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MIMUSOPS ELENGI LINN. : A POTENTIAL SOURCE OF PHYTOCHEMICAL AGENTS USEFUL IN CLINICAL PERIODONTICS

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Ayurvedic medicine is an integral part of Rigveda. More than 80% of population in the developing countries use traditional or local medicine, which is originally a part of ayurveda. Natural medicines are considered to be "safe", as they have been in coexistence with us, without any synthetic chemical. These herbs are very much popular because of their less toxicity and adverse effects. One of these herbs, a common Indian native plant is *Mimusops elengi* Linn. For a long time in the traditional ayurveda system of medicine, *Mimusops* has been described and used for its potential medicinal values. All the different parts of this plant such as leaves, twig, bark, stem, root, fruits, seeds, and flowers are used in different concentration or in combination with other plant materials to improve oral health. Ethanolic extract of bark shows anti-inflammatory, analgesic as well as antipyretic effect. The phytochemical agents such as

Lupeol, saponin present in the bark show anti-inflammatory activity and tannins show antibacterial as well as antioxidant properties. The extract of bark in different materials has shown significant antioxidant potential and scavenging property. The ethanolic, methanolic, acetone, petroleum and water extract of bark showed antibacterial property against different strains of *Streptococcus* species, *Staphylococcus* species and against *E. fecalis*. This plant should be explored and further research work should be carried out in periodontal field for new valuable drug formulation, which will be economically more suitable to the majority of populations in developing countries.

Keywords : **Drug formulation, local medicine, *Mimusops elengi*, phytochemical agents.**

Introduction :

Ayurvedic medicine is an integral part or supplement of Rigveda. It is considered as Upaveda i.e. auxiliary knowledge in the ancient vedic system. The main text of ayurvedic medicine are Charaka samhita and Sushruta samhita, which were written during 100 BC and the field was flourished throughout the Indian subcontinent, including present countries like India, Pakistan, Afghanistan, Srilanka, Iraq, Iran. According to WHO survey, upto 80% of population in the developing countries use some form of traditional or local medicine, which is originally a part of ayurveda (WHO 2014). The central council of Indian medicine (CCIM), 1971 has established The Department of Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homeopathy (AYUSH) as an integral part of Ministry of health and family welfare, Government of India (CCRAS, 2012). Ayurvedic tradition is mainly based on the use of plant medicines. Modern medicinal system in all over the world has recognized the importance of herbal medicine, also known as herbalism or herbology. Natural medicines are considered to be "safe", as they are natural, without any synthetic chemical. These herbs are very much popular because of their less toxicity and adverse effects. As well, these herbs are easily available in the locality of population. The natural medicines from plants are mainly derived from roots, leaves, fruits, barks and seeds.

One of these herbs, a common Indian native plant is *Mimusops elengi* Linn. It is a handsome evergreen tree of family Sapotaceae; Linn stands for "Carl Linnaeus" who first described the modern taxonomy of plants. It is also called as Bulletwood tree or Spanish cherry in English; Bakul in Hindi; Maulsari or Chirapushpa in Sanskrit; Elengi in Malayalam; Ranja in Kanada(Reddy and Reddy 1989). It reaches upto a height of 15-16 meter, found in all over the Indian subcontinent (Kritikar and Basu, 2001). the new leaves come generally in the month of

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February and shape is oval, elliptical, with undulated margin. The leaves are 6-10 cm. long and 3-5 cm. wide with vibrant shiny green coloured surface. The older leaves become dark green in colour. The tree has grayish black channeled bark, which has 10-20 cm longitudinal fissures. The tree is sacred in India since ancient time, due to its fragrant

Figure 1 : Stem bark

flowers, which are widely used in gardens, temples, ornaments of Hindu Gods, garlands etc. These white flowers have been described as symbol of love and beauty in famous Sanskrit literature of Kalidasa (Mitra, 1981). The berry is yellow-orange in colour, fruiting in august and is having astringent property. Seeds are grayish-brown in colour.

Phytochemical composition of *Mimusops elengi* Linn

Stem bark : The bark contains alkaloids, starch, saponins, tannin, some caoutchoue, wax coloring matter, starch and ash forming inorganic salts (Gami and Parabia 2010). The major constituents of bark are Taraxerone, taraxerol, betulinic acid spinasterol, sodium salt of betulinic acid and ursolic acid, Fatty acid esters of alpha-spinasterol (Mishra and Mitra 1967). Along with the triterpenoids, farnan-3-one, and olean-18-en-2-one-3-ol and lup-20 (29)-en-3 beta-ol, mimusopfarnanol, a new chemical i.e. farnanetype pentacyclic triterpene, farnan-2-one-3 betaol, has also been isolated (Akhtar, Ali and Alam, 2008). Another study showed the isolation of beta amyrin, lupeol (triterpene 3β-hydroxy-lup-20(29)-ene-23, 28-dioic acid) (Jahann *et al.* 2009). Ruikar *et al.* (2009) studied and collected sample of 0.18% volatile organic matter from the steam distillation of bark. Gallic acid esters, known as phenyl propyl gallate, alpha cadinol, taumuurolol, hexadecanoic acid, diisobutyl phthalate, octadecadienoic acid are also reported to be obtained from the bark of *Mimusops (*Akhtar *et al. 2010)***.**

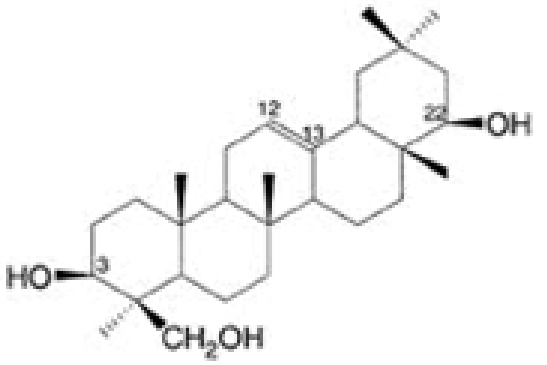
Fruits and Seeds : Contents of fruits are moisture (79.27 %), protein (1.29%), fat (2.76 K Cal), sugar (15.2%), Fiber (1.13%), Vitamin C (3.27 mg / 100 gm), Mineral content (0.32%), Iron (0.59 mg / 100 gm), Sodium (5.16 mg / 100 gm), Potassium (98.54 mg / 100 gm) (Nazaruddin 2012). Different types of acids isolated from fruits are Quercitol, ursolic acid, dihydro quercetin, quercetin, β - d glycosides of β sitosterol, alphaspinasterol. Two new Pentacyclic triterpene acids have also been isolated which are named as mimusops acid and mimusopsic acid. These two acids contain oleanane skeleton and mimusopane (Sen *et al*. 1993). These acids contain the mimusops gene and mimugenone (Sen *et al*. 1993).

The seeds of *Mimusops* contain novel triterpenoid saponins, named as mimusops in and saponin mimus in (Sahu *et al*. 1995), triterpenoid aponins, Mi-saponin A and 16 alpha-hydroxy Mi-saponin A (Sahu *et al.* 1997). Some new types of saponins are also isolated which are taxifolin, alpha-spinasterol glucoside, Miglycoside-1, triterpenoid

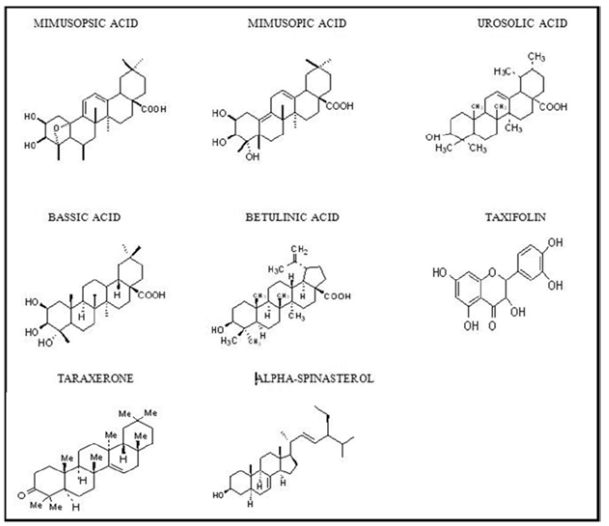
saponins, mimusopside A and B (Sahu 1996, Lavaud *et al*. 1996).

Leaves and Roots : The ethanolic extract of Mimusops leaves has been isolated and its chemical contents are quercitol, hentriacontane, β-carotene, glucose, D-mannitol, β-sitosterol, β-sitosterol-β-D-glucoside (Manjeswar *et al*. 2011, Kalita and Saikia, 2004 and Gami, 2007). The roots of Mimusops contain steroidal saponins 5α-stigmast-9(11)en-3-o-beta-D-glucopyranosyl (1-5)-o-beta-D-xylofuranoside (Saxena and Srivastava, 1988).

Chemical Structure of Major Constituents of *Mimusops elengi* Linn (Kadam *et al*. 2012)



SAPONIN



POTENTIAL EFFECTS OF PLANT ON VARIOUS DENTAL DISEASES :

For a long time in the traditional ayurveda system of medicine, *Mimusops* has been described and used for its potential medicinal values. All the different parts of this plant such as leaves, twig, bark, stem, root, fruits, seeds, and flowers are used in different concentration or in combination with other plant materials to improve oral health.

Since ancient time, *Mimusops* has been used as an astringent to strengthen the teeth and gingival (Singh *et al*. 2014). The root, bark and twig are used as "*dantwan*" to clean the teeth and tongue in rural areas of India (Kalita and Saikia 2004). The stem or bark has been found to be the most effective and potent part showing astringent, antimicrobial, antioxidant and anti-inflammatory property. The bark mixed with pepper, honey and ghee (*kawath*) is used as a gargle to reduce gingival inflammation and strengthen the teeth. The combination of root bark decoction taken along with milk for three days in the morning is said to strengthen the teeth in older individuals (Gami *et al*. 2012). One of the ayurvedic herbal preparation named as "Mahakhadiradivati", which is indicated for swollen and inflammed gingiva, bad odour, stomatitis, contains *Mimusops* bark as an active ingredient.

Ethanolic extract of bark shows anti-inflammatory, analgesic as well as antipyretic effect (Purnima *et al*. 2010). The phytochemical agents such as Lupeol, saponin present in the bark show anti-inflammatory activity and tannins show antibacterial as well as antioxidant properties (Phogat *et al*. 2014). The extract of bark in different materials has shown significant antioxidant potential and scavenging property. The ethanolic, methanolic, acetone, petroleum and water extract of bark showed antibacterial property against different strains of *Streptococcus* species, *Staphylococcus* species and against *E. fecalis (*Jebashree *et al*. 2011 and Mistry *et al*. 2014*)*. The fruit and seed extracts are found to be less active, in comparison to bark extract against gingival diseases and oral pathogens (Shahwar and Raza 2009).

It has been used as an active ingredient in a variety of herbal toothpastes like, Vicco vajradanti®, Sudantha® and *Aloe* dental

cream® for their antimicrobial and astringent properties. The oral hygiene and gingival health have been found to be improved, as well as different clinical parameters such as bleeding on probing, plaque index and probing pocket depth have also been reduced by the use of the herbal toothpaste containing *Mimusops*.

In a study by Mistry *et al*. (2014), different concentration of *Mimusops* bark extract has been examined against *E. fecalis*, *Streptococcus mutans* and *Staphylococcus aureus*. 3 mg concentration was found to produce the maximum inhibitory concentration (MIC) against *E. fecalis.*

Prabhat *et al*. (2010) compared the petroleum ether, acetone, methanol and water extracts of bark, which were tested for their antimicrobial effect against five oral microorganisms *Staphylococcus aureus*, *Streptococcus mutans*, *Streptococcus sanguis*, *Streptococcus salivarius*, *Lactobacillus acidophilus* and *Candida albicans*. Methenolic and water extract were found to be more effective against all strains.The Acetone and ethenol extracts of bark were tested in children for their antibacterial effect against salivary microflora by "paper disc diffusion method". The extracts were found to be effective against different *Staphyloccus* species (Deshpande *et al*. 2010).

Different extracts of bark such as petroleum ether, benzene, chloroform, acetone, methanol and water by saxchlation process have been prepared and were examined against gram positive and gram negative bacteria of dental plaque and calculus by ditch plate method. The best result was obtained by chloroform extract (Murudkar *et al*. 2007). Kulkarni *et al*. (2011) in their study stated, that aqueous and acetone extracts of bark act against salivary microflora, which was evaluated by paper disc diffusion method. The results were not significantly different for both the extracts, although extracts were active against the pathogens.

Malhotra *et al*. (2011) compared the efficacy of a commercially available herbal mouthrinse with chlorhexidine gluconate, in which *Mimusops* bark was used for its astringent property. Though the herbal mouthrinse was less effective than chlorhexidine gluconate, but the clinical parameters such as bleeding on probing and plaque index showed significant difference from baseline. Swelling and inflammation of gingiva have been reduced clinically.

The ethanolic extract and β amyrincaprylate was compared with Indomethacin and the extract was found to show anti-inflammatory property (Rajkumara *et al*. 2012). Phogat *et al*. 2014 compared the Chlosite gel and herbal gel with SRP alone. Results indicated significant reduction in all the clinical parameters, such as plaque index, gingival index, probing pocket depth and clinical attachment levels at the sites where the local application of herbal gel alongwith SRP was done. The herbal gel was containing *Mimusops* as an active anti-inflammatory, antibacterial and anti-oxidant ingredient.

The chloroform and methanol extracts of bark were analysed by 1,1-diphenyl-2-picrylhydrazyl or DPPH radical, nitric oxide and some other hydroxyl radicals and the results showed that the extracts had significant antioxidant potential and scavenging property.

In a different *in-vivo* study, the petroleum, chloroform and alcohol extracts were compared for their antioxidant property against lipid peroxidation, superoxide dismutase and catalase activity. It has been found that alcohol extract was the most potent antioxidant agent in comparison to other two extracts (Ashok *et al*. 2010).

CONCLUSION :

M. elengi Linn. has shown so many medicinal as well as periodontal properties. It has also been found to be more effective against various species of oral pathogens. Despite these studies and its easy availability in the society, it has not been extensively used in periodontal field. All the parts of the plant have been found useful with their medicinal value, but this plant should be explored more and further research work should be carried out in dental and periodontal field for new

valuable and effective drug formulation, which will be economically and easily more suitable to the majority of populations in southern Asiatic countries.

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