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FROM TRADITION TO EVIDENCE: A REVIEW OF THE THERAPEUTIC AND PREVENTIVE BENEFITS OF MISWAK

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ტრადიციიდან მტკიცებულებებამდე: მისვაკის თერაპიული და პროფილაქტიკური სარგებლის მიმოხილვა

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რეზიუმე

მისვაკი, ტრადიციული კბილის საწმენდი ჯოხი, რომელიც მზადდება Salvadora persica-ს ფესვების, ტოტებისა ან ყლორტებისგან, ათასობით წლის განმავლობაში გამოიყენებოდა ძველ ცივილიზაციებში, მათ შორის ბაბილონელების, ბერძნების, რომაელებისა და ეგვიპტელების მიერ. იგი კვლავ ფართოდ გამოიყენება აფრიკის, აზიისა და სამხრეთ ამერიკის ქვეყნებში, განსაკუთრებით კი მუსლიმურ სამყაროში, სადაც მისვაკის გამოყენების ისტორია 1400 წელზე მეტს ითვლის. ის რეკომენდებულია ისლამურ წმინდა ტექსტებშიც, როგორც კბილების გასაწმენდი და პირის ღრუს მოსაწმენდი საშუალება. მრავალმა სამეცნიერო კვლევამ დაადასტურა, რომ Salvadora persica-ს გააჩნია ანტიბაქტერიული, ანტიფუნგალური, ანტივირუსული, ანტიკარიესული და კბილის ნადების საწინააღმდეგო თვისებები. გარდა ამისა, ზოგიერთი კვლევა მიუთითებს მისვაკის ანტიოქსიდანტურ, ტკივილგამაყუჩებელ და ანტიანთებით ეფექტებზე. მისვაკის გამოყენება უშუალოდ მოქმედებს ნერწყვის შემადგენლობაზე, ხოლო კლინიკურმა კვლევებმა აჩვენა, რომ მისვაკის მექანიკური და ქიმიური წმენდის ეფექტურობა შეედრება, და ზოგ შემთხვევაში აღემატება კიდეც, თანამედროვე კბილის ჯაგრისის ეფექტს. მოცემულ მიმოხილვაში წარმოდგენილია Salvadora persica-ს თერაპიული ეფექტები პირის ღრუს ჯანმრთელობაზე და განხილულია ის ბიოაქტიური კომპონენტები, რომლებიც ამ მცენარეშია აღმოჩენილი და რომლებიც მისი ეფექტურობის განმაპირობებელი ფაქტორებია, როგორც ბუნებრივი და ტრადიციული პირის ღრუს ჰიგიენური საშუალების.

Introduction. Dental caries and oral infections continue to be significant public health challenges around the world, with oral hygiene practices remaining the most effective methods for preventing these issues. Various techniques have been utilized to uphold dental and oral cleanliness. Before the creation of the modern toothbrush, diverse tools were used across different cultures for cleaning teeth, such as toothpicks, twig brushes, and cloth wrapped around fingers [1]. Some of the earliest examples of such tools were toothpicks, with some having been found in the ancient Babylonian city of Ur. Historical literature like the Susruta Samhita and Charaka Samhita from ancient India highlighted the importance of oral hygiene methods, including the use of herbal sticks. In the 2nd century BC, the Greek thinker Alciphron advocated for toothpicks to remove fibrous remnants following meals, while Romans preferred those made

from the mastic tree (Pistacia lentiscus). Early Buddhist and Jewish writings also mention the use of tooth-cleaning sticks [2].

The fiber brush from Babylon, often referred to as the “chew stick,” is generally acknowledged as a forerunner to the modern toothbrush. This tool dates back to around 3500 BC and consisted of a wooden stick with one end frayed to create fibrous bristles. In Arab traditions, this implement was known as siwak or miswak. During the Islamic Golden Age, preventive dentistry became intertwined with broader advancements in medicine. The oral cavity was regarded as a crucial component of the body, and significant attention was given to its care. The use of miswak was closely linked to the Prophet Mohammed, who promoted its use before meals, prayers, and recitations of holy texts. The hadith encourages its regular use as “purification for the mouth and a means of the pleasure of the Lord” [3]. In the early Islamic era, miswak not only served as a dental tool but also evolved into a representation of refined living and was formalized within Islamic hygiene laws. In today’s interconnected healthcare setting, acknowledging culturally embedded practices can enhance public health messaging, strengthen patient-provider dynamics, and foster culturally sensitive care. Incorporating traditional practices such as miswak into contemporary dental care may present valuable opportunities for cross-cultural health promotion [4].

Despite the prevalence of modern dental products, there is a resurgence of scientific interest in traditional methods like miswak. Research has shown its antimicrobial, anti-inflammatory, and anti-plaque characteristics in both laboratory and clinical contexts, supporting its possible use as a supplement or alternative in modern preventive dentistry. Additionally, concerns regarding antibiotic resistance, chemical sensitivities, and environmental sustainability further underscore the necessity to reassess traditional tools through research grounded in evidence [5]. This review aims to examine and consolidate available information on the therapeutic and preventive attributes of miswak in dentistry, thus assessing its potential role in current oral healthcare practices.

Methods. We have conducted a systematic literature search using electronic databases to look for some relevant studies. Inclusion criteria: Studies were included based on a specific time frame between (2000-2025), written in English, focused on miswak (salvadora persica) under the context of oral hygiene or antimicrobial properties. We also concluded some peer review articles like original research, reviews and clinical trials. Exclusion criteria: We tried to exclude any article that wasn't in full text or in other languages than English. We excluded any articles unrelated to Miswak and oral health, we excluded non peer reviewed content.

Results and discussion. The World Health Organization recommends and encourages the use of miswak as an inexpensive and effective oral hygiene tool in areas where it is customary. Its availability, low-cost, simplicity, and use have been extensively studied in regions around the world where miswak can play a significant role in the promotion of oral hygiene. As a result, current and upcoming public health practitioners and the dental profession should become familiar with the application of miswak within its traditional customs. Furthermore, efficacy studies are warranted to determine the effectiveness and usefulness of any potential didactic training involving miswak use to educate health professionals [4].

The precise origins of mechanical oral hygiene devices are not well-documented, but historical records indicate that tools for cleaning teeth existed before the advent of the modern toothbrush. Early instruments included toothpicks, twig brushes, and chew sticks—some of which, like the fiber brush found in ancient Ur (around 3500 BC), bear a striking resemblance to contemporary designs. In ancient Greece and Rome, toothpicks were a common item, with Alciphron referring to them as karphos, meaning "blade of straw." The chew stick, especially the miswak or siwak derived from the Salvadora persica tree,

was a prevalent tool in the Arab world even prior to the rise of Islam. With the arrival of Islam, the use of miswak became ritualistic and was deeply rooted in religious and cultural practices. [6] The Prophet Muhammad (PBUH) strongly promoted its usage for oral cleanliness, incorporating it into daily habits and prayer ceremonies. Teachings from the Prophet highlighted its importance for both spiritual and hygienic purposes, leading to its lasting popularity throughout the Muslim world. Today, miswak and modern toothbrushes are frequently utilized in countries with a Muslim majority, often together to improve oral hygiene [5]. Besides cultural and religious importance, miswak is a very nice tool to keep our teeth healthy. That feature is based on the biochemical and phytochemical composition of it. Phytochemical analysis revealed the presence of carbohydrates, flavonoids, terpenes, sterols, alkaloids, and glycosides. Organic sulfur compounds and elemental sulfur were also present as small amounts of fluoride, calcium, phosphorus, silica, and ascorbic acid, Specific alkaloids including salvadoricine and salvadorine, benzyl isothiocyanate (a sulfur-containing compound with antimicrobial properties), cyanogenic glycosides, lignans, saponins, tannins, and fatty acids such as linoleic and stearic acid [7].

Chemical	Benefit to Oral Health
Sulphur	Antibacterial effect
Chlorides, fluorides	Enamel remineralization
Vitamin C	Tissue healing and repair
Tannins	Reduce plaque and gingivitis
Silica	Removing stains
Alkaloids	Antibacterial activity
Benzyl isothiocyanate	Prevent cariogenic and genotoxic compounds
Essential oils	Flow of saliva and buffering pH
Butanediamide	Antimicrobial agent
N-benzyl-2-phenylacetamide	Antimicrobial agent

Figure 1. phytochemical composition of salvadora persica

Several in vitro studies have reported the antibacterial effects of Miswak on cariogenic bacteria and periodontal pathogens including Staphylococcus aureus, Streptococcus mutans, Streptococcus faecalis, Streptococcus pyogenes, Lactobacillus acidophilus, Pseudomonas aeruginosa, Aggregatibacter actinomycetemcomitans, and Porphyromonas gingivalis. testing both aqueous and alcoholic extracts of S. persica against selected pathogenic microbes, concluding that aqueous extract showed significant inhibition in the growth of all pathogens tested with a profound inhibitory activity against Staphylococcus species, on the other hand, methyl alcohol extract had a significant antibacterial effect against L. acidophilus and P. aeruginosa. These results confirm the antibacterial effect, and further testing has been advocated. Investigations extended to explore the antibacterial effect of methanolic extracts on oral bacteria known to be associated with periodontitis concluded that S. persica was effective against most of the bacterial strains found in saliva [7]. Bacteria are attached as colonies on surface of teeth called biofilms, connected by a self-produced polymer matrix composed mainly of polysaccharides, secreted proteins, and extracellular DNA, such complexity helps protect the bacteria and plays a crucial role in the chronicity of illnesses,[7] The growth inhibition and anti-biofilm effects of various extracts on cariogenic Streptococcus mutans isolates were evaluated. Biofilm inhibition, gas chromatography-mass spectrometry (GC-MS) analyses for phytochemicals and their possible mode of interaction with biofilm response regulators were revealed using Ligand Fit docking protocols. All S. persica extracts showed considerable inhibitory activity and the cariogenic S. mutans showed varied susceptibility when compared with controls. The percentage

reduction in biofilm inhibition obtained for methanol, ethanol, chloroform, acetone, and aqueous extracts were 87.92%, 85.75%, 72.44%, 61.66% and 58.68%, respectively. The bioactive, dual-function, anti-biofilm agents in S. persica not only inhibit growth, but also control the colonization and accumulation of caries-causing S. mutans [8]. Multiple studies have shown that Miswak extracts are effective in inhibiting the growth of Candida albicans and other Candida strains. For example, Miswak was found to be more effective than toothpaste in eliminating Candida immediately and after two weeks of use, indicating the presence of potent antifungal compounds [8].

A study evaluated variant S. persica crude extracts (methanol, ethanol, acetone, and water) for the presence of antioxidant molecules and concluded that the methanolic extract contained the highest amount of crude extract, which revealed high concentrations of antioxidant enzymes: peroxidase, catalase, and polyphenoloxidase [7].

Hoor et al. induced inflammation in the hind paw of rats by sub planter injection of 0.1 ml of 1% carrageenan. The anti-inflammatory effect was measured by the volume of edema in the paw in milliliters using a plethysmometer, immediately before injection and then hourly up to five hours. researchers confirmed the S. persica anti-inflammatory effect on decreasing the paw volume of carrageenan-induced edema, as for anti-ulcerative effect, Sanogo et al. studied the effect of S. persica administration prior to induced intragastric ulcers in rats and compared it to placebo. The results suggested that S. persica decoction possessed a significant protective action against ulcers induced by ethanol and by cold-restraint stress, A recent study conducted by Lebda et al. evaluated the effects of S. persica aqueous extract on proinflammatory cytokines, nitric oxide synthases, apoptotic pathways, and oxidative/antioxidative pathways involved in ethanol-induced gastric ulcers in rats. They concluded that S. persica alleviated serious gastric mucosal ulcerations induced by ethanol and affirmed its efficacy as an antiulcer agent [9].

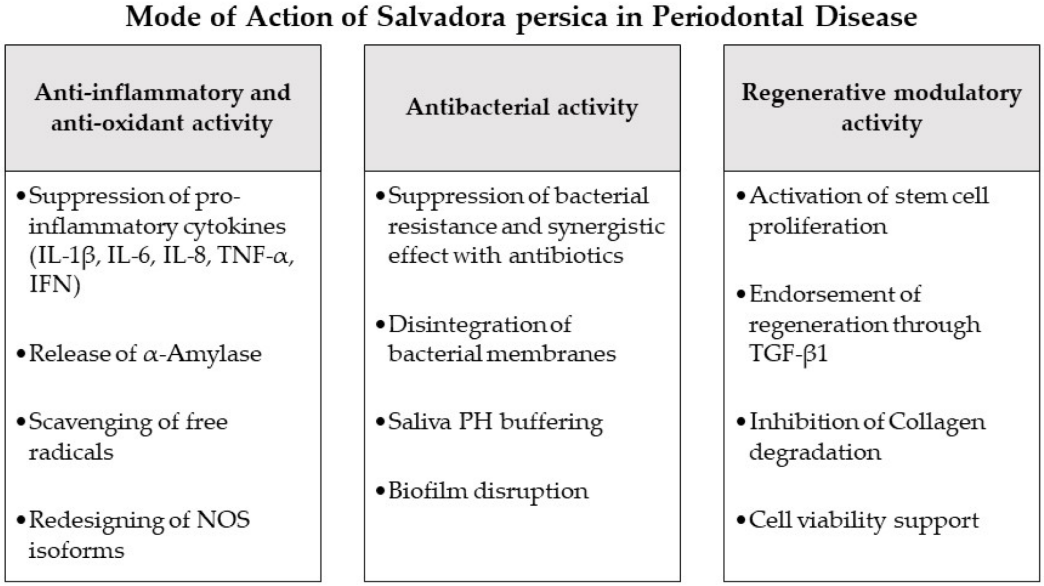

Figure 2. Mode of action of *Salvadora persica* as an adjunctive periodontal chemotherapeutic in periodontal disease. Adapted from *Salvadora persica: Nature's gift for periodontal health*, by M. Mekhemar et al., 2021, *Antioxidants, 10*(5), Article 712. Reprinted under Creative Commons CC BY 4.0.

Traditionally, miswak has been employed for oral hygiene across various cultures and is now backed by contemporary scientific evidence highlighting its effectiveness in multiple facets of dental care. Numerous studies have validated that miswak, whether used as a stick or incorporated into toothpaste, effectively diminishes dental plaque. A meta-analysis conducted by Salem et al. (2020) indicated that toothpaste containing S. persica demonstrates antiplaque and antigingivitic effects that are comparable to

those of conventional, fluoride-based toothpaste. This equivalence is particularly significant given the rising preference for naturally-derived dental care products [10]. Additionally, clinical trials have indicated that individuals who use miswak as a chewing stick achieve comparable plaque control levels to those who utilize standard toothbrushes [11].

Miswak has also been found to be beneficial in managing gingival inflammation and preventing periodontal diseases. Its active compounds, such as tannins and flavonoids, exhibit anti-inflammatory properties that aid in reducing gingivitis. Research by Aljarbou et al. (2022) and Nordin et al. (2020) showed notable decreases in gingival bleeding and enhanced periodontal health among miswak users in comparison to traditional oral hygiene techniques [5, 7]. These results imply that miswak can function as an effective supplementary tool in addressing early-stage periodontal disease.

The cariostatic effects of miswak are primarily linked to its mechanical cleaning properties and its natural chemical ingredients - such as fluoride, silica, and benzyl isothiocyanate - which assist in inhibiting the growth of cariogenic bacteria like Streptococcus mutans. Both in vitro and clinical studies have reinforced miswak's role in lowering the risk of dental caries, particularly when used regularly [5].

When utilized appropriately, miswak is typically safe; however, improper usage - such as applying too much pressure or using it too frequently - can result in dental abrasion. It is advisable to use fresh, properly prepared sticks, which should be replaced regularly and kept in hygienic conditions. Current research is hindered by a shortage of long-term clinical trials and variability in the source, preparation, and standardization of miswak products. Future studies should concentrate on standardized procedures and more comprehensive clinical trials to confirm its long-term effectiveness and safety.

Conclusion. Miswak (*Salvadora persica*) has demonstrated significant potential as a natural adjunct in preventive dentistry. Its documented antimicrobial, anti-plaque, anti-inflammatory, and anti-cariogenic properties support its role in promoting oral health. Historically rooted in traditional and religious practices, miswak continues to be widely used across various populations, especially in Muslim communities. Scientific evidence affirms its efficacy in controlling plaque, reducing gingivitis, and contributing to caries prevention - often comparable to modern oral hygiene products. However, limitations in current research, including the scarcity of standardized clinical trials and variability in miswak preparation, highlight the need for further investigation. Integrating miswak into evidence-based dental care could offer a culturally respectful, accessible, and sustainable alternative or complement to conventional oral hygiene methods.

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FROM TRADITION TO EVIDENCE: A REVIEW OF THE THERAPEUTIC AND PREVENTIVE BENEFITS OF MISWAK

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SUMMARY

Miswak, a natural tooth-cleaning stick sourced from the twigs, roots, or stems of Salvadora persica, has been utilized for thousands of years by ancient cultures, including the Babylonians, Greeks, Romans, and Egyptians. It continues to be commonly used today in regions such as Africa, Asia, South America, and especially within Muslim countries, where its use has been recorded for over 1,400 years. Miswak is also encouraged in sacred Islamic texts for the purpose of cleaning teeth and purifying the mouth. Various scientific studies have shown that Salvadora persica has antibacterial, antifungal, antiviral, anti-cariogenic, and anti-plaque properties. Furthermore, additional studies indicate that miswak may also display antioxidant, analgesic, and anti-inflammatory effects. The immediate effects of miswak usage on saliva composition have been observed, and several clinical studies have validated that its mechanical and chemical cleaning properties are on par with, and in some cases exceed, those of standard toothbrushes. This review outlines the health benefits of Salvadora persica for oral hygiene and emphasizes the bioactive components found in its extracts that enhance its effectiveness as a traditional tool for oral care.

Keywords: Miswak, tradition, evidence, review