The Miracle Twig - Miswak

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Abstract

Chewing sticks are being used as oral hygiene aid since 3500 BC. There are more than 180 plant species from which chewing sticks are being prepared, among which Miswak (tooth cleaning stick) which is harvested from Salvodera persica is used most extensively. It is popularly known as “Tooth brush tree”. Geographic distribution of Salvodera persica includes Africa, Egypt, Saudi Arabia, Iran, Iraq Afghanistan, Pakistan and India. Miswak has many chemical components which makes it a good oral hygiene aid. It acts as a combination of tooth brush and paste. Using Miswak is a religious practice in Islam. The aim of this review article is to high light the miraculous properties of Miswak as an oral hygiene aid.

Keywords: Salvodera persica, Miswak, Chewing stick

1. Introduction

Nowadays people turn back to nature for their ailments. Herbal products are gaining immense popularity. Toothpaste is not an exception. Most of the brands claim one or more herbal ingredients in them. Modern tooth brush is evolved from chewing sticks which were used by Arabs, Greeks and Romans since 3500 BC [1]. Chewing sticks are still being used by many people in rural areas for cleaning their teeth. They are said to have systemic benefits too when they are chewed and sucked.

Miswak is a stick which is not much familiar to us but shares its origin from India too. It has different names in different languages. Miswak or Siwak in Arabic, Peelu in Urdu and Ugaai in Tamil. The botanical name of Miswak is Salvadora Persica. Salvadora Persica is well known as “Tooth brush tree”. “Miswak,” is an Arabic word which means tooth-cleaning stick [2]. Among 180 plant species suitable for preparing toothbrushing sticks, Miswak harvested from Salvadora persica, is used most extensively [3].

World Health Organization (WHO) has recommended and encouraged the use of chewing sticks as an effective oral hygiene tool (WHO 1984). According to the consensus statement on oral hygiene (2000) by WHO, chewing sticks may play an important role in the promotion of oral hygiene. Further research in the evaluation of the effectiveness of chewing sticks would be highly beneficial[8].

2. Origin and appearance

S. persica has a wide geographic distribution ranging from India, Nepal, Malaysia, Pakistan, Iran, Iraq, Saudi Arabia, Egypt, and Africa [9]. The term Salvadora, (from Juan Salvadory Bosca, 1598–1681) was proposed by Dr. Laurent Garcin while persica, term indicates Persia and L is used to indicate Carl Linnaeus (1707–1778), the father of modern taxonomy. S. persica L. belongs to family Salvadoraceae and Class Magnoliopsida [9]. Salvadora persica is an evergreen small tree or shrub, reaching maximum height of three meters. The leaves are oval, thick and succulent with a strong smell of cress or mustard. The fresh leaves are eaten as salad and are used in traditional medicine for asthma, cough, piles, rheumatism, scurvy and other diseases. The flowers are small and fragrant and are used as a stimulant and are mildly purgative. The berries are small. They are eaten both fresh and dried [6]. Although Miswak is usually obtained from the roots of the Arak tree, some sticks are made from its branches [7]. The root bark of the tree is similar to sand in colour and the inner surfaces are an even lighter shade of brown. It has a warm and pungent taste.
3. Chemical composition
The use of miswak for oral hygiene serves dual function i.e. mechanical plaque control by friction between plant fibres and tooth surfaces and chemical plaque control due to its chemical composition which includes [8]

- Benzyl iso thiocyanate - a major component of Miswak, has strong bactericidal effect against oral pathogens involved in periodontal disease.
- Alkaloids (SALVODARINE) - bactericidal effect and stimulates gingiva
- Silica - acts as abrasive material that removes stains and deposits from the tooth surface
- Calcium and fluoride (1 microgram/gm) ions – promote re-mineralization.
- Sodium bicarbonate - mild abrasive and germicidal effect
- Tannic acid – astringent effect, good anti-plaque and anti-gingivitis agent
- Resins – physical function, forms a layer over enamel protecting it from microbial action
- Essential oils – antiseptic effect and stimulates the flow of saliva.
- Vitamin C – healing and repair

3.1 Benzyl iso thiocyanate
The root of Salvadora persica contains a steam-distillable oil composed of 90% Benzyl iso thiocyanate (BIT) and 10% benzyl nitrate [9]. BIT is classified as one of the chemopreventive agents that are thought to prevent carcinogenic and other genotoxic compounds from reaching or reacting with the target sites on the treated tissue [10]. The effect of BIT on epithelial changes induced by trauma and Dimethylbenzanthracin (DMBA) was studied by Dosari et al in the hamster tongue. Their results indicate that BIT retarded the development of neoplastic changes induced by trauma or trauma plus DMBA [11]. BIT is reported to have an anti-viral activity against Herpes simplex virus 1 (HSV-1) at a concentration of 133.3 mg/ml [12]. It is also reported to have a broad-spectrum bactericidal activity [13]. Al-Bagieh et al reported that BIT inhibits the growth and acid production of Streptococcus mutans [14].

3.2 Salvodarine
The alkaloid present in Salvadora persica is Salvodarine, which yields tri methylamine on hyrolytical cleavage [15]. It is bactericidal and stimulates gingiva [16].

4 Miswak on oral health
4.1 Analgesic effects
Miswak has analgesic, astringent and anti-inflammatory properties, making it an effective treatment for primary periodontal diseases [17]. Evidences suggested Miswak being effective against thermal stimuli compared to chemical ones. Focusing on the physiology, the responses of the thermal stimuli are via skin pain receptors whereas the chemical stimulus has its response via the visceral receptors. Thus it was found that Miswak responds to the peripheral pain and not the visceral. Hence, if applied to the oral mucosa it sets a relief in the oral pain [18]. Experiments on mice in a laboratory proved Miswak has a moderate analgesic effect that is related to interaction with the peripheral opiate system [19]. In addition, it has been noted that patients practicing Miswak regularly had a low incidence of toothache compared to toothbrush users [20].

4.2 Anti plaque
Miswak inhibits the formation of dental plaque chemically and the value of Miswak is due primarily to its mechanical cleaning action [21]. Lower plaque scores were reported following the proper use of Miswak as an oral hygiene aid in comparison with the use of conventional tooth brushes. [22]. Lower gingival bleeding was seen in habitual Miswak users [23].

4.3 Release of calcium and chloride in to saliva
Gazi et al investigated the effect of Miswak on the composition of mixed saliva. They found that Miswak produced significant increase in calcium (22-fold) and chloride (6-fold), and significant decrease in phosphate. Calcium saturation of saliva inhibits demineralization and promotes re-mineralization of tooth enamel whereas high concentrations of chloride inhibit calculus formation [24].

4.4 Anti-carious
Many epidemiological studies revealed that Miswak had strong anti-carious effects. In a dental health survey conducted in Sudan, a lower caries prevalence was reported among Miswak users than among toothbrush users [25]. Subsequent studies (Baghdady and Ghose, 1979 [26]; Sathananthan et al, 1996 [27]; Younes and El-Angbawi, 1982 [28]) found similar lower caries incidences among school children using Miswak. Dental loss in adult is very low in adults where Miswak is used widely [29].

4.5 Antibacterial properties
Studies have indicated that Miswak contain substances that possess plaque inhibiting and antibacterial properties against several types of cariogenic bacteria and periodontopathogens which are frequently found in the oral cavity [30]. Al-Otaibi M et al (2004) observed that the use of miswak, in contrast to toothbrush, significantly reduced the amount of A. actinomycetemcomitans in the subgingival plaque, which indicated that extracts from Salvadora persica might interfere with the growth and leukotoxicity of A. actinomycetemcomitans [31]. Almas, 1999 showed that miswak extracts had antimicrobial effects on Streptococcus mutans and E. faecalis. Elvin-Lewis et al. (1980) and Almas (1999) suggested that this effect may be due to the interaction with bacteria, which prevents their attachment on the tooth surface [32].

4.6 Antimycotic activity
Al- Bagieh et al suggested that aqueous extracts of Miswak could be used to reduce growth of Candida albicans. Such inhibition lasted for up to 36/h at concentrations of 15% and above [33].

4.7 Halitosis
Miswak is also used to clean the tongue. It helps in fighting halitosis and effectively removes the white coat that develops on the dorsum of the tongue. This is usually done by the brush end of the Miswak [34].

4.8 Removal of smear layer
Soaking the healthy and periodontally diseased root dentine in Miswak extract resulted in partial removal of smear layer, and occlusion of dentinal tubules was observed in dentine specimens brushed with Miswak solution [35].

5 Milestone studies
Miswak exhibits high antioxidant activity due to the presence of antioxidant enzymes such as peroxidase, catalase,
polyphenoloxidase [36]. In a study it was found that mints with miswak extracts were 20 times more effective in killing bacteria than ordinary mints, which was published in 2007 by Journal of Agriculture and Food Chemistry. It showed that in 30 min 60% of bacteria was killed by mints with miswak extracts when compared to a meagre 3.4% by ordinary mints [37]. Miswak, Neem, Banyan and Mango sticks are among the popular oral hygiene aids that are used in India and a study was done in South India comparing these four sticks, which concluded stating Miswak being the more superior in antimicrobial activity among these chewing sticks [38]. Strong anti-bacterial effect of Miswak against oral pathogens was proved when an invitro study showed both Miswak pieces embedded in the agar plate and suspended above the agar plate at a distance of 3mm showed a zone of inhibition around the stick for Aggregatibacter actinomycetemcomitans, Porphyromonas gingivalis, Lactobacillus acidophilus and Haemophilus influenza. This suggested the volatile antibacterial agents present in the Miswak [39].

6. Traditional Uses of Miswak for Therapeutic Purposes
Miswak is used as a jaw exerciser following traumatic injuries to the jaw and temporomandibular joint. It acts as a Dialogogue - a reflex induction of copious saliva - which is beneficial to the oral hygiene and general health. It may improve appetite and regulate peristaltic movements of the gastro-intestinal tract. Miswak is being used as an ingredient in tooth paste, mouthwash, and endodontic irrigation solution [40].

7. Systemic effects
7.1 Anti diabetic potential
Aqueous extract of Miswak at 500mg/kg dose level in comparison to other extracts was reported to have significant hypoglycemic and hypo lipedemic effects and regenerated pancreatic beta cells in streptozocin treated diabetic rats [41].

7.2 Anti hyperlipidemic activity
The effects of long term administration of a lyophilized stem decoction of S. persica have also been investigated in diet induced rat hypercholesterolemia. The results showed that the miswak decoction significantly lowered cholesterol and LDL plasma levels in rats [42].

7.3 Anticonvulsant and sedative
Monforte et al observed the effect of Miswak stem extracts on sodium pentobarbital activity and on generalized tonic-clonic seizure produced by pentylentetrazol on the rats. It was found that, extracts of S. persica extended sleeping time and decreased induction time induced by sodium pentobarbital. It attenuated pentylentetrazol-induced convulsion by increasing the latency period and diminishing the death rate [43].

7.4 Antiulcer activity
The antiulcer activity of decoction of Miswak has been reported in rats. The ulcer index significantly decreased after the treatment with a lyophilized decoction of miswak (500 mg/kg, os), once daily for 7 days, with respect to controls [44]. Moreover, S. persica decoction possesses significant anti-inflammatory activity. The other study was designed to confirm the antiulcer activity of Miswak decoction using optical microscopy. The elements of gastric mucosa tended to be re-established normally in treated rats [45].

8. Method of use
Miswak has its own unique aspects which should be adapted prior to use for the best results. The functional end of a thin bark piece is stripped off followed by chewing. Chewing of Miswak separates fibers and giving it a brush like appearance that helps in cleaning the teeth and massaging the gums. The recommended length for a stick is about 15 cm so that it can easily be grasped along with ease to carry around, whereas, the diameter is preferred to be less than 1 cm [46]. There are two methods documented to hold the Miswak. One is the three finger grip technique and the other is five finger grip technique. The aim of both techniques is to make sure that all surfaces of the teeth are accessible and cleaned with convenience and controlled movements of the stick in the oral cavity. In order to clean the tooth surfaces, the fibers of Miswak should be held perpendicular to the tooth surface and gently moved in vertical strokes, directed away from the gingival margins on both the buccal and lingual surfaces. Miswak should be freshly cut so that it is supple, easily chewed, and still rich in active constituents. Fresh miswak is light brown in colour where as dry Miswak is dark brown in colour [47]. A very dry Miswak can damage the gums and other oral tissues. If a stick is dry, chewing end should be soaked in fresh water for 24 hours. However soaking for unduly long periods causes loss of active constituents and diminishes the therapeutic properties. If possible the Miswak should be kept in a moist place when not in use [48].

9. Tooth brush and Miswak
Miswak is very similar to the toothbrush in that both have bristles and are used to remove plaque from the tooth surfaces mechanically. But unlike a conventional toothbrush, the bristles of the Miswak lie in the same long axis as its handle. The angulation in the toothbrush enables it to adapt more easily to the distal tooth surfaces especially on the posterior teeth [50]. Removing plaque mechanically is similar with the toothbrush and the chewing stick, e.g. vertical and horizontal brushing. However, techniques are less important than people's attitudes, knowledge and manual dexterity. Miswak is organic and totally biodegradable whereas plastic tooth brushes causes tonnes and tonnes of landfills every year. Tooth brush is usually used along with tooth paste for brushing. Finally the paste is spitted out considering the systemic toxicity of the ingredients, but the juice of the Miswak stick is sucked during brushing and also habitually which has systemic effects. In a study which compared the efficacy of Miswak and use of tooth brush and they found that the use of Miswak was associated with a significant reduction of dental plaque and gingivitis along with comparable or superior oral hygiene effect [51]. It was also reported that the habitual Miswak users had lower gingival bleeding, [52]. A study was conducted among 213 males, aged 20 to 65 years, to evaluate the periodontal status of Miswak and toothbrush users. They reported that periodontal status of Miswak users in Sudanese population is better than that of toothbrush [53]. In a single-blind cross-over clinical study, after professional instruction of the proper use of Miswak and toothbrush, Miswak was found to be more effective than use of tooth brush for reducing plaque and gingivitis in a sample of male Saudi Arabians [54]. A study reported that about 22% of the Saudi school children with gingival recession used Miswak [55]. This group had minimal calculus deposits which may be attributed to the use of Miswak. It has been reported that Miswak users had
significantly more sites of gingival recession than did the toothbrush users. In addition, the severity of the recession was significantly more pronounced in the Miswak users than that in the toothbrush users [56]. However, the gingival recession reported in Miswak users may be due to poor techniques.

10. Conclusion

Natural medicine like herbal chewing sticks (Miswak) has been popular since ancient times; further long-term clinical trials are needed to evaluate the therapeutic and pharmacological effects of various chemical components of Miswak. More and more studies should focus on clinical effectiveness of Miswak as compared with the toothbrush and with various fluoridated and non-fluoridated dentifrices. The results from these studies would definitely open new outlook in the field of dentistry in providing a foundation for various preventive oral health programs for rural and urban society.

11. References


