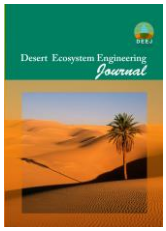
DEEJ (2025) 14 (2) 1-2

University of Kashan

Desert Ecosystem Engineering Journal

Journal homepage: http://deej.kashanu.ac.ir



The ecological role of *Tamarix* in the dynamics of soil properties in the hyper-arid regions of Khuzestan

Banafshe Yasrebi,[1]* Abolfazl Azadi,[2] Mohammad Matinizade,[3] Sayyed Mussa Sadeghi[4]

Received: 26/07/2025 Accepted: 29/09/2025

Extended Abstract

Introduction: *Tamarix* spp. are halophytic, drought-tolerant shrubs that have either naturally expanded or been introduced through planting across many arid and semi-arid regions of Iran, including Khuzestan province. Owing to unique morphological and physiological traits—such as salt secretion via foliar glands, deep root systems, and the production of salt-rich litter—these shrubs significantly influence the chemical, biological, and physical properties of soil. Although sometimes considered invasive, their potential to improve degraded saline soils is generating growing ecological interest.

Objectives: This study aims to evaluate the impact of *Tamarix* shrubs on key soil chemical and biological properties in a hyper-arid region of southwestern Iran. Specifically, it compares soil from beneath the *Tamarix* canopy with soil from adjacent, unvegetated control areas to assess the shrub's role in soil nutrient enrichment and the stimulation of microbial activity.

Materials and Methods: The study was conducted in the Shadgan wetland area, located in southern Khuzestan province, Iran. The region has a hyper-arid climate, characterized by high temperatures, low annual rainfall (~150–200 mm), and high evapotranspiration (>2500 mm/year). Soil samples were collected from the 0–15 cm surface layer at two locations: beneath *Tamarix* canopies and from adjacent unvegetated control plots. Standard laboratory protocols were used to analyze chemical properties—including pH, EC, organic carbon (OC), available phosphorus (P), and exchangeable cations (K, Na, Mg, Ca)—and biological indices, such as basal respiration, substrate-induced respiration, microbial biomass carbon (MBC), and nitrification potential. An independent-samples t-test was used to statistically compare the two treatments.

Results Soil organic carbon content was significantly higher under *Tamarix* canopies than in control plots (0.45% vs. 0.28%; $\Delta = 0.17$, 95% CI: 0.02–0.32, *p* < 0.05), a difference that remained significant following multiple comparison corrections. This enrichment was associated with enhanced microbial activity; microbial biomass carbon and nitrification potential were approximately 25% and 30% greater under the shrubs, respectively (*p* < 0.05). In contrast, while moderate to large effect sizes were observed for substrate-induced respiration and sodium and chloride concentrations, these differences were not statistically significant after multiple comparison correction. Collectively, these findings indicate that *Tamarix* shrubs enhance soil biological quality by increasing organic matter input and stimulating microbial processes.

1. Assistant Professor, Natural Resources Research Department, Khuzestan Agricultural and Natural Resources Research and Education Center, Agricultural Research, Education and Extension Organization (AREEO), Iran. Email: b.yasrebi@areeo.ac.ir
2. Assistant Professor, Soil and Water Research Department, Khuzestan Agricultural and Natural Resources Research and Education Center, Agricultural Research, Education and Extension Organization (AREEO), Iran.
3. Associate Professor, Forest Research Department, Research Institute of Forests and Rangelands, Agricultural Research, Education and Extension Organization (AREEO), Iran.
4. Assistant Professor, Forest Research Department, Research Institute of Forests and Rangelands, Agricultural Research, Education and Extension Organization (AREEO), Iran.

DOI: 10.22052/deej.2025.257289.1115

Conclusion: The persistence of significant effects for key soil indicators after rigorous statistical correction underscores the ecological importance of *Tamarix* in rehabilitating saline, arid lands in Khuzestan. While the non-significant results for other indicators warrant further investigation, this study provides scientific evidence to support the inclusion of this native shrub in sustainable soil management and restoration strategies for dryland ecosystems.

Keywords: *Tamarix* Spp., Soil Salinity, Hyper-Arid Ecosystems, Soil Nutrients, Microbial Biomass Carbon, Nitrification, Rhizosphere Effects, Khuzestan.