

Significant Role of *Salvadora oleoides* with its Medicinal, Economic & Environmental Impact: with special reference to Dudhwakhara, Churu district

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Abstract—*Salvadora oleoides* plays a significant role in various aspects including medicinal, socio-economic and environmental impacts on the desert conditions of Rajasthan and the rural livelihoods dependent on it. It plays a valuable role due to its high medicinal value, role as a soil stabilizer and many other beneficial components. The present study critically examines the multifaceted role of *Salvadora oleoides* spanning economic utility, medicinal relevance, and environmental impact within the arid landscape of Dudhwakhara, Churu. Economically, the tree provides wood, fodder, and fruit, supporting local rural income. Medicinally, various parts of the plant are used in traditional remedies for ailments such as toothache, skin infections, and digestive disorders. *Salvadora oleoides* serves as a key species for land restoration in arid zones, aiding in the control of desertification, strengthening dune structures, and enriching soil fertility.

Keywords—*Salvadora oleoides*, Dudhwakhara, medicinal value, arid region, sustainable rural ecology, environmental impact.

I. INTRODUCTION

Rajasthan, the largest state of India, is predominantly arid and semi-arid in nature, with vast stretches and covering its western and northern regions. Churu, located in the northeastern belt of Rajasthan, experiences intense climatic extremes such as scanty rainfall, high and low temperature variations, and supports ecologically fragile systems. Dudhwakhara Situated in the Churu district, the village exemplifies a semi-rural ecosystem embedded within a hyper-arid desert zone, where traditional ecological knowledge forms the backbone of sustainable livelihood practices. The local population has adapted over generations to live in harmony with the harsh desert environment. In such ecologically vulnerable regions, native plant species play a critical role in supporting livelihoods, maintaining ecological balance, and preserving traditional knowledge systems. Among these native flora, *Salvadora oleoides* which is locally referred to as “Pilu” or “Khara Jaal” have significant importance in this area. This resilient species adapts well to saline and water-scarce soils, thriving even under harsh desert conditions and holds deep-rooted significance in the economic, medicinal, and environmental aspects of life of Dudhwakhara and its surrounding areas. Dudhwakhara spans approximately 4295.85 hectares and is known for its arid landscape and distinct vegetation. Among its natural features, the *Salvadora* species stands out prominently, covering nearly 50 hectares of land. Interestingly, these trees are not confined to forested zones; they are widely distributed around community water bodies (locally called bheed bani or johads) and along the boundaries of agricultural fields throughout the region. This abundant and accessible presence of *Salvadora* vegetation makes it a highly suitable subject for field research. Its occurrence across both community-managed commons and privately owned farmland offers a diverse ecological context, enabling comprehensive observation and data collection.

Given these factors, *Salvadora* was chosen as the focus of this study not only because of its ecological abundance but also due to its integration with the rural landscape and traditional land-use practices. This allowed for the examination of both the biological characteristics and the socio-environmental relationships associated with the species, making it a rich subject for in-depth research. This research aims to comprehensively examine the economic, medicinal, and environmental contributions of *Salvadora oleoides* in the Dudhwakhara region of Churu district. By combining field surveys, traditional knowledge, and a review of scientific literature, the study seeks to highlight the multifaceted value of this species and advocate for its integrated conservation and propagation. The findings are expected to support rural development strategies, promote climate-resilient agriculture, and encourage the inclusion of *S. oleoides* in regional agroforestry and reforestation programs.

A. Study Area

Positioned at the edge of the Thar Desert, Churu district in northeastern Rajasthan acts as a transition zone into arid landscapes. With its dry climate and frequent sand formations, the region experiences minimal vegetative cover and faces critical groundwater scarcity, typical of arid Rajasthan. Churu tehsil, forming an integral part of Churu district, lies in a zone classified as semi-arid under the agro-climatic categorization of the region. The region is distinguished by its harsh climatic extremes, where summer temperatures often exceed 48 °C, while winter temperatures can dip below 2 °C. Owing to scanty rainfall and elevated evapotranspiration rates, vegetation in the region remains limited, with dominance of xerophytic shrubs and resilient tree species adapted to arid conditions. Dudhwakhara is a large revenue village situated in Churu tehsil. It is geographically located at approximately 28.476836° N latitude and 75.086869° E longitude, covering a total area of 4295.85 hectares.

1). Vegetation and land uses

Out of the total village area (4295.85 hectares), approximately 160 hectares are covered under dense vegetation, which includes a mix of grasses, herbs, shrubs and trees. This natural vegetation reflects the adaptive ecological characteristics of the region, where drought-resistant species dominate due to low rainfall and high evapotranspiration. A significant portion of the vegetation also includes extensive grasslands, which support livestock grazing and contribute to the local pastoral economy. These grasslands are composed of native grasses that are well-adapted to arid conditions and play a vital role in soil conservation and moisture retention. Among the 160 hectares of vegetative land, an estimated 50 hectares are naturally populated by *Salvadora* species — mainly *Salvadora oleoides* and *Salvadora persica*. These species are widely distributed across:

- Agricultural field boundaries
- Community grazing lands
- Traditional water bodies

“Their widespread occurrence in diverse land-use zones enhances their value as an ecologically important and socially relevant species, warranting in-depth field-based analysis.”

2). Demographic Profile (Census 2011)

According to data from the 2011 Census of India, the village of Dudhwakhara had a population of 6,240 individuals, including 3,173 males and 3,067 females. The population density is moderate, and most families are engaged in subsistence agriculture, animal husbandry, and seasonal labor. The village has educational institutions, local governance bodies (Panchayat), and basic health infrastructure.

3). Soil and Climate Characteristics

- The climatic, topographical, and environmental conditions of Dudhwakhara are described below-
- Soil type: Coarse sandy soil, low in nutrients and moisture retention:
- Climate: Semi-arid
- Summer temperatures: Often exceed 48°C
- Winter temperatures: Can drop to 1–2°C
- Annual rainfall: Approximately 300–350 mm (District Meteorological Report, 2021).
- Average humidity: 40%–60%, lowest in May–June

These harsh climatic conditions support only hardy, drought-resistant species, yet the local flora and fauna reflect high ecological resilience.

4). Socio-Environmental Aspects

Dudhwakhara exemplifies how social systems and environmental resources are intricately interwoven in a semi-arid rural setting. Its traditional ecological knowledge, community-based land management, and adaptive livelihood strategies provide valuable insights into sustainable development and climate resilience at the village level. The integration of *Salvadora oleoides* into local practices highlights the symbiotic relationship between society and the natural landscape.

B. Review of literature

Several previous studies have acknowledged the ecological and medicinal importance of *Salvadora oleoides*. According to Sharma & Tiagi (1979), this species is naturally distributed in dry tropical and subtropical regions of India and contributes to dune stabilization and soil conservation. Kirtikar & Basu (1935) provided early documentation on its medicinal properties, citing the use of its twigs as traditional toothbrushes and its application in treating oral and digestive disorders. More recent ethnobotanical research by Singh et al. (2014) in western Rajasthan highlights its role in local healthcare systems, where it is used to treat ailments such as skin diseases, coughs, and joint pain. Furthermore, studies by Meena & Yadav (2017) observed that *S. oleoides* significantly contributes to agroforestry practices in Rajasthan, providing fodder, fuelwood, and edible fruits, thereby enhancing economic resilience in drought-prone areas. Despite its multipurpose value, *Salvadora oleoides* remains an under-documented and underutilized species, especially in the specific context of rural Rajasthan. In the Dudhwakhara region, where conventional agriculture faces frequent failure due to erratic climate, such hardy native species offer a sustainable alternative for livelihood support, biodiversity conservation, and land restoration.

II. OBJECTIVES

- To analyze the ecological role of *Salvadora oleoides* in soil conservation, microclimate regulation, and biodiversity support in a semi-arid environment dynamics of Dudhwakhara, with special reference to *Salvadora oleoides*.
- To examine the socio-economic importance of *Salvadora oleoides* in rural livelihoods, including its use as fodder, fuelwood, and traditional medicine.

- To document the medicinal uses of *Salvadora oleoides* in traditional rural healthcare, including its use in treating dental, digestive, and skin-related ailments.

III. METHODOLOGY

This study on *Salvadora oleoides* in Dudhwakhara village was conducted using a multi-method approach, combining field investigation, community interaction, and secondary data analysis to ensure the depth and reliability of findings.

A. Field visits and site observation

Extensive field surveys were conducted in different parts of Dudhwakhara village, including agricultural fields, grazing lands, and traditional water bodies, to identify and map the natural occurrence of *Salvadora oleoides*. Direct on-site observations were made to assess plant density, health, and land-use patterns.

Photographic documentation and field notes were maintained for visual and spatial referencing.



Fig.1. Photos of *Salvadora oleoides* community at Dudhwakhara

B. Community Interaction and Local Knowledge

Structured and semi-structured interviews were carried out with local villagers, particularly pastoralists (sheep and goat rearers), farmers, and village elders. Information was gathered on: Traditional uses of *Salvadora oleoides* (medicinal, fodder, fuel), Conservation practices and beliefs and Historical patterns of vegetation and climate change. Question–Answer sessions and informal discussions were also used to explore folk knowledge and lived experiences.

C. Secondary data collection

Relevant climatic, demographic, and vegetation data were obtained from official sources such as:

- Rajasthan Government portals
- Census of India (2011)
- Churu district environmental and agricultural reports
- Maps and geo-coordinates were used to understand the geographical setting and landscape features.

D. Literature review and academic analysis

A comprehensive review of national and international research articles was undertaken to contextualize the findings. Academic sources were studied for:

- Ecological roles of *Salvadora oleoides*
- Relevance in arid and semi-arid ecosystem management
- Literature findings were compared with field observations for cross-validation.

IV. RESULT

This study on *Salvadora oleoides* in Dudhwakhara village was conducted using a multi-method approach, combining field investigation, community interaction, and secondary data analysis to ensure the depth and reliability of findings.

A. Medicinal applications

Salvadora oleoides has been recognized for its therapeutic potential in traditional medicine. Its medicinal applications are supported by both ethnobotanical practices and preliminary pharmacological studies.

TABLE.1. MEDICINAL VALUE OF VARIOUS PARTS OF *SALVADORA OLEOIDES*

Plant parts	Properties	Uses
Stem	Anti-fatigue Anti-hypoxia Anti-oxidant Anti-inflammatory	Used for making chewing sticks for oral hygiene. The twigs used as a natural analgesic for the treatment of toothaches.
Root	Anti-inflammatory Anti-microbial Anti-oxidative Anti-hyperlipidemic	Used in traditional medicine Root for treating piles, rheumatic pain, tumors, bronchitis, and spleen diseases.
Leaves	Anti-oxidant Anti-cancer Anti-diabetic	Used in traditional medicine for treating rheumatism, piles, scabies and leukoderma.
Fruit	Anti-ulcer Anti-fungal Anti-parasitic Anti-bacterial	Used in traditional medicine to treat cough, rheumatism, and as a blood purifier. Good source of minerals

B. Economic contributions

- *Salvadora oleoides* is a valuable fodder resource especially during dry seasons. Vegetation is scarce. Local goat and sheep rearers depend on its leaves and small branches.
- Local healers often collect and sell bark for herbal remedies.
- The woody stems are used for making fences and shelters, reducing dependency on commercial timber, Its branches are widely used as fuelwood, reducing the cost of cooking energy for rural households.
- The sweet and edible fruits of *S. oleoides* are a source of food and income for local communities. They also yield non-edible oil used in soap-making and as a lubricant, adding value for cottage industries.
- The seed oil is a source of non-edible lipids used in industrial applications and also used in manufacturing of candles. After oil extraction, the remaining cake is utilized as nutritious animal fodder.



A. (Stem)



B. (Roots)



C. (Leaves)



D. (Fruits)

Fig.2. Photos of various parts of *Salvadora oleoides*.

C. Ecological and environmental contributions

- Soil Erosion Control -The plant's deep root network effectively anchors loose soil, reducing erosion by both wind and water. It is especially effective in sandy and degraded soils.
- Combating Desertification -Being drought-resistant and salt-tolerant, *Salvadora* helps stabilize drylands and semi-arid regions. Its ability to grow in harsh, saline conditions makes it a key species for reclaiming desertified land.
- Improving Soil Fertility -Fallen leaves and organic matter from the tree enrich the soil over time. Its presence supports microflora activity, gradually improving soil quality.

- Microclimate Regulation -By providing shade and retaining moisture in the upper soil layer, *Salvadora* contributes to lowering ground temperature and creating favorable microclimates for other plant species.
- Rainfall Enhancement (Indirect Role) -Large-scale plantation of native trees like *Salvadora* contributes to moisture recycling through transpiration, which can potentially aid local precipitation patterns over time.
- Carbon Sequestration -*Salvadora* absorbs carbon dioxide from the atmosphere and stores carbon in its biomass, playing a role in mitigating climate change.
- Biodiversity Support -The plant provides habitat and food for birds, insects, and small mammals, thus supporting ecological balance in arid landscapes.

V. CONCLUSION

Salvadora oleoides represents a resilient native species contributing significantly to sustainable livelihoods and ecological restoration in arid zones. Rooted in the harsh soils of arid and semi-arid regions, this species exemplifies nature's resilience and humanity's deeprooted relationship with indigenous flora. Through generations, its roots have not only held the soil together but have also preserved the wisdom of traditional medicine, sustained pastoral economies, and nourished hopes of ecological restoration. What makes *Salvadora oleoides* extraordinary is not just its medicinal chemistry or economic versatility, but its ability to quietly engineer balance — between man and nature, tradition and science, survival and sustainability. It combats desertification without demanding attention, supports biodiversity without cultivation, and offers healing without industrial processing. In an age where ecological degradation and climate crises dominate global narratives, *Salvadora oleoides* stands as a native solution rooted in local knowledge. Its revival is not just a matter of environmental urgency but also of cultural revival and economic dignity for communities that have safeguarded its legacy for centuries. Thus, this research does not merely conclude with data — it culminates in a call to recognize, respect, and restore the rightful place of *Salvadora oleoides* in both our landscapes and our consciousness. This study on *Salvadora oleoides* in Dudhwakhara village was conducted using a multi-method approach, combining field titigation, community interaction, and secondary data analysis to ensure the depth and reliability of findings.

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