



## *Salvadora Persica L* (Tooth Brush Tree): A Review

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### ABSTRACT

*Salvadora persica L.* also known as tooth brush tree belonging to the *Salvadoraceae* family. Plant has been reported to have anti-microbial, anti-plaque, aphrodisiac, alexiteric, analgesic, anti-inflammatory, anti-pyretic, astringent, diuretic and bitter stomachic activities. It has great medicinal use in the treatment of nose troubles, piles, scabies, leucoderma, scurvy, gonorrhoea, boils and toothache. It contains important phyto-constituents such as vitamin-c, salvadorine, salvadoura, alkaloids, trimethylamine, cyanogenic glycosides, tannins, saponins and salts mostly as chlorides. In view of the immense medicinal importance of the plant this review is an effort to compile all the information reported on its phytochemical, biological and pharmacological activities. The present review is an attempt to generate interest among the people regarding its immense potential in preventing and treating several common diseases like tooth decay, plaque etc.

**Keywords:** *Salvadora persica*, antimicrobial activity, chloride content.

### INTRODUCTION

*Salvadora persica L.* (tooth brush tree) belonging to the *Salvadoraceae* family, is much branched evergreen shrub or small tree. The local names are Pilu, Dhalu and Jal. It is called Bada pilu, chhota pilu, Jal, Pilu in Hindi, Mustard tree, Saltbush, Toothbrush tree in English, Jhal in Bengali, Kalawa, karkol in Tamil, Arak, arraka in Arabic. *Salvadora cyclophylla* Chiov., *Salvadora indica* Wight *Salvadora*, *Wightiana* Planch are the Synonyms of *Salvadora persica L.* *S. persica* is wide spread, notably in thorn shrubs, desert flood-plains, river and stream bank vegetation, and grassy savannahs. Prefers areas where ground water is readily available, by riverbanks, on perimeters of waterholes, in seasonally wet sites, and along drainage lines in arid zones. Also found in valleys, on dunes and on termite mounds. The tree is able to tolerate a very dry environment with mean annual rainfall of less than 200 mm. highly salt tolerant, it can grow on coastal regions and inland saline soils.<sup>[1]</sup> The specie is found in Jodhpur, Barmer, Jalore and Jaisalmer in Rajasthan.<sup>[1]</sup> Other natives are Africa, Saudi Arabia, Iran, Israel, Jordan, Kenya, Srilanka, Sudan, Egypt, Ceylon, Pakistan (Sind), Algeria, Angola, Tanzania, Uganda,

Yemen, Somalla, Republic of Zambia, Zimbabwe.<sup>[1,2]</sup> *Salvadora persica L.* is a large much-branched evergreen shrub or small tree of 6 to 7 m in height; with soft whitish yellow wood; young branches are green in color; bark slightly rough, grayish-brown on main stem paler elsewhere. Leaves are oblong-elliptic to almost circular, light to dark green, rather flashy, sometimes with wart like glandular dots and dense, loose hairs; petiole up to 10 mm long; leaves in opposite pairs. Flowers are greenish to yellowish, very small. Fruits are spherical, fleshy, 5-10 mm in diameter, pink to scarlet when mature.<sup>[1,2]</sup>

The leaves, bark of stem and root of *Salvadora persica L.* have a long history of medicinal uses. The fruit is sweet; aphrodisiac, alexiteric, stomachic; improve appetite; usefulness in biliousness.- The oil is digestive: cure "vata" (Ayurveda). The leaves are bitter: corrective, deobstruent, astringent to the bowels, tonic to the liver, diuretic, analgesic, anthelmintic: useful in ozena and other nose troubles, in piles, scabies, leucoderma: lessen inflammation: strengthen the teeth. The seeds have a bitter sharp taste; purgative, tonic to the liver; improve diuresis (Ynani). The tree drives its Persian name (darakht-i-miswak, or tooth brush tree) from the fact that the wood is much employed for the manufacture of tooth-brushes, and it is supposed by the natives that tooth-brushes made of it strengthen the gums, keep them from becoming spongy, and improve digestion. The bark of the stem is a little warm and somewhat acrid, and is recommended by Indian physicians to be used as a decoction in low fever,

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and as a stimulant and tonic in amenorrhoea. The shoots and leaves are pungent, and are considered in the Punjab as an antidote to poisons of all sorts. The juice of the leaves is given in the scurvy. The leaves are used by the country-people in the south of Bombay as an external application in rheumatism. The fruit is said to be administered in Sind, with good effect in cases of snake-bite. [2]

Fresh root bark is used as a vesicant and is employed as an ingredient of snuff. A paste of the root is applied as a substitute of mustard plaster and their decoction is used against gonorrhoea. The extract of the root is used to relieve the pain due to spleen troubles. A decoction of the bark is used as a tonic and stimulant in low fevers. Stem bark is used as an ascariifuge and for gastric troubles. Leaves possess antiscorbutic and astringent properties. A decoction of the leaves is used in the asthma and cough, and a poultice made out of them is applied to painful tumours and piles. They are also used as an external application in rheumatism. Dried leaves in small doses are given with copious amount of water for treatment of flatulent dyspepsia. Fruits possess deobstruent, carminative, diuretic, lithontriptic and stomachic properties and are used in biliousness and rheumatism. Seed oil is applied on the skin in rheumatism. [3]

## PHYTOCHEMISTRY

A sample of seeds yielded a pale yellow solid fat (39.3% yield). Its fatty acid composition was as follows: capric, 1.0; lauric, 19.6; myristic, 54.5; palmitic, 19.5; and oleic, 5.4%. Air dried root bark yields 27.1% ash, containing considerable amounts of salts, mostly as chlorides. It is also reported to contain a fairly large amount of alkaloidal constituents (including trimethyl amine and unidentified alkaloids), small amount of resin and colouring matter, and traces of tannins and saponins. High amounts of fluoride and silica; Sulphure; Vitmin C; Small amount of flavonoids & sterols were also found. The high chloride content helps to remove tartar and stain from the teeth; the silica helps to whiten them; the resin may form a coating over the enamel; trimethylamine has a stimulating effect on the gums; vitamin-c contributes to the healing and repair of the tissues; and the presence of sulfur compounds and alkaloidal content lend antibacterial activity to the product. [1-3] Upon GC-MS analysis of the volatile oil extracted from *Salvadora persica* L. leaves, identified benzyl nitrile, eugenol, thymol, isothymol, eucalyptol, isoterpinolene and beta-caryophyllene. [4]

*Salvadora persica* L. was identified and quantified for some potential anti-microbial anionic components in root and stem aqueous extracts by using capillary electrophoresis techniques. It was evaluated that the root and stem extracts contained chloride, sulphate, thiocyanate and nitrate and concluded that *Salvadora persica* L. contains potential antimicrobial anionic components. [5]

## BIOLOGICALACTIVITY

### Antimicrobial Activity

A study was done to evaluate the *in vitro* and *in vivo* antimicrobial

effects of an alcoholic extract *Salvadora persica* solution as a root canal irrigant and it was compared with the currently used root canal irrigants (5.25% sodium hypochlorite, 0.2% chlorhexidine, and normal saline). The results of *in vitro* antimicrobial effects of an alcoholic extract *Salvadora persica* (1%, 5%, 10%, and 20%), 5.25% sodium hypochlorite, 0.2% chlorhexidine, and normal saline showed that all concentrations, sodium hypochlorite and chlorhexidine had a significant antimicrobial effect against aerobic and anaerobic bacteria recovered from teeth necrotic pulps, while normal saline had no significant antimicrobial effect. The best antimicrobial effect for *Salvadora persica* extract was noticed at 15%, according to broth microdilution method. [6]

The antimicrobial activity of miswak extract was compared with commercially available non-alcohol mouth rinses *in vitro* and evaluated that miswak extract shows low antibacterial activity against *Streptococcus pyogenis*, *Streptococcus mutans*, *Streptococcus faecalis*, *Staphylococcus aureus* and *Staphylococcus epidermidis* compared to mouth rinses containing chlorhexidine and cetylpyridinium chloride. [7]

Scientists worked on subgingival plaque microbial disease in Saudi Arabians after use of miswak chewing stick and toothbrush. They evaluated that in contrast to toothbrush use, miswak (from stem, or root of *Salvadora persica* L.) use significantly reduced the amount of *A. actinomycetemcomitans* in the subgingival plaque. [8]

The oral health efficacy Persica mouth wash (containing an extract of *Salvadora persica*) was compared with that of a placebo. Use of Persica mouthwash resulted in improved gingival health and lower carriage rate of cariogenic bacteria. The placebo (vehicle control) also improved gingival health significantly. Neither the persica nor the placebo reduced the accumulation of dental plaque. [9] The anti-microbial effect of a tooth brush and miswak on cariogenic bacteria was evaluated. The anti-microbial activity of the miswak chewing stick (*Salvadora persica*) was assessed *in vivo*, especially on *streptococcus mutans* and *lactobacilli*. The study was conducted clinically using patients' saliva and measuring the effect of miswak (chewing stick), miswak extract, toothbrush and normal saline on *streptococcus mutans* and *lactobacilli*. It was concluded that *streptococcus mutans* were more susceptible to miswak antimicrobial activity than *lactobacilli*. [10] The effectiveness of antimicrobial activity of extract of *Azadirachta indica* (Neem) and *Salvadora persica* L. (Arak) chewing sticks were compared and reported that Arak extract was more effective at lower concentration against *Streptofecalis* than Neem. [11]

### Anticonvulsant and sedative effect

The anticonvulsant and sedative effect of *Salvadora persica* L. stem extracts was studied. The effect of *Salvadora persica* L. stem extract on the potentiation of sodium pentobarbital activity and on generalized tonic-clonic seizure, produced by pentylenetetrazole (PTZ) on the rat is reported. The extract of *Salvadora persica* L. extended sleeping time and decreased induction time induced by sodium pentobarbital; in addition it showed protection against pentylenetetrazole-

induced convulsion by increasing the latency period and diminishing the death rate. <sup>[12]</sup>

#### Removal of Smear Layer

The effects of aqueous extracts of chewing sticks (*Salvadora persica*) on the healthy and periodontally involved human dentine were evaluated with Scanning Electron Microscopy (SEM) *in vitro*. 25% aqueous extract of freshly prepared miswak solution was used for the study. Twelve human premolars teeth (6 healthy and 6 with periodontal disease) recently extracted for orthodontic and periodontal reasons were used. 24 SEM specimens were prepared and treated with miswak extract with different conditions e.g. soaking and burnishing with miswak extract. Soaking the healthy and periodontally diseased root dentine in miswak extract resulted in partial removal of smear layer and occlusion of tubules was observed in dentine specimens burnished with miswak solution. <sup>[13]</sup>

#### Analgesic Effect

Miswak (The root and branches of *Salvadora persica*) was found to possess a relatively moderate analgesic effect in mice which could be due to interaction with the central and/or peripheral opiate system. <sup>[14]</sup>

#### Ace-Inhibiting Ability

The *Salvadora persica* L. also possessed a high ACE-inhibiting ability *in vitro*. <sup>[15]</sup>

#### Antimycotic Effect

The antimycotic effect of aqueous extract of miswak (*Salvadora persica*) was investigated on *in vitro* growth of *Candida albicans*. Various concentration of aqueous extract of miswak prepared with Sabouraud medium were incubated at 37°C and the turbidity was determined by OD at 600 nm wavelength measured at specific intervals over a period of 48 hr. This antimycotic effect was probably due to one or more of the root contents that included chlorine, trimethylamine, alkaloid resin and sulphur compounds. <sup>[16]</sup>

#### Hypolipidemic Activity

*Salvadora persica* was evaluated in diet-induced rat hypercholesterolemia. The preparation was administered for 15 and 30 days (by gavage at a dose of 500 mg in an aqueous vehicle in a volume of 0.5 ml/100 g b.w.). Cholesterol, HDL, LDL and triglyceride plasma levels were assayed. The results showed that the *Salvadora persica* decoction significantly lowered Cholesterol and LDL plasma level in rats, providing to be more active at 30 days of treatment. The systemic administration of Triton results in a rise in plasma Cholesterol and triglyceride levels. The results obtained show that *Salvadora persica* decoction was inactive at 18 hr after treatment, whereas at 27 hr, it was able to reduce Cholesterol and LDL levels. In all experiments HDL and triglyceride were unchanged. <sup>[17]</sup>

#### Antiplasmodial Activity

Ethnobotanical investigations led to the selection of 19 plant species, used traditionally in Sudan against malaria and similar tropical diseases, for further studies. The antiplasmodial activity of the different extracts of *Salvadora persica* against *P. falciparum* NF54 strain were found to be 0.6 microg/ml (stems) and 0.7 microg/ml (leaves). <sup>[18]</sup>

#### Antibacterial Effect

Using Discs Diffusion Test, it was found that the extract of the leaves has a considerable antibacterial effect on several different oral aerobic bacteria with comparable results to known antibiotics. <sup>[19]</sup>

#### Antiulcer activity

The decoction of *Salvadora persica* possessed significant protection action against ethanol and stress-induced ulcers. This study was confirmed by using optical microscopy. <sup>[20]</sup>

#### CONCLUSION

Extensive literature survey revealed that *Salvadora persica* L. is an important medicinal plant with diverse pharmacological spectrum. Much of the traditional uses have been validated by scientific research. A number of chemicals isolated from plants like the chloride content helps to remove tartar and stain from the teeth; the silica helps to whiten them; the resin may form a coating over the enamel; trimethylamine has a stimulating effect on the gums; vitamin-c contributes to the healing and repair of the tissues; and the presence of sulfur compounds and alkaloidal content lend antibacterial activity to the product. The plant has been extensively studied in terms of pharmacological activity of its major components, and the results indicate potent antimicrobial, anticonvulsant, analgesic, ace-inhibiting, antimycotic, hypolipidemic, antiplasmodial, antibacterial, antiulcer activities. In recent years, emphasis of research has been on utilizing traditional medicines that have a long and proven history of treating various ailments. In this regard, further evaluation needs to be carried out on *Salvadora persica* in order to explore the concealed areas and their practical clinical applications, which can be used for the welfare of the mankind.

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