

ROLE OF NATURAL TOOTHBRUSHES IN CONTAINING ORAL MICROBIAL FLORA-A REVIEW

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ABSTRACT

Objective: To review the interest in the use of natural tooth brushes as environment friendly and cheap tool for dental care and oral hygiene.

Methods: The role of natural tooth brushes obtained from Gum Arabic tree, Meswak, Banyan, Neem, Apple, Mangosteen, Licorice, Olive, etc. versus modern toothbrushes in controlling oral microbial flora were reviewed from available literature.

Result: Natural toothbrushes reported dental protection similar to modern toothbrushes. They are more ecological in its life-cycle, lower cost (0-16% of the cost of a toothbrush). They require no tooth paste, maintenance and can combat bad breath.

Conclusion: Using Natural toothbrushes will be more beneficial to our oral hygiene than modern brushing techniques in controlling oral microbial flora.

Keywords: Meswak, Banyan, Microbial flora, Dental caries.

INTRODUCTION

Oral hygiene practices have been practiced by different populations in different ways. Plants have been used for centuries to improve dental health and to promote oral hygiene, and this practice persists in several communities throughout the world. In some countries where brushing with toothbrushes are uncommon, brushing with chewing sticks have been followed [1]. It is an affordable oral hygiene device and additional benefits are derived from its functional aspect of chewing as jaw exerciser, as well as reflex induction of saliva which is beneficial to the oral hygiene. Studies have also shown that the use of chewing sticks have a high efficacy compared to the conventional toothbrushes without toothpaste [2]. There are around 173 different types of trees, which can be used as chewing sticks, belonging to the families Acacia Fabaceae, Terminalia, Combretaceae, Lasianthera, Icacinaceae, Gouania, and Rhamnaceae [3,4]. It has also been suggested that antimicrobial substances that naturally protect plants against various invading microorganisms or other parasites may leach out into the oral cavity, and that these compounds may benefit the users by protection against cariogenic and periodontopathic bacteria. The various benefits of using natural toothbrushes are they act as an antibacterial agent, astringent, detergent. Furthermore, it has anti-inflammatory qualities, abrasive qualities, significantly plaque inhibiting properties. It also enhances salivation, fights caries, and provides nutrients for bone and tooth development, a natural way to whiten stains, remove stains, prevent plaque, and cavities [5].

GUM ARABIC TREE (ACACIA NILOTICA)



Vachellia nilotica (widely known by the taxonomic synonym *Acacia nilotica*, or the common names gum arabic tree, Babul/Kikar, Egyptian thorn, Sant tree, Al sant or prickly acacia; called thorn mimosa or prickly acacia in Australia; lekkerruikpeul or scented thorn in South Africa; karuvela maram in South India) is a species of *Vachellia* native to Africa, the Middle East and the Indian subcontinent. It is also currently an invasive species of significant concern in Australia [6]. Thin twigs of *Acacia nilotica* have been used as a toothbrush in large parts of the Indian sub-continent [7].

Acacia nilotica commonly known as babul, kikar or Indian gum Arabic tree, has been recognized worldwide as a multipurpose tree. It is distributed throughout the greater part of India in forest areas, roadsides, farmlands, tank foreshores, agricultural fields, village grazing lands, wastelands, bunds, along the national highways and railway lines. Mostly, it occurs as an isolated tree and rarely found in patches to a limited extent in forests and has been widely planted on farms throughout the plains of the Indian subcontinent. The tender twigs are used as toothbrushes [8]. If chewed, most of the twigs fray into finer strands, which have the effect of "flossing" between the teeth, or if rubbed up and down, can scrub tooth enamel clean as well as any brush. However, they can taste bitter compared with commercial toothpastes.

MESWAK (*SALVADORA PERSICA* [SP])

SP (Arak, Galenia asiatica, Meswak, Peelu, Pilu, *Salvadora indica*, or toothbrush tree, mustard tree, mustard bush), is a species of *Salvadora*. SP has antiurolithiatic properties. Used for centuries as a natural toothbrush, its fibrous branches have been promoted by the World Health Organization for oral hygiene use. Research suggests that it contains a number of medically beneficial properties including abrasives, antiseptics, astringent, detergents, enzyme inhibitors, and fluoride [9-12].

“Miswak” is an Arabic word meaning “tooth-cleaning stick,” and SP miswak has a wide geographic distribution. It was used by ancient Arabs to whiten and polish the teeth. SP is a wild plant that grows in the region extending from north western India to Africa. This plant is also known as natural Arak tree, chewing stick, toothbrush, and Meswak [13]. It is used to treat gingival problems. Studies indicate that SP extract exhibits low antimicrobial activity compared to other oral disinfectants and anti-plaque agents like Triclosan and Chlorhexidine Gluconate [14,15].

Compared to toothbrushing, the use of the miswak resulted in significant reductions in plaque ($p < 0.001$) and gingival ($p < 0.01$) indices. Image analysis of the plaque distribution showed a significant difference in the reduction of plaque between the miswak and toothbrush periods ($p < 0.05$). It is concluded that the miswak is more effective than tooth brushing for reducing plaque and gingivitis, when preceded by professional instruction in its correct application. The miswak appeared to be more effective than tooth brushing for removing plaque from the embrasures, thus enhancing interproximal health [16].

The miswak, also called the “chewing stick,” looks like a painter’s brush rather than a normal toothbrush. There’s no curved edge at the tip covered with bristles, but rather a thin line of bark with the bristles pointing out straight ahead. You chew the tip at either end to create the bristles, which also releases oils within the wood that naturally fight plaque and protect your teeth. You start using it by chewing on one end, breaking it into bristles while the chewing releases saliva (that also fights tooth decay), then brush with the bristles like you always have. Some historians believe its shape inspired the design of the modern toothbrush we use today. The miswak is uniquely suited to brushing teeth because of a combination of silica and natural antiseptics found inside the sap. The silica is an abrasive, which cleans teeth the same way baking soda or manufactured toothpaste does. The natural antiseptics kill the bacteria that cause bad breath and mouth ulcers, just like store-bought mouthwash. According to The Journal of Health, miswak can be as effective or more effective in reducing plaque and gum disease as a regular toothbrush.

BANYAN (*FICUS RELIGIOSA*)



A Banyan (also Banian) is a fig that starts its life as an epiphyte (a plant growing on another plant) when its seeds germinate in the cracks and crevices on a host tree (or on structures like buildings and bridges). “Banyan” often refers specifically to the Indian banyan (*Ficus benghalensis*), which is the national tree of the Republic of India.

The aerial roots of the banyan can be used as disposable toothbrushes. The banyan roots have astringent properties, which not only make

the teeth whiter, but also make the teeth and gums healthier [17]. The banyan chewing sticks are used widely because it is a good mechanical plaque remover. Banyan roots contain natural astringent property that makes your teeth white and give you a complete relief from the yellowness in your teeth [18]. Indian medicine (Ayurveda) used the twigs of the neem or banyan tree to make toothbrushes and other oral-hygiene-related products for millennia [19].

NEEM (*AZADIRACHTHA INDICA*)



Azadirachta indica, also known as Neem, Nimtree, and Indian Lilac is a tree in the mahogany family Meliaceae. It is one of two species in the genus *Azadirachta*, and is native to India and the Indian subcontinent including Nepal, Pakistan, Bangladesh and Sri Lanka. *A. indica*, popularly known as Indian Neem, Margosa tree or Indian lilac, is well known in India and its neighboring countries for more than 2000 years as one of the most versatile medicinal plants having a wide spectrum of biological activity. Importance of Neem tree has been recognized by United States (US) National Academy of Sciences where Neem is entitled as “a tree for solving global problems.” Although literature search reveals that Neem tree has multiple potential uses in dentistry, its application is limited in routine dental practice.

The twigs are used as a tooth brush. One end is chewed to turn it into soft bristles to clean the teeth by brushing. Toothbrush: Traditionally, slender neem twigs (called datun) are first chewed as a toothbrush and then split as a tongue cleaner [20]. This practice has been in use in India, Africa, and the Middle East for centuries. Many of India’s 80% rural population still start their day with the chewing stick, while in urban areas neem toothpaste is preferred. Neem twigs are still collected and sold in markets for this use, and in rural India one often sees youngsters in the streets chewing on neem twigs. It has been found to be equally effective as a toothbrush in reducing plaque and gingival inflammation [21,22]. The neem tree is a traditional remedy to get white healthy teeth. Neem twigs are still used by many Indians as toothbrushes. Neem oils possess astringent and antiseptic properties to prevent bad breath, destroy microorganisms present in the teeth and to fight dental caries and cavities.

Neem can be bitter for a first timer, but its taste transforms as you do. It is powerfully anti-bacterial and cleaning. You can also make a mouthwash with the leaves. The microbial flora of the mouth is highly complex, containing a wide variety of bacterial species. The most common oral disease, dental caries is related to dental plaque and seem to occur when the normal balance between the microorganisms and the host is disturbed. Neem bark is used as an active ingredient in a number of toothpastes and tooth powders because of its antibacterial properties. Its usage are proven to be beneficial for tooth and gums health. Herbal ingredients like Neem tree extracts have become very popular in last few years not only because of their therapeutic value but also because of no adverse side effects [23]. Extracts from Neem sticks or bark have been shown to inhibit the growth of *Streptococcus mutans* and significant reductions in bacterial adhesion

in vitro, suggesting that it can reduce the ability of some streptococci to colonize tooth surfaces. Neem extract produced the maximum zone of inhibition on *Streptococcus mutans* at 50% concentration. In addition, other *Streptococcus* species which are involved in the development of dental caries such as *Streptococcus salivarius*, *Streptococcus mitis*, and *Streptococcus sanguis* are also inhibited by Neem extracts [24].

APPLE (*MALUS DOMESTICA*)



The apple tree (*M. domestica*) is a deciduous tree in the rose family best known for its sweet, pomaceous fruit, the apple. It is cultivated worldwide as a fruit tree and is the most widely grown species in the genus *Malus*. The tree originated in Central Asia, where its wild ancestor, *Malus sieversii*, is still found today. Apples have been grown for thousands of years in Asia and Europe, and were brought to North America by European colonists.

Apple is known as the king of fruit. People eat apples as a normal part of the diet, but apples are also used as medicine. Apples are used for cleaning their teeth. For most of this century ending a meal with a hard food or fruit has been widely advocated for preventing the two major dental diseases, dental caries, and periodontal disease. Of these hard foods, apples have been the most commonly recommended, since it has been claimed [25] "that the eating of fresh uncooked apples has a regenerative influence upon the teeth and gums." Apples have commonly featured in dental health programs [26] and have become, to some extent, a symbol of dental health.

The apple could be considered a natural toothbrush: Its firm flesh stimulates the gums and the malic acid (the apples natural occurring fruit acid) content cleanses the teeth. Apple juice contains condensed tannins which have properties that may help prevent periodontal or gum disease. Apples have the highest concentration of flavonoids (also known as bioflavonoids) of any fruit. Research indicates that flavonoids help protect against heart disease and cancer. Since flavonoids are plant pigments, which are responsible for the coloration of fruit, you may be well advised to choose apples not only for taste, but also for beauty [27]. Apples are known as "Nature's toothbrush." When chewing an apple, you are actually stimulating your gums. This can help increase saliva flow which washes away food particles in your mouth. If you pack an apple in your child's lunch, encourage them to eat it last so that it can wash away some of the other foods from lunchtime.

"Toothbrush foods are those fruits and vegetables, which act as natural cleanser for your teeth. For example, apple, celery, peas are crunchy in texture and require a lot of chewing, which in turn helps to clean the surface of the teeth. The tiny fibers that get caught between the teeth function as an all-natural floss. Furthermore, vegetables like carrots, broccoli, cauliflower, and cucumber are also natural teeth cleaners," explains dental surgeon Dr Kinjal Shah and advises having them as a snack or chewing on them after a meal, as they help rid your teeth of plaque and food that get stuck between them. Cosmetic dentist Dr Karishma Jaradi says, Toothbrush foods are not only are good for your teeth, but also good for a healthy mouth. Remember, your mouth is the window to your overall health. Eating apples are good for the gums and teeth because they give a cleansing effect. By reducing the amount of sugar you consume by eating apples than sugary snacks, you're strengthening your teeth [28]. An apple a day not only keeps the doctor away but can also serve to give you long-lasting teeth. Eating apples rather than drinking juice does your teeth and gums a great favor. By

doing this, you are actually stimulating cleaning and strengthening of your teeth while reducing the amount of sugar you are consuming.

MANGOSTEEN (*GARCINIA MANGOSTANA*)



The purple mangosteen (*G. mangostana*), colloquially known simply as mangosteen, is a tropical evergreen tree believed to have originated in the Sunda Islands and the Moluccas of Indonesia. It grows mainly in Southeast Asia, and also in tropical South American countries such as Colombia, in the state of Kerala in India and in Puerto Rico [29,30], where the tree has been introduced.

Mangosteen fruit originally called *G. mangostana* and is a tropical evergreen tree that has three major parts-the deep purple rind, the white edible flesh which is just like the oranges and the third part are the seeds. The flesh and the seeds are totally contradictory to each other. The flesh is sweet to eat and is full of fragrance while the seeds are bitter and inedible. Mangosteen twigs have been used as chew sticks in Ghana, Mangosteen might slow blood clotting. Taking mangosteen might increase the risk of bleeding during or after surgery. Stop taking mangosteen 2 weeks before surgery [31].

The fruit has become famous for the reason that it has medicinal properties and has found a place in traditional medicines of Asia. The benefits of mangosteen grew like a wildfire and even the Queen Victoria tasted it sample to know the reality of the fruit. This fruit as the people say is a storehouse of different nutrients which are not covered by our daily routine diet and is thus a great compensation tool. Parts of the mangosteen tree, including the fruit and bark, have been used in folk medicine in Asian countries for many years. Dentists recommend having Mangosteen to their patients who suffer from weak gums, disordered teeth and even bad breath. It finds a great use in dental problems and is a natural cure against dental health problems. Mangosteen is the Queen of Fruits. She is best known for her fruit which heals skin disorders and a long list of ailments - her twigs also clean mouths. She is a powerful cleanser! Your teeth feel very clean after a brush with her. She is an expert in anti-bacterial and mouth diseases. She is most commonly used at a mouth cleanser in Ghana. You can also find her in Bali, Australia, China, Cambodia, Indonesia, Malaysia, Thailand, Singapore, Taiwan, and Philippines.

LICORICE (*GLYCYRRHIZA GLABRA*)



Liquorice, or licorice [32], is the root of *Glycyrrhiza glabra* from which a sweet flavor can be extracted. The liquorice plant is a legume native to southern Europe, India, and parts of Asia. It is not botanically related to anise, star anise, or fennel, which are sources of similar flavoring compounds. The word liquorice/licorice is derived (via the Old French *licoresse*) from the Greek word *glukurrhiza*, meaning "sweet root," [33].

Licorice, the name given to the roots and stolons of *Glycyrrhiza* species, has been used since ancient times as a traditional herbal remedy. Licorice contains several classes of secondary metabolites with which numerous human health benefits have been associated. Recent research suggests that licorice and its bioactive ingredients such as glycyrrhizin, glabridin, licochalcone A, licoricidin, and licorisoflavan A possess potential beneficial effects in oral diseases [34].

Dried licorice root an herb sometimes used to treat sore throats, respiratory and digestive problems and other disorders might be an effective agent to fight the bacteria that cause tooth decay and periodontal disease, according to a recent study [35]. In the study, published in the *Journal of Natural Products*, author Stefan Gafner Ph.D., a researcher for the natural care products company Tom's of Maine, (a division of Colgate-Palmolive) reported that two compounds found in dried licorice root are effective antibacterial substances that can prevent the growth several major bacteria connected with cavities and gum disease. In the study, licoricidin and licorisoflavan A inhibited two of the major bacteria responsible for dental cavities and two of the bacteria that promote gum disease and licoricidin also inhibited a third gum disease bacterium.

Licorice's anti-inflammatory and immune boosting properties can be useful in supporting healthy teeth and gums. Dried licorice roots, known as chew sticks can be used as an aid in keeping teeth and breath clean, since chewing on them acts as a kind of alternative or supplement to brushing your teeth [36,37]. Glycyrrhizin by itself does not stain teeth, but when combined with dark food dyes, tobacco and/or curries, liquorice is associated with stains [38].

OLIVE (*OLEA EUROPAEA*)



The olive (*O. europaea*, meaning "olive from/of Europe") is a species of small tree in the family Oleaceae, found in much of Africa, the Mediterranean Basin from Portugal to the Levant, the Arabian Peninsula, and southern Asia as far east as China, as well as the Canary Islands, Mauritius, and Réunion.

The species is cultivated in many places and considered naturalized in France, Corsica, Greece, Cyprus, Albania, Crimea, Egypt, Iran, Iraq, Israel, Italy, Jordan, Spain, Palestine, Syria, Lebanon, Java, Norfolk Island, California, and Bermuda [39].

You can also make toothbrush sticks from Olive trees [8].

Here are a few proven benefits of using olive stick toothbrush:

- It kills the bacteria which causes gum disease
- Fights plaque better than traditional toothpaste

- Leads to fewer cavities
- Freshens breath; kills odor causing bacteria
- Whitens teeth naturally
- Effectively cleans between teeth better than regular toothbrushes
- Contains natural fluoride
- Also great for those who want to stop smoking!
- Safe for toddlers; safe to swallow.

How to use a olive stick toothbrush:

First, peel or chew the bark off about ½ inch from the end of the stick. Chew the wood on the end until the fibers begin to separate. Then brush your teeth with this fibrous end as you would a regular toothbrush (minus the toothpaste). As the brush end gets dirty or begins to come apart, break off or cut the end and start with a fresh tip. No need for water, though you should wash the end of the brush when finished if possible. You can also soak it in rosewater to cleanse.

Not only is it healthier, natural, and better for the environment, these sticks can save you money too! This simple twig can replace your toothbrush, toothpaste, floss, mouthwash, and teeth whitening products!!

CONCLUSION

This review is more informative and gives a clear idea on brushing teeth with natural toothbrushes as it has more advantages when compared with the other toothbrushes. When compared to toothbrushes, teeth cleaning twigs have several advantages:

- Reported similar dental protection as toothbrushes
- More ecological in its life-cycle
- Lower cost (0-16% of the cost of a toothbrush)
- Independence from external supplier if made at home from privately owned trees
- Low maintenance, with some twigs need moistening with water if they become dry, to ensure the end is soft. The end may be cut afresh to ensure hygiene, and should not be stored near a sink. The twig is replaced every few weeks to maintain proper hygiene.
- No need for toothpaste. Can combat bad breath.

Disadvantage:

- Excessive scrubbing can damage the gums.

Though we have shifted to these modern brushing techniques, there are still many people using these natural toothbrushes in many countries. It is more cost-effective and has a lot of benefits. It will be better if we start using natural toothbrushes as it seems to be more beneficial for our oral hygiene.

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