



ISSN (E): 2277- 7695  
ISSN (P): 2349-8242  
NAAS Rating: 5.23  
TPI 2021; 10(8): 1201-1204  
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[www.thepharmajournal.com](http://www.thepharmajournal.com)

Received: 06-06-2021

Accepted: 21-07-2021

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## *Salvadora oleoides* (Meethi- JAL): A plant of ecological and medicinal importance

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#### Abstract

*Salvadora oleoides* (Mithi Jal) is a versatile plant provides oil, bioactive compounds with high ecological importance. The *Salvadora oleoides* extract played important role in the production of new medicinal compounds. The fruits, branches, bark, leaves and stem are used to extraction for the determination of different solvent extractive values. The medicinal extracts are associated with many health benefits that can fight against number of diseases. Based on the studies, the current review aims to provide up-to-date information on the cultivation methodology of *Salvadora oleoides* and its anti-bacterial, anti-microbial activities that will help to explore their therapeutic values for future studies.

**Keywords:** Mithi Jal, extractive values, cultivation methodology, anti-bacterial, anti-microbial activities bioactive compounds, diseases

#### Introduction

*Salvadora oleoides* is a multipurpose tree, medicinal enriched oil-yielding tree that belongs to the family Salvadoraceae. The habitat of tree ranges between in subtropical and tropical Africa and Asia. It is widely known in India as “Mithi Jal” or “Peelu”. It is an enabling halophyte plant widely adapted in dryland and arid tracts of India. A large number of today’s drugs has been extracted from the plant parts and played a crucial role in the process of development of new drug in pharmaceutical industry (Farombi, 2003) [8]. The India is blessed by nature with the rich wealth of biodiversity and so known as “Botanical Garden of the World” (Baker, 1995) [5]. In India have a diversity of approximately 45,000 species of plant noticed so far, out of that 7,500 plant species have been known and are used for medicinal research and treatment purposes (MOEF, 1994) [25].

Extract or parts of medicinal are plants are efficiently utilized in the treatment of number of life threatening diseases (Kala, 2005) [15]. This plants of medicinal value may be capable for provide new source or molecule that are significantly affective against microorganisms like antibacterial antiviral and antifungal agents activity. *Salvadora oleoides* plant extract contains terpenoids, phenolic compounds, alkaloid, glycosides and flavanoids, that are frequently used against many microbial activities. The plant extract contains acidic, sweet, sour, appetizer, laxative, carminative (leaves) and stimulant, alexipharmic from stem bark, which are effective in piles, rheumatic pain, tumors, bronchitis, spleen disease, hypoglycaemic, antihyperlipidemic activity, and frequently antimicrobial use (Galati, 1999) [10] and (Naresh *et al.*, 2013) [27].

#### Introduction and Classification

Evergreen *Salvadora oleoides* tree have twisted trunk with numerous drooped branching. The forks are swollen, bark is grey to whitish-grayish colour stem that attains a height of 6-9 meter under growing favorable conditions. Leaves are leathery bluish-green in appearance with linear-or ovate-lanceolate in structure and become grey on mature. The flowering occurs during January to March. The flowers are greenish-white, sessile, and having cup-shaped calyx. The fruits are greenish yellow in beginning and became red brown on maturity. The mature fruits average yield per tree is 10 - 15 kg fresh fruits or 2 - 3 kg dried fruit. The plant fruits have slightly pungent aromatic, peppery and sweet in taste and ripen fruits may be eaten as raw. Tree also contains fructose, glucose, and sucrose in fruits and are also used in fermented drinks. Dry and arid region are best habitat in India for *Salvadora oleoides*. The Salvadoraceae family has three genera and twelve species that are largely distributed in subtropical and tropical Africa and Asia continent (Farombi, 2003) [8]. The fruits of tree also called as desert grapes.

## Phytochemistry

The *Salvadora oleoides* plant contains high concentration of useful medicinal extracts shown in Table 1. follows as

**Table 1:** Extract oil from different parts of *Salvadora oleoides*

Sr No	Plant Part	Compound	Percentage	References
1	Leaves	Phenolic compounds	25.7	Kala (2005) <sup>[15]</sup> (Singh <i>et al</i> 1996) <sup>[30]</sup> , Gautam & Vidyasagar (2011) <sup>[11]</sup> Ali <i>et al.</i> , (2002) <sup>[2]</sup>
		Methoxy-4-vinylphenol	25.4	
		Trans- $\beta$ -damascenone	2.1	
		N-hexadecanoic acid	6.9	
		Phytol	13.9	
		(Z)-cis-3-Hexenyl benzoate	16.8	
2	Stem	Hydrocarbons	1.34	
		2- methoxy-4-vinylphenol	21.6	
		Octacosane	7.9	
		Squalene	3.9	
		Heptacosane	5.9	
		Nonacosane	7.3	
		1-octadecene	5.8	
		Pentacosane	3.4	
		Hexacosane	4.5	
		N-hexadecanoic acid	3.6	
		Phytol	12.9	
		Trans- $\beta$ -damascenone	2.3	
3	Seed	Myristic acid	28.4	
		Linoleic acid	1.3	
		Oleic acid	12	
		Lauric acid	47.2	
		Lalmitic acid	28.4	
4	Roots, fruit and other	Salvadorine, chlorides, salvadoura, alkaloids, vitamin C		
5	Aerial parts extract (Methanolic)	4-hydroxy benzoic acid, amino acids, $\beta$ -sitosterol, stearic acid, ursolic acid, lupeol, $\beta$ – amyryn, gums, Trimethylamine, saponins, oleanolic acid, $\beta$ – sitosterol-3- O- $\beta$ –3 $\beta$ - erythrodiol, resins, proteins, noctacosanol, tannins, carbohydrates, D- glucoside, tetracosone fatty acids, mucilage, dibenzylurea, and flavonoids		

**Table 2:** Show the plant of morphological and characterstics

Plant part	Morphological Characteristics	Uses	Reference
Leaves	bluish-green, fleshy, dark greenish-to grey when maturity	Widely used in tonic for liver health, scabies, diuretic, analgesic, nasal infections, an antidote to poison, teeth strengthening, leukoderma, and inflammation	Arora <i>et al.</i> , (2014) <sup>[4]</sup>
		Scurvy treatment	Jain and Saxena, 1984 <sup>[14]</sup>
		Cure of anus piles	Upadhyay <i>et al.</i> , 2010 <sup>[32]</sup>
		Cure for enlarged spleen, rheumatism, snake bites, coughs and low fever,	Kirtikar & Basu, 1984 <sup>[21]</sup> Khan, 1996a <sup>[20]</sup> , Iqbal, 2011 <sup>[13]</sup>
		Water mixed paste used for opacity of cornea	Katewa and Galav, 2006 <sup>[17]</sup>
		Placenta retention	Kumar <i>et al.</i> , 2008 <sup>[23]</sup>
Fruits	Drupe, clustered, reddish brown fruits	Conjunctivitis	Jain and Saxena, 1984 <sup>[14]</sup>
		Cure enlarged spleen and rheumatic fever	Sharma <i>et al.</i> , 1992 <sup>[28]</sup>
		Aphrodisiac	Khan, 1996a <sup>[20]</sup>
		Rheumatism treatment	Kumar <i>et al.</i> , 2008 <sup>[23]</sup>
		Constipation, indigestion and stomatitis	Katewa and Galav, 2006 <sup>[17]</sup>
Roots and bark		Cooling effect	Kumar <i>et al.</i> , 2008 <sup>[23]</sup>
		Treatments for tumors, bronchitis, spleen diseases, opens pores of body expectorant, diuretic and	Iqbal <i>et al.</i> , 2011 <sup>[13]</sup>
		Ash used for killing mange and removing hair, fever treatment	Badshah and Hussain, 2011 <sup>[6]</sup>
Seeds		Regulate the menstrual periods	Kumar <i>et al.</i> , 2008 <sup>[23]</sup>
		Making toothpaste for clearing teeth, a tonic in amenorrhea	Almas <i>et al.</i> , 2005 <sup>[3]</sup>
Seeds		Cure camel bite, rheumatic pain, stomachache, eye disease, body pain, catarrhal fever, headache and earache, preserving nerve blood flow	Iqbal <i>et al.</i> , 2011 <sup>[13]</sup> Kumar <i>et al.</i> , 2017 <sup>[22]</sup>

## Extraction Methods

Different methods are used to extraction from Jaal plant for the determination of solvent extractive value (Mukherjee, 2002) <sup>[26]</sup>, determination of extractive value (water soluble), extractive value (alcohol soluble), extractive value (ether

soluble), chloroform test and Moisture Content (w/w%) were studied and reordered for different extracts values in air dried samples of *Salvadora oleoides* shown in Table 3 & 4. (Harborne, (1984) <sup>[12]</sup>, Mukherjee, (2002) <sup>[26]</sup>.

**Table 3:** Solvent Extractive Value Drug by different methods

Extractive Value (%) (Drug Solvent)	Extract value w/w% (water)	Extract value (w/w%) (alcohol)	Extractive value (w/w%) (Ether)	Moisture content (w/w%)
<i>Salvadora oleoides</i>	21.05	10.20	4.75	3.1

**Table 4:** Physico-chemical properties

Extractive Value (%) (Drug Solvent)	Ash value total (w/w%)	Ash value (w/w%) (Acid insoluble)	Ash value (%) (water soluble)	Organic Matter (% w/w)
<i>Salvadora oleoides</i>	0.7	4.1	0.5	0.8

### Biological and medicinal importance

The *Salvadora oleoides* tree grows in moderately saline soils of dryland areas and desert tract. The evergreen *Salvadora oleoides* tree have twisted trunk with drooping branches. The flowers are greenish white in colour and the fruit are smooth globose berry type that becomes yellow to red on maturity and have single seeds. The flowering and fruiting occurs between months of March to June. The various plant parts can be used for different purpose like, sweet raw fruit for cooling effect in stomach, branches and roots as tooth brush utilized for dental care. Seed oil and paste are used for treatment rheumatism (Kumar *et al.*, 2005) [24]. The plant can be propagated by nursery sowing and after that transplanted in monsoon season. The tree also regenerates by vegetative means by root suckers. The plant suckers have very high capacity to form a ring around main stem and this morphological characteristic make this tree highly suitable for shelterbelts and as windbreaks in dry tracks. The wider adaptability and capability to withstand in adverse condition, it is widely used in land reclamation projects. It is a very important tree for diversity management, re-clothing bare and dry tracts in the Sind-Punjab region (Gamble, 1975) [9]. It contains 15 times more calcium than wheat (Anon, 2020) [1].

### National and social importance

*Salvadora oleoides* a evergreen plant and also have higher root to shoot ratio, which keep continuous supply of water, that's why the plant keeps its canopy green in the hot summers. It is facultative halophytes as well as mesomorphic xerophytes. *Salvadora oleoides* leaves are excellent fodder source. The stem and branches are used for cooking in rural areas. Non-edible oil are found in the seeds. The oil extracted from *Salvadora oleoides* is used as substitute of coconut is in soap and detergent production industries. The *Salvadora* oil is used by companies like, Tata Oil Mills Godrej Soaps Ltd. and Hindustan Lever Ltd. etc (Rao, *et al.*, 2004) [33]. The dense branching, evergreen capability and free from thorns make it a ideal habitat for domestic animals and wildlife against adverse environmental conditions. The temperatures under *Salvadora* canopy in summer are often up to 8°C lower than surrounding environments. It provides a habitat for different types of birds (nesting), lizards, rodents (burrows), mammals and snakes (Zodape and Indusekhar, 1997) [34]. The fruit of *Salvadora sp.* is also relished by a variety of insects rodents and birds (Khan,1996) [20]. The *Salvadora persica* recently considered as a natural source of benzylamides (Khalil, 2006) [18]. The soils of dry area are sandy and deficient in organic nutrients, *Salvadora sp.* through standing biomass or by litter formation helps in establishing soil fertility. The lateral and vertical extensions of the root suckers along with dense canopy covers protect the soil from wind erosion and used in land scaping. The *Salvadora species* may play an important role in reforestation, of the degraded arid tract and provides shelter for wildlife, fodder for livestock, branching for

thatching, fruits for eating, and recreation for inhabitants of local areas. Interestingly, *Salvadora oleoides* can also have the adaptation mechanism for survival in waterlogging conditions. *Salvadora persica* is salt tolerant plant, so use in restoration of highly saline soils. Major threat of irrigation schemes are water logging and increased salinity, bio-drainage through appropriate plantations in dry arid regions. The *Salvadora sp.* is cost effective plant for reclamation of waterlogged and saline areas, (Kapoor (1998) [16] and Tewari, (1997) [31].

### Future prospects

The extracts isolated from *Salvadora sp.* have broad spectrum of biological, antimicrobial, antiviral and antimicrobial properties. The preparations made from the plant parts are safe and exhibited additional biological effects like, antifever, antigingival, antioxidant, irritation and antiplatelet-aggression effect. The extract of *Salvadora oleoides* has higher antimicrobial activity against fever along with cooling effect. Based on the pharmacological and chemical properties, this species can be proved beneficial even against COVID-19 which is causing worldwide havoc in current era.

### Preservation or reclamation

Over exploitation, poor viability of seeds, limited seed set and inefficient vegetative propagation are the major reasons for continuously decreasing population of *S. oleoides* Singh (2004) [29] and Dwivedi (1993) [7]. This tree provide shelter space for variety of insects, birds and rodents due to Canopy density of *Salvadora*. The vertical and lateral extensions of the root system act as a windbreak that helps in prevention of soil erosion. *S. oleoides* is a very important and useful species in degraded soil restoration programs in dry tracts. The morphological and phenological characteristics make it a ideal plant for fodder, wildlife conservation and inhabitants recreation belongs to the specific ecological region. *Salvadora oleoides* tree is capable of survive even in prolonged waterlogged situation. The excess ground water or excess salt can be removed through bio-drainage activity of *Salvadora oleoides* in land reclamation projects. It can also be very helpful in increasing forest / medicinal area of India by flourishing regional biodiversity. It can also provide the multipurpose endangered plants from Indian diversity pool bank

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