

PHARMACOLOGICAL AND PHARMACOGNOSTICAL STUDY OF *SALVADORA OLEOIDES*: A REVIEW

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ABSTRACT

Salvadora oleoides belong to the family Salvadoraceae is a small, multipurpose tree commonly grown in western Rajasthan and Gujarat states of India. It is known in India as "Mithi Jal" or "Peelu". Many chemical constituents such as carbohydrates, alkaloids, steroids, glycosides, saponins, tannins, triterpenes, mucilage, fats and oils have been reported from its leaves and stems extracts. Because of the presence of these active chemical constituents it possesses anti-inflammatory, anti-asthmatic, analgesic, anti-ulcer, anthelmintic, antibacterial, antifungal and diuretics.

KEYWORDS: *Salvadora oleoides*, Mithi Jal, Pharmacology, Pharmacognosy.

INTRODUCTION

Salvadora Linn. A small genus of evergreen trees, distributed in tropical Africa and Asia, extending to Egypt, Mascarene Island and China. Two species occur in India i.e., *Salvadora oleoides* and *Salvadora persica* Linn. *Salvadora oleoides*, belong to family Salvadoraceae commonly found in Western region in India.^[1] *Salvadora oleoides* Decne, commonly known in

India as mithi jal is an oil-yielding medicinal and multipurpose tree. It can grow in arid and alkaline conditions.^[2] In Rajasthan it forms dominant part of vegetation of Jodhpur, Barmer, Bikaner, Jaisalmer, Churu, Jhunjhunu and Nagaur. The leaves of *Salvadora oleoides* Decne are used to relieve cough and for treatment of enlarged spleen and fever.^[3]



Fig. 1: Whole plant of *Salvadora oleoides*.

CLASSIFICATION

Kingdom = Plantae
Division = Magnoliophyta
Class = Magnoliopsida
Order = Brassicales
Family = Salvadoraceae
Genus = *Salvadora*
Species = *S.oleiodes*

Vernacular Names

Table: 1 Data showing synonyms of *Salvadora oleoides* in different languages.

| | |
|-----------|---|
| English | Grape of the desert |
| Hindi | Bahapilu, Jal, Jhal, Pilu |
| Punjabi | Jaal |
| Sanskrit | Dhani, Gudaphala, Kallabhavallabha, Karavallabha, Laghupilu, Mahapilu, Piluka, Shakhi, Shyama |
| Tamil | Kalawa, Karkol, Ughaiputtai |
| Telgu | Jalachettu |
| Marathi | Godpilu, Khakan, Kharkanela |
| Urdu | Peelu |
| Gujrati | Moti Pilu, Mithijar |
| Rajasthan | Jaal, Mithi Jaal |
| Arabic | Arak |

HABITAT:^[2,4,5]

Salvadora oleoides commonly known in India as meethi jal and grows naturally by seed germination. This tree is of multipurpose use because of its oil-yielding potential, pharmaceutical application, fodder and fuel values and many others. The plant possesses good medicinal value and is used by people for the treatment of various diseases. It can grow in the coastal area as well as in the non-saline and marginal semi-arid area and alkaline conditions. This species is also suitable for shelterbelts and windbreaks in arid zones and reduce soil erosion.

GEOGRAPHICAL SOURCE:^[3,4]

Salvadora oleoides is found in the subtropical and tropical zones and other arid regions in Asia and Africa, extending to Egypt, the Mascarene Islands and China. This species grows on dry, saline and desert areas of Rajasthan, Haryana, Punjab, Maharashtra, Madhya Pradesh and Gujarat. In Rajasthan it forms dominant part of vegetation of Jodhpur, Pali, Jalore, Barmer, Bikaner, Jaisalmer, Churu, Jhunjhunu and Nagaur. It is distributed to some extent in Andhra Pradesh, Karnataka and Tamil Nadu.

DESCRIPTION:^[3,4,8]

Salvadora oleoides is a shrub or small tree, attaining 6-9m height under favourable conditions.

(a) Root

Short pieces of the root, about the size of goosequill, are used as toothbrushes to clean the teeth.

(b) Stem:^[4]

Stem is short, often twisted or bent, up to 2m in diameter, branches stiff, rough, spreading, often swollen at forks, yellow green, surface glaucous with trichome. The presence of trichomes on branch surface is a distinguishing character of this species.

(c) Leaves:^[4]

Leaves are bluish-green, linear or ovate-lanceolate, leathery and somewhat fleshy, dark greenish-yellow when young, grey when mature and leaf size ranges from 3-10cm x 0.3-1.2cm. New leaves usually appear in April. Its petiole is 2-1.2cm long, lamina 1.5-7.5cm long, 4-1.5cm broad, elliptic-lanceolate, mostly acute, rarely

obtuse or mucronate glabrous with obscure lateral veins. The leaves are fleshy and have a pungent odour.

(d) Inflorescence:^[4]

Inflorescence axillary panicles or branched spikes, 2.5-4cm long often clustered.

(e) Flowers:^[4]

Flowers greenish white, 2-3mm across; pedicel 1mm long or absent. Calyx 1.5-2mm long, with round lobes and wavy margin, divided nearly half way down, glabrous. Corolla 2.5mm long, obovate or oblong; lobes sub-acute and recurved. Stamens 4, inserted at the base of the corolla tube. Style absent and stigma is peltate. The tree generally flowers in March-April.

(f) Fruits:^[4]

Fruit a drupe, clustered, 5mm in diameter, globose, reddish brown fruits or red when dry. They are sweet with a big of pungent taste. In some cases, the fruits are pink and violet. The Fruits can be harvested in June

(g) Seed:^[4]

Seeds are greenish-yellow, about 3mm in diameter, globular, 6.54 μm long and 5.24 μm wide. Seed surface show reticulate pattern with small pits.

Phytochemistry

These species contain important phyto-constituents such as salvadorine, salvadorea, vitamine C, trimethylamine, tannins, glycosides, alkaloids, saponins, Flavonoids, resins, proteins, carbohydrates, mucilage, fatty acids and gums. Leaves of *Salvadora oleoides* contain high concentration of phenolic compounds (25.7%) and stems contain high concentration of hydrocarbons (41.3%). Twenty three chemical constituents were common in the essential oil of both leaves and stems of *Salvadora oleoides*. Among all these compounds methoxy-4-vinylphenol (25.4%), (Z)-cis-3-Hexenyl benzoate (16.8%), phytol (13.9%), n-hexadecanoic acid (6.9%) and trans- β -damascenone (2.1%) were the main constituents of the essential oil of leaves whereas stems contain high concentration of 2- methoxy-4-vinylphenol (21.6%), phytol (12.9%), n-hexadecanoic acid (3.6%), octacosane (7.9%), nonacosane (7.3%), 1-octadecene

(5.8%), heptacosane (5.9%), hexacosane (4.5%), pentacosane (3.4%), squalene (3.9%) and trans- β -damascenone (2.3%).^[3-8]

Constituent Percent (wet basis)

| | |
|--------------------|--------|
| Moisture | 3.1% |
| Total ash | 4.1% |
| Crude fibre | 8.13% |
| Total proteins | 9.60% |
| Total carbohydrate | 72.63% |
| Fat | 10.70% |

n = 3; Means (Standard derivation) of triplicate analysis

Traditional Uses

This tree species is having a number of proven medicinal applications and almost all parts having been found to be pharmaceutically important. Decoction of leaves is given to the cattles to promote the expulsion of dead fetus from the uterus. The leaves are used in dry cough, asthma, digestive disorders, enlarged spleen, rheumatism, low fever, snake bites and conjunctivitis. The leaf paste was applied on an open wound to treat inflammation of legs and its extract was recommended for relief of abdominal pain in new born babies. Leaf juice can also be used for anemic patients. They also possess anti-inflammatory, analgesic and anti-ulcer activities. Fruits are sweet with cooling effect and employed in the treatment of enlarged spleen, rheumatism, low fever, snake bites, piles tumor and bronchitis. Stem possesses an anthelmintic and diuretic activity. Root bark is used as vesicant and also used in the treatment of piles. Seeds are used in the treatment of cough. Seed oil is applied topically in rheumatic pain and in preparation of toothpaste.^[4-9]

Pharmacological Uses

Anti-oxidant activity

Crude extract of fungal endophytes from *S. oleoides* have shown positive activity. The antioxidant potencies of acetone extracts of all fungal were significant as compared to the Methanolic and aqueous extract.^[1,4-7]

Hypoglycemic and hypolipidemic activity

The ethanolic extract of parts of *S. oleoides* produced significant reduction in blood glucose and also showed beneficial effects on the lipid profile in euglycemic as well as alloxan-induced diabetic rats at the end of the treatment period. However, the reduction in the blood glucose and improvement in lipid profile was less than that achieved with the standard drug tolbutamide.^[1,4]

Analgesic activity

Analgesic activity of the successive extracts (chloroform, ethyl acetate, ethanol and aqueous extracts) of powdered leaves at the dose of 500 mg/kg body weight was evaluated using eddy's hot plate method in albino mice. The results of the statistical analysis showed that ethanolic aqueous extracts have significant analgesic activity.^[8]

Antimicrobial activity

Aqueous and organic solvent extracts of different plant parts of *Salvadora oleoides* were screened for antimicrobial activity by the agar well diffusion method and microtitre plate method. Different extracts obtained by Soxhlet extraction method were evaluated for their antimicrobial potential against eight bacterial strains: *Bacillus subtilis*, *Bacillus cereus*, *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Escherichia coli*, *Proteus vulgaris*, *Proteus mirabilis*, *Klebsiella pneumoniae* and three fungal strains: *Aspergillus fumigatus*, *Candida albicans* and *Aspergillus niger*. Benzene extracts of both root and stem possesses highest antibacterial activity with Minimum inhibition Concentration (MIC) of 6.25 to 12.5 mg/ml and MIC of 6.25 to 25 mg/ml respectively. The leaf extract was inactive against all the tested pathogenic microbial strains. Antimicrobial activity of the root and stem benzene extracts were highly significant when compared with standard drug streptomycin (10 μ g).^[8,10]

Anti-inflammatory activity

The anti-inflammatory effect of chloroform, ethyl acetate, alcohol and water extracts of *S. oleoides* leaves were tested on various animal models. All the extracts were tested at the dose of 200 and 400 mg/kg body weight. Out of all the extracts, chloroform and ethyl acetate extracts of leaves of *S. oleoides* does not produce significant anti-inflammatory activity, while alcohol and water extracts, at the dose of 400 mg/kg body weight have shown anti-inflammatory activity. The exhibited anti-inflammatory activity was compared with the standard drug Indomethacin.^[4]

Larvicidal activity

S. oleoides seed oil was tested against larvae of *Aedes aegypti*, *Culex fatigans* and *Anopheles stephensi* at 0.01, 0.1 conc. Out of all the larvae, seed oil showed 100% toxicity against *A. stephensi* at 0.01%.^[4]

Cytotoxicity activity

Two polyamides isolated from Methanolic extract of *S. oleoides* were tested for their cytotoxicity activity against breast, liver and colon cancer cell lines. Both polyamides had shown weak activity against all cell lines. However, good activity was observed against fungus and both gram positive and gram negative bacteria.^[4]

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