REVIEW ARTICLE **Open Access**

The Effect of Siwak Wood Extract (Salvadora Persica) Solution on Oral Heatlh: Literature Review

Arina Fathiyyah Arifin[1*], Sry Marwah[2], Arni Isnaini Arfah[3], Sri Irmandha[4], Sri Wahyuni Gayatri[5]

[1]Department of Histology, Universitas Muslim Indonesia, Makassar, Indonesia

[2]Medical Eduction Study Program, Faculty of Medicine, Universitas Muslim Indonesia, Makassar, Indonesia

[3]Department of Psychology, Faculty of Medicine, Universitas Hasanuddin, Makassar, Indonesia

[4]Department of Ophthalmology, Faculty of Medicine, Muslim University of Indonesia, Makassar, Indonesia

[5]Department of Biochemistry, Faculty of Medicine, Muslim University of Indonesia, Makassar, Indonesia

*Corresponding Author. E-mail: arinafathiyyah.arifin@umi.ac.id Mobile number: 081342300943

ABSTRACT

Background: In terms of beliefs, culture and values or life practices, Islam encourages its adherents to keep themselves and their environment clean, including guidance on maintaining oral hygiene using miswak.. Siwak extract has an antibacterial effect, is effective against bacteria that play a role in the formation of dental plaque thus, with a decrease in plaque bacteria, the salivary pH will also increase One of the contents of miswak (Saldavora persica) hich is useful for preventing dental plaque is trimethylamine (TMA). In addition, it is also potential as an antibacterial.(3) (4) The World Health Organization (1987) recommends the use of miswak as an effective tool for oral health, with the mechanical action of soft-wood fibers and the therapeutics action of its chemical content.
Content: it is necessary to conduct a Literature Review study to determine the effect of a solution of siwak wood extract (Salvadora Persica) on oral health. The feature of this research is we want to know with siwak extract can be maintained acid-base balance in salivary pH which can kill some bacteria in the mouth. The purpose of this study was to determine the effect of a solution of siwak wood extract on oral health. Literature Review with Systematic review design.

(Continued on next page)

GREEN MEDICAL JOURNAL
E-ISSN 2686-6668

Article history:
Received: 20 February 2022
Accepted: 15 March 2022
Published: 30 April 2022

Published by:
Faculty of Medicine Indonesia

Address:
Jl. Urip Sumoharjo Km. 5, MakassarUniversitas Muslim Indonesia South Sulawesi,

Mobile number:
+62821 9721 0007

Email:
greenmedicaljournal@umi.ac.id

(Continued from previous page)

Conclusion: The effect of a solution of siwak wood extract on oral health, concluded that siwak extract can affect salivary pH, production of salivary secretions, reduce plaque scores and inhibit the microorganisms development in the oral cavity.

Keywords : Siwak wood extract; Salvadora persica; Oral health

Introduction

Islam in terms of beliefs or culture and values or norms of life also encourages its followers to keep themselves and their environment clean, including guidance provided for maintaining oral hygiene using miswak.[1] Miswak (Misswak, meswak, miswaki, siwaki, Sewak) is one of the most widely used ancient chewing sticks obtained from Salvadora persica L (Arak Tree) or toothbrush tree.[2] Siwak (salvadora persica) contains trimethylamine, salvadorine, chloride, fluoride, silica, sulfur, mustard oil, vitamin C, resins, tannins, saponirs, flavonoids, and sterols. One of the contents of miswak (salvadora persica) which is useful for preventing dental plaque is trimethylamine (TMA). In addition, it is also potential as an antibacterial.[3] Apart from having antimicrobial effects, Salvadora persica has mild laxative, diuretic, anti-pyretic, anti-inflammatory, astringent, and analgesic effects.[4]

Prevention of acid imbalance in saliva can be done mechanically or chemically, with mouth rinses that are considered cheaper, efficient, environmentally friendly, and have minimal side effects. The World Health Organization (1987) recommends the use of miswak as an effective tool for oral health, with the mechanical action of soft-wood fibers and the therapeutic action of its chemical content.(5) The 2017 Global Burden of Disease Study estimates that oral disease affects nearly 3.5 billion people worldwide, with dental caries being the most common condition. Globally, an estimated 2.3 billion people suffer from dental caries and more than 530 million children suffer from primary dental caries.(6) The results of the 2018 Basic Health Research (Riskesdas) stated that the largest proportion of dental problems in Indonesia was damaged/cavities/sick teeth (45.3%). Meanwhile, the majority of oral health problems experienced by the Indonesian population are swollen gums and/or ulcers (abscesses) by 14%.(7)(8) Based on the above background, the authors are interested in making a literature review to determine the effect of a solution of siwak wood extract (*Salvadora Persica*) on oral health.

Subheading 1

This study uses literature search sources using an Electronic Based that is accredited/indexed by Sinta such as Biomed Central, Portal Garuda, Google Scholar, Elsevier / Clinical Key, PubMed, and other database sources. Inclusion criteria in the form of articles with keywords: Effect of a solution of siwak wood extract (salvadora persica) on oral health, the literature contains 20 references with a publication period of the last 3 years counting backward from the year KTI was carried out. If it is not found, then it is allowed to withdraw until a maximum of the last 10 years, references to international accredited scientific journals, references to national accredited scientific journals, references from citations to lecturers' writings in the form of research, literature reviews, case reports, Clinical Key references, Text books, and proceeding books. While the exclusion criteria, namely the references obtained are not related to the effect of siwak wood extract solution (Salvadora persica) on oral health, references cannot be accessed in full.

Journal Name (year of publication)	Tittle	Method	Authors
2021	(Salvadora persica)	Experimental	ErnieThioritz, Asridiana, Khoirunnisa Ilham
2021	Antibacterial activity of siwak wood extract (Salvadora persica) against Staphylococcus bacteria Epidermidis	Experimental	Nugroho Eko W B
2021	Comparative Evaluation of the Antibacterial Effects of GIC Containing Chlorhexidine and Siwak on Streptococcus mutans and Streptococcus sobrinus in Carious Children	Experimental	Amruta J Kalpavriksha, Shakuntala Bethur Siddaiah,Shivaprasad Bilichodmath, Somanna Prabhakara, Hanumantha Rao HM
2019	Impact of fungicide salvadora persica L. (miswak) extract on the growth of foodborne pathogens Aspergillus species	Experimental	Amna Ali Saddiq, Monagi H. Alkinani
2018	Differences in gargling a solution of siwak extract (salvadora persica) on oral saliva secretion in the elderly with hypertension, diabetes	Experimental	Syamsiah syam, RisnayantiAnas, Andi nelda yunita

	mellitus and does not have Systemic disease at Tresna Werdha Social Institution, Gau Mabaji		
2018	Antibacterial activity of siwak wood (salvadora persica) ether fraction against staphylococcus aureus in vitro	Experimental	RIZA AMALIA, Nurul marfu'ah, Surya amal
2017	The effectiveness of toothpaste containing siwak (salvadora persica) extract in reducing	Experimental	Zulfikri
2017	Effect of siwak wood powder extract (Salvadora persica) on the growth of Streptococcus bacteria mutans	Experimental	Mardia Apriansi
2016	Differences in salivary pH before and after gargling with siwak solution in patients with diabetes mellitus at the dr.h. soewondo kendal	Experimental	Chyntia adha purnama sari, Mugi hartoyo, Wulandari M
2016	2016 Evaluation of Antibacterial Properties of Fresh Siwak Extract and Siwak Extract Immersed in 0.5% Sodium Fluoride Against Streptococcus Mutans	Experimental	Priyanka SG, Nagesh L,Puja C Yavagal
2015	antibacterial activity of siwak (Salvadora persica L.) extract on hygiene	Experimental	Mohammad abhary, Abdulaziz al-hazmi
2015	Effect of gargling with a solution of siwak (salvadora persica) extract on pH oral saliva	Experimental	Tiara adzakiyah, IndrawatiLipoeto, Nila kusuma
2015	Effect of gargling siwak extract in preventing the occurrence of stomatitis in patients undergoing chemotherapy at SMC RS telogorejo	Experimental	Veronica maya novita, Sripuguh kristiyawati, Supriyadi.
2014	The effectiveness of siwak (salvadora persica) and siwak toothpaste on the accumulation of dental plaque in children	Experimental	Indra bramanti, Iwa sutarjoRS, Navilatul ula, Muhammad isa
2014	Test the effectiveness of extracts of miswak (Salvadora persica) at various concentrations	Experimental	Ervina diah Ruslinawati,Rahma Sri Praptiningsih,Siti Chumaeroh

	against Dental plaque formation		
2013	Effectiveness of ethanol extract of siwak wood (salvadora persica) by percolation method on the growth of resistant staphylococcus aureus isolate 248 multiantibiotic	Experimental	Fuad fatkhurrohman, Anamedawati
2013	The antifungal effect of the ethanolic extract of siwak (salvadora persica) on the growth of the fungus Candida albicans on the media saboraud dextrose agar	Experimental	Rizki AMALIAH, Al Munawir, Rosita Dewi
2012	Effect of siwak (salvadora persica) extract solution on Streptococcus mutans: in vitro study and in vivo	Experimental	Oedijani SANTOSO, AiniPramoda Wardani, Nilakusumasari

Subheading 2

1. Effect of Siwak Extract (Salvadora Persica) on saliva pH

The content of essential oils in siwak stems such as benzyl isothiocyanate can stimulate the flow of saliva in the oral cavity. This increase in salivary flow will increase the salivary bicarbonate buffer activity so that the salivary pH will also increase. [5]

In a study conducted by Ernie et al. Researchers concluded that siwak (salvadora persica) is very suitable to be used as an alternative mouthwash that can maintain the balance of the degree of acidity (pH) of the oral cavity. Therefore in this case the Siwak mouthwash can maintain a normal acid-base balance in the oral cavity. [6] Research conducted by Tiara et al. There is an average pH of saliva before rinsing with a 50% miswak extract solution of 6.56. There is an average pH of saliva after gargling with a 50% miswak extract solution of 7.4. Gargling with a 50% miswak extract solution can increase the pH of saliva. [5] In a study conducted by Mohammad abhary et al. The saliva pH of the collected samples was measured before and after rinsing with siwak mouthwash. The use of siwak mouthwash showed an increase in salivary pH from an average of 6.93-7.28 for all 40 samples. The effect of salivary pH on the total number of bacteria after using miswak mouthwash where there was a decrease in the total number of bacteria and inversely with the increase in pH.[7] In a study conducted by Oedijani Santoso et al. The results of the minimum inhibitory level test showed that the use of 50% siwak extract caused the growth of S. mutans not to grow, so if a mouthwash with 50% siwak extract was used, it might disturb the microbial balance in the oral

cavity.

At this stage of the study, 25% of siwak extract was used as a mouthwash, so as not to disturb the normal flora of the oral cavity. Giving a 25% siwak extract solution (in vivo) can significantly increase the salivary pH.[8]

This research is following the study was conducted by *Catur Eka Sukma et al. Research concluded that the combination of brushing using siwak and toothpaste for 10 days can reduce the amount of anaerobic bacteria in gingival samples.(22)*

2. Effect of Siwak Extract (Salvadora Persica) on microorganisms

Several researchers reported the antibacterial effect of miswak against cariogenic bacteria and periodontal pathogens, especially Bacteroides species, and inhibited plaque formation. Another study stated that siwak extract has antibacterial activity against Streptococcus mutans and S. faecalis. [9] Siwak (Salvadora persica) has been widely used since the time of the Prophet Muhammad as an alternative mouth cleanser. Siwak ethanol extract is known to have substances such as saponins, tannins, salvadorin, and flavonoids that function as antibacterial and antifungal agents. [10]

In a study conducted by Nugroho eko W. B. Siwak can be used as an alternative herbal antimicrobial agent against both S. mutans and S. sobrinus. Conventional anhydrous GIC was the least effective in reducing the mean numbers of S. mutans and S. sobrinus.[11] In a study conducted by Amna ali saddiq et al. The results showed that the different concentrations of S persica extract used had a suppressive impact on the growth of A niger, A flavus, and A fumigatus. High concentration (100 mg/mL). Aqueous extract of S persica siwak showed a strong fungicidal effect against Aspergillus species, and this may support the utilization of this extract as an antifungal agent versus aspergillosis-associated diseases.[12] In a study conducted by Riza Amalia et al. Siwak wood can be used as alternative medicine in preventing or treating periodontal disease caused by Staphylococcus aureus bacterial infection. [13]

In a study conducted by Mardia Apriansi. Giving siwak wood powder extract with different concentrations had a very significant effect and inhibited the growth of Streptococcus mutans bacteria. [14] In a study conducted by Priyanka SG et al. The three different solvent extracts (Distilled water, Ethanol and Ethyl acetate) were sensitive to the tested microorganisms but were found to be high against distilled water followed by ethanol and ethyl acetate. 0.5% of miswak extract soaked in sodium fluoride showed antibacterial activity against S. mutans and L. acidophilus. The 0.5% aquadest extract of the siwak extract soaked in sodium fluoride showed higher antibacterial efficacy against S. mutans than the ordinary siwak extract.[15] In a study conducted by Rizki amaliah et al. The inhibition zone has started to form from the smallest concentration, which is 6.25% and is increasing along with the addition of the extract concentration to 50% where the higher the concentration given, the higher the inhibition zone produced. [10] In a study conducted by Fuad Fatkhurrohman and Ana Medawati. The ethanolic extract of siwak

wood by the percolation method was able to inhibit the growth of the second largest bacteria causing multiantibiotic-resistant oral cavity inflammation, namely Staphylococcus aureus isolates 248. v in vitro. [16] In a study conducted by Oedijani Santoso et al. Miswak extract solution can inhibit the growth of S. mutans (in vitro), and the concentration of 50% was the lowest concentration that was effective in inhibiting the growth of S. mutans. Giving a 25% siwak extract solution (in vivo) can significantly increase the salivary pH. [8]

3. Effect of Siwak Extract (Salvadora Persica) on Dental Plaque

The presence of silica substance in the siwak also helps the mechanical action of the miswak in cleaning plaque. The siwak toothpaste contains chloride which is useful in removing stains silica which is a tooth-cleaning agent and trimethylamine which functions in reducing calculus and stains, so that both siwak and siwak toothpaste can inhibit the formation of dental plaque. [9]

In research conducted by Zulfikri. The average score of dental plaque before brushing with toothpaste containing siwak extract ranged from 1.2 to 3.6 with an average plaque index of 2.18, and after brushing the teeth ranged from 0.2 to 0.8 with an average plaque index was 0.48. There is an effect of brushing teeth using toothpaste containing siwak extract in reducing plaque scores.[17] In a study conducted by Indra bramanti et al. The results of this study also showed that there was no significant difference between the basic toothpaste group and the siwak toothpaste group. The existence of a non-significant difference in the mean difference in plaque scores between the control group and siwak toothpaste, among others, is possible because this study was conducted on adolescent children (12-15 years), where the child's motor skills have developed well so that they can brush their teeth based on the recommended method with optimal. [9] In a study conducted by Ervina et al. The results showed that the siwak extract with a concentration of 50% was the most effective extract in inhibiting the formation of dental plaque and the effect was even better when compared to the siwak extract with a concentration of 75% and 100%, even with chlorhexidine which was recommended as a mouthwash. [18]

4. Benefits of Siwak Extract (Salvadora Persica) for patients who have certain diseases

Siwak extract has an antibacterial effect, is effective against bacteria that play a role in the formation of dental plaque, so with a decrease in plaque bacteria, the salivary pH will also increase. The content of essential oils in the stem of the miswak such as benzyl isothiocyanate can increase the secretion of saliva in the oral cavity. This increase in saliva production will increase the salivary bicarbonate buffer activity so that the salivary pH will also increase. [19] Research conducted by Cyntia et al. Before treatment, all respondents had an acidic pH, after being given the treatment with gargling with siwak solution, most of the respondents' saliva pH changed to neutral 19 (57.6%), remained acidic 7 (21.2%), changed to alkaline 7 (21.2%) respondents. Gargling with miswak solution is an effective way to increase salivary pH in DM patients who experience a decrease in salivary pH, especially in DM patients who have a high risk of

developing complications in the mouth. [20] Research conducted by Syamsiah syam et al. The results of the average oral saliva secretion of the elderly at the Tresna Werdha Gau Mabaji Gowa Social Home after

gargling a 25% siwak extract solution (Salvadora Persica) were hypertension (HT) 4.514ml/5minutes, diabetes mellitus (DM) 4.875ml/5minutes, and no systemic disease 4,379ml/5min. Difference change in secretion saliva between diabetes mellitus and not having systemic disease because it produces a p or sig value of 0.007 <0.05 so that diabetes mellitus has a higher change in salivary secretion compared to other data. [19] In a study conducted by Veronica et al. the oral condition of patients in the control group who did not experience stomatitis were 3 (17.6%) respondents and 14 (82.45) respondents who experienced stomatitis. So it can be concluded that there is an effect of gargling siwak extract in preventing the occurrence of stomatitis ($p = 0.000$, $p < 0.05$) in patients undergoing chemotherapy at SMC Telogorejo Hospital. [21]

Conclusion

After using a solution of siwak (Salvadora persica) extract, the salivary pH tends to be more stable and under normal conditions. Siwak wood extract (Salvadora persica) can effectively inhibit the growth of Streptococcus mutans, Streptococcus sobrius, Staphylococcus aureus, Stapylococcus epidermidis and Lactobacillus acidophilus bacteria. In addition to antibacterial, miswak extract can also be used as an antifungal that effectively inhibits the development of Aspergillus sp. and Candida albicans. Brushing teeth using toothpaste containing siwak extract can reduce dental plaque scores. After gargling a solution of siwak wood extract, it can increase salivary secretion and pH in the elderly who have systemic disease (diabetes mellitus and hypertension) and the elderly who do not have systemic disease and prevent the occurrence of stomatitis in patients undergoing chemotherapy. From 18 journals that have been studied, the authors can conclude that the extract solution of siwak wood (Salvadora persica) provides many benefits for the health of the oral cavity at the age of children, adolescents, adults to the elderly.

The suggestions are, necessary to do more specific research on the benefits of a solution of siwak wood extract (Salvadora persica) for the treatment of diseases. And it needs to be investigated further by looking at the active chemical substances that have functioned as antiplaque, antibacterial, and active chemical substances that affect salivary secretion and salivary pH and it is hoped that future researchers will have other variables or interventions, besides the benefits of Siwak extract for patients with diabetes mellitus, hypertension and patients undergoing chemotherapy.

Conflict of interest:

None

Funding sources:

None

Acknowledgment:

None

Reference

[1] Bramantoro, T. *et al.* Miswak users' behavior model based on the theory of planned behavior in the country with the largest muslim population. *Clin. Cosmet. Investig. Dent.* **10**, 141–148 (2018).
[2] Nordin, A. *et al.* Miswak and oral health: An evidence-based review. *Saudi J. Biol. Sci.* **27**, 1801–1810 (2020).
[3] Sartika, E. D. & Universitas Sumatera Utara. Perbedaan Efektifitas Kayu Siwakdengan Sikat Gigi Menggunakan PastaGigi Nonherbal Terhadap Oral HigieneIndeks (OHI) pada Jemaah MesjidAl-Jihad Medan. (2018).
[4] Jassoma, E., Baeesa, L. & Sabbagh, H. The antiplaque/anticariogenic efficacy of Salvadora persica (Miswak) mouthrinse in comparison to that of chlorhexidine: A systematic review and meta-analysis. *BMC Oral Health* **19**, 1–14 (2019).
[5] Adzakiyah, T., Lipoeto, I. & Kasuma, N. Pengaruh Berkumur dengan Larutan Ekstrak Siwak (Salvadora persica) Terhadap pH Saliva Rongga Mulut. *J. Sains Farm. Klin.* **2**, 74 (2015).
[6] Thioritz, E. & Ilham, K. Ph Saliva Setelah Penggunaan Obat Kumur Siwak (Salvadora Persica). *Media Kesehat. Gigi Politek. Kesehat. Makassar* **20**, 29–34 (2021).
[7] Abhary, M. & Al-Hazmi, A.-A. Antibacterial activity of Miswak (Salvadora persica L.) extracts on oral hygiene . *J. Taibah Univ. Sci.* **10**, 513–520 (2016).
[8] Oedijani Santoso, Aini Pramoda Wardani, N. K. Pengaruh Larutan Ekstak Siwak (Salvadora Persica) Terhadap Streptococcus Mutans: Studi In Vitro dan In Vivo. *Media Med. Indones.* **46**, 6–11 (2012).
[9] Bramanti, I., Rs, I. S., Ula, N. & Isa, M. Efektifitas siwak (Salvadora persica) dan pasta gigi siwak terhadap akumulasi plak gigi pada anak-anak (Effectiveness of Siwak (Salvadora persica) and siwak toothpaste on dental plaque accumulation in children). **47**, 153–157 (2014).
[10] Amaliah, R., Munawir, A., Dewi, R., Ilmiah, A. & Penelitian, H. Efek Antifungal Ekstrak Etanol Siwak (Salvadora persica) terhadap Pertumbuhan Jamur Candida albicans pada Media Saboraud Dekstrose Agar. *Artik. Ilm. Has. Penelit. Mhs. Jember 2013* 4 (2013).
[11] Kalpavriksha, A. J., Siddaiah, S. B., Bilichodmath, S., Prabhakara, S. & Hanumantha Rao, H. M. Comparative evaluation of antibacterial effect of gic containing chlorhexidine and miswak on streptococcus mutans and streptococcus sobrinus in early childhood caries children: A pcr study. *Int. J. Clin. Pediatr. Dent.* **14**, 229–234 (2021).
[12] Saddiq, A. A. & Alkinani, M. H. Fungicidal Impact of Salvadora Persica L. (Miswak) Extract on Growth of Foodborne Pathogens, Aspergillus Species. *Dose-Response* **17**, 1–5 (2019).
[13] Amalia, R. & Amal, S. AKTIVITAS ANTIBAKTERI KAYU SIWAK (Salvadora persica) FRAKSI ETER TERHADAP BAKTERI Staphylococcus aureus SECARA IN VITRO. **2**, 1–7.
[14] Apriansi, M. *et al.* PENGARUH EKSTRAK SERBUK KAYU SIWAK (Salvadora persica) TERHADAP PERTUMBUHAN BAKTERI Streptococcus mutans. *Agroqua J.* **15**, 29–34 (2017).
[15] SG, P., L, N. & Yavagal, P. C. Evaluation Of Antibacterial Property Of Fresh Miswak Extract And 0 . 5 % Sodium Fluoride Impregnated Miswak Extract Against Streptococcus Mutans And Lactobacillus Acidophilus – An Invitro Study. **3**, (2016).
[16] Fatkhurrohman, F., Medawati, A. & Yogyakarta, M. Efektifitas Ekstrak Etanol Kayu Siwak (Salvadora Persica L .)

Dengan Metode Perkolasi Terhadap Pertumbuhan Staphylococcus Aureus Isolat 248 Yang Resisten Multiantibiotik The Effectifity Siwak Wood Etanolic (Savadora Persica L .) Extract With Percolatio. 34–41.

[17]Zulfikri. efektifitas pasta gigi yang mengandung ekstrak siwak (salvadora persica) dalam menurunkan skor plak gigi. **XI**, 20–25 (2017).

[18]Ruslinawati, E. D., Praptiningsih, R. S. & Chumaeroh, S. UJI EFEKTIFITAS EKSTRAK SIWAK (Salvadora Persica) BERBAGAI KONSENTRASI TERHADAP PEMBENTUKAN PLAK GIGI - Studi terhadap Murid MTsN Sale. *ODONTO Dent. J.* **1**, 16 (2015).

[19]Syam, syamsiah. dkk. perbedaan berkumur larutan ekstrak siwak (salvadora persica) terhadap sekresi saliva rongga mulut lanjut usia dengan hipertensi, diabetes mellitus dan tida memiliki penyait sistemik di panti sosial tresna werdha gau mabaji gowa tahun 2017. **10**, (2018).

[20]Rsud, D. I. & Kendal, H. S. PERBEDAAN pH SALIVA SEBELUM DAN SESUDAH BERKUMUR DENGAN LARUTAN SIWAK PADA PASIEN DIABETES MELLITUS. 1–10.

[21]Novita, V. M., Kristiyawati, S. P. & Supriyadi. Pengaruh kumur ekstrak siwak dalam mencegah terjadinya stomatitis pada pasien yang menjalani kemoterapi di smc rs telogorejo. *Ilmu Keperawatan dan Kebidanan* **4**, 1–9 (2015).

[22]*Sukma, C.E., Elyani H. & Yahya A. Pengaruh Menyikat Gigi dengan Kombinasi Pasta Gigi dan Siwak (Salvadora persica) terhadap Jumlah Koloni Bakteri Anaerob pada Saliva dan Mukosa Gingiva Santri Ar-Razi. Jurnal Kedikteran Komunitas Vol.8 No.1 (2020).*