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The genus *Tamarix* (*Tamaricaceae*) in Sicily: first contribution

Abstract

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The tamarisks flora of Sicily is here up dated with the addition of two species new for Italy (*Tamarix rosea* and *T. chinensis*) and three new records for the island (*T. africana* var. *fluminensis*, *T. tetragyna* and *T. hampeana*).

Key words: Tamarisks, Taxonomy, Mediterranean Area.

Introduction

Tamarix L. is a critical genus of the Italian vascular flora and it is characterized by a considerable morphological and ecological resemblance of taxa, infraspecific variability and teratology of floral elements. The number of floral parts is sometimes constant but this parameter cannot be considered valid for any identification of specimens when it is not correlated with the position of flowers on the raceme, the reciprocal position of floral parts, the variability in their numbers, etc. The difficulties in the identification of tamarisk species are sometimes caused by inaccurate descriptions and by problems in analytical keys.

According to Willdenow (1816), Desvaux (1824), Ehrenberg (1872), Bunge (1852) and Ahrendt (1926), 200 specific and intraspecific taxa are included in the genus *Tamarix*. This number was reduced to 69 (54 species and 15 varieties) by Baum (1978). Baum (1968), Zangheri (1976) and Pignatti (1982) reported 5 taxa for Italy: *Tamarix africana* Poiret, *T. canariensis* Willd., *T. gallica* L., *T. dalmatica* Baum and *T. parviflora* DC. Recently Conti *et al.* (2005) in the “Annotated Check-list of the Italian Vascular Flora” added 5 tamarisk species collected in Sardinia by De Martis *et al.* (1984): *T. arborea* (Sieb. ex Ehrenb.) Bge., *T. hampeana* Boiss. & Heldr. emend. Boiss., *T. passerinoides* Delile and *T. tetragyna* Pall. ex M. Bieb.

The main objective of this work was to survey the tamarisk flora of Sicily and to revise the herbarium specimens from Sicily in order to provide new ecological and distributive data.

The genus *Tamarix* L. in Sicily

A part from some references on *Tamarix gallica* L. reported by Boccone (1674) and Cupani (1696-1697) the first available records of the genus *Tamarix* L. in Sicily arose from Gussone (1842, 1843) who reported, from information provided by the naturalist Francesco Minà Palumbo, *T. gallica* and *T. canariensis* from different localities of eastern Sicily and *T. africana* from the isles of Salina, Lipari and Vulcano (Aeolian Archipelago). These records were also confirmed by Bertoloni (1837) and Parlatore (1872). Floristic data on the presence of tamarisks species on the Etna volcano were carried out by Strobl (1881) and Tornabene (1889-1929) and by Albo (1919) from southern Sicily. Ethnobotanical data and vernacular names of *T. africana* and *T. gallica* were pointed out by Calcara (1845) and Penzig (1924). Fiori (1923-1929) confirmed the floristic data provided by Gussone (l.c.) while Strobl (1903) reported two varieties of *T. africana*: *T. africana* var. *cilindrica* Strobl and *T. africana* var. *ovalis* Strobl. The latter two taxa were not considered by modern authors and in the monograph on the genus *Tamarix* (see. Baum, 1978). Lojacono-Pojero (1891), reported *T. gallica* from many localities of Sicily and surrounding islands and included *T. africana* var. *mannifera* Gasp. in the list of tamarisks growing in the island. *T. africana* Poiret, *T. canariensis* Willd., *T. gallica* L. and *T. dalmatica* were reported by Pignatti (1982) in the monograph "Flora d'Italia" and *T. parviflora* DC. was subsequently added to the vascular flora of Sicily by Venturella (1995). A large number of data on *T. africana* and *T. gallica* was gathered during floristic and phytosociological investigations (Raimondo *et al.*, 1982). Carratello *et al.* (1991) reported *T. canariensis* from the isle of Ustica (province of Palermo). According to Brullo & Spampinato (1990) and Brullo & Sciandrello (2006) the tamarisk flora of Sicily belongs to the alliance *Tamaricion africanae* Br.-Bl. & O. Bolòs 1957, distributed in environments with more arid and warm climate when compared with the climate of the *Rubus ulmifolii*-*Nerion oleandri* O. Bolòs 1985, widespread along the rivers which cross the territories characterized by

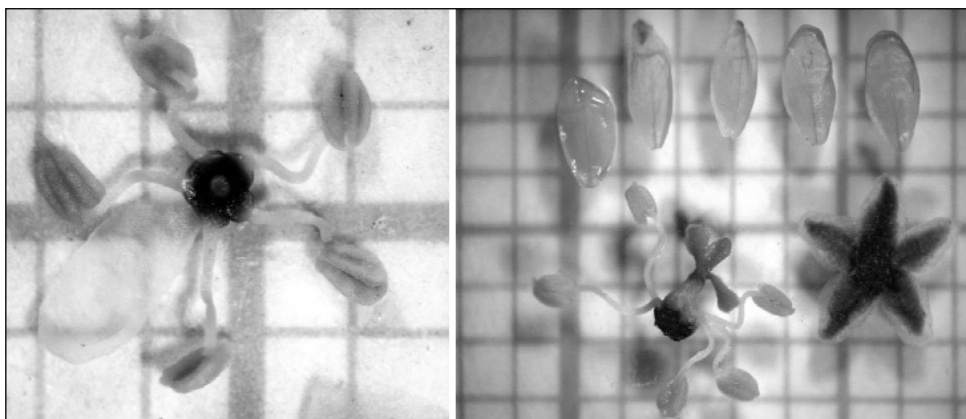


Fig. 1. Observations under microscope of flowers elements.

evaporitic rocks dating to the Messinian and distributed in central and south-western Sicily. In particular, the association *Tamaricetum gallicae* Br.-Bl. et Bolos 1957 was described along the less populated medium and lower beds of Simeto and southern Imera rivers where the vegetation is mainly characterized by shrubs of *T. gallica* and *T. africana*. The *Tamarix africana* group was recorded along the rivers of central and south-western Sicily. It seems to be the floristically poorest and not well defined from the phytosociological point of view. Recently Brullo & Sciandrello (2006) proposed a new association *Tamaricetum africano-arboree* Brullo & Sciandrello, located on the side of “Biviere di Gela” (southern Sicily), which is thermo-xerophilous, ecologically differentiated and characterized by the presence of *T. arborea*. The *Tamaricetum africano-arboreae* shows some affinities with *Nerio-Tamaricetum arboreae* Barbagallo, Brullo & F. Furnari described for Tunisia by Barbagallo *et al.* (1990) and included in the *Tamaricion boveano-canariensis* Izco, Fernández-González & A. Molina 1984.

Materials and Methods

A large number of wild and cultivated tamarisks branches and racemes were collected in different localities of Sicily. The list of localities investigated and the cartographic references in scale 1:50.000 (Official Map of the Italian State, I.G.M.I.) are reported in Table 1.

The habit, the colour of young branches, the presence of fasciations, the type of flowering (vernal or aestival), the type of inflorescence (simple or composed) were included in the sheet for field and laboratory investigation.

The collected plant material was preserved in plastic bags in order to avoid withering and then subjected to the traditional drying techniques under a plant press. The leaves and flowers of dried specimens are fragile and did not handle well and the separation of each floral elements and leaves became quite impossible. According to the methodology pointed out by B. Baum, the twigs with leaves and racemes were put in a beaker and re-hydrated in simmering water for 3-5' and then transferred to a mixture of lactic acid and phenol. The samples were briefly dried in blotting-paper and immediately examined under a Leica microscope. The observation of the size of disks, flowers, racemes and bracts has been made easier by covering the base of microscope with a sheet of graduate paper (Fig. 1). The analysis of the floral parts was carried out through the observation of 100 flowers per raceme.

The characters of Sicilian tamarisks not corresponding with the description of Baum (1968, 1978) are reported in bold in the data recorded paragraph. The undecipherable parts of the herbarium labels were reported as [...].

The herbarium samples of tamarisks kept in the herbaria of PAL!, CAT! and FI! were also analysed. The specimens collected on the field are kept in the *Herbarium Mediterraneum* (PAL).

Table 1. List of localities and related collection sites.

Sheet n°	Collection sites
581 (I. ^{le} Eolie o Lipari)	Isle of Lipari (Lipari, province of Messina)
585 (Mondello)	Isola delle Femmine (province of Palermo), SS 113, km 275 (Isola delle Femmine, province of Palermo)
595 (Palermo)	Roccella, Via Messina Marine (Palermo), Villa Trabia (Palermo), Foro Italico near Villa Giulia (Palermo), Botanical Garden of Palermo (Palermo), Allaura (Palermo), Mondello (Palermo), S. Nicola l'Arena (Trabia, province of Palermo),
596 (Capo Plaia)	Beach of Gorgolungo (Lascari, province of Palermo)
597 (Cefalù)	Lungomare Cefalù (province of Palermo), Cefalù Est (province of Palermo), Valtur village (Finale di Pollina, province of Palermo)
599 (Patti)	Capo d'Orlando (province of Messina)
608 (Caccamo)	Trabia (province of Palermo); Piana di Vicari (province of Palermo); Serre di Ciminna (province of Palermo).
609 (Termini Imerese)	Campofelice di Roccella (province of Palermo), S. Leonardo river (Termini Imerese, province of Palermo), Buonfornello (province of Palermo), Imera river (Termini Imerese, province of Palermo)
610 (Castelbuono)	SS 286, km 10 Castelbuono (province of Palermo), Petralia Sottana (province of Palermo)
620 (Lercara Friddi)	S. Stefano di Quisquina (province of Agrigento), Piano del Leone (Filaga, province of Palermo)
621 (Alia)	Tudia (province of Caltanissetta), Crossroad of Tudia (Tudia, province of Caltanissetta)
628 (Sciacca)	Sciacca (province of Agrigento), Caltabellotta (province of Agrigento)
629 (Aragona)	Campofranco (province of Caltanissetta), Comitini (province of Agrigento), near an old mine of sulphur (Comitini, province of Agrigento)
630 (S. Cataldo)	Mussomeli (province of Caltanissetta), Mustigarufi (S. Cataldo, province of Caltanissetta)
635 (Capo Bianco-Isole Pelagie)	Eraclea Minoa (Cattolica Eraclea, province of Agrigento), Archaeological site of Eraclea Minoa (Cattolica Eraclea, province of Agrigento), Torre Salsa (Siculiana, province of Agrigento)
636 (Agrigento)	Crossroad of Montallegro (Montallegro, province of Agrigento) , C. ²⁰ Busunè (Agrigento), C.da Fontanelle (Agrigento), San Leone (Agrigento)

Data recorded

The observations carried out in 36 different localities of Sicily yielded the identification of nine taxa: *Tamarix africana* Poir., *T. africana* var. *fluminensis* (Maire) Baum, *T. gallica* L., *T. canariensis* Willd., *T. parviflora* DC., *T. tetragyna* Ehrenb., *T. hampeana* Boiss. & Heldr., *T. arborea* (Sieb. ex Ehrenb.) Bge., *T. rosea* Bge. and *T. chinensis* Lour. *T. rosea* and *T. chinensis* are recorded for the first time in Italy and *T. africana* var. *fluminensis*, *T. tetragyna* and *T. hampeana* are new for Sicily. *T. dalmatica*, reported by different authors from Sicily, was never found during our investigation.

Tamarix gallica L. (Fig. 2)

Tree, often shrubby, **5-6 m high**, with blackish-brown to deep purple bark, entirely glabrous. Leaves sessile with narrow base, **sometimes auriculate, 1.5-2.5 (4.5) mm**. Inflorescences loosely compound. Racemes 2-4 cm long, 4-5 mm broad. Lower bracts of vernal racemes oblong, with apices blunt with point, others narrowly triangular, acuminate, with usually more or less irregularly denticulate margins, longer than pedicels but not exceeding the calyx. Pedicels usually somewhat shorter than or as long as calyx. Calyx pentamerous. Sepals **trullate-ovate, margin subentire**, the outer 2 somewhat smaller, slightly keeled, the inner somewhat longer and more obtuse, **1.8-2.2 (3) mm long**. Corolla pentamerous, caducous. Petals **elliptic to ovate, 2-2.2 mm long**. **Gynoecium with three carpels and three stigmas**. Androecium haplostemonous, of 5 antesepalous stamens, insertion of filaments peridiscal, disk synlophic. Nectariferous tissue poor, i.e., torus almost membranous. **Anthers sometimes apiculate**.

Habitat: Dunes, inland hilly districts, marly - arenaceous formation, Middle - Upper Pliocene in age and Evaporitic Formation, Messinian, along the canals and shores of hilly small lakes, reforested areas on dunes, cultivated, on unstable scarps, nurseries.

Distribution: Isola delle Femmine (province of Palermo), S. Stefano di Quisquina (province of Agrigento), Eraclea Minoa (province of Agrigento);

Flowering: (March) April to September

Selected specimens: *Isola delle Femmine (Palermo), 04 Apr 1994, G. Venturella, s.n., (PAL);*

Isola delle Femmine (Palermo), 07 Apr 1994, G. Venturella, s.n., (PAL);

Eraclea Minoa (Agrigento), near the archaeological site, 21 Mar 2001, G. Venturella, s.n.,

(PAL); Santo Stefano di Quisquina (Agrigento), 07 Apr 1994, G. Venturella, s.n., (PAL);

In arenosis maritimis – Torrenova, presso il fiume Zappulla, Majo, Todaro, 787 (PAL); Lotto S.

Marco, s.d., s.coll., s.n., (PAL); Catania, Ponte di Primosole, Luglio 1827, s.coll., s.n., (PAL);

Trapani, s.d., s.coll., s.n., (PAL); Catania.[...], Giugno, s.coll., s.n., (PAL); Sponda del fiume

nei [...], di Terranova, 26 giugno 1829, s.coll., s. n., (PAL); Cataniae at Simeti alveo, Majo

*Junio, Erb. Tornabene, 3651, (CAT); sub *Tamarix africana* Desf., Simeto at Cataniae at inun-*

*data et alveo fluviorum, aprili majo, Erb. Tornabene, 3663, (CAT); sub *Tamarix africana**

Poir., Catania, aprile-maggio, Erb. Tornabene, 3664, (CAT); Original label: Simeto [...]

*Catania, s.d., Erb. Tornabene, 7316, (CAT); Revision label: *Tamarix gallica* L., [D'Urso, 7*

*Luglio 1934]; Original label: *In paludis maritimis Torrenova, s.d., Todaro, 4385 3 (FI);**

*Revision label: *Tamarix gallica* L., [B. Baum, 1965]; Original label: *In arenosis maritimis -**



Fig. 2. The autumnal habitus of *Tamarix gallica* L.

Terranova presso il fiume Zappulla, Majo, Todaro, 4835 4 (FI); Revision label: Tamarix gallica L., [B. Baum, 1965]; Original label: In humidis reg. infer. Catania, V 1909, H. Ross, 4835 5 (FI); Revision label: Tamarix gallica L., [B. Baum, 1965]; Original label: Ad fossas vel in locis humidis planitici catanensis, 19 Junio 1874, P. Gabriel Strobl, 4835 6 (FI); Revision label: Tamarix gallica L., [B. Baum, 1965]; Original label: In arenosis maritimis - Terranova presso il fiume Zappulla, Majo, Todaro 4835 7 (FI); Revision label: Tamarix gallica L., [B. Baum, 1965]; Original label: Scoglitti In arenosis maritimis humidi, s.d., S. Sommier, 4835 8 (FI); Revision label: Tamarix gallica L., [B. Baum, 1965]; Original label: Scoglitti (Sicilia), 15 Maggio 1873, s.coll., s.n., 4835 9 (FI); Revision label: Tamarix gallica L., [B. Baum, 1965]; Original label: In arenosis maritimis - Terranova presso il fiume Zappulla, Majo 1828, Todaro, 4835 10 (FI); Revision label: Tamarix gallica L., [B. Baum, 1965]; Original label: Catania, Sept. 1845, Herbarium Parlatoreanum, 4835 12 (FI); Revision label: Tamarix gallica L., [B. Baum, 1965]; Original label: Lipari, 1858, s.coll., s.n., 4835 14 (FI); Revision label: Tamarix gallica L., [B. Baum, 1965]; Paternò: M^e Castellaccio vicino il fiume Simeto, 14-5-1942, R. Corti e F. D'Urso, 4835 15 (FI).

Notes: *T. gallica*, according to Baum (1978), is distributed in France, Spain, Morocco, Switzerland and Italy. Since 1842 it was reported from Sicily by Gussone (1842-1843). In a collected specimen, apparently of hybrid origin, the leaves and bracts tend to be auricu-

late and the disk showed a synparalophic configuration. According to Baum (1978) in *T. canariensis*, which is closely related to *T. gallica*, there is more nectariferous tissue on both sides of the filaments and the disk tend to be paralophic.

***Tamarix arborea* (Sieb. ex Ehrenb.) Bge. var. *arborea* (Fig. 3)**

Tree, often bushy, with brown to reddish brown bark, younger parts more or less papillose. Leaves **sessile to auriculate**, 2-3 mm long. **Racemes subtended by bract**, aestival racemes **simple or composed**, 3-5 (6) mm broad, 3-7 cm long; vernal racemes simple, 5 mm broad, 4-7 cm long. Bracts **sessile, diaphanous, long as the pedicels or longer than pedicels**. Pedicels shorter than calyx. Calyx pentamerous. Sepals **1.2 x 1.6 mm long**, the outer 2 **ovate or trullate-ovate**, acute, serrated-erose, the inner with obtuse apex. Corolla pentamerous, caducous. Petals elliptic to **slightly ovate, 2 x 2.5 mm**. **Gynoecium with 3 carpels and 3 stigmas**. Androecium haplostemonous, of 5 antesepalous stamens (occasionally also with 1-2 abortive antesepalous stamens); insertion of filaments peridiscal. **Anthers apiculate**. Disk fleshy, nectariferous, **paralophic**.

Habitat: cultivated in the Botanical Garden of Palermo, public gardens and tree-lined.

Distribution: town of Palermo, Sciacca (province of Agrigento).

Flowering: April to September

Selected specimens: *Foro Italico, near Villa Giulia (Palermo)*, 06 Apr 1994, G. Venturella, s.n., (PAL); *Sciacca (Agrigento)*, 06 Apr 1994, G. Venturella, s.n., (PAL); *Botanical Garden of Palermo, Francesco Bruno path, 10 Sept 2006*, G. Venturella, s.n., (PAL); sub: *T. gallica L. var. b., s.d., s.coll., s.n., (PAL)*.

Notes: according to Baum (1978) it is distributed in Tunisia, Lybia, Egypt, Israel, Sudan and Sokotra Island. The presence of a strong variability in the analysed samples could support the assumption that some hybrids could be found in wild populations.

***Tamarix canariensis* Willd. (Fig. 4)**

Bushy tree, **2-4 m high**, reddish-brown bark, younger parts papillose to sparsely papillulose, rachis of raceme always papillose. Leaves sessile with narrow base, **2-3 mm long**. Vernal inflorescences simple, aestival densely compound. Racemes **1.5-6(7) cm long**, 4-5 mm wide, densely flowered. Bracts linear-triangular, **long acuminate**, entire, adaxial side and margins often papillulose, almost equalling to somewhat exceeding calyx, **entirely diaphanous, (1.5) 2-3 mm long, longer than pedicel**. Pedicels more or less equalling calyx. Calyx pentamerous. Sepals incised-denticulate with many narrow and small dense teeth, **1-2 mm long**, acute, the outer 2 trullate-ovate, the inner trullate. Corolla pentamerous, caducous. Petals **elliptic-obovate, 2-2.5 mm long**. **Gynoecium with 3 carpels and 3 stigmas**. Androecium haplostemonous of 5 antesepalous stamens. **Anthers usually apiculate**. Insertion of filaments peridiscal. Disk fleshy, synlophic **or synparalophic**.

Habitat: Dunes and carbonatic rocks, gravelly banks of rivers, inland hilly districts characterized by marly - arenaceous formation, Middle - Upper Pliocene in age and Evaporitic Formation, Messinian, along canals and hilly lakes banks, alluvial planes submitted to



Fig. 3. *Tamarix arborea* var. *arborea* cultivated in the Botanical Garden of Palermo.

floodings, reforested areas on dunes, cultivated, on unstable escarpments, nurseries.

Distribution: Allaura (town of Palermo), Cefalù (Palermo), Castelbuono (Palermo), Campofranco (Caltanissetta), Comitini (Agrigento), Montallegro (Agrigento), Agrigento.

Flowering: (March) April to September (October)

Selected specimens: *promenade of Cefalù (Palermo), s.d., G. Venturella s.n., (PAL); Bivio Montallegro (Agrigento), 21 Mar 2001, G. Venturella, s.n., (PAL); Allaura (Palermo), 19 Mar 2001, G. Venturella, s.n., (PAL); Foro Italico (Palermo), s.d., G. Venturella s.n., (PAL); SS 286 Km 10 Castelbuono (Palermo), stream of Castelbuono, s.d., G. Venturella s.n. (PAL); Campofranco (Caltanissetta), SS 189, km 46, on the observance belt at the border of cultivated land on clay soils, 28 May 2005, G. Mandracchia, s.n. (PAL); Comitini (Agrigento) SS 189, km 50.5, road border at the base of clay slopes, 28 May 2006, G. Mandracchia, s.n. (PAL); Comitini (Agrigento), tree-lined on valley slopes near ex mine of sulphur, 28 May 2006, G. Mandracchia, s.n., (PAL); C.da Fontanelle (Agrigento), at the*

base of clay slopes close to a low wall, 20 Aug 2006, G. Mandracchia, s.n., (PAL); C.^{zo} Busunè (Agrigento), clay soils, 23 Aug 2006, G. Mandracchia, s.n., (PAL); Piana di Catania, roadside, 21 Mag. 1829, s.coll., s.n., (PAL); Caltagirone, Giugno, 1851, s.coll., s.n., (PAL); sub: *Tamarix gallica*, Santa Margherita, fiume Belice, s.d., Riccobono, s.n., (PAL); sub: *Tamarix gallica*, Bosco di Dagali presso il fiume, s.d., Riccobono, s.n., (PAL); sub: *Tamarix gallica* c. [...], *elongati fili laxiusculis*, Torrenuova, Maggio 1850, Todaro s.n. (PAL); sub: *Tamarix gallica* L., Piana di Catania, Giugno, s.coll., s.n., (PAL); sub: *Tamarix gallica*, Girgenti ai Macalubi, 15 maggio 33, s.coll., s.n., (PAL); sub: *Tamarix gallica* v. *rosea*, Trapani, s.d., s.coll., s.n., (PAL); sub: *Tamarix gallica* v. *rosea*, Catania, Simeto, 1850, Erb. Tornabene, 3650, (CAT); sub: *Tamarix gallica* L., al Pantano di Lentini (Siracusa), 8 V 98, Baccarini, Erb. Tornabene, 3655, (CAT); sub: *Tamarix gallica* L., Catania - Alla Playa, 11.X.1902., Cavara, Erb. Tornabene, 3656, (CAT); sub: *Tamarix gallica* L., al Simeto, 3^a decade Agosto, Baccarini, Erb. Tornabene, 3657, (CAT); sub: *Tamarix gallica* L., al Biviere di Torrenova, 25 V 98, Lopriore, Erb. Tornabene, 3658, (CAT); sub: *Tamarix gallica* L., al Simeto, 3^a decade Agosto 93, Baccarini, Erb. Tornabene, 3659, (CAT); Original label: In humidis reg. infer. – Catania, V-1909, H. Ross, 4385 2 (FI); Revision label: *Tamarix canariensis* Willd., [B. Baum, 1965].

Notes: *Tamarix canariensis* is sometimes confused with *T. gallica* or reported as variety of *T. gallica* (*T. gallica* L. var. *agrigenina* Bge., *T. gallica* var. *sardoa* Bge., *T. gallica* var.



Fig. 4. *Tamarix canariensis* on cliffs near Isola delle Femmine (Palermo).

canariensis (Willd.) Ehrenb.). Previously recorded by Gussone (1842) in Sicily, its distribution in Italy is restricted to Sardinia (De Martis *et al.*, 1984). According to Baum (1978) is also distributed in France, Spain, Morocco, Canary Islands, Algeria and Tunisia. The presence of papillae on young twigs and axis of racemes is a useful character for identification.

***Tamarix chinensis* Lour. (Fig. 5)**

Tree, **5-6 m**, with **brown-reddish to brown-blackish bark**, entirely glabrous. Leaves sessile with narrow base and **acuminate apex**, 1.5-3 mm long. Vernal inflorescences pyramidal, of many dense racemes, **aestival inflorescences simple or compound**. Racemes **few dense**, 2-6 cm long, **4-6 mm broad**. Pedicel about as long as calyx. Bracts equalling pedicels to slightly longer, linear to linear-oblong; the lower bracts of the vernal racemes oblong and equalling pedicels, the upper bracts and those of the aestival racemes longer, narrowly triangular, acuminate, entire, **diafanus or parzilmante erbacee**. Calyx pentamerous. Sepals 0.75-1.25 mm long, **ovate, the inner obtuse, the outer 2 acute**, keeled; connate at base in aestival inflorescences, **margin dentate**. Corolla pentamerous, persistent. Petals elliptic to elliptic ovate or rarely obovate and keeled at base, 1.5-2.25 mm long. **Gynoecium with 3 carpels and 3 stigmas**. Androecium haplostemonous, of 5 anteseptal stamens; **insertion of filaments peridiscal**. Disk hololophic.

Habitat: cultivated in Botanical Garden of Palermo, public gardens and tree-lined.

Distribution: Botanical Garden of Palermo, Allaura (Palermo), Capo D'Orlando (province of Messina).

Flowering: June to September

Selected specimens: *Orto botanico di Palermo, sector of Proteaceae and Tamaricaceae, 02 Aug 1996, G. Venturella, s.n., (PAL); Capo d'Orlando, 10 Jun 2006, G. Venturella, s.n., (PAL); Allaura, 05 Jul 2006, G. Mandracchia, s.n., (PAL); Promenade of Capo D'Orlando near Hotel La Tartaruga, 17 Mar 2007, G. Venturella, s.n., (PAL).*

Notes: *T. chinensis* was reported by Baum (1978) from Mongolia, China and Japan but commonly cultivated outside its native habitat. This is the first record in Italy. During our investigation we have never observed vernal racemes.

***Tamarix africana* Poir. var. *africana* (Fig. 6)**

Tree or bushy tree, **5-6 m high**, with **brown-reddish** to dark purple bark. Younger parts glabrous except for some papillose parts of racemes. Leaves sessile with narrow **to auriculate base**, **2.5-4 mm long**, with narrow scarious margins, occasionally minutely papillose on both sides or underneath; margins often muciculate-papillate. Inflorescences usually simple. Racemes vernal and simple, **(0.4) 0.5-0.8 (1.0) cm wide and 1.5-4.5(5) cm long, densely flowery, on short pedicels covered by sturdy bracts densely closed, aestival inflorescences never observed**. Bracts sessile, **2.5-3.0 mm long**, about as long as calyx, narrowly oblong or shortly acute to triangular ovate and acuminate, entire, usually with dense minute tooth-like papillae on margins, **entirely diaphanous**. Calyx pentamerous.



Fig. 5. *Tamarix chinensis* cultivated in the Botanical Garden of Palermo.

Sepals **ovate to trullate-ovate**, the outer keeled and acute, the inner with obtuse apex, **margin entire to dentate**, (1.8) **2.0-3 mm long**. Corolla pentamerous, **persistent**. Petals trullate to **elliptic-obovate or, rarely trullate-ovate, 3-4.5 (5) mm long**. **Gynoecium with 3 carpels and 3 stigmas**. Androecium of 5 antesealous stamens, insertion of filaments peridiscal, **Anthers apiculate**. Disk synlophic, sometimes **synparalophic**.

Habitat: Dunes and carbonatic rocks along the coasts, gravelly banks of rivers, alluvial planes submitted to floodings, inland hilly districts characterized by marly-arenaceous formation, Middle-Upper Pliocene in age and Evaporitic Formation, Messinian in age, along canals and hilly lakes banks, anthropized area with scarce drainage, in the nearby of transverse and longitudinal stream rehabilitation works, cultivated, on unstable scarps, nurseries.

Distribution: Termini Imerese (province of Palermo), Finale di Pollina (province of Palermo), Petralia Sottana (province of Palermo), Castelbuono (province of Palermo), Serre di Ciminna (province of Palermo), Vicari (province of Palermo), Filaga (province of Palermo), Mustigarufi (province of Caltanissetta), Tudia (province of Caltanissetta), Torre Salsa (Agrigento).

Flowering: (March) April to September (October)

Selected specimens: *Finale di Pollina (Palermo)*, Valtur village, 25 Mar 1995, G. Venturella, s.n., (PAL); *Mustigarufi (Caltanissetta)*, 31 Mar 1994, G. Venturella, s.n., (PAL); *SS 286, km 10 Castelbuono (Palermo)*, s.d., G. Venturella, s.n., (PAL); *Fiume San Leonardo (Termini Imerese, Palermo)*, 13 Apr 1995, G. Venturella, s.n., (PAL); *C.da Gorgonero (Polizzi Generosa, Palermo)*, 18 May 2006, G. Mandracchia, s.n., (PAL); *Serre di Ciminna (Palermo)*, 05 May 2006, G. Mandracchia, s.n., (PAL); *Lago Pian del Leone (Filaga, Palermo)*, s.d., G. Venturella, s.n., (PAL); *Piana di Vicari (Palermo)*, 11 Apr 1995, G. Venturella, s.n., (PAL); *Buonfornello (Termini Imerese, Palermo)*, 25 Mar 2001, G. Venturella, s.n., (PAL); *Torre Salsa (Agrigento)*, 21 Mar 2001, G. Venturella, s.n., (PAL); *Bivio Tudia (Caltanissetta)*, s.d., G. Venturella, s.n. (PAL); *Bivio Tudia (Caltanissetta)*, 20 Mar 2001, G. Venturella, s.n. (PAL); *Imera river (Termini Imerese, Palermo)*, s.d., G. Venturella, s.n., (PAL); *T. africana Desf., s.d., s.coll. s.n. (PAL)*; *T. africana Poir., s.d., s.coll. s.n. (PAL)*; *Lipari, Aprile 54, s.coll. s.n. (PAL)*; *a Lentini sponde del Lago, 28-4-99, Baccarini, Erb. Tornabene, 3665 (CAT)*; *al Fiumazzo, 3^a dec Febb 1898, Baccarini, Erb. Tornabene, 3666 (CAT)*; *a Castelbuono, 12 Aprile 89, Calcara, Baccarini, Erb. Tornabene, 3667 (CAT)*; Original label: *In humidis reg. infer. – Messina, IV V 1906, H.*



Fig. 6. *Tamarix africana* var. *africana* on the alluvial plane submitted to floodings in the Piana of Vicari (Palermo).

Ross, 4835 18 (FI); Revision label: *Tamarix africana* Poir., [B. Baum, 1965]; Original label: Mondello, 1886, C. Marchesetti, 4385 20 (FI); Revision label: *Tamarix africana* Poir., [B. Baum, 1965]; Original label: Ad torrentium alveos - Misilmeri, Majo, Todaro, 4385 22(FI); Revision label: *Tamarix africana* Poir., [B. Baum, 1965]; Original label: Capo S. Alessio (Messina), 12-5-56, Arena, Rossi, Gramuglio, 4385 23 (FI); Revision label: *Tamarix africana* Poir., [B. Baum, 1965]; Original label: In arenosis maritimis prope Catanam, 1874, P. Gabriel Strobl, 4385 24(FI); Revision label: *Tamarix africana* Poir., [B. Baum, 1965]; Original label: Trapani, falde del M. S. Giuliani, V 1919, Ponzo, 4385 25 (FI); Revision label: *Tamarix africana* Poir., [B. Baum, 1965]; Original label: In humidis reg. infer. – Messina, IV V 1906, H. Ross, 4835 26 (FI); Revision label: *Tamarix africana* Poir., [B. Baum, 1965]; Original label: ad torrentium alveos, 1881, Todaro, 4835 27 (FI); Revision label: *Tamarix africana* Poir., [B. Baum, 1965]; Original label: In arenosis maritimis: Faro ap. Messina, 1880, A. Borzi, 4835 28 (FI); Revision label: *Tamarix africana* Poir., [B. Baum, 1965]; Original label: In humidis reg. infer. – Messina, IV V 1906, H. Ross, 4835 29 (FI); Revision label: *Tamarix africana* Poir., [B. Baum, 1965]; Original label: Girgenti, lungo il fiume che conduce al mare, 29 Marzo 1900, U. Martelli, 4835 30 (FI); Revision label: *Tamarix africana* Poir., [B. Baum, 1965]; Original label: al Fiumazzo presso Catania, 25-8-1898, Baccarini, 4835 31 (FI); Revision label: *Tamarix africana* Poir., [B. Baum, 1965]; Original label: 4385 32 (FI); Palermo, 1845, Todaro, 4385 32 (FI); Revision label: *Tamarix africana* Poir., [B. Baum, 1965]; Original label: *Tamarix africana*, maggio 1836, Panormi a Mondello, da Parlatore in Agosto 1842, 4385 33 (FI); Revision label: *Tamarix africana* Poir., [B. Baum, 1965]; Original label: In arenosis Mondello, 26 Mart. 1855, E. et A. Huet du Pavillon, 4835 34 (FI); Revision label: *Tamarix africana* Poir., [B. Baum, 1965]; Original label: ad torrentium alveos-Misilmeri, Majo, Todaro, 4835 36 (FI); Revision label: *Tamarix africana* Poir., [B. Baum, 1965]; Original label: sub: *Tamarix gallica*L., Messina, majo 82, A. Borzi, 4835 37 (FI); Revision label: *Tamarix africana* Poir., [B. Baum, 1965].

Notes: *T. africana* was reported in Sicily by Gussone (1842). According to Baum (1978) it is distributed in Italy, France, Corsica, Spain, England, Portugal, Canary Islands, Morocco, Algeria and Tunisia. Baum also reported doubtful specimens kept in some herbaria [Gussone, Sicilia 1831 ? (G, K, S, P); Todaro 497 (G, HGB, K, S, U)]. We also collected specimens that showed unguiculate petals supporting the hypothesis that some hybrids of *T. africana* and *T. boveana* could be present in the Sicilian populations. *T. africana* is usually reported with a distribution from 0 to 800 m (Pignatti, 1982) while we collected a single individual on the Madonie Mts at 1000 m a.s.l.

***Tamarix africana* Poir. var. *fluminensis* (Maire) Baum (Fig. 7)**

Racemes broader than *T. africana* var. *africana*, (5) 7-10 mm, densely flowered; petals **elliptic-obovate** to obovate; bracts usually exceeding calyces.

Habitat: Dunes and carbonatic rocks along the coasts, gravelly banks of rivers, alluvial planes submitted to floodings, inland hilly districts characterized by marly - arenaceous formation, Middle - Upper Pliocene in age and Evaporitic Formation, Messinian in age.

Distribution: Sferracavallo (province of Palermo), Isola delle Femmine (province of



Fig. 7. The bract exceeding the calyx in the vernal raceme of *Tamarix africana* var. *fluminensis*.

Palermo), Lascari (province of Palermo), Castelbuono (province of Palermo), Caltabellotta (province of Agrigento), Torre Salsa (province of Agrigento), Eraclea Minoa (province of Agrigento), San Leone (town of Agrigento).

Flowering: (March) April to September (October)

Selected specimens: *Isola delle Femmine (Palermo)*, 07 Apr 1994, G. Venturella, s.n., (PAL); *SS 286, km 10 Castelbuono (Palermo)*, s.d., G. Venturella, s.n., (PAL); *Gorgolungo (Lascari, Palermo), on the beach*, 19 Mar 2006, G. Mandracchia, s.n., (PAL); *Caltabellotta (Agrigento)*, s.d., G. Venturella, s.n., (PAL); *Eraclea Minoa (Agrigento)*, s.d., G. Venturella, s.n., (PAL); *Torre Salsa (Agrigento)*, 21 Mar 2001, G. Venturella, s.n., (PAL); *Torre Salsa (Agrigento)*, 18 Sept 2001, G. Venturella, s.n., (PAL); *Agrigento, alle Dune, on clay soils*, 24 Mar 2007, G. Mandracchia, s.n., (PAL); *Palermo, Maggio*, s.coll., s.n., (PAL).

Notes: this is the first record from Sicily.

***Tamarix hampeana* Boiss. & Heldr. (Fig. 8)**

Tree with brown to reddish-brown bark, entirely glabrous. Leaves sessile with narrow base, **sometimes auriculate**, 1.75-4 mm long. Inflorescences simple, **loosely composed of racemes never observed**. Racemes vernal, simple, 2.0-10 cm long, **8-10 mm wide, aestival never observed**. Bracts diaphanous, oblong, acute, slightly boat-shaped, **in vernal**

racemes longer than pedicels. Pedicel as longer as calyx. Calyx pentamerous. Sepals trullate-ovate, acuminate, with obtuse apex, **1.5-3 mm long**, the outer 2 keeled, subentire, more acute than the more or less regularly and slightly denticulate inner ones. **Corolla pentamerous**, caducous. **Petals elliptic-ovate to trullate with cuneate base**, 2.75-4 mm long. **Gynoecium with 3 carpels and 3 stigmas. Androecium haplostemonous, sometimes with one or two additional antepetalous abortive stamens.** Insertion of filaments peridiscal. Disk fleshy, paralophic.

Habitat: on alluvial deposits in winterborne stream.

Distribution: Castelbuono (province of Palermo), Mondello (town of Palermo).

Flowering: April

Selected specimens: *SS 286, km 10 Castelbuono (Palermo), 02 Apr 1994, G. Venturella, s.n., (PAL); Mondello (Palermo), s.d., G. Venturella, s.n., (PAL).*

Notes: Previously recorded as new species from Italy by De Martis *et al.* (1984). According to Baum (1978) is distributed in Greece, Turkey and Israel. This is the first record from Sicily.



Fig. 8. *Tamarix hampeana* in the river-bed of Torrente Castelbuono (Palermo).

***Tamarix rosea* Bge. (Fig. 9a, b)**

Small tree or shrub, **2-3 m**, with blackish brown to brown bark, entirely glabrous. Leaves sessile with narrow base, 1.5-3 mm long. **Racemes vernal simple and aestival simple and compound, 1.5–4.0(5.5) cm long and 6 mm wide**. Bracts: in each racemes, some flower have at least 2 or 3 bracts each, oblong, more or less short, acute, the lowest in the raceme shorter than pedicels, the upper longer than pedicels or even exceeding calyces in length. Bracts sessile, diaphanous and herbaceous. Pedicel equalling calyx or shorter. Calyx pentamerous. Sepals 1.2-1.5 mm long, the inner with broad scarious margin, trullate-ovate, acute, the outer somewhat narrower, keeled. Corolla pentamerous, caducous. Petals **elliptic**, 2-3.5 mm long. **Gynoecium with 3 carpels and 3 stigmas**. Androecium haplostemonous, with 5 stamens or **partially diplostemonous with one or two antepetals with filaments shorter or abortive, anthers apiculate**. Disk holophic.

Habitat: cultivated.

Distribution: Palermo, Campofelice di Roccella (province of Palermo), Trabia (province of Palermo).



Fig. 9. *Tamarix rosea*: **a**) individuals cultivated as ornamental along the streets of Foro Italico (town of Palermo); **b**) the aestival raceme.

Flowering: April

Selected specimens: *Aiuole*, near *Geodeus*, *Campofelice di Roccella (Palermo)*, s.d., *G. Venturella*, s.n., (PAL); *Trabia (Palermo)*, 30 Apr 1995, *G. Venturella*, s.n., (PAL); *Foro Italico (Palermo)*, s.d., *G. Venturella*, s.n., (PAL); *Original label:* sub: *Tamarix gallica* Lin., *Tamarix canariensis* Willd., *Catanae, Simeto, majo-junio*, *Erb. Tornabene*, 3662 (CAT); *Revision label:* *Tamarix africana* Poir. [D'Urso 07/07/1934].

Notes: Baum (1978) reported *T. rosea* for Tadjik SSR, Georgia SSR, Iran, Turkey, Lebanon. The same author quoted a form of transition between *T. rosea* and *T. hampeana*. This is the first record of *T. rosea* in Italy.

***Tamarix tetragyna* Ehrenb. (Fig. 10)**

Small tree or shrub with purple to blackish-brown bark, younger parts papillose to occasionally glabrous, especially papillose on bracts and rachis of racemes. Leaves **3-5.5 mm long**, sessile with narrow base, **sometimes auriculate**. Vernal inflorescences simple and loose, **aestival inflorescences simple**. Vernal racemes **1.5-5 cm long, (5) 6-9 (10) mm broad**. Aestival racemes 2-5 cm long, **7-8 mm broad**. **Bracts sessile, auriculate, diaphanous**, oblong to linear-oblong, the lowest blunt with a short obtuse point, the upper more acuminate, all longer than pedicel sub-equalling calyx to much longer than calyx. Calyx urceolate, tetra-pentamerous, usually tetramerous in lower part of vernal racemes, pentamerous in upper part or in aestival racemes. **Sepals (1.8)2-3(3.2) mm**, with few teeth at their apices or finely denticulate, the outer 2 broadly trullate, acute, keeled, **the inner trullate-ovate** with obtuse apex. Corolla tetra-pentamerous, pentamerous in aestival racemes, subpersistent. Petals 3-5 mm long, **elliptic-obovate to trullate** with cuneate base, in aestival flowers much smaller, 2.25 mm long, ovate and also with cuneate base. **Gynoecium with 3 carpels and 3 stigmas, rarely bicarpellate with 2 stigmas**. Androecium **haplostemonous** of 4-5 antesepalous stamens, insertion of filaments peridiscal. Disk paralophic (rarely sub-ololophic).

Habitat: Dunes, wet areas on clay and marls, cultivated.

Distribution: Lascari (province of Palermo), Capo D'Orlando (province of Messina), Eraclea Minoa (province of Agrigento), Torre Salsa (province of Agrigento), Montallegro (province of Agrigento).

Flowering: (March) April to September

Selected specimens: *Archaeological site of Eraclea Minoa (Agrigento)*, s.d., *G. Venturella*, s.n. (PAL); *Archaeological site of Eraclea Minoa (Agrigento)*, 18 Sept 2001, *G. Venturella*, s.n., (PAL); *Torre Salsa (Agrigento)*, 18 Sept 2001, *G. Venturella*, s.n., (PAL); *Gorgolungo (Lascari, Palermo)*, on the beach, s.d., *G. Venturella*, s.n., (PAL); *Promenade of Capo D'Orlando, near Hotel La Tartaruga*, 17 Mar 2007, *G. Venturella*, s.n., (PAL).

Notes: Baum (1978) reported *T. tetragyna* for Egypt, Israel, Jordania, Syria and Cyprus. Qaiesr & Ghafoor (1979) reported it also from Lybia. In Italy it was only recorded from Sardinia (De Martis *et al.*, 1984). During our observation we also found synlophic disks in specimens probably hybrids with *T. africana*.



Fig. 10. *Tamarix tetragyna* on the relict dunes of Gorgolungo (Lascari, province of Palermo).

***Tamarix parviflora* DC. (Fig. 11)**

Low tree or shrub, **1-4 m high, with reddish-brown to light purple bark**, entirely glabrous. Leaves sessile with narrow base, 2-2.5 mm long, **sometimes auriculate**. Vernal inflorescence simple, aestival inflorescences rare. Racemes **shortly pedunculate, 1.5-3(7) cm long**, 3-5 mm broad, densely flowered. Bracts **sessile, triangular-acuminate, boat-shaped, entirely diaphanous (rarely herbaceous in the lower part), 2 mm long, not exceeding the calyx but often subequal to the calyx**. Pedicel much shorter than calyx. Calyx tetramerous. Sepals trullate to ovate, **(1) 1.5-1.8(2) mm**, the outer 2 acute and keeled, the inner with obtuse apex, **margin dentate**. Corolla tetramerous, **persistent**. **Petals ovate to trullate, rarely obovate, 2-2.5(3) mm, never erose**. Androecium haplostemonous, of 4 antesealous stamens; insertion of filaments peridiscal. **Gynoecium with 3 carpels and 3 stigmas, rarely 4. Anthers strongly apiculate**. Disk synphic.

Habitat: cultivated, along the streets and public gardens.

Distribution: Isola delle Femmine (province of Palermo), Palermo, S. Nicola l' Arena (province of Palermo), Cefalù (province of Palermo), Lipari (province of Messina), Capo D'Orlando (province of Messina), Sciacca (province of Agrigento), Montallegro (province of Agrigento), Mussomeli (province of Caltanissetta),

Flowering: (March) April to September (October)

Selected specimens: *Via Messina Marine, Roccella (town of Palermo), s.d., G. Venturella, s.n., (PAL)*; *Sciacca (Agrigento), s.d., G. Venturella, s.n., (PAL)*; *S. Nicola l' Arena (Palermo), 13 Apr 1995, G. Venturella, s.n., (PAL)*; *Isola delle Femmine (Palermo), 10 Apr*



Fig. 11. *Tamarix parviflora* on the wild along the road from Sciacca to Agrigento.

1994, G. Venturella, s.n., (PAL); Isola delle Femmine (Palermo), 16 Apr 1994, s.coll. s.n. (PAL); Isle of Lipari (Messina), 21 May 1994, G. Venturella, s.n., (PAL); Villa Trabia (town of Palermo), 25 Mar 1995, G. Venturella, s.n., (PAL); Montallegro (Agrigento), 18 Sept 2001, G. Venturella, s.n., (PAL); Mussomeli (Caltanissetta), s.d., G. Venturella, s.n., (PAL); Promenade of Cefalù (Palermo), s.d., G. Venturella, s.n., (PAL); Promenade of Capo D'Orlando, near Hotel La Tartaruga, 17 Mar 2007, G. Venturella s.n. (PAL).

Notes: This species was reported by Pignatti (1982) for N-E Italy. In Sardinia it was previously recorded by De Martis *et al.* (1984) and in Sicily by Venturella (1995).

Other sheets of taxonomical interest:

***T. aralensis* Bge. (Fig. 12)**

Original label: sub: *Tamarix gallica* var. *mycrophylla* Torn., *Habitus, foliis, et floribus specie minoribus, Cataniae, rara prope Simetum, majo, Erb. Tornabene, 3652 (CAT);*

***T. boveana* Bge. (Fig. 13)**

Original label: sub: *Tamarix gallica* L., ad Agnone, maggio 96, Baccarini, Erb. Tornabene, 3660 (CAT); sub: *Tamarix gallica*, s.d., s.coll. s.n. Erb. Tornabene 3661 (CAT) *Tamarix africana* Poir. [D'Urso 07/07/1934].

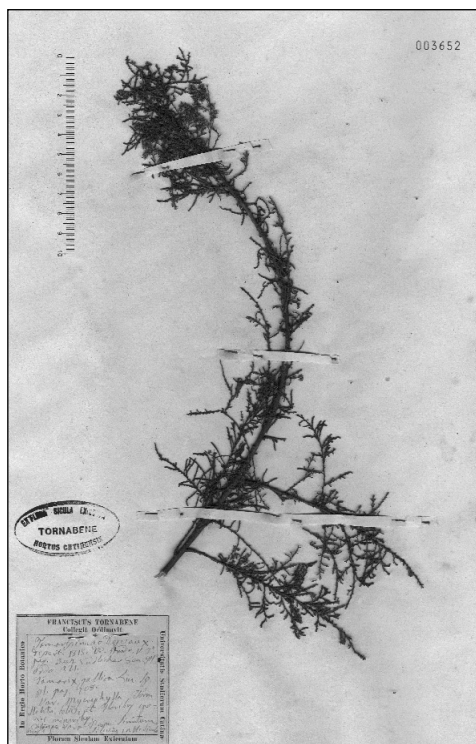


Fig. 12. The exsiccatum of *Tamarix aralensis* kept in the *Herbarium Siculum R. Horti Catinensis* (CAT!) [sub *Tamarix gallica* var. *microphylla* Torn.].



Fig. 13. The exsiccatum of *Tamarix boveana* kept in the *Herbarium Siculum R. Horti Catinensis* (CAT!) [sub *Tamarix gallica* L.].

Conclusions

The tamarisks are widely distributed in all the Sicilian territory. They grow in different natural habitats such as dunes, inland hilly districts, gravelly banks of rivers and alluvial plains submitted to flooding. The tamarisks are also distributed along the canals and shores of hilly small lakes, reforested areas on dunes, unstable scarps, alluvial deposits from winterborne streams. Some plants are located in the proximity of transverse and longitudinal stream rehabilitation works while others are cultivated in nurseries, botanical gardens, public and private gardens and used as tree-lines along the streets of the towns.

A huge number of individuals, cultivated in nurseries and introduced in Sicily as ornamentals, remain unidentified or are misidentified. In the same fashion the wild populations are characterized by a mixture of different individuals showing similar macro-morphological characters which usually make the identification inconclusive. A number of intermediate forms were also observed during our investigation supporting the existence

of hybrids in wild populations. These individuals require further morphological analysis and ecological characterization.

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