DRA Annual International Conference On
Developed India @2047: Global Pathways for Sustainable Socio- Economic, Linguistic, Science and Technological Transformation

Ind. Jr. of Mod. Res. and Rev *PEER-REVIEWED JOURNAL* *Volume 4 [Special Issue 1] Year 2026*

Indian Journal of Modern Research and Reviews

This Journal is a member of the *'Committee on Publication Ethics'*

Online ISSN:2584-184X

Research Article

Sustainable Conservation of *Salvadora Persica* Through Identification of Seed Production Area in Rajasthan

Desha Meena
Scientist, Thana Ram Rathore (Chief Technical Officer), Ganpat Deora (Field Assistant),
Genetics and Tree Improvement Division, Arid Forest Research Institute, New Pali Road, Jodhpur Rajasthan, India

Corresponding Author: *Desha Meena

DOI: https://doi.org/10.5281/zenodo.19658620

Abstract

Salvadora persica (commonly called the toothbrush tree or miswak) is a hardy plant well adapted to desert and arid ecosystems. It has deep root systems that help it to access groundwater and stabilize sandy soils. The plant tolerates high salinity and drought, making it important for preventing soil erosion in deserts. It also provides shade, shelter, and food for desert wildlife, supporting ecosystem balance. The present study aims to identify seed production areas for *Salvadora persica* as an effective strategy for the conservation of the species in desert ecosystems. For this, a reconnaissance survey was carried out in Rajasthan and five potential seed stands were identified from Jodhpur (one), Churu (one), Balotra (three) districts of Rajasthan. Quadrats of 30*30m were laid down at each of the surveyed stands for inter-comparison between seed stands for desirable traits. The scoring and comparative assessment for quantitative traits and qualitative traits were performed and ranked them in descending order for screening of superior seed stands on top and inferior at the bottom. Selecting healthy and genetically superior populations ensures the availability of quality seeds for restoration and afforestation programs. This approach supports sustainable regeneration, maintains genetic diversity, and strengthens the long-term survival of the species in arid regions.

Manuscript Information

- **ISSN No:** 2584-184X
- **Received:** 16-03-2026
- **Accepted:** 17-04-2026
- **Published:** 20-04-2026
- **MRR:**4(SP1); 2026: 88-91

- **Plagiarism Checked:** Yes
- **Peer Review Process:** Yes

How to Cite this Article

Meena D. Sustainable Conservation of *Salvadora Persica* Through Identification of Seed Production Area in Rajasthan. Indian J Mod Res Rev. 2026;4(SP1): 88-91.

Access this Article Online

www.mrrjournal.in

KEYWORDS: Conservation, Ecosystem, Restoration, Salinity, Seed production areas, Traits

1. INTRODUCTION

Arid and semi-arid regions cover a significant portion of India, with Rajasthan representing the largest expanse of desert ecosystem. Vegetation in these regions plays a critical role in combating desertification, stabilizing soils, conserving biodiversity, and supporting rural livelihoods. For ecological restoration and sustainable land management, tree species adapted to harsh climatic conditions of arid and semi-arid regions plays an important role.

Salvadora persica (family Salvadoraceae), commonly known as the toothbrush tree or miswak, is an important drought and salt-tolerant species native to arid and semi-arid regions of India (Kumar *et al.,* 2012) [5]. This species is characterized by a deep and extensive root system, enabling it to access groundwater and survive prolonged droughts (Tewari, 1995; Singh and Saxena, 1998) [7, 6]. It thrives well on saline, sandy, and degraded soils where few other tree species can survive and grows well. In addition to its ecological significance, *S. persica* holds medicinal, cultural, and economic importance, particularly due to its use in traditional oral hygiene practices (Azizan *et al.,* 2025; Bohra *et al.,* 2021) [1, 2].

Despite its adaptability, natural populations of *S. persica* are under threat due to overexploitation, land-use changes, overgrazing, and lack of systematic conservation measures. The natural regeneration of this species is often poor, primarily due to grazing pressure and limited availability of quality seeds. Thus, for sustainable supply of genetically superior seeds, identification of seed production areas (SPAs) can be a solution and proven strategy in forest tree improvement and conservation programs. Seed production areas are selected natural stands managed to produce high-quality seeds while maintaining genetic diversity (Zobel 1978; Zobel and Talbert 2003) [8, 9]. Establishing SPAs of *S. persica* can significantly enhance restoration efforts in arid zones (Singh and Saxena, 1998) [6]. The present study was undertaken to identify and evaluate potential seed stands of *S. persica* in Rajasthan, with the objective of selecting superior populations for sustainable conservation and afforestation programs.

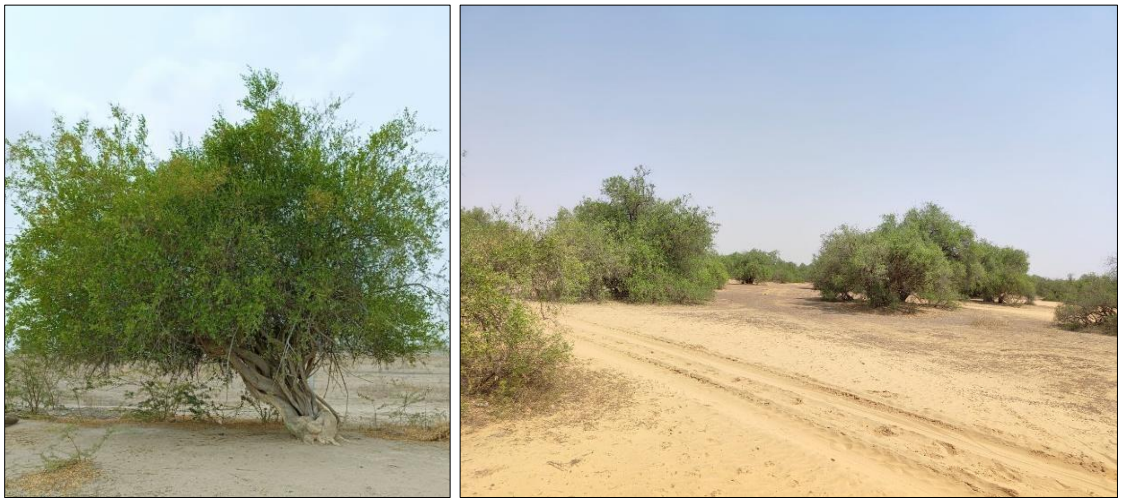

Fig 1: Close up of Tree and Natural stand of *Salvadora persica*

2. MATERIALS AND METHODS

Study Area

The study was conducted in arid regions of Rajasthan, India, characterized by extreme temperatures, low and erratic rainfall, sandy soils, and high evapotranspiration rates.

Reconnaissance Survey and Selection of Seed Stands

Preliminary field visits were conducted in Rajasthan to locate naturally occurring populations of *S. persica* stands with healthy, mature, well-distributed trees and based on population density, tree vigor, seed bearing potential and accessibility. Special emphasis was given to stands showing good regeneration, minimal anthropogenic disturbance, and uniform growth characteristics.

Sampling Design

At each selected seed stand, a quadrat of 30 × 30 m was laid randomly. All *S. persica* trees within the quadrat were enumerated and assessed for various phenotypic traits. The quadrat size was chosen to adequately represent stand structure and variability.

Assessment of Quantitative and Qualitative Traits

The evaluation of seed stands was carried out using both quantitative and qualitative traits commonly employed in forest tree selection.

Quantitative traits included:

- Tree height (m)

- Diameter at breast height (DBH, cm)
- Crown spread
- Number of fruiting branches
- Flowering and fruiting percentage

Qualitative traits included:

- Tree health and vigor
- Stem straightness
- Disease and pest incidence
- Overall phenotypic appearance

Each trait was scored using point grade method and ccomposite scores were calculated for each stand to facilitate comparative analysis.

Scoring and Ranking

Based on the cumulative scores of quantitative and qualitative traits, the seed stands were ranked in descending order. The highest-ranking stands were considered superior and suitable for designation as seed production areas, while lower-ranking stands were considered relatively inferior.

3. RESULTS AND DISCUSSION

The exhaustive surveys were carried out in Rajasthan and five potential seed stands of *S.persica* were identified and marked from Jodhpur (1stand), Churu (1stand), and Balotra districts (3 stands). The quadrants of 30*30m were laid down at each of the surveyed stands and trees falling in quadrates were individually marked and data were recorded for various quantitative and qualitative traits. For each trait in each tree, proper scores were recorded in the sample plot following point grade method. The scoring and comparative assessment of seeds stands of *S.persica* in Rajasthan is presented in Table 1. All these stands were ranked in a descending order based on the average score of all the trees in the sample plots representing them. After sample plot analysis, superior seed stands were identified. The stands belong to Bilara with an average score of 13.66 ranked first followed by stand identified at Balotra with an average score of 12.30,11.06,11.0. The results clearly indicate that *S. persica* stands at Bilara are in comparatively better condition and exhibit superior growth attributes. In contrast, the stands at Churu showed comparatively lower performance. The scoring-based comparative assessment proved effective in differentiating stand quality and can be reliably used for prioritization, conservation planning, and site-specific management interventions. These identified superior seed stand will be further converted into seed production areas by removing the inferior trees from the stands in near future and recognized as seed production areas (SPA) for the species.

Table 1: The scoring and comparative assessment of *S.persica* based on quantitative traits

Species	Site	Location	Plot No.	Avg H (m)	GBH (cm)	Score
Salvadora persica	1	Talchhapar, Churu	1	10.50	133.00	16
			2	8.10	157.00	8
			3	8.66	188.33	7
			Avg.	9.09	159.44	10.3
	2	Range-Bilara, Forest block-Haripura Jode, Jodhpur	1	6.50	147.50	20
			2	8.00	155.00	12
			3	11.00	185.00	9
			Avg.	8.50	162.50	13.66
	3	Range- Siwana, Forest block- kharantiya, Balotra	1	9.50	127.00	16
			2	8.0	142.00	8
			3	8.98	112.00	9
			Avg.	8.82	127.00	11.0
	4	Range- Siwana, Forest block- kotadi, Balotra	1	9.0	119.0	18
			2	6.5	136.0	9
			3	7.30	143.0	8
			Avg.	7.6	132.6	11.06
	5	Range- Balotra, Forest block- Tilwara, Balotra	1	8.3	126.0	21
			2	9.8	142.2	8
			3	8.9	130.0	8
			Avg.	9.0	311.3	12.30

The identification of superior seed stands of *S. persica* is a crucial step toward its sustainable conservation and utilization in arid ecosystems. Considerable variation was observed among the five seed stands with respect to growth, vigor, and seed production traits. Stands located in Churu district generally exhibited better performance in terms of tree vigor, crown development, and fruiting intensity, possibly due to favourable micro-site conditions. The assessment of quantitative traits like tree height and DBH varied significantly among stands. Superior stands showed taller trees with broader crowns and higher fruit-bearing capacity, indicating better genetic potential for seed production. Similarly, the qualitative trait evaluation

revealed noticeable differences in crown form, stem quality, and overall tree health and superior stands exhibited well-formed crowns, minimal pest or disease symptoms, and robust growth. Based on cumulative scoring, the seed stands were ranked from highest to lowest. One stand from Bilara emerged as the most promising seed production area, followed by the remaining Balotra stands, while the stands from Churu ranked relatively lower. Observed variations among seed stands may be attributed to genetic differences, site conditions, and management history. Selection of high-performing stands ensures availability of genetically superior seeds with better germination, survival, and growth potential.

The use of phenotypic traits for SPA selection is widely accepted in tree improvement programs, particularly for species with limited genetic studies. Establishing SPAs from natural populations helps maintain local adaptation while enhancing seed quality (Goel and Behl 2001) [4]. For arid zone species like *S. persica*, this approach is especially important due to harsh environmental conditions and limited regeneration opportunities. Furthermore, *S. persica* contributes to soil stabilization, salinity tolerance, and biodiversity conservation. Therefore, promoting its plantation using quality seeds from SPAs can significantly strengthen desert afforestation and land restoration initiatives in Rajasthan.

4. CONCLUSION

The present study successfully identified and evaluated potential seed production areas of *S. persica* in Rajasthan. Significant variation among seed stands enabled the selection of genetically superior and healthy populations suitable for seed collection which will ensure a sustainable supply of quality planting material for afforestation and restoration programs in arid and semi-arid regions. This strategy supports genetic conservation, enhances ecosystem resilience, and contributes to the long-term survival of *S. persica* in desert landscapes.

5. ACKNOWLEDGEMENT

Authors are grateful to Forest Department, Rajasthan for funding the project. Authors are also thankful to the Director, ICFRE-AFRI, Jodhpur for providing necessary facilities to conduct the study

REFERENCES

1. Azizan NF, Mohd N, Azis NMN, Baharin B. Knowledge, awareness, and practice towards the use of *Salvadora persica* L. (miswak) chewing stick: a scoping review. Healthcare. 2025;13:2747.
2. Bohra NK, Kumar S, Soni A, Giri V. *Salvadora persica* (toothbrush tree): an important tree with multidimensional uses. International Journal of Advanced Research in Biological Sciences. 2021;8(10):149–153.
3. Food and Agriculture Organization of the United Nations. Seed production areas and seed stands. 2014.
4. Goel VL, Behl HM. Genetic selection and improvement of hardwood tree species for fuelwood production on sodic soil with particular reference to *Prosopis juliflora*. Biomass and Bioenergy. 2001;20(1):9–15.
5. Kumar S, Rani C, Mangal M. A critical review on *Salvadora persica*: an important medicinal plant of arid zone. International Journal of Phytomedicine. 2012;4:292–303.
6. Singh G, Saxena KG. Desert vegetation and conservation strategies. 1998.
7. Tewari DN. A monograph on *Salvadora persica*. 1995.
8. Zobel BJ. Gene conservation–as viewed by forest tree breeders. Forest Ecology and Management. 1978;1:339–344.
9. Zobel BJ, Talbert J. Applied forest tree improvement. 2003.