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REVIEW ARTICLE

Salvadora persica L. (Meswak) in dental hygiene

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KEYWORDS

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Abstract *Salvadora persica* L. of the family Salvadoraceae, is an evergreen shrub, with a short trunk 4–6 m tall, smooth green leaves and white bark. Meswak, a chewing stick is prepared from its stings and roots. Its anatomical structure as well as its chemical constituent which had been investigated from time to time in last three decades made this plant a choice as tooth-powder and tooth-cleaner. The acceptance of meswak is broad due to the fact that a part of Islam's religious practice is the incorporation of dental hygiene and recommends meswak specifically for this purpose. Moreover the traditional use of *S. persica* as antimicrobial toothbrush stick for oral hygiene and to treat gum inflammation, is a part of Greeko-Arab system of medicine and is a centuries old practice. The available literature mostly stresses upon the higher antibacterial activity against oral bacteria of Meswak although the plant has other medicinal values. So keeping all of its beneficial therapeutic properties in view, this review was focused to highlight the available literature of its role in maintaining the dental hygiene and ultimately the potential and safely use as dental remedy.

Contents

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1. Introduction

The use of herbal toothbrushes is a common act in maintenance of oral hygiene in most of the countries of Asia, Africa, and Middle East. Many herbs like, *Aegles marmelos*, *Azadirachta indica*, *Fagara zantholoxoids*, *Salvadora persica* L., *Acacia arabica*, *Juglans regia* and many others have been used as tooth stick by people of different cultures. Among all the herbs, *S. persica* L. reports the largest use throughout the world and particularly in Arabian countries. The tree grows mainly in Saudi Arabia but also in other parts of the Middle East. Meswak, a chewing stick is prepared from its stings and roots. However the commonly available meswak in markets is a root preparation. The use of meswak in Muslim countries is treated as compulsory act for religious part.[29] It has been used by Muslims for more than 1000 years since the prophet Muhammad (S.A.W) realized its value as an oral hygiene device.[38] In ayurvedic system of medicines *S. persica* L. is reported to have potent activity for dental complaints. Moreover the differentiate applications and its chemical composition so far studied places it forward in dental check up. It also attracts the users in having good smell and relevant taste. In addition, Meswak wicks aside from cleaning between the teeth, they are flexible and strong as they do not break regardless of the amount of pressure applied. The WHO recommended the use of meswak in 1986 and in 2000 in an international consensus report on oral hygiene. With the agreement of earlier investigations it is confirmed that meswak exhibited significant antimicrobial activity against both aerobic as well as anaerobic bacteria collected from teeth with inflamed gums and necrotic pulps. Reportedly the extracts from meswak tree have shown antidepressant effects, wound-healing, antiviral and antimicrobial activity. In this review we have focused upon its role in maintaining the dental hygiene which hopefully will encourage the researchers and common people its need to document the effect of meswak in dental checkup.

2. *Salvadora persica* L. (Meswak tree)

Salvadora persica L. (Salvadoraceae) is a plant native to Saudi Arabia, India and Egypt.[39] The term *Salvadora*, (Juan Salvadory Bosca, 1598–1681) was proposed by Dr. Laurent Garcin while as *persica*, term indicates Persia. And L. is used to indicate Carl Linnaeus (1707–1778), the father of modern taxonomy. *S. persica* L. belongs to Class Magnoliopsida, and family Salvadoraceae. Branches long, often pendulous or semiscandent, glabrous or pubescent. Leaves subsucculent; blades coriaceous, landeolate to elliptic, occasionally orbicular, 1–3–10 cm long, 1–2–3 cm wide, rounded to acute at apex, cuneate to subcordate at base. Flowers are small, greenish–white with lateral and terminal panicles up to 10 cm long and petals up-to 3 mm long. Drupes red or dark red purple when ripe.

3. Meswak, the tooth paste stick

The use of Meswak as chewing sticks prepared from the roots and twigs of *S. persica* is widespread in Middle Eastern, some Asian and African cultures. It is prepared by cutting the stings or roots into pieces of 10-to 25-cm long. Meswak is usually used 3–10 times daily considered as an inexpensive and an efficient oral hygiene device.[28] The utilisation of *S. persica* for this purpose is particularly prevalent and the resulting meswak has been reported to have beneficial effects on dental health. The relatively strong taste of the meswak extract may have stimulated salivary flow effect. Consequently, meswak inhibits growth and the acid production of *Candida albicans*. The use Meswak is entirely consistent with the Primary Health Care Approach (PHCA) principles.[27]

4. Meswak Chemistry and bioactivity

Some phytochemical data of Meswak was presented earlier by Dymock W.[10] According to them, the root-bark contains 27.06% ash and is 'remarkable for the large amount of chlorine present'. The root and stem contain a fairly substantial amount of silica as a desert plant, whereby its mechanical action should provide the teeth a dazzling whiteness. The resin present in the plant parts may be forming a coating over the enamel of the teeth, thus protecting them. Meswak contains the following compounds: lauric, myristic and palmitic acids; polysaccharide and lignin derivatives of phenols and furans; sterols. Five lignin glycosides were isolated by Kamel et al.[2] as sodium l-Obenzyl-fi-D-glucopyranoside-2-sulphate (salvadoside) and 5,5′-dimethoxylariciresinol 4,4′-bis-*O*-β-D-glucopyranoside (salvadoraside), syringin, liriodendrin and sitosterol 3-*O*-glucopyranoside. Quercetin and flavonoids rutin were detected in the stems.[24] Ashraf Taha Khalil[31] proved the presence of four benzyl derivatives viz, Benzylamides. N1,N4-bis(phenylmethyl)-2(S)-hydroxy-butanediamide (1), N-benzyl-2-phenylacetamide (2), N-benzylbenzamide (3), and benzylurea (4). It was further investigated that Compound 2 revealed a significant inhibitory effect on human collagen-induced platelet aggregation, and a moderate antibacterial activity. The compound Salvadourea, (m-MeOC6H4CH2NH)2CO, has been reported in the roots.[3] The benzylisothiocyanate isolated from the Meswak showed antiviral activity against HSV-1[26] and acts as an agent for controlling dental caries.[28] β-sitosterol and ascorbic acid, present in the bark of Meswak show hypocholesterolemic properties.[17] Te compounds trimethylamine and salvadorine present in it have shown antiphlogistic, antibacterial and gingiva-stimulating effects.[18] Moreover trimethylamine may have a stimulatory action on the gums. According to studies, chlorine, trimethylamine, alkaloid resin, and sulfur compounds present in meswak have antimycotic effect.[15] Probably, the chlorine present as chloride could act as a dentifrice for removing tartar

and other stains from the teeth. The taste and pungent smell present in the sulphur compounds and as commonly known as 'mustard plant' are well-known bactericidal agents. The Vitamin C generally present in the plant contain the organic sulphur compounds, helps in the introduction of the antiscorbutic principle in the body, which cures spongy and bleeding gums.[4] In a broad study Noumi et al.[30] studied that the essential oil obtained from the stems of *S. persica* was rich in benzyl isothiocyanate (52.5%), benzyl nitrile (38.3%), carvacrol (3.3%), benzaldehyde (2.5%), aniline (0.7%) and naphthalene (0.6%).

5. Meswak in dental care

Meswak has been scientifically proven to be very useful in the prevention of tooth decay, even when used without any other tooth-cleaning methods.[4] However the use of meswak extract chewing gum may promote periodontal health by decreasing in plaque, bleeding and gingival indices.[19] Diabetes mellitus and renal transplant patients (usually conditioned with immunosuppressive agents) are known to predispose to oral candidal infection[14,5] because these disorders reduce the patient's immune response. Meswak when tested showed a great antimicrobial activity against some. The tannins and resins in meswak have an astringent effect on the mucus membrane and form a layer over the enamel which indeed gives protection to the teeth.[1] Elvin-Lewis et al.[45] showed that the dental loss in adults is very low in the countries where Meswak is used widely.

6. Meswak in dental plague checkup

Dental plaque refers to the diverse microbial community (predominantly bacteria) found on the tooth surface, embedded in a matrix of polymers of bacterial and salivary origin. For its benefit, plaque develops naturally on teeth, and forms part of the defense systems of the host by helping to prevent colonisation of enamel by exogenous microorganisms.[36] Moreover often pathogenic microorganisms are hosted by it which forms the sites for greatest risk of disease. Mutans group of Streptococci were established as the key agents causing dental caries and these are mostly hosted by these sites because of their ability to initiate the plaque formation.[33] Several studies have demonstrated that meswak contains substances that possess dental plaque inhibiting properties against oral microbes.[12,11,13] The meswak's mechanical action in plaque removal could have been due to the substantial amount of silica detected in Persica ashes. It may also play a potential role in caries prevention and raises the plaque pH after acidic challenge.[23,22] This material does not exist in Persica extract. This may explain the disagreement between this study and the findings which showed meswak stick can reduce the plaque accumulation.[19] Moreover the there are no. of reports which sport the anti-plaque property or elongation of the duration for plaque formation.[8,9,23,7]

7. Miscellaneous activities of Meswak tree

In Eastern Africa, the roots of *S. persica* are used as a remedy for rheumatic pain, ancylostomiasis, gastritis, gonorrhoea and the leaf is also presumed to be diuretic. The extract of the stems is reported to possess anti-inflammatory,[34] antimicrobial,[32] hypolipidemic[37] and hypoglycemic[35] activities. A protective action of *S. persica* decoction against ethanol- and stress-induced ulcers was observed in rats.[6] The use of Persica containing chewing gum in comparison to placebo gum has a strong effect on gingival inflammation and gingival bleeding.[19] Study confirm that the renal transplant patients (RTPs) who used miswak had a significantly lower prevalence of oral candidiasis than the RTPs using modern toothbrushes. Both aerobic as well as anaerobic bacteria collected from teeth with inflamed gums and necrotic pulps were checked by extacts.[50,44] Antiplasmodial activity and its use as part of remedies to treat malaria was studied by Ali et al.[43] Moreover the plant possess analgesic, anti-plaque, aphrodisiac, anti-microbial, alexiteric, anti-inflammatory, astringent, anti-pyretic, diuretic and bitter stomachic activities.[46,49] It has been used in the treatment of nose troubles, leucoderma, scabies, piles, scurvy, gonorrhea, venereal diseases, boils and toothache, for teeth cleaning, to treat hook worm, cough and asthma, in rheumatism, reestablishment of the components of gastric mucosa, to lower cholesterol plasma levels, and as a laxative.[42,21] The dental loss in adults is very low in the countries where Meswak is used widely.[45] The use of Persica mouth rinse significantly reduced the gingival bleeding.[21] The seed oil is useful for the treatment of some skin diseases and joint pain.[41]

8. Discussion

Meswak is commonly used for brushing teeth and for religious purposes in the Middle East, including Saudi Arabia and Gulf States, and parts of Asia and Africa. Meswak (or siwak) in Arabic means "sticks for rubbing the teeth".[18] It has been shown to contain salvadorine, fluoride, chloride, trimethylamine, silica, mustard oil, sulphur, vitamin C, saponins, resins and traces of tannins, sterol and flavonids. The World Health Organization recommends and encourages the use of chewing Persica sticks (miswak) as an effective oral hygiene procedure in areas where its use is traditional.[25]

Various studies have been performed on the Persica stick's antimicrobial effect because the natural toothbrushes are commonly used by millions of people in different areas of the world. This counterpart of the modern day toothbrush was believed to be unknown in Europe until about 300 years ago[1] and Meswak was the best source for teeth cleaning till era. Many studies have demonstrated the antiperiodontopathic, anticaries, antifungal and antibacterial properties of the contents of Meswak.[15,16] It is an inexpensive source and has been reported to show anti plaque and many other pharmacological properties, and its taste although slightly bitter is not unpleasant.[20] All of its activities possibly occur due to presence of several biologically active chemical constituents such as flavonoids, saponins, alkaloids, volatile oils, steroids, terpenoids, and carbohydrates in it.[40,47,48] Thus Meswak can be recommended as a good hygiene tool in oral health checkup and for dental health care in the communities where they are used as a natural toothbrush.

Conflicts of interest

The authors have no conflicts of interest.

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