

# Role of *Triphala Kwatha Gandusha* in the management of Aphthous ulcer: A review study

## Review Article

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### Abstract

*Mukhapaka* (Stomatitis) is a common ailment seen in general practice. The *Pittaja Mukhapaka* (Aphthous ulcer) is fully described in Ayurveda under the term *Mukha rogas*. Oral ulcers are estimated to impact 4% of the global population, with aphthous ulcers being the most frequent, affecting up to 25% of the global population. Psychological stress, hormonal impacts, dietary sensitivity, and nutritional insufficiency are the primary causes of *Pittaja Mukhapaka* (Aphthous ulcer). It is a painful and frequently recurring inflammatory disorder of the oral mucosa that can develop as a result of several well-defined disease processes. As a result, *Gandusha* is described as one of the key therapies in the Ayurvedic system of medicine for both preventing and treating oral cavity illnesses. *Triphala* (*tri* means three and *phala* means fruits) is an Ayurvedic preparation made up of three equal parts of Indian subcontinent herbal fruits: *Terminalia bellerica*, *Phyllanthus emblica*, and *Terminalia chebula*. *Triphala* includes powerful antioxidants as well as other bioactive substances such as flavonoids, saponins, anthraquinones, amino acids, fatty acids, and different carbohydrates. As a result, it promotes the maintenance and promotion of oral hygiene by exerting a cleansing activity and strengthening the defence mechanism in the oral cavity. An attempt is made in this regard to discuss the role of *Triphala Kwatha Gandusha* in *Pittaja Mukhapaka*.

**Key Words:** *Triphala Kwatha Gandusha*, *Pittaja Mukhapaka*, *Aphthous ulcer*, *Terminalia bellerica*, *Phyllanthus emblica*, *Terminalia chebula*.

### Introduction

The ailments of the mouth cavity are referred to as *Mukha rogas* in Ayurveda. Ancient literature identifies "Mukha" as an organ consisting of *dantamoola* (gums), *osta* (lips), *jihwa* (Tongue), *talv* (palate), *danta* (Teeth), and *gala* (throat) (1). According to Astanga Hrudaya, *Pittaja Mukhapaka* (Aphthous ulcer) is one of the *Mukha rogas* diseases that can be interchanged with Aphthous ulcer due to comparable characteristic traits. The vitiated *pitta dosha* produces inflammation and ulceration of the oral mucosa, resulting in little reddish-yellow papules that grow in any location of the mouth, causing acute burning pain, altered taste, trouble masticating, and deglutition (2). Aphthous ulcers, which typically originate on the non-keratinized oral mucosa, can be excruciatingly painful and can impair eating, speaking, and swallowing. RAS are classed as tiny (1 cm in size) ulcers that heal quickly and without scarring and major (>1 cm in size) ulcers that take

longer to heal and frequently scar. Herpetiform ulcers are the third type, and they appear as repeated crops of dozens of tiny lesions throughout the mucous membranes (3). Psychological stress, heredity, trauma, tobacco, inflammatory bowel disease, B-complex, vitamin, and folate deficiency, microbial causes, hormonal changes, and immunologic factors may all contribute to the development of ulcers (4). The clinician may run a blood test to rule out iron, vitamin B<sub>12</sub>, or folate deficiencies, as well as a full blood count, regularly. If a hematinic deficit is present, elimination diets or dietary supplementation may entirely alleviate symptoms. Thus, *Gandusha* is explained as one of the treatments to avoid or treat *Mukha rogas* disorder in Ayurveda to safeguard or treat the disorder of the mouth cavity. Depending on the severity of the sickness and the desired therapeutic results, various medicated liquids or decoctions can be used. The classics textbook lists a variety of yogas for *Gandoosha/Kavala*. *Triphala* is a well-known Ayurvedic medicinal constituent. It is regarded as the greatest and most flexible herbal formulation in India. The majority of *Mukha rogas* are *kapha rakta pradhana rogas*, whereas *Triphala* is *kapha pitta hara dravya*. As a result, *Gandusha* combined with *Triphala kashaya* will accelerate the healing process in *Pittaja Mukhapaka* (1). This paper presents a review of the important role of *Triphala Kwatha Gandusha* in *Pittaja Mukhapaka*.

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### Three important dried fruits of the herbs combined from Ayurveda

1. In *Shalaky Tantra* tradition, *Amla* or *Amlaki*, also known as Indian Gooseberry (*Emblica officinalis* - Family Euphorbiaceae), is considered auspicious.
2. *Harad* or *haritaki*, also known as Myrobylan (*Terminalia chebula* - Family Combretaceae).
3. *Baheda* or *Vibhitaki*, also known as Belliric myrobalan (*Terminalia bellirica* - Family Combretaceae).

*Triphala's* rasa or flavour is sweet, sour, pungent, bitter, and astringent; the only flavour not included in the recipe is salty. The formula's *virya*, or potency and action, is neutral, and its *vipaka*, or post-digestive impact, is sweet. *Triphala* is rich in *prabhava*, which helps to balance all *doshas* and constitutions. *Amalaki's* *gunas* are *guru* and *ruksha*, and *Haritaki* and *Bhibitaki* are both regarded *laghu* and *ruksha* (5).

### Possible Mode of Action of Triphala Kwatha Gandusha

*Gandusha* is the oral administration of medications in which the active elements and chemical constituents of the drugs are absorbed through the buccal mucosa and enter the bloodstream (6). *Gandusha* raises the mechanical pressure inside the oral cavity, activates the salivary glands, enhances vascular permeability, and keeps the oral pH stable (6). The tannins, gallic acid, ellagic acid, and chebulinic acid are the formula's main ingredients, and they are all powerful antioxidants. *Triphala* also contains different carbohydrates, flavonoids (such as quercetin and luteolin), saponins, amino acids, fatty acids, and anthraquinones (5). The active ingredients in the medicine stimulate the parasympathetic fibres of the salivary gland, causing a significant amount of water to be released in the saliva. Parasympathetic fibres stimulate acetylcholine, acinar cells and widen salivary gland blood vessels. When sympathetic fibres are stimulated, saliva is secreted, which is viscous and rich in organic elements such as mucus. These fibres stimulate the nor-adrenaline system, acinar cells, and produce vasoconstriction (7). Furthermore, saliva inhibits bacterial growth by eliminating components that serve as bacterial culture media, proline-rich proteins contained in saliva that have anti-microbial properties, and immunoglobulin Ig in saliva that has antibacterial and anti-viral action (1).

### Phytoconstituents of Triphala

#### Tannins

Tannins are a broad term for a family of polymeric phenolic compounds with complex structures in plants that can tan leather or precipitate gelatin from solution, a trait known as astringency. Tannins are widely dispersed, accounting for 5 to 10% of dry vascular plant components and found primarily in bark, stems, seeds, roots, buds, and leaves. Tannins can also be found in foods such as grapes, blackberries, strawberries, walnuts, cashew nuts, hazelnuts, mangoes, and tea, among others (8). Their architectures divide them into three groups: hydrolysable tannins, condensed

tannins, and complex tannins. The term "hydrolysable tannins" refers to a class of chemicals generated by phenolic acids and their derivatives via glycoside or ester linkages with glucose or polyols. They are further classified as gallotannins, which include solely galloyl groups, ellagitannins, which contain hexahydroxydiphenoyl group(s), and hydrolysable tannin oligomers, which are classified as dimers, trimers, and tetramers based on the number of glucose nuclei. Condensed tannins are a type of chemical that results from the carbon-carbon bond polymerization of flavane-3-ols like catechins or their derivative gallo catechin. Complex tannins are a family of molecules that are partially linked by carbon-carbon bonds and are composed of flavane-3-ol, the unit of condensed tannins and hydrolyzed tannins (9). Tannins are found in many plants and are thought to be defence chemicals that protect plant tissues against herbivorous attacks due to their astringent taste. This class of chemicals, particularly green teas and red wines, has gotten a lot of attention in recent years because of their ability to heal or prevent a variety of diseases. Tannins have been connected to several human physiological activities, including phagocytic cell activation, host-mediated tumour activity, and a broad range of anti-infective properties. They create complexes with proteins through non-specific forces such as hydrogen bonding and hydrophobic effects, as well as covalent bond formation, as one of their molecular functions (10,11). As a result, their ability to inactivate microbial adhesins, enzymes, and cell envelope transport proteins may be related to their antimicrobial action mechanism (12). Several natural tannins and related compounds have been shown to have biological activities such as antioxidant, anticancer, hypolipidemic, hypoglycemic, and antibacterial properties (13).

#### Quinones

Quinones are a class of natural and manmade chemicals with a variety of therapeutic properties. Quinones are electron carriers that participate in photosynthesis. Like vitamins, they are a type of chemical that can help prevent and treat a variety of disorders, including osteoporosis and cardiovascular disease (14). Quinones are aromatic rings with two ketone substitutes. They're everywhere, and they're quick to react. The individual redox potential of the quinone-hydroquinone duo is crucial in many biological activities. Vitamin K is a naphthoquinone anti-hemorrhagic substance (15). Quinones have been shown to permanently interact with nucleophilic amino acids in proteins, resulting in protein inactivation and loss of function, as well as providing a source of persistent free radicals. As a result, the potential spectrum of quinone antibacterial activities is broad. In the microbial cell, surface-exposed adhesins, cell wall polypeptides, and other surface-exposed adhesins could be targets. Quinones can also prevent bacteria from accessing substrates (7). Quinones boost overall health due to their antioxidant activity. Many of the cancer treatments that have been authorised or are now in clinical development are quinone-related chemicals. Quinones

are toxicologically active due to their occurrence as photoproducts of air pollution. Quinones are redox cycling compounds that can connect to thiol, amine, and hydroxyl groups (16).

### Flavones, flavonoids, and flavonols

Polyphenolic flavonoids are among a large range of phytochemicals with one carbonyl group found in the human diet (as opposed to the two carbonyls in quinones). The inclusion of the 3-hydroxyl group results in the formation of the flavonol. Flavonoids are hydroxylated phenolic compounds as well, but they have a C6-C3 unit linked to an aromatic ring (17). Flavonoid consumption may reduce the risk of various age-related chronic diseases, according to preliminary research, animal models, and human trials. A large number of flavonoids and mixes of their subclasses, such as flavonols, flavones, and flavanones, as well as the variety of agricultural techniques that affect their concentration in foods, have made developing comprehensive food composition databases for these chemicals difficult (18). Nonetheless, dietary assessments have been used in cohort and case-control epidemiological studies, and several of them show an inverse association with the incidence of certain types of cancer, cardiovascular disease, and other chronic illnesses. Because they are known to be produced by plants in response to microbial infection, it is not surprising that they have been demonstrated in vitro to be effective anti-microbial chemicals against a wide variety of microorganisms. Their ability to form complexes with extracellular and soluble proteins, as well as bacterial cell walls, is most likely responsible for their activity. Microbial membranes may be harmed by high lipophilic flavonoids (19). These compounds have been shown to inhibit *Vibrio cholerae*, *Shigella*, and *Streptococcus mutans* in vitro. Inhibition of isolated bacterial glucosyltransferases in *Streptococcus mutans*, as well as a 40% reduction in fissure caries, has also been reported (12).

### Gallic acid

Gallic acid is a commonly found phytoconstituent in all three *Triphala* plants. Gallic acid is a polyphenolic component found naturally in processed beverages such as red wines and green teas. It is found in plants as free acids, esters, catechin derivatives, and hydrolysable tannins (20). The pharmacological activity of these compounds as radical scavengers has piqued the curiosity of researchers (21). It has been shown to have potential preventive and therapeutic effects in many conditions where oxidative stress has been implicated, including cardiovascular disease, cancer cell growth inhibition, hepatoprotection, neurological disorders, and ageing (22). Gallic acid has been reported to occur in several plants, some of them are *Allan blackia floribunda*, *Garcinia densivenia*, *Bridelia micrantha*, *Caesalpinia sappan*, *Dillenia indica*, *Diospyros cinnabarina*, *Paratecoma peroba*, *Terminalia bellerica*, etc (7).

### Ascorbic acid

Vitamin C, or ascorbic acid, is an essential dietary component for a variety of human biological functions, albeit its function at the cellular level is not obvious. Vitamin C is needed for collagen synthesis, the protein that fulfils so many connective roles in the body (23). It is essential in the manufacture of collagen under physiological conditions by promoting the hydroxylation of proline and lysine residues, permitting correct intracellular folding of pro-collagen for export and deposition as mature collagen. The framework of bone, gums, and binding materials in skin, muscle, or scar tissue are all collagen-containing components and structures in the body (24). In humans, vitamin C also functions as a cofactor in several essential hydroxylation events, including the production of catecholamines (through the conversion of dopamine to norepinephrine), L-carnitine, cholesterol, amino acids, and certain peptide hormones. Vitamin C is required to produce certain hormones and neurotransmitters, as well as the metabolism of various amino acids and vitamins. Scurvy is caused by a shortage of vitamin C, a pathological condition that causes blood vessel fragility and connective tissue damage due to a failure to produce collagen, and, eventually, death as a result of a total collapse. As an antioxidant, it reduces inflammatory symptoms by reacting with molecules such as histamines and peroxides (25). Its antioxidant properties have been linked to a reduction in cancer incidence and the prevention of cardiovascular disease. This vitamin also aids the liver in the detoxification of toxins in the body, as well as the blood in combating infections. Furthermore, the effects of vitamin C on the neurological system and chronically unwell patients have been reported. Because of the health benefits of vitamin C, people are lured to consume too much of it. Adults' vitamin C requirements do not appear to be consistent across cultures. Minimal increases in blood vitamin C levels reduce the chance of death from this disease (26). The fruit juice of *Emblia officinalis* has the most vitamin C concentration (478.56 mg/100 mL). When combined with other fruits, the fruit improved its nutritional quality in terms of vitamin C content. In *E. officinalis*, vitamin C accounts for 45-70 % of the antioxidant action. The combination of vitamin C and bioflavonoid aids in the healing process (12).

### Applications

#### The Potential of *Triphala* in Oral Care

*Triphala* has traditionally been utilised as an antimicrobial agent in Ayurvedic treatment. *Triphala* has been shown in numerous controlled clinical experiments to greatly reduce the number of oral bacteria, dental plaque, and gingivitis in human subjects. *Triphala* contains a high concentration of polyphenols and tannins. *Triphala's* polyphenolic content is responsible for its antioxidant and radioprotection potential by converting reactive oxygen free radicals to non-reactive products (27). *Triphala* effectively reduces oxidative damage caused by cold stress. Lipid peroxidation (LPO), enzymatic superoxide dismutase (SOD), catalase (CAT), non-enzymatic

(Vitamin C) antioxidation status, and other parameters are used to assess cold-stress-induced oxidative stress. *Triphala* components significantly suppress Y-radiation-induced strand break development in plasmid DNA. They can scavenge free radicals such as DPPH and superoxide and prevent radiation-induced lipid peroxidation. Instead of using separate substances, the *Triphala* combination is more effective because it contains the combined activity of all three. *Triphala's* superoxide radical scavenging activity with xanthine and xanthine oxidase activity demonstrated that, in addition to reacting with superoxide radicals, *Triphala* suppressed uric acid production. *Triphala* contains a lot of phenols, polyphenols, and tannins. HPLC analysis revealed the presence of gallic acid. The antioxidant activity was assessed using the 1, 1-diphenyl-2-picrylhydrazyl (DPPH) technique, as well as the prevention of lipid peroxide generation caused by the Fe<sup>2+</sup> ascorbate system. They were discovered to have a high correlation with total polyphenol concentration. Antioxidant activity has been observed for mallotusin and mucic acid 1, 4-lactone 3-Ogallate. *Triphala* is an effective scavenger of hydroxyl and nitric oxide radicals and has been shown to increase the capacity of experimental animals to withstand non-specific stress (5,28).

#### **Triphala against stress**

*Triphala* supplementation has been shown to alleviate stress. *Triphala* treatment for 48 days can prevent cold stress-induced behavioural and biochemical abnormalities such as an increase in immobilisation, with an increase in rearing, grooming, and ambulation activity, as well as a significant increase in lipid oxidation (LPO) and corticosterone levels (29). *Triphala* protects rats from noise-induced alterations in the antioxidant and cell-mediated immune response (5).

#### **Triphala in Wound healing**

The granulation tissue has a lower bacterial population and higher levels of collagen, hexosamine, and uronic acid. When collagen sponges infused with *Triphala* were used to treat wounds, they demonstrated higher thermal stability, water uptake capabilities, faster wound closure, improved tissue regeneration, and other benefits. The combination of epigallocatechin gallate with collagen leads to rapid wound healing activity (30).

#### **Antimicrobial activity of Triphala**

*Triphala churna* also has antibacterial properties against a variety of infections. Its extracts in acetone, ethanol, and methanol have a significant antibacterial potential against a wide range of bacteria, including *Staphylococcus epidermidis*, *Staphylococcus aureus*, *Pseudomonas*, and *E. coli*. *Triphala* and its constituents had an antibiotic impact on both gram-positive and gram-negative bacteria, implying that active phytochemicals entered the bacterial cells through both walls. *Triphala kwatha churna* is antimicrobial and effective against a variety of bacterial infections. *Triphala* has antibacterial efficacy against

pathogens such as *Salmonella*, *Staphylococcus aureus*, *Pseudomonas*, *E. coli*, and *Bacillus* isolated from worker and student wounds. *Triphala* is beneficial against enteric bacterial infections as well as enterococci. It has demonstrated broad-spectrum antibacterial efficacy against several resistant bacterial isolates. *Triphala* and its components have also been shown to be beneficial against harmful microorganisms in humans (31).

#### **Analgesic, antipyretic and ulcerogenic activities of Triphala**

*Triphala's* analgesic, antipyretic, and ulcerogenic properties were compared with the nonsteroidal anti-inflammatory agent, Indomethacin in rat experimental models, and it was discovered that *Triphala* exhibited outstanding analgesic and antipyretic effects at both dose levels, with minimal gastrointestinal harm. In a recent study, the anti-ulcer efficacy of polyherbal formulation was investigated in rats with aspirin and pyloric ligation caused stomach ulcers (32).

#### **Triphala as an immune modulator.**

*Triphala* has immunomodulatory effects when assessed using the carbon clearance test and the Delayed-Type Hypersensitivity (DTH) reaction. *Triphala's* immunomodulatory properties can be attributed to flavonoids, alkaloids, tannins, saponins, glycosides, and phenolic chemicals (32). Furthermore, studies have validated several potential uses of *Triphala*, including free radical scavenging, antioxidant, immune-modulating, appetite stimulation, gastric hyperacidity reduction, dental caries prevention, antipyretic, analgesic, antibacterial, antimutagenic, antistress, wound healing, anti-cariogenic, hypoglycemic, anti-inflammatory, anticancer, hepatoprotective, adaptogenic, and chemoprotective (33). *Triphala* may also enhance appropriate digestion and absorption of food, improve circulation, relax bile ducts, lower serum cholesterol levels, prevent immunosenescence, maintain endocrine system balance, and increase red blood cell and hemoglobin formation (28).

#### **Anti-inflammatory effects of Triphala**

Chronic inflammation is harmful and affects most major chronic health disorders. *Triphala* is effective as an anti-inflammatory drug. In one study, *Triphala* outperformed or was similar to normal medication treatment in several biochemical measures of inflammation (34,35). *Triphala* also decreased inflammatory markers, as well as bone and cartilage deterioration, in arthritic rats. *Triphala* extract was found to be much more effective than indomethacin, a nonsteroidal anti-inflammatory medication, in alleviating arthritic and inflammatory symptoms (28,30).

**Table 1. Samhita and Nighantu (36)**

	<b>Samhita and Nighantu</b>	<b>Varga</b>
1	Charaka Samhita	Virechanopaga Mahakashaya, Jwarahara Mahakashaya, Kashaya skandha
2	Susruta Samhita	Muskadi gana, Parushkadi gana, Mustadi gana, Triphala gana, Amlakyadi gana, Kashaya skandha
3	Astanga Hridaya	Virechana gana, Parushkadi gana, Muskadi gana Mustadi gana
4	Astanga Sangraha	Virechanopayogi Dravya, Jwarahara Mahakashaya Parushkadi gana, Muskadi gana, Mustadi gana
5	Dhanvantari Nighantu	Guduchyadi gana, Mishrakadi varga
6	Shodhala Nighantu	Guduchyadi gana
7	Kaidev Nighantu	Aushadhi varga
8	Madanpal Nighantu	Abhyadi varga
9	Raj Nighantu	Mishrakadi varga, Audhabhida varga
10	Bhavaprakash Nighantu	Haritkyadi Nighantu
11	Priya Nighantu	Haritkyadi Nighantu
12	Nighantu Adarsh	Haritkyadi Nighantu
13	Dravya guna Vigyan	Rasayana varga, Chednadi varga

## Discussion

Following a review of the drug's qualities, it is discovered that Tannin's mode of anti-microbial action may be related to its ability to inactivate microbial adhesins, enzymes, and cell envelope transport proteins, which can treat or prevent a range of diseases. Surface-exposed adhesins, cell wall polypeptides, and membrane-bound enzymes are the most likely targets of quines in the microbial cell (37). Flavones, flavonoids, and flavonols are known to be generated by plants in response to microbial infection and potent anti-microbial compounds against a wide range of bacteria (18). Gallic acid has also been demonstrated to have hepatoprotective and antioxidant properties (21). *Triphala* has the potential in oral care to reduce the number of oral bacteria, tooth plaque, and gingivitis in human subjects by combining vitamin C and bioflavonoid. *Triphala* reduces stress, aids wound healing due to the incorporation of collagen sponges, and has analgesic, antipyretic, and ulcerogenic properties. It is more likely that antiseptic gargles and *Gandusha* aid in the maintenance and healing of Aphthous Ulcer. It has both local and systemic effects, however, it is most noticeable in local activities such as *Gandusha*. Several ulcers in the previous month were reported as oral ulcer activity. If there were no ulcers, this was scored zero; otherwise, it was scored one if the number of ulcers was greater than or equal to one. A 100-mm line with extreme values at either end. Patients

must mark the level of their pain on a line (28). *Triphala* has immunomodulatory qualities as well as *Shothahara* (anti-inflammatory) and *Ropana* (healing) characteristics, as well as anti-oxidant properties (33).

## Conclusion

*Triphala* is the right medicine with therapeutic properties given to the world by Ayurveda. A wide range of human disorders can be treated with minimal negative effects. *Triphala kwatha gandusha* maintains and heals Aphthous ulcer oropharyngeal illness by increasing mechanical pressure inside the oral cavity, stimulating salivary glands, increasing vascular permeability, maintaining oral pH, and its anti-inflammatory, anti-oxidant, and wound healing qualities.

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