



Review Article

## *Mimusops elengi* (Linn.): An effective aid in dental care

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### ABSTRACT

*Mimusops elengi* (Linn.) has been used in Ayurveda and many other traditional systems of medicine. This plant has various dental uses and is more significant in periodontal therapy. The present review highlights the proven properties of *M. elengi* and the scope of advancement for using it as an effective suture coating material projecting its use in decreasing bacterial load after periodontal surgery. Information compiled here will be useful to improve the present investigation regarding *M. elengi* in periodontal therapy.

**Keywords:** *Mimusops elengi*, Suture coating, Antimicrobial, Periodontal therapy

### INTRODUCTION

Primary health care is the backbone of the health system in any country. Irrational and raised use of antibiotics might result in the adverse effects within the body. Hence, an integrative approach of combining Allopathy with Ayurveda should be considered to minimize the side effects of the drugs. Conventionally, plants have been used since a protracted time for the treatment of human diseases in Asian countries.

*Mimusops elengi* (Linn.), domestically known as “Bakul” or “Maulsari,” is a large evergreen tree found all over India. It has a compact leafy head, and short erect trunk with smooth, scaly, and gray bark.<sup>[1]</sup> The leaves are elliptical or oblong. It yields white, fragrant flowers, and silky, ovoid fruits which become yellow when ripe. The seeds of this tree are solitary, ovoid, and brown.<sup>[2]</sup> It is known to have an antimicrobial activity which is also used in Ayurvedic medicine.

### Taxonomy

Kingdom: Plantae  
Order: Ericales  
Family: Sapotaceae  
Genus: *Mimusops*  
Species: *Elengi*  
Binomial name: *Mimusops elengi*.

### GENERAL PROPERTIES

The bark is acrid and sweet; cooling, cardiotoxic, alexipharmic, stomachic, anthelmintic, and astringent.<sup>[3,4]</sup> The twig of this tree is used for tooth-brushing and chewing it for a long period

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strengthens the teeth. It is used in gargles for odontopathy, inflammation, and bleeding gums.<sup>[5]</sup> It is also an important constituent in many herbal tooth powders along with tannin-rich substances. It is the main constituent of “Mahakhadiradivati” which is an herbal remedy for stomatitis, halitosis, spongy gums, and pharyngeal problems. It is also used in making commercial dyes.

“Kawath” of the bark along with pepper, honey, and ghee in gargle form reduces the pain and strengthens the loose teeth.<sup>[11]</sup> Seed powder is used to fix loose teeth. Decoction of root bark taken with milk in the morning for 3 days could strengthen the teeth of even an old person. Chewing bark for a long period strengthens the teeth like anything.<sup>[6]</sup>

The fruit of *M. elengi* has astringent property. The immature fruits are known to protect loose teeth. Hot water extract of dried seeds is also used for fixing loose teeth. The root of *M. elengi* also has aphrodisiac, diuretic, and astringent properties.<sup>[7]</sup> The hot aqueous extract is used in strengthening the teeth and gums. Antipyretic properties of the root are also given in the literature.

The extracts of dried flowers are useful in the healing of wounds and ulcers. It is also used as an expectorant in liver, nasal, and asthmatic conditions. Application of ointment prepared of 25 g of its flowers, fruit, and bark in 200 g wax is beneficial in boils, ringworm, and other skin diseases.<sup>[8]</sup>

The leaves extract can be used as an antidote for snakebite.<sup>[8]</sup>

## CHEMICAL COMPOSITION

The ethanolic extract of bark chemically is a mixture of saponins and fatty acid components. Other constituents isolated from the bark are alpha-cadinol, tau-murolool, pentadecanoic acid, di-iso-butyl phthalate, hexadecanoic acid, eicosane, oleic acid, octadecanoic acid, 4-hydroxy 3-methoxybenzaldehyde (vanillin), clindamycin, 2-furancarboxaldehyde, 1,4,5,8 dimethanaphthalene-2,3-diol, and alanine N-proparyloxycarbonylisohehexyl ester.<sup>[2]</sup>

Leaves contain hentriacontane, carotene, lupeol, quercitol,  $\beta$ -carotene, d-mannitol,  $\beta$ -sitosterol, and  $\beta$ -sitosterol- $\beta$ -d-glucose.<sup>[1]</sup>

Fruits and seeds contain quercitol, quercetin, a triterpene alcohol, ursolic acid,  $\beta$ -sitosterol, alpha spinasterol, mimusops acid, mimugenone, pentacyclic triterpines 3 $\beta$ ,6 $\beta$ ,19 $\alpha$ ,23- tetrahydroxyurs-12-ene and 1 $\beta$  hydroxyl-3 $\beta$ -hexanoyllup-20(29)-ene-23, 28-dioic acid, mi-saponin A, taxifolin, alpha-spinasterol glucoside, and mimusopside A and B.<sup>[2]</sup>

Flower consists of essential oil,  $\beta$ -sitosterol, and its glucoside, ursolic acid, lupeol, gallic acid, quercetin, and kaempferol.<sup>[9]</sup>

*M. elengi* reportedly contains calcium (212 mg) and phosphorus (30 mg) per 100 g.<sup>[11]</sup>

A new steroidal saponin, 5-alpha-stigmast-9(11) en-3-O beta-D-glucopyranosyl (1-5) O-beta-D- xylofuranoside, was isolated in the root of *M. elengi* tree.<sup>[10]</sup>

Lavaud *et al.* in a study isolated six saponins from the seed kernel of *M. elengi*.

Three of them are new compounds: 3-O-( $\beta$ -d-glucuronopyranosyl) 28-O-( $\alpha$ -l-rhamnopyranosyl (1  $\rightarrow$  3)  $\beta$ -d-xylopyranosyl (1  $\rightarrow$  4) [ $\alpha$ -l-rhamno pyranosyl (1  $\rightarrow$  3)]  $\alpha$ -l-rhamnopyranosyl (1  $\rightarrow$  2)  $\alpha$ -l-arabinopyranosyl) protobassic acid, 3-O-( $\beta$ -d-glucuronopyranosyl) 28-O-( $\alpha$ -l-rhamnopyranosyl (1  $\rightarrow$  3)  $\beta$ -d-xylopyranosyl (1  $\rightarrow$  4)  $\alpha$ -l-rhamno pyranosyl (1  $\rightarrow$  2)  $\alpha$ -l-arabinopyranosyl) 16- $\alpha$ -hydroxyprotobassic acid, and 3-O-( $\beta$ -d-glucopyranosyl (1  $\rightarrow$  3)  $\beta$ -d-glucopyranosyl) 28-O-( $\alpha$ -l-rhamnopyranosyl (1  $\rightarrow$  3)  $\beta$ -d-xylopyranosyl (1  $\rightarrow$  4)  $\alpha$ -l-rhamno pyranosyl (1  $\rightarrow$  2)  $\alpha$ -l-arabino pyranosyl) protobassic acid.<sup>[11]</sup>

## ANTIMICROBIAL PROPERTIES OF *M. ELENGI*

Microflora including Gram-positive and Gram-negative organisms is numerous present in the oral cavity. Some of them are useful for a healthy oral environment while others are the reason for the causation of disease progression. Rational use of drugs can be effective in reducing the diseases of the oral cavity.

*M. elengi* is one such plant and stated in Ayurveda literature and research which possesses effective antimicrobial properties.

Ali *et al.* reported antibacterial and antifungal properties in their *in vitro* study on the antibacterial and antifungal screening performed with petroleum ether, ethyl acetate, and methanol extracts of bark, fruits, and leaves of *M. elengi* against seven pathogenic bacteria and six fungi by the standard disk diffusion method. Petroleum ether extract showed higher activity against *Staphylococcus aureus* and *Klebsiella* species whereas ethyl acetate extract displayed maximum toward *S. aureus* and *Shigella dysenteriae*. Methanol extract inhibited toward all the tested bacteria whereas ethyl acetate extract could not inhibit Gram-negative *Shigella boydii*. All of the extracts were appeared to be effective against the organisms *S. aureus*, *Streptococcus b-haemolyticus*, and *S. dysenteriae*. Petroleum ether extract showed maximum activity against *S. dysenteriae*. The bark extracts were found to be active against most of the tested fungal strains.<sup>[12]</sup>

Purnima *et al.* assessed the anti-inflammatory, analgesic, and antipyretic activities of *M. elengi* in animals. They concluded that the alcoholic extract of *Mimusops* possessed significant anti-inflammatory, analgesic, and antipyretic activities in experimental animals at a dose of 200 mg/kg.<sup>[13]</sup>

Lalitha *et al.* observed cardiac glycosides, tannins, alkaloids, flavonoids, saponins, steroids, and reducing sugar present in BLE.<sup>[14]</sup>

Essential oil from leaves at the concentration of undiluted/disk and antifungal activity was against *Keratinomyces ajelloi*, *Microsporum gypseum*, *Trichophyton equinum*, *Trichophyton mentagrophytes*, *Trichophyton terrestris*, and *Trichophyton rubrum* on the agar plates.<sup>[15]</sup>

## CLINICAL APPLICATIONS OF *M. ELENGI* IN PERIODONTAL THERAPY

Dental plaque is the community of microorganisms found on a tooth surface as a biofilm, embedded in a matrix of polymers of host and bacterial origin.<sup>[16,17]</sup> Biofilm accumulation and pathogens are the key contributors to the formation of dental plaque. Mechanical plaque removal is inadequate in most people due to the variations in the time of brushing and other oral hygiene practices. Therefore, additional approaches for maintaining oral hygiene such as dentifrices and mouthwashes containing chemical or herbal agents are suggested to be used along with tooth brushing. Long-term use of any antiseptic oral rinse has side effects, including staining of teeth, alteration of taste sensation, and development of antimicrobial resistance. The role of phytotherapy in oral health has gained attention lately and a lot of studies have been conducted in this area.<sup>[18]</sup> The use of herbal extracts can be a substitute to help overcome these side effects. Herbal mouth rinse derived from *M. elengi* bark aqueous extract was found to be a potent plaque inhibitor. Tannins present in this plant provide astringent and hemostatic properties to any compound.<sup>[19]</sup> They interact with carbohydrates, proteins, and therefore enzymes polysaccharides, and bacterial cell membranes. Hence, it interferes in plaque accumulation and acts as an anti-plaque agent.

*M. elengi* extract can be used for treating or controlling oral complications such as dental caries and gum bleeding. Accumulation of plaque and tartar eventually leads to bleeding gums. In Ayurveda, *M. elengi* has been reported to treat the bleeding gums. The chewing of a twig of *M. elengi* is known to be an effective cleaning aid. In many Ayurveda formulations of tooth powder, its bark powder is a major constituent. The bark and seed coat is used for strengthening of the gums and enter into the composition of various herbal tooth powders under the name of "Vajradanti."<sup>[20]</sup> The chloroform extract showed prominent antibacterial activity in dental patients by ditch plate technique in several studies.

Gingivitis if left untreated may progress into periodontitis. Hot aqueous extract of dry bark and fruit is used as an astringent and also given orally to cure gingival diseases. The

fruit and root of *M. elengi* have astringent properties which are helpful in the treatment of gingivitis. Triterpenes present in fruits have antimicrobial properties which may be related to the mechanism of hydrophobicity. This allows a non-specific interaction with cell membrane phospholipids of Gram-positive bacteria.

The fruits and roots of *M. elengi* have been proved effective in treating periodontitis. Unripe fruit and seed are used for treating mobile teeth. Saponins, alkaloids, and tannins are metabolites of plants possessing antimicrobial activity.<sup>[21]</sup> The saponins present in the bark are surface-active compounds that can act as a surfactant.<sup>[22]</sup> They are anti-carcinogenic, anti-microbial, cholesterol decreasing, immune-modulating, as well as anti-inflammatory. The saponins were found to be most active against histamine.<sup>[23]</sup> Dried flowers when powdered are also used in cleaning the teeth. An important anti-inflammatory feature of flavonoids present in *M. elengi* is the capability to inhibit eicosanoids biosynthesis. Prostaglandins, which are eicosanoids, are involved in a number of immunologic responses, as well as are the final products of the cyclooxygenase and lipoxygenase pathways.<sup>[24]</sup>

The ointment derived from the extract of *M. elengi* has been proved to be effective in wound healing and ulcers. The wound healing process consists of different phases such as contraction, epithelization, granulation, collagenation, collagen maturation, and scar maturation which are concurrent but independent of each other. Gupta and Jain in their study demonstrated that methanolic extract ointment possesses a definite pro healing action. As the results showed that the methanolic extract ointment of *M. elengi* effectively stimulated wound contraction; increase the tensile strength of incision; and dead space wounds.<sup>[25]</sup>

Thus, the extract derived from *M. elengi* can be a potent ingredient in formulating the treatment for periodontal therapy and can be used as an adjunct to the routine periodontal procedures also. Due to its diverse properties, we are targeting its use in the form of suture coating gel and local drug delivery in the management of chronic periodontitis. The research is still under process. The formulation of suture coating gel (Reg. No. - L-107909/2021) and mouthwash (Reg. No. - L-108026/2021) has been copyrighted by Copyright Office, Government of India. Furthermore, the ozonized form of *M. elengi* oil (Reg. No. - L-111732/2022) can be used in the disinfection of dental implants, the formulation of which is also copyrighted by the Copyright Office, Government of India.

## CONCLUSION

In the present review, phytochemical, pharmacological, and antimicrobial usage of *M. elengi* for medical and dental purposes are stated. It has been proven for its anti-inflammatory,

antimicrobial, antipyretic, anthelmintic, astringent, analgesic, and diuretic properties. The extract derived from *M. elengi* bark has been used in an ointment which has been proved effective in wound healing in prior studies.

To the best of our knowledge, *M. elengi* has not yet been used as a suture coating material in dentistry before. Due to its diverse properties it might help in preventing bacterial colonization, oral biofilm formation and wound healing after the oral surgeries. This can be used as a promising suture coating material in the oral surgical procedures. Hence, further clinical studies are required for formulating an effective form in dentistry using *M. elengi* extract.

### Declaration of patient consent

Patient consent not required as there are no patients in this study.

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Nil.

### Conflicts of interest

There are no conflicts of interest.

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