followed by delicately sweet taste. Seeds of Amalaki contain fixed oil, phosphatides and an essential oil whereas fruits, bark and leaves are rich in Tannins.² Fruit has one of the highest concentrations of vitamin C of any food or edible plant ever discovered - averaging 720 mg per 100 gm fruit. Usually, while storing dry or in other forms, vitamin C gets destroyed due to exposure to heat, but in Amalaki, it stays protected due to the presence of tannins which protects it from being destroyed. It is therefore accepted as a prime anti-oxidant.³

Therapeutic Uses

According to the Ayurveda Encyclopedia, Amalaki acts as an “aphrodisiac, astringent, hemostatic, laxative, nutritive tonic, rejuvenative and stomachic”⁴

Amalaki is good for all diseases where there is an inflammation as it doubles the “natural killer cells” within three days. It acts on the blood, bones, liver and heart, rebuilds and maintains new tissues, increases red blood cell count. Amalaki also acts as a blood sugar regulator and a heart tonic, therefore used for blood diseases such as anemia and diabetes. It cleanses the mouth, strengthens teeth, nourishes bones, aids nail & hair growth, improves eyesight, stops bleeding gums, and also improves appetite. In the digestive system, Amalaki cleanses the intestines and stops inflammation of the colon

and stomach.⁴ Apart from this, stress induced brain damage is also prevented due to the presence of tannins.³

Bibhitaki (*Terminalia bellerica*)

Bibhitaki consists of pericarp of dried ripe fruits of *Terminalia bellerica* (Family-Combretaceae), a large deciduous tree, 10-12 m or more in height, commonly found in plains.

Fruit is spherical to ovoid, 2.5-4.0 cm in diameter and astringent in taste. Fresh ripe fruit is slightly silvery or with whitish shiny pubescent surface whereas mature fruit is grey or greyish brown in colour with slightly wrinkled appearance. Fruit of Bibhitaki contains 17% tannins, gallo-tannic acid and resin whereas seeds are rich in greenish yellow oil.²

Therapeutic Uses

It is a strong laxative herb, and being an astringent, cleanses and tonifies the bowel.

Further, the actions of Bibhitaki are “anthelmintic, antiseptic, astringent, expectorant, laxative, lithotriptic, rejuvenative and tonic.”⁵

It is good for conditions of chronic diarrhoea and dysentery and increases appetite. It is also effective in cold and cough, and can be taken with honey for sore throats. Apart from this, it is also involved in antioxidant, antidiabetic, analgesic, immune-modulatory, antihypertensive, hepatoprotective, antispasmodic and bronchodilator activities.⁶

Haritaki (*Terminalia chebula*)

Haritaki consists of the pericarp of mature fruits of *Terminalia chebula* (Family- Combretaceae), a moderate or large sized tree found throughout India, chiefly in deciduous forests and areas of light rainfall. The intact fruit is yellow-brown in colour, ovoid in shape, 20-35 mm long, wrinkled and ribbed longitudinally. The pericarp is fibrous, non-adherent to the seed with an astringent taste. Fruit contains up to 30% Tannins, chebulic acid, gallic acid and some purgative constituents of the nature of Anthraquinone.²

Therapeutic Uses

Caraka-Samhita describes Haritaki as having all tastes except saline. The actions are “rejuvenative, tonic, astringent, laxative, nervine, expectorant and anthelmintic”

Haritaki is a good digestive herb, regulating the function of the colon. Haritaki also improves the absorption, and has a dual property, based on dosage, of correcting both the diarrhoea and constipation. It has antibacterial, antifungal, antiviral and anti-carcinogenic, anti-oxidant, anti-anaphylactic and radio-protective properties as well.⁷

Medicinal uses of triphala

Triphala may very well be a wonder drug for most of the conditions we face today. Because of its tridoshic formula, it can be used to bring balance to all constitutions. Triphala possesses all five tastes (astringent, pungent, sweet, bitter and sour) except salty which makes the taste unpleasant and tough to mask.⁸ However, it can be taken daily, without any fear of over-reliance and with no adverse drug reactions and toxicity.

Triphala can be prepared and used in two proportions:
 1:1:1- equal proportion of Haritaki, Bhibhitaki, Amalaki
 1:2:4- one proportion of Haritaki, 2 proportions of Bhibhitaki and 4 proportions of Amalaki

Triphala may be of value in

Colon cleaning ⁹
Anti- oxidant activity ^{10,11}
Anti-inflammatory and analgesic activity ¹³
Anti-hyperlipidemic activity ¹⁴
Strengthens vision and beneficial in ophthalmic ailments like cataract ¹³
Anti- cancer activity ¹⁴
Hepatoprotection ¹⁵
Wound healing ¹⁶
Immunomodulation ¹⁷
Radioprotection ¹⁸

TRIPHALA IN DENTISTRY

Triphala as a mouth rinse

A multitude of mouthwash products containing many different active and inactive ingredients are being encountered by patients and oral health care professionals. Among the mouthwashes available, chlorhexidine (CHX) has been highly effective in reducing the oral microbial load and hence considered as the “Gold Standard”.¹⁹ However, long-term compliance of the patient using CHX is poor due to its inherent side effects like- staining of teeth and composite restorations, altered taste perception, metallic taste, burning sensation, etc. In addition, the relative unavailability and non-affordability of chlorhexidine in the rural and peri-urban areas of India drives the need of a mouthwash which is easily available, acceptable and affordable.

Periodontal diseases have been treated with Ayurvedic drugs since time immemorial. The 20th Shloka of Sushruta Samhita states that Triphala can be utilized as a gargling agent in dental diseases because of its antibacterial, antiseptic and anti-inflammatory properties.²⁰

Triphala mouth rinse in conjunction with scaling and root planing showed statistically significant reduction in the plaque index, gingival index, and oral hygiene index which was comparable to chlorhexidine at 7, 30, and 45 days with no evidence of staining of teeth.²¹

0.6% Triphala mouthwash & 0.1% CHX exhibited a similar trend in preventing formation of plaque with progressive decrease in the plaque scores from the baseline till the end of 9 months. Both groups also showed similar outcomes on gingival health and inhibitory effects on microbial counts, except Lactobacillus count where Triphala showed better results than Chlorhexidine.²²

6% Triphala used twice a day brought down the oral streptococci count by 17% and 44% compared to 0.2% chlorhexidine group which showed 16% and 45% reduction at the end of 48 h and 7 days respectively suggesting that the anti-oral-streptococci efficacy of Triphala is comparable to that of chlorhexidine.²³

Advantages of Triphala Mouthwash over Gold standard “Chlorhexidine”

Triphala mouthwash does not cause staining of teeth & tastes like a raw fruit and this taste disappears within a few minutes following rinsing of the mouth.²⁸ On the contrary, use of chlorhexidine results in a lingering bitter taste, altered taste sensation as well as some amount of yellowish staining of teeth.

Triphala is highly valued in Indian folk medicine and has many potential systemic benefits. It has been prescribed by Ayurvedic

practitioners because of its wide array of actions to cure a host of systemic illnesses. Thus, instead of causing side-effects, if consumed, it provides systemic benefits. Thus it might prove to be favourable for disabled and bedridden patients, and those unable to maintain adequate oral hygiene.²³

Also, the dried and powdered mixture of triphala constituted by locally available fruits - Amla, Vibhitakai, and Haritakai in a 1:1:1 ratio is quite cost effective. Thus, it is a promising alternative especially for developing countries where majority of the population finds the commercially available mouth rinses quite unaffordable.

Free Radical Scavenging Property and Antimicrobial Activity of Triphala

Oxidative stress has been credited as a major contributor in over 100 disorders including periodontitis. Imbalance between formation of free oxygen radicals and inactivation of these species by antioxidant defence system causes the damage associated with such diseases. Triphala has a potent radical scavenging activity (antioxidant activity) which is attributed to phenolic compounds present in its extracts. The total phenolic content present in Triphala extracts varies from 33% to 44% in terms of Gallic acid equivalents. Under different conditions, all three constituents of Triphala exhibit slightly different activities. *Emblica officinalis* exhibits considerable efficiency in lipid peroxidation and plasmid DNA assay, while *Terminalia chebula* has pronounced radical scavenging activity. Thus their concoction, Triphala, is expected to be a better antioxidant due to the combined activity of the individual constituents.²⁴

Aqueous and ethanol extracts of Triphala & its constituents demonstrated antibacterial activity against *Pseudomonas aeruginosa*, *Vibrio cholera*, *Staphylococcus aureus* etc.²⁵ Antibacterial activity of Triphala also varies with different constituents. Most of the bacterial strains are more sensitive to *T. chebula* than *T. belerica* and *E. officinalis*. The complex mechanisms of antibacterial activity of Triphala include either inhibition of the cell division or damage to the cell walls of the bacterium.¹

Ethanol extract of triphala showed potent antioxidant and antimicrobial activity showing minimal inhibitory and minimal bactericidal concentration at 50µg/ml itself. It also controlled the plaque formation effectively by inhibiting 83.72% growth of *S. mutans* in 5% solution.²⁶

Collagenase Inhibitory Activity of Triphala

Matrix metalloproteinases (MMPs) are important family of zinc and calcium dependant endopeptidases that play a central role in periodontal remodelling, both in physiological and in pathological conditions. Periodontal disease is characterised by imbalance between activated matrix metalloproteinases and their host-derived endogenous inhibitors. The development of synthetic MMP inhibitors provides a useful treatment strategy for the management of periodontitis by allowing the host to restore enzyme-inhibitor equilibrium. These MMP inhibitors act as potential therapeutic agents.²⁷

Tetracyclines, which modulate many of the matrix-protective mechanisms, have been found to be effective inhibitors of MMP-mediated connective tissue destruction. Tetracyclines block catalytic activity of collagenase in extracellular matrix by binding to its secondary Zn²⁺ (and to lesser extent, Ca²⁺), thus altering the confirmation of enzyme molecule.²⁷ However, prolonged use of tetracyclines cause microbial resistance, adverse events such as gastrointestinal upset and overgrowth of yeast, therefore, it is not advocated for the routine treatment of adult periodontitis. Plant

derived inhibitors of collagenase can be used as possible adjuncts in the treatment of periodontal disease as they are devoid of such side effects.

Triphala formulation inhibits the collagenase enzyme activity in a dose-dependent manner. Each of the components of Triphala causes significant and reproducible inhibition of collagenase. The *T.chebula* component of Triphala is the most potent collagenase type 2 inhibitor. Water extracts of Triphala decoction (0.15 mg/ml) cause complete collagenase inhibition.²⁸

Triphala produces significant inhibitions of MMPs at 1,500µg/ml concentration but well within the safety profile confirmed by toxicological studies. All these properties along with biological activities of Triphala make it a prospective Ayurvedic drug for the treatment of periodontal diseases.²⁹

Triphala as Denture Cleanser

60-65% of denture wearers are affected by Candida-associated denture stomatitis which usually has a multifactorial etiology with deficient denture hygiene being one of the prime contributing factors.³⁰ Elderly population has a decreased access to specialized products available for denture cleansing, therefore, herbal alternatives which are easily available would cater to needs of such population.

Significant inhibitory effect on Candida species has been shown by aqueous, ethyl acetic and ethanolic fractions of *Terminalia chebula*. Triphala has shown a significant reduction of the total Candida count and has been found to be as effective as a denture cleansing tablet against Candida.³¹ The anticandidal activity may be attributed to the gallic acid components present in Triphala.³² The potential use of such herbal products should be further considered to improve overall oral health and quality of life of the masses.

Root Canal Irrigant

Primary root canal infections are polymicrobial in nature and are dominated by gram negative anaerobic rods. However *E. faecalis*, a facultative anaerobic gram positive coccus is commonly found in high percentage of root canal failures and plays a major role in etiology of persistent periradicular lesions.³³ Sodium hypochlorite (NaOCl) has been successfully used as a root canal irrigant as it exhibits excellent antibacterial activity but due to its inability to remove smear layer, unpleasant taste, high toxicity and deleterious effects on dentine like reduction of its elastic modulus and flexural strength, other alternatives are being looked for.

Triphala has a potent antibacterial activity against enteric pathogens and has shown significant inhibitory activity against 2 week biofilm. This may be attributed to the presence of tannic acid which is a major constituent of ripe fruit of *T.chebula*, *T.belerica* and *E.officinalis*.³⁴ Triphala may also have an added advantage of being an antioxidant and anti-inflammatory agent over traditional root canal irrigants, thereby proving to be an excellent herbal alternative without undesirable side effects of NaOCl.

Anticancerous activity

The cytotoxic effects of Triphala have been extensively investigated. The viability of cancer cells treated with Triphala has been found to decrease with increasing concentrations. Apoptosis has been found to be significantly higher in tumour tissues treated with Triphala, suggesting the involvement of apoptosis in tumour growth reduction by Triphala.

Gallic acid, one of the major ingredients of Triphala is accomplished inhibitor of cancer cell proliferation suggesting it to be a principal

factor responsible for antimutagenic and cytotoxic effects of Triphala.³⁵ Polyphenols such as tannins are also established inducers of tumor cell apoptosis. Thus, Triphala possesses the property of sparing normal cells while inducing cytotoxicity in tumour cells which makes it a potential anticancer drug for clinical treatment.³⁶

Analgesic, Antipyretic and Ulcerogenic Activities

Increased body temperature and pain are two most important cardinal signs of inflammation. Most of the currently available anti-inflammatory drugs are associated with analgesic and antipyretic effects, but most of them may lead to gastric damage as an adverse effect. Therefore, attempts are being made to ascertain whether any herbal product exhibit analgesic and antipyretic activities without any gastric damage. When these activities of Triphala (500/1000 mg/kg body wt) were compared with then non-steroidal anti-inflammatory drug Indomethacin (10 mg/kg body wt) on the experimental models in mice, it was seen that Triphala produced excellent analgesic and antipyretic effect at both the dose levels, without any gastric injury.³⁷

The analgesic action of the Triphala is attributed to the blockade of the effect or release of the endogenous substances that stimulate pain nerve endings as seen in non-steroidal anti-inflammatory drugs.³⁸ Triphala extract ointment (10%w/w) also shows strong antibacterial, wound healing, and antioxidant activities during the management of infected wounds in rat model.²⁴

Anticaries activity

The oral streptococci, especially *Streptococcus mutans*, *Streptococcus mitis*, *Streptococcus salivarius* and *Streptococcus sobrinus*, have always been linked with dental caries in humans. Establishment and maintenance of the oral micro flora and the development of a cariogenic dental plaque is attributed to complex interplay among streptococcal species within the dental biofilm.³⁹ *Streptococcus mutans* metabolizes sucrose by producing a sticky insoluble glucan (dextran) which promotes the firm adherence of the organisms to the tooth surface and thereby contributing to the formation of dental plaque which subsequently leads to localized decalcification of the enamel surface.

Several undesirable side effects associated with currently available anti-plaque agents has intensified the efforts to explore herbal products which are easily extracted and cost effective and, thus, can be used for prevention of dental caries. The aqueous extract of *Terminalia chebula* (component of Triphala) strongly inhibited the growth, sucrose induced adherence and glucan induced aggregation of virulent cavity inducing organism (*Streptococcus Mutans*). Mouth rinsing with the extract significantly reduced both the total bacterial counts and the total streptococcal counts in the saliva samples for up to 3 hours after rinsing demonstrating its ability as caries preventing agent.⁴⁰

CONCLUSION

Natural compounds contained in the herbal cocktail can act in a synergetic manner within the human body. Triphala, a gift from ancient Ayurveda, is one such drug which offers an inexpensive solution to more expensive modes of treatment for everyday concerns with minimum or no undesirable side effects. It is a natural, renewable, earth-friendly agricultural product which can be taken regularly to improve health. Triphala may very well be a panacea for many conditions we face today, however, its role in dentistry as a novel drug is far from being explored. Hence, further research exploring various therapeutic actions of Triphala should be encouraged in dentistry.

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