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## The genus *Tamarix* (*Tamaricaceae*) from archaeological to contemporary landscape\*

### Abstract

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This review includes the data concerning the presence of *Tamarix* species in old and contemporary landscapes, and their presence in archaeological areas. Their role as wild and ornamental plants, their use in sacred places, and their depiction in old relief sculpture, old and more recent paintings is also reported. Notes on the presence of *Tamarix* species in current landscapes and their invasiveness are discussed.

*Key words:* *Tamarix*, archaeology, landscape, biological invasion, distribution.

### Introduction

Since ancient times tamarisks (*Tamarix* sp. pl.), were used in different Babylonian rituals, to ward away evil influence, in celebrations, as act of gratitude, to commemorate the birth of children, to accompany the procuring of water rights, as ornamental, medicinal plant, windbreak, etc. (Calvin 1847). In addition, tamarisks were a component of oaths and they were utilized in purification and divination. As folk use, the tamarisks were also used to produce a resinous, sugar exudation and for making cakes when mixed with wheaten flour (Forster 1942).

As reported by Umbarger (2012), the Genesis 21:33 states that “Abraham planted a tamarisk tree in Be'er Sheva”. On the basis of subsequent interpretations, it seems likely that Abraham planted a tamarisk to delimit the area around his altar in Be'er Sheva wanting to depict a sanctuary in the open or as symbol of his hospitality.

The remains of Saul, the first king of the Kingdom of Israel, and Judah (1047-1007 B.C.), was buried under a tamarisk tree (Holman Bible Publishers 2010).

*Tamarix* species were sacred to Osiris, the God of Afterlife (Barguet 1967), and it is said that next to his tomb the branches of a tamarisk support his soul with the appearance of a bird (McIntosh 2005).

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The above examples highlight the knowledge and several uses of tamarisks by ancient populations. The documents consulted show how tamarisks have long been a constant component of the landscape of various territories and in particular of the Middle East.

In this work, an analysis of the role of tamarisks in the evolution of the plant landscape is reported through their representation in old and more recent paintings, in wooden sculptures, etc. In addition, the current problems related to their invasiveness and the effects on ecosystems are also analyzed.

### ***Tamarix* as a component of plant landscape in sacred places**

*Tamarix nilotica* (Ehrenb.) Bunge is a floristic element characterizing the plant landscape in sacred places. This tree still characterizes the flora of Israel, currently consisting of 13 *Tamarix* taxa according to reports by Danin & Fragman (2016) in Flora of Israel Online. This is a well adapted species to saline soils, it is free of thorns, and not succulent. The twigs are slender and the leaves are lanceolate. The racemes bring pentamerous, white or pink, flowers. In Israel, *T. nilotica* grows on soil “islands” at the main channel of Nahal Zin and in sites where soil stays wet even many days after the flood (Danin & Fragman 2016), and on alluvium on Mount Sinai.

*Tamarix aphylla* (L.) Karsten is a rare species in Israel, common only in the Arava Valley, usually planted near wells in the northern Negev, northern Sinai, west and northwest of Mishmar HaNegev, Shuval, and Bet Kama, including the well of Abraham in Be'er Sheva (south Israel), the remnants of the village Masmiya and Tel Nizzana. This species can be recognized by its purplish brown and smooth branches. The twigs are drooping, wiry or needle-like and the leaves are bluish-green, alternate, reduced to tiny scales. The flowers are numerous, tiny, whitish-pink. Old trees of *T. aphylla* from the Hamriyah area of the Emirate of Sharjah (United Arab Emirates) are considered by local population of cultural importance and a link between present, past, and future generations (Mahmoud & al. 2015).

In the Zarka River Valley (biblical Jabbok) along the Jordan river, there is a wide population of *Tamarix jordanis* Boiss. It is a small tree with slender stems, red when young, leaves alternate, scale-like. The racemes bring white or pink flowers, clustered on terminal spikes.

### ***Tamarix* in relief sculpture, old and more recent paintings**

Looking at some most important and prized old paintings in which *Tamarix* species are depicted, it is possible to recognize the habitat and morphological characters of each species.

In Guy Rose (1867–1925), “Tamarisk Trees”, Southern France it is possible to observe the twisted shape of the slender trunks and the scattered foliage as well as the sandy habitat of *T. aphylla*.

In “Pharonic Fantasies of a Foolish Old Man” by Stanza Widen, Canada, it can be recognized the habitus of *T. usneoides* E.Mey. ex Bunge with slender branches and an upright form.

The “Tamarisk Tree of Lake Como” by Sigismund Christian Hubert Goetze, hosted in The Fitzwilliam Museum (Cambridge, United Kingdom), is clearly referred to *T. gallica* L., and in particular to a still living plant occurring along the shores of the lake.

Finally, the Private Painting Holiday by Angela Corben (Majorca, June 2017), entitled “Plein Air under the tamarisk”, refers to a tree of *Tamarix africana* Poir., that grows on sand near the sea.

Most Egyptian timber consists of tamarisk, acacia and Sycamore figs (Lipshchitz 1998). Tamarisk wood, most probably from *T. nilotica*, was used in combination with wood of *Ficus sycomorus* L. The timber of tamarisks is dense, hard, durable, and used to prepare throwing sticks, bows, pegs, walking sticks and, boxes. The wooden nail of wooden masks, dating back to the 18th, 19th and 20th dynasties and some nail of coffins (320–330 BC) from Museums in Israel are made with tamarisks. A stamp seal with a small ring on the back dating to the Egyptian Middle Kingdom, the Head of Osiris (26th Dynasty), the statuettes of Shabti (New Kingdom), Isis and the head of the statuette of Osiris Ptah-Sokar (Ptolemaic Period, 3rd-2nd century B.C) are made with tamarisk wood.

### Current distribution of *Tamarix* species

The genus *Tamarix* L. is naturally and widely distributed from Mediterranean Area (including North Africa) to western Europe, northeastern China, Mongolia, India, and Japan (Baum 1978). Tamarisks are adapted to arid climates and grow into the wild in a wide range of habitats. Some species are cultivated as ornamental plants or marine wind-breaks and for the sandy dune stabilisation (Mandraccchia & al. 2017). Some other species are cultivated for their recognized ethnobotanical uses (Tuttolomondo & al. 2014). The halophytic character of *Tamarix* leaves and the presence of salt glands are also a common feature (Alaimo & al. 2013; Grisafi & al. 2016).

In Europe, thanks to the recent increase in floristic exploration, the number of known tamarisk species is gradually increasing. New tamarisks growing spontaneously and others, introduced for cultivation in Italy through nurseries or random events, have recently been described as casual alien plants (Venturella & al. 2012).

The fluctuation in the number of tamarisks species occurring in Italy is mainly due to difficulties in the correct identification. The analysis of some features (habitus, size of racemes, etc.) adopted in the past are not exhaustive since the type of flower disk is an important discriminant character.

### Notes on invasiveness

Tamarisks are considered worst invasives across different countries and included among the top twelve America’s “least wanted” by Nature Conservancy (Stein & Flack 1996; Zavaleta 2000). *Tamarix* sp. pl. are reproductive, competitive, and tolerant (Brotherson & Field 1987). In fact, these species are characterized by continuous seed production during the growing season, a seed output of more than 500,000 per individual per year, a high seed viability, an adaptation for long distance dispersal by means of wind and water. In addition,

tamarisks show a high vegetative reproductive capability. The deep and extensive root system makes it easy to compete with other plants and to tolerate a wide range of environmental conditions. *Tamarix* sp. pl. are also facilitated in their invasiveness for the ease with which it is possible to root out after a fire, flooding, cutting, and herbicide treatment.

Among the various examples reported in the literature, highlighting the role of tamarisks in the alteration of some habitats and in the composition of flora and fauna, we can mention that of *Tamarix ramosissima* Ledeb. which has been related to several environmental changes in North America, and it negatively affected avian communities and bird nests (MacGregor-Fors & al. 2013).

In recent times, *T. usneoides* has undergone biological control in the United States and South Africa (Marlin & al. 2017).

*T. ramosissima* and *T. chinensis*, introduced from Asia in the United States of America, have become common and invasive in many western riparian habitats (Gaskin & Kazmer 2009).

One of the most effective biological agents tested in arid and semi-arid ecosystems against the invasiveness of *Tamarix* is *Diorhabda carinulata* Desbrochers, 1870, also known as northern tamarisk beetle (Pattison & al. 2011).

In Italy, although there is some evidence that tamarisks introduced and escaped from cultivation are spreading in nature, there are still no specific studies on the invasiveness of this genus.

## Conclusions

*Tamarix* species show interaction with four ecological factors, such as regional climate and local weather climate, hydrologic variables, fire dynamics, and the salinity of the soil and groundwater. Over the years, these interactions have contributed to create a different plant landscape than in the past.

The tamarisks have long characterized the plant landscape of the coastal dunes and hinterland and have been elected as symbolic plants in some rituals and sacred places. The tamarisks, moreover, are widely cultivated as ornamentals and as such have been depicted in many paintings and sculptures.

The correct identification of these species is still a problem, as well as the absence in the catalogues of nurseries of the exact origin of the cultivated species. The problems linked to the invasiveness of tamarisks that escape cultivation are known above all in the United States, while they are becoming increasingly evident in Europe, especially because tamarisks are often introduced as ornamentals, but also used in some environmental restoration works.

It is therefore necessary to intensify taxonomic studies on this still critical genus and to monitor actions on species that are gradually becoming spontaneous in different territories.

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