

THE GENUS TAMARIX (TAMARICACEAE) IN PAKISTAN*

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A revision of *Tamarix* in Pakistan is presented, including nomenclature, key, descriptions, locality lists and critical comments. The treatment is based on extensive living material as well as herbarium material in Pakistan and major European herbaria. Types have been examined of almost all taxa discussed. 25 species, one of which is divided into two varieties, are recognized in Pakistan. 5 new species are described: *T. pakistanica* Qaiser, *T. baluchistanica* Qaiser, *T. sultanii* Qaiser, *T. alii* Qaiser, and *T. sarenensis* Qaiser. One new combination, *T. androssowii* Litw. var. *transcaucasica* (Bge.) Qaiser, is presented. The following names are for the first time treated as synonyms: *T. florida* Bge. var. *albiflora* Bge. (= *T. arceuthoides* Bge.), *T. bungei* Boiss. (= *T. arceuthoides* Bge.), *T. karakalensis* Freyn var. *myriantha* Freyn (= *T. arceuthoides* Bge.), *T. leptopetala* Bge. (= *T. mascatensis* Bge.), *T. desertii* Boiss. [= *T. tetragyna* Ehrenb. var. *meyeri* (Boiss.) Boiss.], *T. bengalensis* Baum (= *T. indica* Willd.), *T. pauciovulata* J. Gay ex Batt. & Trab. (= *T. passerinoides* Del. ex Desv. var. *macrocarpa* Ehrenb.), *T. balansae* J. Gay ex Batt. & Trab. (= *T. passerinoides* Del. ex Desv. var. *macrocarpa* Ehrenb.).

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جنس‌گز *Tamarix* (Tamaricaceae) در پاکستان
از: قیصر

مطالعه‌ای از جنس‌گز (*Tamarix*) در پاکستان شامل اصول نامگذاری، کلید شناسایی، شرح واحدهای رده‌بندی، لیست ایستگاه‌های جمع‌آوری و نکات انتقادی دیگری ارائه میگردد. این مقاله براساس مطالعه مقدار قابل توجهی از نمونه‌های زنده و نمونه‌های هرباریوم تهیه گردیده بطوریکه نگارنده کلیه نمونه‌های تیپ واحدهای رده‌بندی مشروح را مشاهده و از نزدیک مورد مطالعه قرار داده است. بطورکلی جمعا ۲۵ گونه‌گز در پاکستان شناخته شده که در بین آنها یک‌گونه به‌دو وارسته تقسیم شده و پنج‌گونه زیر برای اولین بار نامگذاری و معرفی گردیده‌اند.

T. pakistanica Qaiser, *T. sultanii* Qaiser, *T. baluchistanica* Qaiser,
T. sarenensis Qaiser, *T. alii* Qaiser .

ترکیب جدید *T. androssowii* Litw. var. *transcaucasica* (Bge.) Qaiser
ارائه و اسامی زیر برای اولین بار تحت نام مترادف ذکر میشوند.

T. florida Bge. var. *albiflora* Bge. (= *T. arceuthoides* Bge.), *T. bungei* Boiss. (= *T. arceuthoides* Bge.), *T. Karakalensis* Freyn var. *myriantha* Freyn (= *T. arceuthoides* Bge.), *T. leptopetala* Bge. (= *T. mascatensis* Bge.), *T. desertii* Boiss. (= *T. tetragyna* Ehrenb. var. *meyeri* (Boiss.) Boiss.), *T. bengalensis* Baum (= *T. indica* Willd.), *T. pauciovulata* J. Gay ex Batt. & Trab. (= *T. passerinoides* Del. ex Desv. var. *macrocarpa* Ehrenb.), *T. balansae* J. Gay ex Batt. & Trab. (= *T. passerinoides* Del. ex Desv. var. *macrocarpa* Ehrenb.).

Introduction

The present revision of the genus *Tamarix* in Pakistan, is part of a thesis, approved by the University of Karachi, for the award of the Ph. D. degree.

Tamarix L. is a medium sized genus of the Old World, chiefly distributed in saline areas of deserts, semideserts, steppes or along the springs or rivers of the mountains of Asia, Europe and N. E. Africa. The number of species always remained disputable, e. g., Gorshkova (1949), Zohary (1972) reported 90 species; while Baum (1966) accepted 54 species.

The genus is not of much economic importance. The wood of *Tamarix aphylla* (L.) Karst. is used for making house rafters. In North Arabia, Africa and Iran tannin obtained from this species is used for colouring goat and sheep skins (Hutchinson 1967). *Tamarix manna* (a sweet excretion of insects, living on *Tamarix*, Bodenheimer 1929) is used in medicines in India and Arabia (Hutchinson 1967). The twigs of *T. dioica* Roxb. ex Roth are used in local medicines for curing ring worms, gonorrhoea etc. (Said 1969). Some of the *Tamarix* species are cultivated as ornamental (Bailey 1950; Lawrence 1951) and shelter belt plants.

Linnaeus (1753) in his 'Species Plantarum' included only 2 species and erroneously described a species of *Tamarix* under the name *Thuja aphylla* L. (1755) from Egypt. This species occurs also in the Indo-Pakistan subcontinent.

Pallas (1788) described one species of *Tamarix* from Russia which was later also recorded from Kashmir. Rottle & Willdenow (1803) described one more

species from India which was also reported from Pakistan. Willdenow (1816) in his monograph recognized only 3 species from our region. Desvaux (1825) described 2 new species from the Indo-Pakistan subcontinent. However one of these was later proved to be conspecific with an earlier species. Ehrenberg (1827) enumerated 8 species along with 9 varieties of *T. gallica* L., some of which later proved to be distinct species. Arnott (in Wight & Arnott 1834) recognized only 2 species from the Indo-Pakistan subcontinent. He also applied an erroneous name, *T. gallica* L., for *T. indica* Willd. Bunge (1822) in his generic monograph, accepted 51 species including 21 new species and many varieties. Only 4 species were reported from our area.

Boissier (1867) in his 'Flora Orientalis' (which included Baluchistan and a part of North West Frontier Province) recorded 38 species including 3 new species. One of these was endemic to Baluchistan. Dyer (1874) revised the family for 'Flora of British India'. He recognized only 6 species with *T. salina* Dyer as a new species.

Aitchison (1888) reported for the first time *T. macrocarpa* (Ehrenb.) Bunge (*T. Passerinoidea* Del. ex Desv. var. *macrocarpa* Ehrenb.) from Baluchistan. Niedenzu (1895) in Engler's 'Die Natürlichen Pflanzenfamilien' accepted 64 species of *Tamarix*. In 1896 in his monograph of the genus Niedenzu raised the number to 67 and for the first time gave the terminology for the different shapes of the disc (the same terminology is being followed in the present study). In 1925 he revised the family once again for the second edition of 'Die Natürlichen Pflanzenfamilien' and accepted 78 species.

Cooke (1901), Burkill (1909), Meebold (1909), Talbot (1911), and Parker (1918) enumerated common species of *Tamarix* from the subcontinent, especially from the area that is presently known as Pakistan.

Arendt (1926) monographed the genus *Tamarix* and reduced the number to 70. Schiman-Czeika (1964) prepared an account of the family in Rechinger's 'Flora Iranica'. The area covered also includes some portions of Pakistan. She recognized 35 species of *Tamarix* (only 9 from Pakistan). Baum (1966) in his monograph of the genus recognized 54 species in all, including 2 new species. This work records only 11 species from Pakistan. Recently Stewart (1972) reported 16 species from Pakistan including a doubtful species. The present study revealed the existence of 26 taxa from Pakistan including 5 new species.

Explanation of special terms

LEAVES

The shape of the leaves in the genus *Tamarix* is a reliable taxonomic marker. Along with some normal shapes of the leaves as ovate or sessile with narrow base etc., following main types may be recognized.

- (1) *Vaginate*: Completely surrounding the stem by the convolute base and the leaves strongly fitting into one another (e.g., *T. dioica* and *T. aphylla*, Fig. 1 A).
- (2) *Pseudovaginate*: The same as the last, but in a smaller degree, i.e. very strongly amplexicaul with tightly touching margins but some portion of the stem visible (e.g., *T. indica* and *T. sarenensis*,

Fig. 1 B).

- (3) *Amplexicaul*: Clasping the stem with the base (e.g., *T. passerinoides* var. *macrocarpa*, Fig. 1 C).

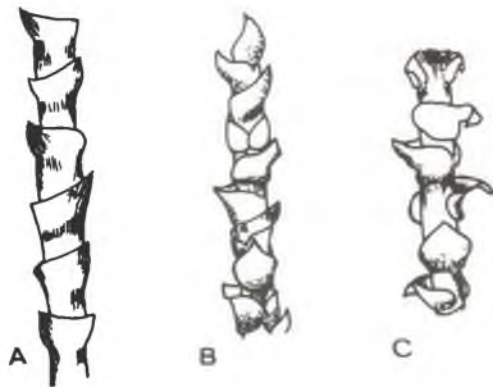
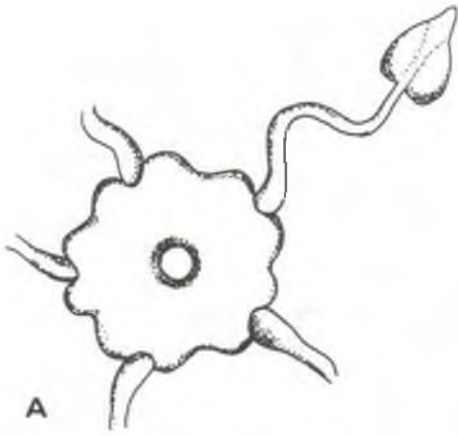


Fig. 1. Some leaf shapes in *Tamarix*. — A. Vaginate. — B. Pseudovaginate. — C. Amplexicaul.

DISC

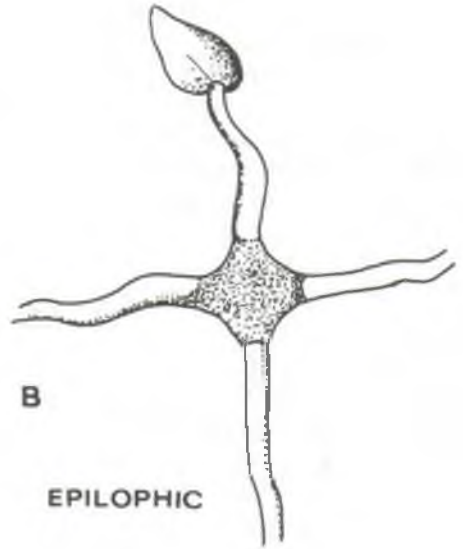
The configuration of the disc is one of the most important and reliable taxonomic markers. Following 4 types of discs are recognized (after Niedenzu 1895). Besides these 4 types of configurations intermediates are also met with.

- (1) *Mesodiscine*: This is the most common type of configuration. The filaments are inserted in between the lobes of disc (e.g., *T. indica* and *T. aphylla*, Fig. 2 A).
- (2) *Epilophic*: In this case the bases of the filaments gradually merge with the discal lobes, thus suggesting a broad base of the filament (e.g., *T. parviflora*, Fig. 2 B).



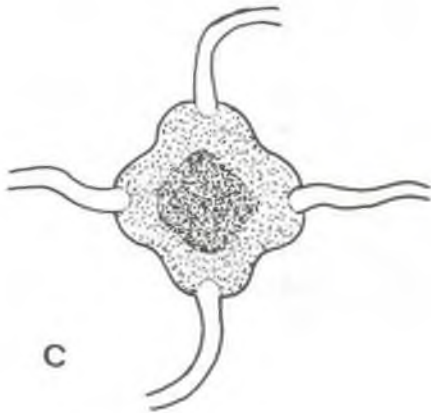
A

MESODISCINE



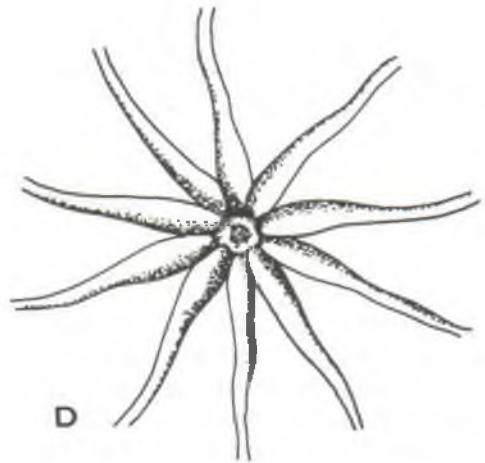
B

EPILOPHIC



C

CONFLUENT EPILOPHIC



D

EPIDISCINE

Fig. 2. Diagrammatic representation of different types of disc.

(3) *Confluent epilophic* : The two sides of the discal lobes gradually approach the filament, thus each filament is inserted in between the two confluent lobes (e.g., *T. androssowii* and *T. alii*, Fig. 2 C).

(4) *Epidiscine*: In this case no apparent disc or disc lobes are formed and the bases of the filaments meet almost at the centre of the torus (e.g., *T. passerinoides* var. *macrocarpa* and *T. ericoides*, Fig. 2 D).

Tamarix L .

Linn., Sp. Pl. 270 (1753); Gen. Pl., ed. 5, 131 (1754); Ehrenberg, in Linnaea 2:241—344 (1827); DC., Prodr. 3:95 (1828); Bunge, Tentamen 1—85 (1852); Boiss., Fl. Or. 1:763 (1867); Benth. & Hook. f., Gen. Pl. 1:159 (1867); Dyer in Hook. f., Fl. Brit. Ind. 1:248 (1874); Parker, For. Fl. Punj. Del. Haz. 24 (1918); Cooke Fl. Pres. Bomb. 1:74 (1958, repr. ed.); Talbot, For. Fl. Bomb. Sind 1:84 (1911); Gorshkova in Shishkin & Bobrov, Fl. USSR 15:290 (1949); Baum, Monog. Genus *Tamarix* 22 (1966); Hutch., Gen. Fl. Pl. 2:323 (1967). — Lectotype: *T. gallica* L. *Trichaurus* Arn. in Wight & Arn., Prodr. Fl. Penin. Ind. Or. 1: 40 (1834).

Shrubs or trees, 2-10(-12) m tall, with a deep root system, densely branched, glabrous, papillose or subpapillose, bark of various colours, mostly brownish to blackish brown. Leaves small, 0.5-7 mm long, scale-like, alternate, sessile, amplexicaul, vaginate or auriculate, glabrous or papillose, covered with punctate salt secreting glands. Inflorescence simple or compound racemes or panicles, 1—15 cm long, on younger and older branches.

Flowers small, penta- or tetramerous; mostly bisexual, rarely unisexual, then plants dioecious; each flower usually subtended by one bract, occasionally by two or more; bracts ovate, triangulate or linear, amplexicaul or subplexicaul, herbaceous or diaphanous, entire or denticulate, acute or obtuse, shorter than, equal or longer than pedicel. Calyx 4 - or 5 - lobed, subequal or equal with imbricate aestivation, 2 outer, 3 inner lobes (pentamerous) or 2 outer, 2 inner lobes (tetramerous), denticulate or entire, obtuse or acute, variously shaped, mostly ovate or orbicular, glabrous or slightly papillose. Petals 4 or 5, free, ovate, oblong, obovate or elliptical, obtuse, slightly notched or somewhat cuneate at the apex, equi- or unequilateral, pink, violet, purple or white, deciduous or persistent. Stamens 4—10 (-12), diplostemonous or haplostemonous, antisepalous stamens usually slightly larger than antipetalous stamens, inserted on or below the nectariferous disc. Disc variously shaped, anthers ovoid, apiculate or obtuse. Stigmas 3—4, rarely 5 or 2, elongate, clavate or divergent, 2—3 times shorter than the ovary. Ovary pyramidal or bottle-shaped, placentas very short at the base of the locules. Capsule 3—5 angled, conical or pyramidal, dehiscent by 3 valves downward to base. Seeds small, compressed, glabrous, hairy from the apex, coma sessile.

Key to the species

1. + Flowers unisexual. 18. *T. dioica*
- Flowers bisexual. 2
2. + Androecium haplostemonous .
- Stamens 4—5. 3

- Androecium diplostemonous or partially diplostemonous. Stamens (6-) 7-10. 23
- 3. + Flowers tetramerous or with tetra and pentamerous flowers in the same raceme. 18
- Flowers always pentamerous. 4
- 4. + Racemes 6-9 mm broad. 5
- Racemes 3-4 (-5) mm broad. 8
- 5. + Rachis and branches papillose. 6. *T. pakistanica*
- Plant entirely glabrous. 6
- 6. + Bracts linear oblong, exceeding calyces. Leaves semiamplexicaul. 5. *T. salina*
- Bracts ovate or triangulate-ovate, never exceeding calyces. Leaves vaginate. 7
- 7. + Petals recurved, sepals orbicular. Stamens exerted. 21. *T. alii*
- Petals erect, sepals ovate. Stamens included. 19. *T. sultanii*
- 8. + Leaves vaginate. 9
- Leaves not vaginate. 10
- 9. + Leaves papillose Bracts not vaginate. Disc epilophic. 22. *T. kermanensis*
- Leaves not papillose. Bracts vaginate. Disc mesodiscine. 20. *T. aphylla*
- 10. + Petals persistent. 11
- Petals deciduous. 12
- 11. + Petals ovate to orbicular with a gibbous base. Peduncle naked for a considerable distance. 8. *T. smyrnensis*
- Petals obovate without a gibbous base. Peduncle not naked, densely flowered. 10. *T. ramosissima*
- 12. + Racemes 2-5 cm long. 13
- Racemes up to 15 cm long. 14
- 13. + Leaves sessile with narrow base, usually with papillose margin. Petals obovate. Disc mesodiscine. 2. *T. arceuthoides*
- Leaves amplexicaul, without papillose margin. Petals elliptic ovate. Disc epilophic or confluent epilophic. 4. *T. mascatensis*
- 14. + Disc mesodiscine. 15
- Disc epilophic or confluent epilophic. 16
- 15. + Leaves pseudovaginate to amplexicaul, rachis minutely papillose. Bract 1 mm long, capsules 6 mm long. 1. *T. indica*
- Leaves ovate or sessile with narrow base. Rachis glabrous. Bracts 2 mm long. Capsule 3-4 mm long. 11. *T. korolkowii*
- 16. + Leaves cordate with broad base. Younger parts papillose. Bracts amplexicaul. 7. *T. karelinii*
- Leaves with narrow base. Entirely glabrous. Bracts not amplexicaul. 17
- 17. + Disc epilophic. Capsule 1.75-2 mm long. Pollen grains without columellae. 3. *T. leptostachya*
- Disc confluent epilophic. Capsule 3-3.5 mm long. Pollen grains with columellae. 9. *T. baluchistanica*
- 18. + Racemes 6-10 mm broad. 19
- Racemes 3-4 (-5) mm broad. 20
- 19. + Bracts exceeding calyces, broadly linear to obtrullate. Petals 3-3.5 mm long. Racemes 5-13 cm long. 14. *T. tetragyna* var. *meyeri*
- Bracts not exceeding calyces, oblong lanceolate. Petals 2-2.5 mm long. Racemes 2-4 cm long. 13. *T. szovitsiana*

20. + Bracts longer than the pedicels. 21
 - Bracts shorter than the pedicels. 22
21. + Petals parabolic, persistent. Flowers tetra- as well as pentamerous.
 12. *T. parviflora*
 - Petals elliptic to obovate, deciduous. Flowers only tetramerous.
 17. *T. kotschyi*
22. + Racemes umbellate at apex.
 16. *T. androssowii* var. *transcaucasica*
 - Racemes not umbellate at apex.
 15. *T. androssowii* var. *androssowii*
23. + Racemes 4–5 mm broad. Leaves vaginate only 23. *T. stricta*
 - Racemes 6–10 mm broad. Older leaves vaginate, younger imbricate. 24
24. + Androecium completely diplostemonous. Raceme 9–11 mm broad. Disc fleshy.
 24. *T. ericoides*
 - Androecium partially diplostemonous. Racemes 6–8 mm broad. Disc not fleshy. 25
25. + Leaves amplexicaul or semiamplexicaul. Rachis papillose.
 25. *T. passerinoides* var. *macrocarpa*
 - Leaves pseudovaginate to vaginate. Rachis glabrous. 26. *T. sarenensis*

1. *Tamarix indica* Willd.

Tamarix indica Willd., Ges. Naturf. Freunde Berlin, Neue Schr. 4:214 (1803); Bunge, Tentamen 56 (1852); Baum, Monog. *Tamarix* 60 (1966); Stewart in

Nasir & Ali, Ann. Cat. Vasc. Pl. W. Pak. & Kash. 491 (1972). — Holotype: India, Klein s. n. 1799 (Herb. Willd. No. 6063 B!).

T. epacroides Smith in Rees, Cyclop. 35:4 (1817). — Holotype: Habitat copiose prope Flumen Colloram maximum non ad Junctio Flumina, Koenig 383.3 (LINN!).

T. gallica L. var. *indica* (Willd.) Ehrenb., in Linnaea 2:268 (1827).

T. troupii Hole in Indian Forester 45:245 (1919). — Holotype: Sibi Range, Baluchistan, Troup 1916 (DD not seen); Iso. (W!).

T. bengalensis Baum, Monog. *Tamarix* 180 (1966); syn. nov. — Holotype: Hook. f. & Thomson Bengal or regio troupp/ temp (W!); Iso. (B!, BM!, K!, P!).

T. gallica sensu Wight & Arnot, Prodr. Fl. Ind. or. 40 (1834); Dyer in Hook. f., Fl. Brit. Ind. 1:248 (1874) et auct. plur.; non Linn. (1753).

A tall shrub or small tree, 2-6 (-8) m tall with reddish-brown bark, glabrous. Leaves pseudovaginate, sessile, ovate with deltoid base, amplexicaul or auriculate, younger imbricate, acute, 1-2 mm long, without coherent margins. Racemes both vernal and aestival, (vernal usually simple, aestival densely compound), 3-12 (-15) cm long, 3-4 (-5) mm broad. Rachis minutely papillose or entirely glabrous. Bract triangular, acuminate, somewhat irregularly denticulate at the margin, sometimes slightly keeled, c. 1 mm long, pedicel shorter than bract, c. 0.5 mm long. Sepals 5, fused at the base, inner somewhat broader than the outer, outer more acute, ovate or trullate ovate to somewhat orbicular, deeply denticulate at the apex, margin somewhat

membranous, 0.75–1 mm long, c. 0.5 mm broad. Petals 5, free, elliptic or elliptic obovate, obtuse 1–2 mm long, 0.75–1 mm broad. Stamens 5, filaments filiform, inserted in between the 10 lobes of the mesodiscine disc, insertion perihypodiscal, anthers somewhat unequal, apiculate. Styles 3, clavate, ovary somewhat bottle-shaped, trigonous, truncate at top. Capsule c. 6 mm long, conical, triangular.

Distribution. Bangla Desh, Ceylon, India, Pakistan, Afghanistan.

Pakistan. Widely distributed and known from the following districts (number of localities in parenthesis): Mardan (1)–Mianwali (2) – Loralai (1) – Jhang (1) – Sahiwal (1) – Chagai (2) – Sibi (1) – Multan (1) – Muzaffargarh (1) – Makran (17) – Dadu (4) – Kalat (1) – Nawabshah (2) – Sanghar (2) – Sukkur (1) – Khairpur (1) – Lasbella (4) – Thatta (26) – Karachi (2).

(1). *Tamarix indica* Willd. is usually confused with *T. gallica* L. Almost all the previous workers of the subcontinent, have erroneously treated the former taxon as *T. gallica* L. Wight and Arnott (1834) seem to be the first to have done so. They were generally followed by other workers such as Stewart (1867), Brandis (1874), Dyer (1874) etc. *T. gallica* L. is purely a European species and does not occur in this subcontinent. It is readily distinguished from *T. indica* Willd. in having auriculate leaves, glabrous rachis, somewhat ovate petals and epilophic disc. In *T. indica* Willd., the leaves are subauriculate to pseudovaginate, the rachis is papillose, the petals

are elliptic-oblong and the disc is mesodiscine.

(2). *T. indica* Willd. is a highly polymorphic species especially in leaf characters, size and thickness of the racemes, but the variation is continuous and over all and it is not possible to recognize even infraspecific categories. This inference is drawn after studying 300 specimens (partly in living condition and partly on herbarium sheets). However there seems to be some correlation with edaphic factors. The plants growing in more waterlogged and saline soils have longer racemes (6–15 cm long), mostly with semi- to fully amplexicaul leaves, while those growing on less saline and waterlogged soils have shorter racemes (up to 8 cm long) and pseudovaginate leaves. The thickness of racemes also varies slightly. In the former condition it is 4–5 mm thick, while in the latter condition the racemes are 3–4 mm thick. However large number of intermediates are also met with, hence infraspecific categories cannot be recognized.

(3). Baum (1966) accepts two distinct species, *T. indica* Willd. and *T. bengalensis* Baum, but critical examination of the holotypes of both taxa and the material available in the different herbaria indicates that they are conspecific. The shape of the leaves and the character of the sepals used by Baum in distinguishing the two species are found most variable. At one extreme the leaves vary from subauriculate to pseudovaginate condition and in many cases one may find all these stages on one and the same plant. Similarly the sepals also vary from ovate to orbicular. It is very difficult to draw a

line between the two taxa using these characters. Therefore the delimitation into distinct taxa on the basis of leaf and sepal characters is not justified.

2. *Tamarix arceuthoides* Bge.

Tamarix arceuthoides Bge., Mem. Acad. St. Petersb. 7:295 (1851), Tentamen 58 (1852); Boiss., Fl. Or. 1:775 (1867); Gorshk. in Shishkin & Bobrov, Fl. USSR 15:312 (1949); Baum, Monog. *Tamarix* 31 (1966). — Lectotype: Häufig an den steinigen Ufern des obern Strafschan bis in den Karatau 6.9 1841, Lehmann (p!); Iso. (K!).

T. florida Bge. var. *kotschyi* Bge., Tentamen 38 (1852). — Lectotype: Ad rivis prope pagum Dalechi inter Abuschir et Shiraz Kotschy 157, March 1852 (P!); Iso. (BM!, G!, K!, W!).
T. florida Bge. var. *albiflora* Bge. l. c. 38; syn. nov. — Holotype: Prope Yesd, Buhse 1210 (P!).

T. bungei Boiss., Fl. Or. 1:774 (1867); syn. nov. — Holotype: Prope Kefterchan inter Kerman et Yesd, 21 April 1859, Bunge (G-BOISS!); Iso. (P!).

T. askabadensis Freyn in Bull. Herb. Boiss. 2(3): 1059 (1903). — Holotype: Regio transcaspica Aschabad pr. Kösen, 19 May, 1900 P. Sintenis 295 (G!); Iso. (W!, P!, G!).

T. karakalensis Freyn var. *verrucifera* Freyn l. c. 1062. — Holotype: Regio transcaspica Germab in paludosis salsis prope pagum Skobelewka, 29 June, 1900 P. Sintenis 646 a (G!); Iso. (E!, K!).

T. karakalensis Freyn var. *myriantha* Freyn, l. c. 1062; syn. nov. — Holotype: Aschabad versus Besmen, 4 June, 1900 P. Sintenis 467 (G!); Iso. (B!, BM!, E!,

K!, P!, W!).

Shrub or very small tree, 2 - 3 (-4) m tall with reddish brown-pinkish bark, densely branched, glabrous. Leaves sessile, with narrow base, somewhat ovate-deltoid, acute with minutely papillose margin (1 -) 1.5 - 2.5 mm long; 0.5 mm broad. Inflorescence a compound raceme, dense, erect or subspreading, both aestival and vernal, 1.5 - 5 (-8) cm long, 2.5 - 4 mm broad. Bracts ovate, triangulate, 1-1.5 mm long, 0.5 mm broad, acuminate, entire, pedicel 0.5 - 1 mm long, rarely equal to bracts. Calyx 5 - lobed, sepals 0.5 - 0.75 mm long, 0.3 mm broad, ovate to trullate ovate, finely denticulate, the outer 2 more obtuse than the inner 3. Petals 5, obovate, 1 - 1.75 mm long, 0.5 mm broad, pink, caducous. Stamens 5, filaments slender, 2-3 mm long, anthers dorsifixed, acute-subobtuse, disc purplish, deeply 5-lobed, lobes notched, thus becoming obscurely 10-lobed, insertion of filaments peridiscal, inserted between the lobes of the disc (mesodiscine disc), anthers subreniform, exapiculate to somewhat apiculate. Ovary conical, 0.75- 1.25 mm long, styles 3, very short, almost fused. Capsule 3-4 (-5) mm long, 1 mm broad, dehiscing by 3 longitudinal valves. Seeds many.

Distribution. Iraq, Iran, Russia, Afghanistan and Pakistan. In dry river beds and river banks of Baluchistan and northern regions of Pakistan.

Pakistan. Gilgit Dist.: Gilgit, R. R. Stewart 26462 (RAW); 30 miles from Farm on way to Gilgit, Sultanul Abedin & M. Qaiser 9075 (KUH); 15 miles from

Gilgit on way to Nomal, common near the river bank, Sultanul Abedin & M. Qaiser 9094 (KUH); Gilgit — Juglosh road, Sultanul Abedin & M. Qaiser 9089 (KUH); 5 miles from Gonar Farm on way to Gilgit, Sultanul Abedin & M. Qaiser 9070 (KUH); Chahichito, Gilgit, Giles 230 (K); Shulu, Gah Bla, 9 - 12000 ft., J. W. Thomley 46 (E). — Chitral Dist.: Bombrait, Siddiqui & Rehman 26769 (RAW); south of Hindu Kush, ± 7000', Giles (E); sandy river bed, 4 - 7000', Chitral S. M. Toppin 212 (K); *ibid.*, J. D. A. Stainton 2592 (BM); Baltistan, fls. purplish, along the bank of Indus, F. Ludlow 319 (BM); Indus valley, Bung, c. 5000 ft., R. Scott Russel 1871 (BM). — Sibi Dist.: Kach, near Ziarat J. F. Duthie s. n., May 1893 (K). — Chagai Dist.: Zangi Nawar, a flood lake on Quetta river W. S. W. of Naushki, sand dunes, common, up to 6' high, Henry Crookshank 45 (K). — Makran Dist.: Inter Kappar at Gawadar, K. H. Reehinger 27899 (W); 33 miles from Basima on way to Surab, Sultanul Abedin & Abrar Hussain 6986 (KUH); 30 miles from Basima on way to Surab, Sultanul Abedin & Abrar Hussain 6983 (KUH).

(1). A careful examination of the types of *T. florida* Bge. var. *albiflora* Bge., *T. bungei* Boiss. and *T. karakalensis* Freyn var. *myriantha* Freyn reveals that all these taxa are conspecific with *T. arceuthoides* Bge.

(2). In the Geneva Herbarium, there are 3 sheets of *T. askabadensis* Freyn, two with printed labels and one in the handwriting of Freyn and this sheet bearing the author's signature is regarded as holotype.

(3). According to Freyn *T. askabadensis* differs from *T. arceuthoides* Bge. by having obtuse anthers and oblong petals. In *T. arceuthoides* Bge., the petals are elliptic and the anthers are somewhat apiculate, but there are many specimens which show a continuous variation in petal and anther characters. In the type of *T. askabadensis* Freyn, the racemes are slightly longer than normally in *T. arceuthoides* Bge., but the rest of the characters including the disc shape are similar. It just has to be treated as a minor variant of *T. arceuthoides* Bge.

(4). Sintenis labels are not always consistent and different specimens are mounted bearing identical labels, e. g., in the Edinburgh Herbarium, there are 2 sheets bearing number 46 a, one of them is definitely *T. hispida* Willd. and the other belongs to *T. arceuthoides* Bge.

(5). According to Stafleu (1967) "Bunge's original collections are at Leningrad. The Le set, Probably, is the first set of Eastern Asiatic plants, but a set was also acquired by Cosson (now at Paris) and it is possible that in some cases Bunge's holotypes will be found in Paris rather than in Leningrad"; while Dr. H. Heine of Paris (personal communications) on the other hand states that Bunge's original collection of Asiatic plants are in Paris and LE has a duplicate set. He also quotes that Stafleu has also used the word "probably" about the existence of the first set in Leningrad.

3. *Tamarix leptostachya* Bge.

Tamarix leptostachya Bge., Mem. Acad.

St. Petersburg. 7:293 (1851), Tentamen 71 (1852); Boiss., Fl. Or. 1:776 (1867); Gorshk. in Shishkin & Bobrov, Fl. USSR 15:310 (1949); Baum, Monog. *Tamarix* 62 (1966), excl. syn. *T. kasakhorum* Gorshk. — Lectotype: Syssow in der Kirghisen Steppe "Barssuki" am Aralsee, 8. 1840 (P!, selected by Baum, 1966).

T. gallica L. var. *micrantha* Ledeb., Fl. Ross. 2:135 (1843) p.p. — Lectotype: Altai Songar, ad lacum Nor-saissan, Politow 1826 (P!); Iso. (E!).

Shrub, 1–3 (-5) m tall with reddish brown to greyish brown bark and more or less appressed branches, plant entirely glabrous. Leaves sessile with narrow base, narrowly ovate to lanceolate, younger leaves somewhat imbricate, 2–4 mm long, 0.5–2 mm broad, acute. Racemes aestival, densely compound, 4–12 (-15) cm long, (2.5–) 3(-3.5) mm broad, peduncle 0.5–2.5 cm long. Bracts herbaceous somewhat narrowly triangular, 1.5–2 mm long, less than 0.5 mm broad, acuminate; pedicel c. 1 mm long or slightly shorter. Flowers pentamerous, pink. Sepals almost free, ovate or trullate ovate, acute to obtuse, finely denticulate at the margin, 0.5–0.75 mm long, 0.25–0.4 mm broad. Petals free, obovate, rarely somewhat spatulate, 1.25–1.5 mm long, 0.5 mm broad, obtuse, caducous. Stamens 5, haplostemonous, filaments fused with the disc lobes, i.e. epilophic, 3 mm long, anthers obtuse, insertion peridiscal. Styles 3, obovate, ovary stipitate, bottle-shaped, c. 1 mm long. Capsule 1.75–2 mm long, 0.5 mm broad.

Distribution. A Central Asian species,

distributed in Mongolia, Russia, Western Tibet, Pakistan and Iran.

Pakistan. Karakorum Hunza and Nagar, Gebiet Serat: Ufer und Grundwasser Gehölze der *Artemisia* (Wüsten) Steppe 2540 m, Paffen 294 (W); Natunza, Hunza valley, E.J. Ecker s. n., 26.10.1973 (KUH); Sukho Gam Nall, Gilgit, 9–12000', J. W. Thornley 46 (BM); Garukh, Giles 500 (K); near Lohari Pass, Chitral, M. A. Siddiqi 32176 (RAW); Kashmir, Shagosi valley of Indus, Winterbottom 832 (K).

4. *Tamarix mascatensis* Bge.

Tamarix mascatensis Bge., Tentamen 60 (1852); Boiss., Fl. Or. 1:774 (1867); Schiman - Czeika in Rech. f., Fl. Iranica 4:12 (1964); Baum, Monog. *Tamarix* 38 (1966); — Lectotype: Oman, Regn. Mascate secus Torrente, Aucher - Eloy 4912 (W!); Iso. (BM!, P!).

T. leptopetala Bge., Tentamen 72 (1852), syn. nov. — Holotype: In valle Loura monte Elburs, Pers. Bor., Kotschy 728 (P!); Iso. (G!).

2–3 m tall shrub or very small tree with reddish brown bark, entirely glabrous. Leaves sessile, somewhat ovate with narrow base, 1.5–2 mm long, 0.5–1 mm broad, acute. Racemes simple, aestival, 1–3 cm long, 3–4 mm broad, densely flowered. Flowers pentamerous, pinkish. Bracts triangular, acuminate, finely denticulate, 1(-1.5) mm long, 0.5–0.75 mm broad. Pedicel shorter than the bract, 0.5–0.75 mm long. Sepals fused at the base, ovate, 0.75–1 mm long, 0.5 mm broad, finely denticulate, the outer 2 somewhat smaller and acute than the

inner 3. Petals elliptic-ovate, 1–1.5 mm long, 0.75–1 mm broad. Stamens 1–1.5 mm long, anthers somewhat apiculate, c. 0.5 mm long. Disc epilophic. Styles 3, obovate, ovary stipitate, 0.5–0.75 mm long. Capsule 3 mm long.

Distribution. Somalia, Sokotra Island, Saudi Arabia, Oman, Iran, Russia (Caucasia) and Pakistan.

Pakistan. Chagai Dist.: Nokkundi, M. Qaiser 59 (KUH); 24 miles from Nokkundi on way to Zahedan, M. Qaiser & A. Ghafoor 3521A (KUH).

(1). This species is reported for the first time from Pakistan.

(2). Boissier (1867), Niedenzu (1895), Gorshkova (1949) and Schiman - Czeika (1964) have treated *T. mascatensis* Bge. and *T. leptopetala* Bge. as two distinct species, but a careful examination of the types of both taxa suggests that they are conspecific. The type of the latter not only matches the former in habit but the other characters such as shape of disc, sepals and petals are also exactly similar to *T. mascatensis* Bge. Since both species were published at the same time in the same publication there is no question of priority. As *T. leptopetala* Bge. has lately been treated as the synonym of *T. kotschyi* Bge., I am retaining the first name as the valid one.

(3). Baum (1966) has erroneously included *T. leptopetala* Bge. under the synonymy of *T. kotschyi* Bge. despite of its pentamerous flowers, not diaphanous bracts and epilophic disc. In *T. kotschyi* Bge. the flowers are tetramerous, the

bracts entirely diaphanous and the disc confluent epilophic.

5. *Tamarix salina* Dyer

Tamarix salina Dyer in Hook. f., Fl. Brit. Ind. 1:248 (1874); Parker, For. Fl. Punj. Haz. & Delhi 27 (1918); Baum, Monog. *Tamarix* 147 (1966) p. p.; R. R. Stewart in Nasir & Ali, Ann. Cat. Vasc. Pl. Park. & Kash. 490 (1972). — Holotype: Pakistan, Kaffir Kote and Esakhil, West Bank of Indus, 4.3 1852, Flemming 115 (K!); Iso. (E!).

Erect shrub, 1–2.5 m tall with dark reddish brown bark. Leaves subamplexicaul, acute, younger imbricate, entire, c. 3 mm long, 6–7 mm broad, rachis entirely glabrous. Bracts linear to linear-oblong, acutish, entire, 3–4(–5) mm long, 1–1.25 mm broad; pedicel much shorter than the bract, c. 1 mm long. Sepals 5, slightly fused at the base, ovate, obtuse to somewhat acute, 1.5–1.75 mm long, 1–1.25 mm broad; inner 3 somewhat broader, almost entire, outer 2 smaller, subentire. Petals 5, elliptic, obovate, obtuse, entire, 2–3 mm long, 1–1.75 mm broad. Stamens 5, filaments filiform, c. 2 mm long, anthers dorsifixed, slightly apiculate, disc epilophic to confluent epilophic. Styles 4, ovary somewhat conical, c. 1.5 mm long, capsule pyramidal, 4–6 mm long.

Distribution. Endemic to Pakistan. Probably confined to Sind and Punjab.

Pakistan. Khairpur Dist.: Miras in saline soil and water, plant bushy, 3–5 ft., flowers purple, common, M. A. Ali AA 651 (PFI–B). — Sukkur Dist.: 14 miles

from Sukkur on way to Hyderabad, M. Qaiser 4422A (KUH); 25 miles from Sukkur on way to Hyderabad, M. Qaiser 4428 (KUH).

(1). Baum (1966) enumerated the following characters for *T. salina* Dyer. Leaves amplexicaul, twigs and rachis densely papillose, bracts cordate, shorter than pedicel. However, a careful examination of the holotype, which is at Kew, revealed that neither the leaves were amplexicaul nor the twigs and rachis were papillose. The bracts were also linear oblong and much longer than the pedicel, almost reaching the flower's apex as mentioned by Dyer himself in his description.

It is, therefore obvious that Baum's concept of *T. Salina* is different from that of Dyer and consists of more than one taxon. After studying large number of specimens belonging to this complex, present in different herbaria, two distinct groups are segregated on the basis of the characters listed in Tab. 1.

It is inferred from the tabulated observations that group A belongs to true *T. Salina* Dyer and the group B belongs to a new taxon *T. pakistanica* Qaiser, which is being described below. The former species seems to be less common than the latter.

6. *Tamarix pakistanica* Qaiser sp. nov.

Fig. 3

Tamarix pakistanica Qaiser, sp. nov. — Holotype: 45/6 miles from Karachi on way to Hyderabad, Sultanul Abedin 3535 (KUH).

T. Salina sensu Baum, Monog. *Tamarix* 147 (1966) p. p.; non Dyer 1874.

Frutex 2–3 m altus; cortex fusco-niger vel nigro-fuscus. Rami papilloso vel subpapilloso. Folia sessilia amplexicaulia vel pseudovaginantia, acuta vel acuminata, 1–2 mm longa, 0.5 mm lata. Inflorescentiae aestivales, simplices; racemi 3–7 cm longi, 5–6 (–7) mm lati, rachide dense vel breviter papillose. Bractae simplices, ovatae, triangulato-ovatae, 1–1.5 mm longae, 0.5–0.75 mm latae, crenato-dentatae vel integrae; pedicelli 0.5–1.25 mm longi. Calyx pentamerus. Sepala c. 1.5 mm longa, 0.75–1 mm lata, ovata, obtusa, margine inciso-denticulata, dua exteriora breviora. Corolla pentamera, petala elliptico-oblonga vel obovata, 2–2.5 mm longa, 1–1.25 mm lata, decidua, Stamina 5.3–3.5 mm longa; filamenta filiformia, insertione hypodiscali. Discus epilophus, confluent; antherae cordatae, nec apiculatae, 0.75 mm longae. Ovarium stipitatum, ovatum, sub anthesi c. 2–2.5 mm longum; styli tres, plus minusve oblongi. Capsula pyramidata, c. 5 mm longa, 1.5 mm lata.

Erect shrub, 2–3 m tall with brownish black to blackish grey bark, branches papillose to sub-papillose. Leaves sessile, amplexicaul or pseudovaginate, acute or acuminate, 1–2 mm long, 0.5 mm broad. Inflorescence aestival, simple raceme, 3–7 cm long, 5–6 (–7) mm broad, rachis densely papillose to papillose. Bracts simple, ovate, triangulate-ovate, 1–1.5 mm long, 0.5–0.75 mm broad, crenate-dentate or entire, pedicel 0.5–1.25 mm long, Calyx pentamerous, sepals c. 1.5 mm long, 0.75 mm broad, ovate, obtuse with incised-denticulate margin, outer 2 short. Corolla pentamerous, petals elliptic oblong or obovate, 2–2.5 mm long, 1–1.25 mm broad, deciduous. Sta-

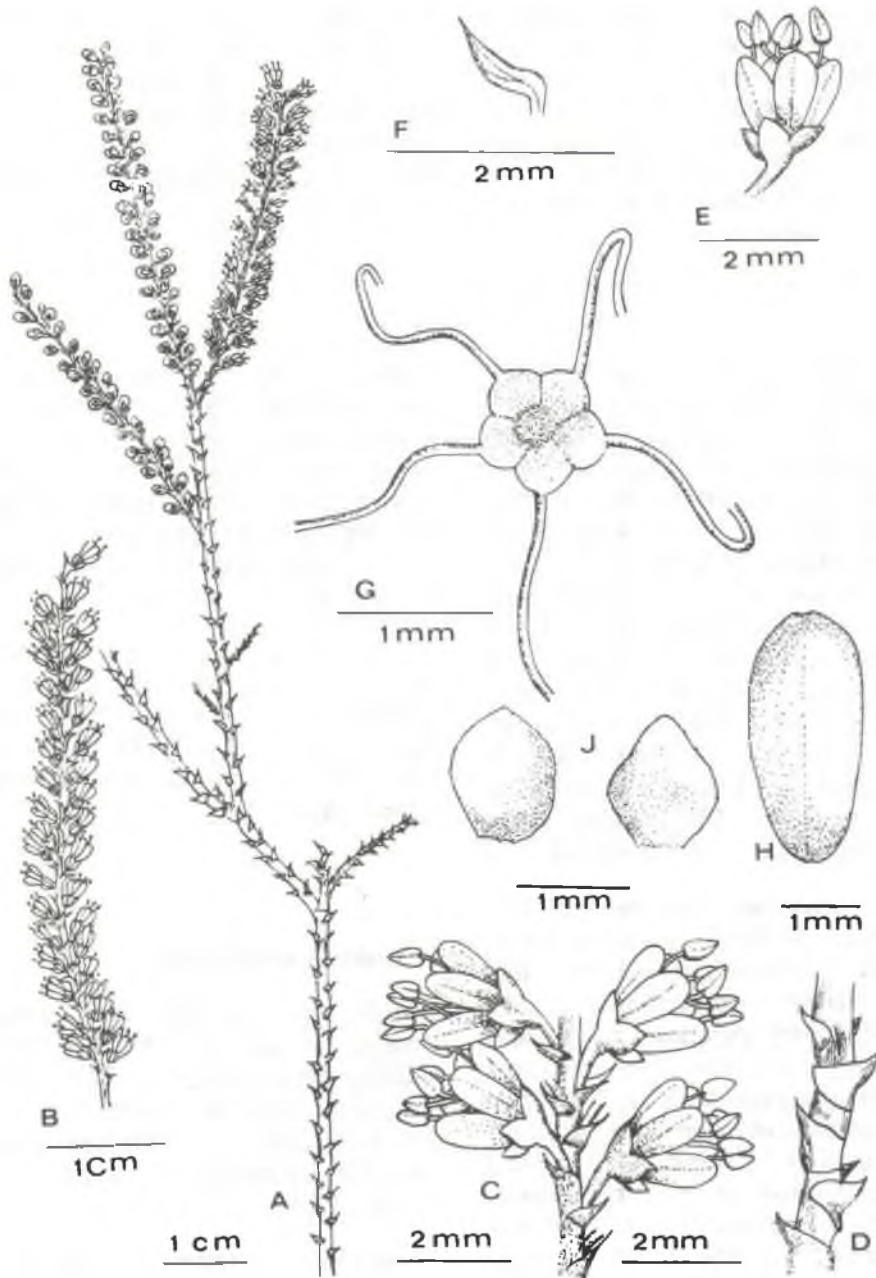


Fig. 3. *Tamarix pakistanica*. — A. Twig. — B. Raceme. — C. Part of raceme. — D. Leaves. — E. Flower. — F. Bract. — G. Disc. — H. Petal. — J. Sepals.

mens 5.3 — 3.5 mm long, filaments filiform, insertion hypodiscal with epilophic to confluent epilophic disc, anthers cordate, not apiculate, 0.75 mm long. Ovary stipitate, ovate, 2—2.5 mm long after anthesis, styles 3, ± oblong. Capsule pyramidal, c. 5 mm long, 1.5 mm broad.

Distribution. Probably endemic to Pakistan.

Pakistan. Multan Dist.: Near Miranpur, R. N. Parker 2.2 1937 (K); Multan, Punjab, Edgeworth (K). — Makran Dist.: Near Rest House Sunstar, S. I. Ali, S. A. Faruqi & Sultanul Abedin 1136 (KUH); 24 miles from Dadu on way to Larkana, S. A. Faruqi & M. Qaiser 2225 (KUH). — Khairpur Dist.: Saline and sandy ground, near police station pond, Khairpur, S. M. H. Jafri 1020 (K). — Karachi Dist.: 12.1 1959 Shamshad M. Naqvi (KUH); Drigh Road, W. T. Stearn 23A (K); Hawksbay, M. Qaiser & Saida Qureshi 4238 (KUH). — Hyderabad Dist.: Kotri, H. H. Rich 442 (K). — Thatta Dist.: Haleji Lake, Ruqqaya Islam 11.10 1956 (KUH).

(1). This interesting taxon resembles *T. indica* Willd. in having pseudovaginate leaves and papillose rachis but differs chiefly in having broader racemes, 5—7 mm thick, more papillose rachis and different type of disc, i.e. confluent epilophic to epilophic. In *T. indica* Willd., the rachis is glabrous to sparsely papillose, the racemes 3—4 (—5) mm thick and the disc is mesodiscine. In the former taxon the adbasal part of the hairs of the seeds is much longer than in the latter (see seed morphological results for details). Pollen grains of the two taxa are very different. In the former the luminae are distinct at

the edges of the furrows and without columellae, while in the latter, luminae are indistinct at the edge of the furrows and with columellae (Qaiser 1976). Chemically the two species also show differences in their phenolic constituents. An unidentified hydroxy - aromatic acid is present in *T. pakistanica* Qaiser and absent in *T. indica* Willd. (Qaiser 1976).

(2). It also resembles to *T. arborea* (Sieb. ex Ehrenb.) Bge. in having papillose rachis and epilophic disc but differs by its pseudovaginate leaves, elliptic oblong petals, triangulate bracts and broader racemes. In *T. arborea* (Sieb. ex Ehrenb.) Bge. the leaves are auriculate, the racemes 5 mm broad, the petals trullate ovate and the bracts are linear triangular.

(3). *T. pakistanica* Qaiser resembles *T. salina* Dyer to some extent in having a similar type of disc and broad racemes but differs in a number of characters (see Tab. 1, and discussions under *T. salina* Dyer).

7. *Tamarix karelinii* Bge.

Tamarix karelinii Bge., Mem. Acad. St. Petersb. 7: 294 (1851). Tentamen 68 (1852); Boiss., Fl. Or. 1: 773 (1864); Gorshk. in Shishkin & Bobrov, Fl. USSR 15: 315 (1949). — Lectotype: Turcomania, Ins. Qgurtschinsk, Karelin (P!); Iso. (P!, G!, K!).

T. karelinii Bge. var. *densior* Trautv., Bull. Soc. Imp. Nat. Mosc. 39: 310 (1866). — Holotype: Soongaria, Schrenk V/66 (LE, n. v.); Iso. (K!).

Table 1. Diversity of *T. salina* Baum.

Group A (<i>T. salina</i> Dyer s. str.)	Group B (<i>T. pakistanica</i> Qaiser)
Leaves semiamplexicaul.	Leaves amplexicaul to pseudovaginate.
Twigs and rachis glabrous (Fig.4)	Twigs and rachis densely papillose.
Racemes 6-7 mm broad.	Racemes 6-7 mm broad.
Bracts linear oblong, 3-4 (5) mm long.	Bracts ovate, triangular - ovate, 1-1.5 mm long.
Pedice1 1 mm long.	Pedice1 0.5-1.25 mm long.
Disc epilophic to confluent epilophic.	Disc epilophic to confluent epilophic.
Styles 4.	Styles 3.
Seeds columnar, with distinct longitudinal and transverse ridges on the seed coat.	Seeds ecolumnar, no ridges visible.
Pollens with columellae inside the luminae, no gradation in the size of luminae from pole to equator.	Pollens without columellae with distinct gradation in size from pole to equator.

T. serotina Bge. ex Boiss., Fl. Or. 1:773 (1867).—Holotype: In septentume urbis Birdschand ad fontes salinas in humidis inter Herat et Tebes, Bunge Nov. 1858 (G — BOISS!).

T. pallasii var. *ramosissima* Karelin, Enum. Pl. Turcom. 335 (1839), pro syn.

T. hispida Willd. var. *karelinii* (Bge.) Baum, Monog. *Tamarix* 58 (1966).

Erect shrub, 2-3 (-4) m tall, with reddish brown to somewhat purplish brown bark, glabrous or younger parts somewhat papillose, especially the rachis. Leaves simple, sessile, ovate, covered with

salt glands, 1-2 mm long, 0.5-1 mm broad, acute. Racemes aestival, densely compound, 4-10 (-15) cm long, 3-4 mm broad, with papillose rachis. Flowers pink to dark pink, pentamerous. Bracts 1.5-2.5 mm long, amplexicaul, lanceolate, acute-acuminate, almost entire to very finely denticulate; pedice1 very short, c. 0.5 mm long. Sepals 5, connate at base, 0.75-1 mm long, 0.5-0.75 mm broad, ovate, finely denticulate, outer 2 more acutish than the inner 3. Petals 5, elliptic to elliptic obovate, 1.5-1.75 mm long, c. 1 mm broad, connivent. Stamens 5, exserted, filaments filiform, 1.5-1.75

mm long, anthers cordate, oblong, shortly apiculate. Disc epilophic, somewhat membranous. Ovary concial, somewhat stipitate, styles 3, \pm oblong-clavate. Capsule pyramidal (4–)5–6 mm long, 1.5–3 mm broad.

Distribution. Russia, Iran, Afghanistan and Pakistan.

Pakistan. Quetta Dist.: 35 miles from Chaman, towards Quetta on roadside, S. A. Faruqi & M. Qaiser 2351, 2352, 2353, 2354 (KUH); 3 miles from Mastung on way to Quetta, M. Qaiser & A. Ghafoor 4377 (KUH); Populzai Forest, Pishin, G. Watt 3972 (E); *ibid.*, J. H. Lace 3809 (K, E); near Yasin Zai, J. H. Lace Oct. 1855 (K). — Kalat Dist.: Mastung 29° 44' N, 60° 56' E, K. H. Rechinger 27360 (W).

(1). This species is reported for the first from Pakistan.

(2). Baum (1966) has erroneously included *T. karelinii* Bge. under the synonymy of *T. hipida* Willd. However a careful study of the types of both taxa suggests that the two can readily be distinguished from each other. The former is almost glabrous to somewhat papillose with finely denticulate sepals and membranous disc while in the latter, all parts are densely hairy and sepals irregularly denticulate and with a fleshy disc.

8. *Tamarix smyrnensis* Bge.

Tamarix smyrnensis Bge., Tentamen 53 (1852); Baum, Monong. *Tamarix* 45 (1966), excl. syn.: *T. hohenackeri* Bge., *T. bachtiarica* Bge. ex Boiss., *T. florida* Stev. ex Bge., *T. jordanis* Boiss. ssp. *xeropetala* Gutm. and *T. jordanis* Boiss. ssp. *brachy-*

stachys Zoh.; Baum in Davis, Fl. Turkey 2: 350 (1967). — Lectotype: In arenosis humidis Smyrnae, Fleischer 131, April 1827 (P!); Iso. (K!).

T. gallica L. var. *pycnostachys* Ledeb., Fl. Ross. 2: 135 (1843). — Syntype: Kislar, Steven (P!).

T. pallasii Desv. var. *macrostemon* Bge., l. c. 50. — Lectotype: Ad. fl. Alasan in Prov. Saleki, Transcauc., Kolenati 1157 (P!); Iso. (K!).

T. florida Bge. var. *rosea* Bge. l. c. 38. — Holotype: Buhse 1349/2 (b) (P!).

T. pallasii Desv. var. *effusa* Bge., l. c. 51. — Holotype: Persia borealis, Karababa, Szowits 1829 (P!).

T. pallasii Desv. var. *moldavica* Bge., l. c. 52. — Lectotype: In arenosis ad ripas fluvii Siret, Guebhard 51 (W!); Iso. (G!).

T. lessingii Presl ex Bge., l. c. 51. — Isotype: Rossia, hab. ad ripam dextrum fluvii Ural, Lessing (P!).

T. pallasii Desv. var. *smyrnensis* (Bge.) Boiss., Fl. Or. 1: 773 (1867).

T. pallasii Desv. var. *albiflora* Grint, Bull. Inf. Grad. Bot. Cluj. 5:95 (1925). — Isotype: In alveo rivuli Parhova prope stationem viae forreae Parhova, \pm 130 m. s. m., June 1923 (G!).

A tall shrub or very small tree, 1.5–4 (–5) m tall with reddish brown bark, entirely glabrous. Leaves lanceolate-ovate, sessile with somewhat narrow base, 2–3 mm long, 1–1.5 mm broad, entire, acute. Racemes aestival, compound, 1–4 cm long, 3–4 mm broad with floral axis naked at the basal part. Flowers pentamerous, pink or pinkish white, peduncle 0.5–1 cm long. Bracts triangular, amplexicaul, acute, entire, 1.75–2.25 mm long, 0.5–0.75 mm broad, pedicel 0.5–1 mm long. Sepals 5, fused

at the base, ovate, to trullate ovate, 1 mm long, 0.5–0.75 mm broad, denticulate especially at the apex, obtuse. Petals 5, orbicular-suborbicular or ovate, with a gibbous base, connivent, 1.25–2 mm long, 1 mm broad, persistent. Stamens 5, filaments filiform, inserted in between the lobes of the mesodiscine disc, lobes not deeply emarginate, anthers cordate, not apiculate. Styles 3, somewhat clavate, ovary somewhat stipitate, c. 2 mm long. Capsule pyramidal, 4–5 mm long.

Distribution. Rumania, Bulgaria, Greece, Turkey, Russia, Iran, Iraq, Afghanistan and Pakistan.

Pakistan. Quetta Dist.: Jalgir, near Pishin, ± 5000', Zaffar Ali 5696 (RAW, K); Quetta, Sariab road, ± 1700 m, Jennifer Lamond 915 (E, KUH); 20 km N. of Quetta, 3rd. Danish expedition to Central Asia, M. Köie 3097 (C); Baleli, 5700', narrow valley, between less cliffs and well watered, Crookshank 482 (K); Urak, near Quetta, R. R. Stewart 650 (K); Quetta, Baluchistan, James Sinclair 2779 (E); Baleli Nallah, M. Qaiser & A. Ghafoor 1264, 1266, 1267, 4357, 4358 (KUH); Baleli, M. Qaiser 6 (KUH); Forest Nursery Nallah, M. Qaiser & A. Ghafoor 4348, 4351, 4352 (KUH); Meteorological department, Barori, Sultanul Abedin 4896 (KUH); 8 miles from Quetta on way to Ziarat, S. A. Faruqi & M. Qaiser 2355, 2356 (KUH). — Kalat Dist.: Kalat, near water, alt. c. 6500', S. M. H. Jafri & Akbar 2735 (KUH).

(1). This species is reported for the first time from Pakistan.

(2). Baum (1966) treated *T. hohenackeri* Bge. as a synonym of *T. smyrnensis* Bge.

Other botanists like Boissier (1867) treated them as two distinct taxa and reduced the latter to a variety of *T. pallasii* Desv. Gorshkova (1949) accepted *T. hohenackeri* Bge. as a distinct species but did not include *T. smyrnensis* Bge. under its synonymy. A careful examination of the types of both taxa suggests that they are not conspecific. *T. hohenackeri* Bge. can easily be distinguished from *T. smyrnensis* Bge. by its lax and longer racemes (6–7 cm long), which are squamate at the base while in *T. smyrnensis* Bge. the racemes are shorter, compact and naked at the base.

(3). Baum (1966) also included *T. bachtiarica* Bge. ex Boiss. under synonymy of *T. smyrnensis* Bge. According to Boissier (1867) the petals are deciduous. The type specimen [holotype: Ssof inter Isfahan et Tehran, Bunge 13.5 1859 (G — BOISS!)] is not in fruting stage, but mainly flowering, so it is very difficult to decide whether the petals are deciduous or not; moreover the types of *T. bachtiarica* Bge. ex Boiss. and *T. hohenackeri* Bge. exactly match each other.

(4). I have not seen the holotypes of *T. jordanis* Boiss. ssp. *xeropetala* Gutm. and *T. jordanis* Boiss. ssp. *brachystachys* Zoh., which are in (HUI) but judging from the description and the detailed discussion given by Zohary (1972) it is concluded that they are not conspecific with *T. smyrnensis* Bge., contrary to the conclusions of Baum (1966).

(5). Bunge (1852) cited a number of specimens under *T. pallasii* Desv. var. *macrostemon* Bge. Most of them are present in the Paris Herbarium. All of them are in agreement with Bunge's description. Kol-

enati's specimen is selected as lectotype as it is the best and most complete specimen.

9. *Tamarix baluchistanica* Qaiser, sp. nov. (Fig. 4)

Tamarix baluchistanica Qaiser, sp. nov. — Holotype: 15 miles from Ziarat on way to Quetta, M. Qaiser & A. Ghafoor 1436 (KUH).

Frutex 1.5 — 3(— 4) m altus, cortice fusco. Rami glabri. Folia sessilia, basi angusta, plus minusve ovata, 1.5—2(—3) mm longa. 0.5 mm lata, acuta. Inflorescentia composita, 3—10 cm longa, 3—4 mm lata, rachide glabra. Flores pentameri, rosei. Bractea triangulato-trullatae, integrae, 1.5 — 1.75 mm longae, 1 mm latae, acutae. Pedicelli c. 1 mm longi. Sepala 5, ovata vel trullato-ovata, 0.75 — 1 mm longa, 0.5 mm lata, margine inciso-denticulata, interiora tria breviora, dua exteriora longiora, acutiora. Petala 5, obovata vel plus minusve unguiculata, 1.5 — 1.75 mm longa, 0.75 — 1 mm lata. Stamina 5; filamenta filiformia, 2—3 mm longa; antherae apiculatae. Discus confluens, epilophus. insertione hypodiscali. Ovarium stipitatum, ovatum, 1.5 — 2 mm longum. Capsula pyramidata, 3—3.5 mm longa, 1—1.5 mm lata.

1.5—3(—4) m tall shrub with brownish bark. Branches glabrous. Leaves narrow at base, more or less ovate, 1.5 — 2(—3) mm long, 0.5 mm broad, acute. Inflorescence aestival, compound 3—10 cm long, 3—4 mm broad with glabrous rachis. Flowers pentamerous, pink. Bracts triangular-trullate, entire 1.5 — 1.75 mm long, 1 mm broad, acute; pedicel c. 1 mm

long. Sepals ovate or trullate ovate, 0.75 — 1 mm long, 0.5 mm broad, with denticulate margin, inner 3 smaller, outer 2 large and acute. Petals 5, obovate or more or less unguiculate, 1.5 — 1.75 mm long, 0.75 — 1 mm broad. Stamens 5, filaments filiform, 2—3 mm long, anthers apiculate, disc confluent epilophic, insertion hypodiscal. Ovary stipitate, ovate, 1.5—2 mm long. Capsule pyramidal, 3—3.5 mm long, 1—1.5 mm broad.

Distribution. Only known from the type locality in Pakistan.

Pakistan. Quetta Dist.: 15 miles from Ziarat on way to Quetta, M. Qaiser & A. Ghafoor 1436, 1437 (KUH).

(1). This is an interesting taxon which resembles *T. salina* Dyer and *T. pakistanica* Qaiser in having confluent epilophic disc but differs in having much thinner racemes (3—4 mm broad), and smaller petals. It is readily differentiated from *T. pakistanica* Qaiser by its glabrous twigs and columnar seeds, while the former taxon is densely papillose and has columnar seeds. It also differs from *T. salina* Dyer by its finely denticulate sepals, which are almost entire in latter taxon. In *T. baluchistanica* Qaiser the pollen grains are also much smaller than those of *T. salina* Dyer (Qaiser 1976).

(2). *T. baluchistanica* Qaiser also resembles *T. mascatensis* Bge. to some extent in having a similar type of disc and thin racemes, but differs in having longer racemes and obovate petals. In *T. mascatensis* Bge., the racemes are 1—3 cm long and the petals are ovate to elliptic ovate. Both taxa also differ in their

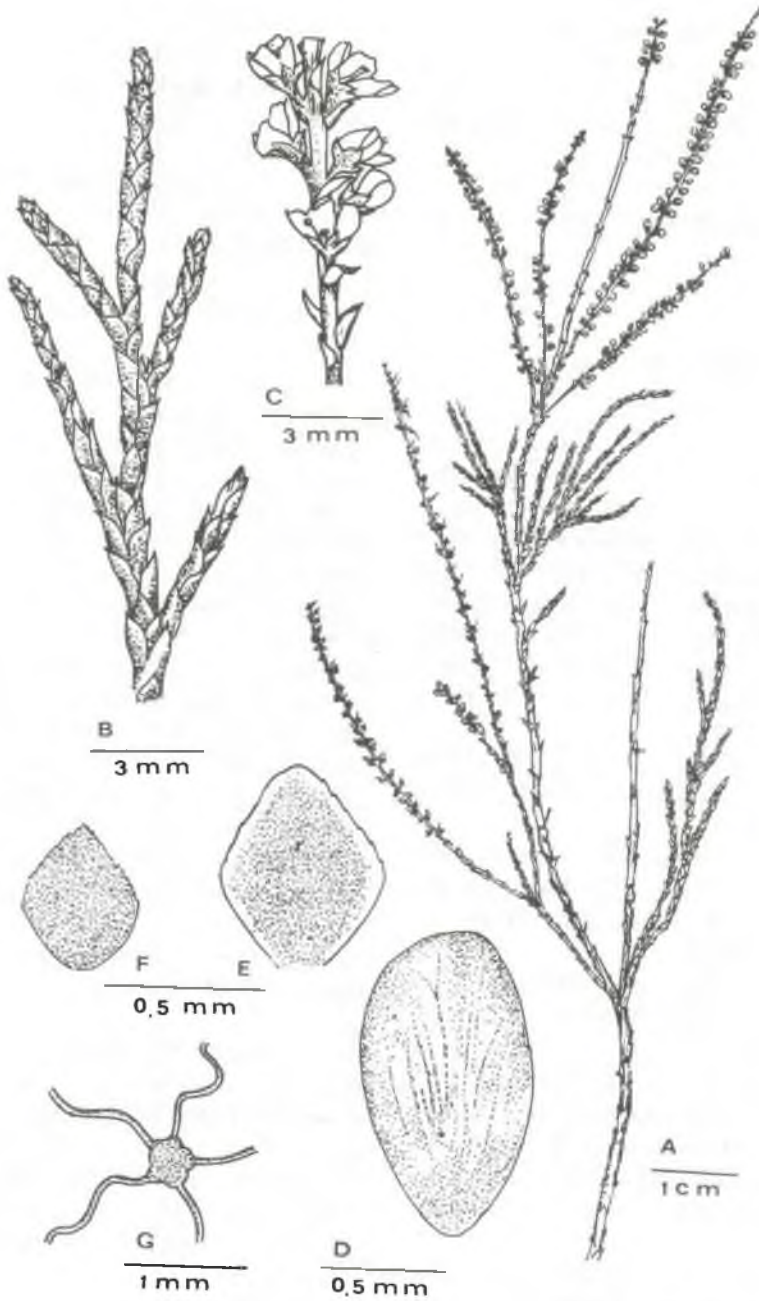


Fig.4. *Tamarix baluchistanica*. — A. Twig. — B. Leaves. — C. Part of inflorescence. — D. Petal. — E—F. Sepals. — G. Disc.

pollen characters, the former has distinct columellae inside the luminae, while in the latter no columellae are visible (Qaiser 1976). The longitudinal ridges are also elevated on the seed coat of *T. mascatensis* Bge. while in *T. baluchistanica* Qaiser, the ridges are not elevated (Qaiser 1976).

10. *Tamarix ramosissima* Ledeb.

Tamarix ramosissima Ledeb., Fl. Alt. 1: 424 (1829), Ic. Pl., Fl. Ross. 3: 17 (1831); Gorshk. in Shishkin & Bobrov, Fl. USSR 15: 311 (1949); Schiman - Czeika in Rech. f., Fl. Iranica 4: 11 (1964); Baum, Monog. *Tamarix* 42 (1966); Stewart in Nasir & Ali, Ann. Cat. Vasc. Pl. W. Pak. Kash. 490 (1972). — Holotype: Altai Desert, Songar, ad lacum Nor - saissan 1826 Politow (LE, n. v.); Iso. (P!, E!, K!) p.

T. pentandra pall., Fl. Ross. 2: 72 (1788), nom. illegit. — Holotype: Siberia 14a, p. S. Pallas (BM!).

T. pallasii auct. sensu DC., Prodr. 3: 26 (1828) et auct. plur., non Desv. (1824).

T. gallica L. var. *micrantha* Ledeb., Fl. Ross. 2: 135 (1843) p. p.

T. eversmannii Presl ex Ledeb., l. c. — Holotype: ad ostium Volgae, Claus (LE, n. v.); Iso. (P!).

T. odessana Stev. ex Bge. Tentamen 47 (1852). — Lectotype: Odessa circa salsum occidentalem in argillosis rarissima, Szowits 146 (P!); Iso. (G!, W!).

T. pallasii Desv. var. *ramosissima* (Ledeb.) Bge., Tentamen 52 (1852).

T. pallasii Desv. var. *minutiflora* Bge., l. c. 51. — Holotype: Mongoliae Desert Ghobi, Bunge s. n. 1831 (P!).

T. pallasii Desv. var. *brachystachys* Bge.,

l. c. — Lectotype: In arenosis ad lacum Nor — saissan, Karelin & Kirlow 718 (P!); Iso. (G!, W!), together with a specimen of *T. leptostachya* Bge.

T. pallasii Desv. var. *tigrensis* Bge., l. c. 52. — Holotype: Insulis Tigridis pr. Mossul sparsim, 10 Sept. 1841, Kotschy 153 (453) (P!).

T. gallica L. var. *pallasii* auct., non Desv., Dyer in Hook. f., Fl. Brit. Ind. 1: 248 (1874).

1 — 5 m tall shrub or small tree with reddish or reddish brown bark. Leaves sessile, ovate or deltoid cordate, 2–4 (–5) mm long, 1–2 mm broad, acute, somewhat subamplexicaul. Inflorescence aestival and vernal, aestival densely compound vernal simple, loose, 1–5 (–7) cm long, 3–4 (–5) mm broad, on 0.2–1 cm long peduncles. Bracts ovate, trullate, triangular, 1.5–2 mm long, 0.5 mm broad, acute, acuminate, with denticulate margin especially in their lower parts, pedicel very small, 0.5 mm long. Flowers pentamerous. Calyx 0.75–1.25 mm long, sepals 5, 0.5–1 mm long, inner 3 much broader than the outer 2, ovate, acute, irregularly denticulate with somewhat scarios margin. Petals pink to pinkish purple rarely white, obovate-elliptic to obovate, unequilateral, slightly notched at the apex, 1.25–1.75 mm long, 0.75–1 mm broad, persistent. Stamens 5, filaments filiform 2.5–3 mm long, inserted in between the lobes of the disc, i. e. mesodiscine disc, lobes of the disc deeply emarginate, insertion hypodiscal, anthers obtuse. Styles 3, clavate, connivent, ovary stipitate. Capsule trigonous, 4–5 mm long, 0.75–1 mm broad, dehiscing by 3 longitudinal slits.

Distribution. Korea, China, Mongolia,

Russia, Iran, Afghanistan and Pakistan.
Pakistan. Ladakh Dist.: Khalsar, Shyok valley, 10,300 ft., F. Ludlow 519 (E). — Quetta Dist.: Ispling valley, A. H. Khan 16.10 1950 (PFI-B), near Quetta, R. R. Stewart 28173 (RAW); Quetta, A. H. Khan 16.10 1950 (PFI-B), Sariab, S. of Quetta, K. H. Rechinger 28828, 28829 (W); Spin Karez K. H. Rechinger 29429 (W).

(1). Pallas (1788) published this taxon for the first time under the name *T. pentandra* Pall., unfortunately he included *T. gallica* L. as a synonym. Thus *T. pentandra* Pall. must be treated as a superfluous name for *T. gallica* L.

(2). The type of *T. ramosissima* Ledeb. is mounted along with a specimen of *T. leptostachya* Bge. Therefore the entire sheet should not be taken as type (cf. Baum 1966).

(3). This is a rare species in Pakistan and the specimens cited under this species by Stewart (1972) mostly fall under *T. smyrnensis* Bge. The two taxa resemble each other very much in general habit and persistent petals, but *T. ramosissima* Ledeb. can readily be distinguished by elliptic or elliptic obovate petals which are not gibbous at the base and by the notches of the disc which are more emarginate than those of *T. smyrnensis* Bge. In *T. smyrnensis* Bge. the petals are ovate-orbicular, gibbous at the base and the notches of the disc are less emarginate.

11. *Tamarix korolkowii* Regel & Schmalh. ex Regel

Tamarix korolkowii Regel & Schmalh.

ex Regel, Acta Horti Petrop. 5: 582 (1877); Gorshk. in Shishkin & Bobrov, Fl. USSR 15:316 (1949); Baum, Monog. *Tamarix* 36 (1966). — Holotype: Chiwa below Ammu-Daria and Chiwa, Korolkow & Krause 25.5 1873 (LE n. v.); Iso. (G!, K!, W!).

T. martana Kom., Trav. Soc. Nat. Petersb. 26:142 (1896). — Isotype: Iskander kul, alt. 7000 ped. (*Zona Juniperus*), 7.7 1892, Komarov (K!).

T. leptostachya sensu Rusanov, Sredn. Tamariksi 58 (1949); non Bge. (1852).

2–3 m tall glabrous shrub with somewhat reddish brown bark. Branches more or less appressed. Leaves sessile, ovate to ovate-oblong with somewhat narrow base, 1–2(–3) mm long, 0.5–0.75 mm broad, acute. Racemes aestival and vernal, vernal simple, aestival compound, 4–15 cm long, 3–4 mm broad, peduncle 0.5–2 cm long. Flowers pentamerous, pink. Bract triangulate-ovate or lanceolate, c. 2 mm long, 0.25 mm broad or slightly more; pedicel 0.5–0.75 mm long. Sepals 5, ovate, finely denticulate, 0.75 mm long, 0.5 mm broad, outer more acutish than the inner. Petals 5, elliptic obovate, entire c. 1 mm long, 0.5–0.75 mm broad. Stamens 5, c. 1 mm long, filaments filiform, inserted in between the notches of the mesodiscine disc, with hypodiscal insertion, anthers slightly apiculate. Styles 3, short, stigmas discoid, ovary c. 1 mm long, capsule pyramidal, 3–4 mm long, 1–1.5 mm broad.

Distribution. Russia, Iran, Afghanistan and Pakistan.

Pakistan. Chitral Dist.: Chitral, Yasin Nasir 4975 (RAW); 2 miles from Chitral on way to Ayun, M. Qaiser & A.

Ghafoor 1870, 1874, 1875 (KUH); village Birir Nisar, Sultanul Abedin 8155 (KUH); Yarkhun, ± 2410 m, J. D. A. Stainton & G. Wöehrl 153 (W).

(1). This species is recorded for the first time for Pakistan.

(2). Rusanov (1949) treated *T. korolkowii* Regel & Schmalh. as a minor variant of *T. leptostachya* Bge. The two taxa can readily be distinguished by their different type of disc, bracts and petals. In the former taxon the disc is mesodiscine, the bracts almost equalling the pedicel, and the petals erect while in the latter taxon the disc is epilophic, the bracts much longer than the pedicels and the petals half spreading.

12. *Tamarix parviflora* DC.

Tamarix parviflora DC., Prodr. 4:97 (1828); Bge., Tentamen 32 (1852); Boiss., Fl. Or. 1:770 (1867); Baum, Monog. *Tamarix* 122 (1966). — Holotype: Constantinople s. n., 1822 Costagne 24 (G—DC!).

T. laxa Willd. var. *subspicata* Ehrenb. in Linnaea 2:254 (1827). — Isotypes: *T. gallica* Armiro, Sieber (W!, P!, K!).

T. cretica Bge., Tentamen 33 (1852). — Lectotype: *T. gallica* Sieber (W!); Iso. (P!, K!).

T. parviflora DC. var. *cretica* (Bge.) Boiss., Fl. Or. 1:770 (1867).

T. rubella Batt., Bull. Soc. Bot. France 44:256 (1907). — Isotype: Battandier 13547 C, Batna, April 1892 (G!).

T. lucronensis Sennen & Elias, Bol. Soc. Iberica Nat. 27:133 (1928). — Isotypes: Herrera Bosquet d'un ancicu monastero, 29 May 1926, Elias 4989 (G!, W!).

Tall shrub, 4 m high, with reddish brown bark. Leaves simple, alternate, sessile, ovate with somewhat auriculate base, 3–5 mm long, 1–1.5 mm broad, long acuminate. Racemes lateral, vernal, 2–4 cm long c. 5 mm broad. Flowers pinkish, tetra- and pentamerous but more often tetramerous. Bracts longer than pedicel, trullate ovate, acuminate with a diaphanous blunt end, apex subobtusely, membranous at the margin, c. 2 mm long, c. 1 mm broad; pedicel c. 1 mm long. Sepals fused at the base, outer sepals acute, inner obtuse, ovate, denticulate, membranous at the margin, c. 1.5 mm long, 1 mm broad. Petals oblong, obovate, somewhat parabolic, 2–2.25 (–2.5) mm long, 1 mm broad, persistent, rarely subsistent. Stamens 4 or 5 (depending upon tetra- or pentamerous flowers), 3.5–4 mm long, filaments filiform, confluent with the disc lobe, i. e. epilophic disc, anthers 1 mm long, ovate, apiculate. Styles 3, somewhat club-shaped, ovary conical. Capsule trigonous, c. 4 mm long, c. 2 mm broad.

Distribution. Turkey, Greece, Yugoslavia, Albania, Italy, Spain; introduced elsewhere.

Pakistan. Kurram Dist.: Kurram valley, near Parachinar Rest House, M. Qaiser & Sultanul Abedin 6065–6 (KUH). — Quetta Dist.: cultivated in PAS compound, Duthie s. n. (K).

(1). This taxon is being reported for the first time from Pakistan. It is perhaps introduced.

(2). Bunge (1852) established a new species, *T. cretica* Bge., on the basis of exapiculate anthers and spreading leaves.

A careful examination of the type and the material available in the different herbaria suggests that the variation is continuous in anther and leaf characters. There are a number of specimens which show intermediate condition. Therefore using these characters, it is very difficult to draw a line between the two taxa.

13. *Tamarix szovitsiana* Bge.

Tamarix szovitsiana Bge., Tentamen 26 (1852); Boiss., Fl. Or. 1:679 (1867); Parsa, Florae de l'Iran 1:1276 (1951); Baum, Monog. *Tamarix* 91 (1966), excl. syn. *T. laxa* Willd. var. *macrantha* Bge. — Lectotype: In campo salso ad pagum Schabanli districti Khoi, Provinciae Aderbeidschan, Persiae borealis, 27 April 1826, Szovits 135 (P!); Iso. (G!, P!, W!, K!).

T. ispanhanica Bge. ex Boiss., Fl. Or. 1:768 (1867). — Holotype: Persia, Ispanhan, Bunge May 1859 (G!); Iso. (P!).

Shrubs, (2-) 3-7 (-8) m tall, entirely glabrous with greyish brown bark. Leaves sessile, somewhat elliptic ovate-lanceolate, acute with diaphanous (cartilaginous) end, 2-2.5 mm long, 0.5-0.75 mm broad, branches and racemes somewhat squamate at the base, scales brown, ovate. Racemes lateral, vernal, 2-4 cm long, 7-10 mm broad. Bracts oblong-lanceolate, obtuse, finely denticulate, apex cartilaginous, 2-3 mm long, 1-1.25 mm broad; pedicel shorter than bract, c. 2-2.5 mm long. Flowers tetramerous, pink or whitish pink. Sepals ovate, finely denticulate, c. 1.5 mm long, c. 1 mm broad with membranous margin, outer 2 more acute than the inner 2. Petals broadly elliptic to obovate, somewhat attenuate at the

base, first erect, later on reflexed, 2-2.5 mm long, 1-1.5 mm broad. Stamens 4, filaments fused with discal lobes, disc epilophic or confluent epilophic, anthers cordate, minutely apiculate, c. 1 mm long, filaments twice the length of the anthers. Styles 4, free, ovary trigonous, 3-3.5 mm long.

Distribution. Russia, Iran, Pakistan .

Pakistan. Quetta Dist.: Mastung, 29° 44' N, 65° 56' E, K. H. Rechinger 27359 (W, KUH).

(1). This species is recorded for the first time for Pakistan.

(2). *T. laxa* Willd. var. *macrantha* Bge. is regarded as a synonym of *T. szovitsiana* Bge. by Baum (1966) but a critical study of the type of *T. laxa* Willd. var. *macrantha* Bge. [syntypes: prope Loktensem, Pallas (P!, K!)] indicates that this taxon is different in having bracts shorter than the pedicel and more denticulate sepals. In *T. szovitsiana* Bge. the bracts are much longer than the pedicel and the sepals are almost entire.

14. *Tamarix tetragyna* Ehrenb. var. *meyeri* (Boiss.) Boiss.

Tamarix tetragyna Ehrenb. var. *meyeri* (Boiss.) Boiss., Fl. Or. 1:768 (1867); Zohary, Fl. Palest. 2:360 (1972). — Holotype: Ad more Caspium, 1829 Meyer 1460 (G-BOISS!); Iso. (K!, P!)

T. desertii Boiss., Diagn. Ser. 1, 10:9 (1849); Zoh. in Trop. Woods 104:33 (1956), syn. nov. — Lectotype: Desert Arabique terrain salsugineux, March 1844, Husson 387 (G-BOISS!).

T. meyeri Bge., Mem. Acad. St. Petersb.

7:295 (1851), nom. illegit.

T. tetragyna Ehrenb. var. *desertii* (Boiss.) Zohary, Fl. Palest. 2:360 (1972).

2–5 m tall shrub with reddish brown bark, glabrous. Leaves alternate, sessile, ovate to oblong-ovate with somewhat narrow base, entire, 2–5 mm long, 1–1.5 mm broad with a diaphanous, blunt or acutish end. Inflorescence vertical, racemes 3–9 cm long, 5–8 mm broad, peduncle naked for a considerable distance, but somewhat squamate at the base. Flowers mostly tetramerous, rarely pentamerous in the same raceme. Bracts broadly linear to somewhat obtrullate, slightly denticulate at the margin, usually ending in somewhat blunt end, 2–5 mm long, 1–1.25 mm broad, pedicel much shorter than the bract, 0.75–1 mm long. Sepals 4(–5), united at the base, 2 mm long, 1–1.25 mm broad, inner somewhat smaller, obtusish, subentire, outer somewhat larger, more acutish and finely denticulate. Petals 4(–5), obovate-elliptic, 2–3 mm long, 1.25–1.75 mm broad, entire, very slightly retuse at the tip, deciduous. Stamens 4(–5), filaments filiform, c. 1.5 mm long, anthers cordate, obtuse or minutely apiculate, disc confluent epilophic with hypodiscal insertion. Ovary somewhat stipitate, conical to bottle-shaped. Styles 4, somewhat clavate to spatulate. Capsule pyramidal, c. 6 mm long.

Distribution. Extending from eastern Mediterranean to the Saharo-Arabian region, including southern Russia, Jordan, Egypt, Israel, Lebanon, Iran, Afghanistan and Pakistan.

Pakistan. Quetta Dist.: 38 miles from Quetta on way to Chaman, Sultanul

Abedin 4867 (KUH). — Sibi Dist.: 35 miles from Quetta on way to Ziarat, Sultanul Abedin 4781 (KUH). — Chagai Dist.: A flooded lake on Quetta river, S. W. of Nushki, large bushy shrub, 8 ft., flowers somewhat pinkish, Crookshank 54 (K).

(1). This taxon is recorded for the first time for Pakistan.

(2). A critical study of the holotype of *T. meyeri* Boiss. and the isotype of *T. tetragyna* Ehrenb. (Ehrenberg, ad San, June 1821, K!; unfortunately the holotype of *T. tetragyna* Ehrenb. was destroyed during Second World War) reveals that the former taxon does not deserve more than a varietal rank and there is no justification in keeping them as two distinct species. The two taxa differ in the length of raceme. In the type variety, var. *tetragyna*, the flowers are mostly pentamerous, while in var. *meyeri* (Boiss.) Boiss. they are mostly tetramerous. Moreover both varieties intergrade with each other to some extent. Boissier (1849) was also aware of the close relationship of *T. tetragyna* Ehrenb. and *T. meyeri* Boiss. Later (1867) he himself reduced the latter taxon as variety under *T. tetragyna* Ehrenb.

(3). *T. desertii* Boiss. is generally considered to be conspecific with *T. tetragyna* Ehrenb. by botanists such as Bunge (1852) and Baum (1966). Even Boissier in 'Flora Orientalis' (1867) reduced it to a synonym of *T. tetragyna* Ehrenb. Zohary (1972) treated *T. desertii* Boiss. as a variety under *T. tetragyna* Ehrenb. A careful examination of the type and the material available in different herbaria

shows that it has predominately tetramerous flowers and exapiculate to apiculate anthers, hence it should not be treated as a synonym of *T. tetragyna* Ehrenb. var. *tetragyna*. As *T. desertii* Boiss. is in no way different from *T. meyeri* Boiss., it is here treated as a synonym of *T. tetragyna* Ehrenb. var. *meyeri* (Boiss.) Boiss.

15. *Tamarix androssowii* Litw. var. *androssowii* (Fig. 5 A-H)

Tamarix androssowii Litw., Sched. Herb. Fl. Ross. 5:41 (1905); Groshk. in Bot. Mat. Gerb. Bot. Inst. SSSR, VII (4):79 (1938); in Shishkin & Bobrov, Fl. USSR 15:300 (1949); Baum, Monog. *Tamarix* 118 (1966); Stewart in Nasir & Ali, Ann. Cat. Vasc. Pl. W. Pak. Kash. 490 (1972). — Holotype: Turkistania, dominium Buchara, in locis arenoso-salsis pr. pag. Farab, ad fl. Amu-Darya, 1.3 1903 Androssow 1317 (LE n. v.); Iso. (G!).

A shrubby tree, 2–5 m tall with brownish to reddish brown bark, glabrous. Leaves ovate to oblong ovate, sessile, subamplexicaul, narrowly scariously margined, acute, 1–2 (–2.5) mm long, c. 0.5 mm broad. Racemes usually vernal, simple, lateral, loose, 1.5–4 cm long, 3–4 (–5) mm broad; peduncle 0.5–1 cm long, sparsely covered with bract-like scales at the base. Bracts 1 mm long, 0.5 mm broad, upper bract slightly larger, boat-shaped, diaphanous, acute, somewhat denticulate at the margin; pedicel 1–1.25 (–1.5) mm long, Flowers tetramerous, white. Sepals 1–1.25 (–1.5) mm long, 0.5–0.75 mm broad, ovate to trullate ovate, the outer 2 fused at base and somewhat keeled, obtuse, inner 2 acute, more or less den-

ticulate with scarious margins. Petals free, obovate, elliptic, rarely elliptic ovate, 1–1.5 mm long, 0.75 mm broad. Stamens 4, filaments filiform, 1.5 mm long, confluent with the discal lobes, disc confluent epilophic to epilophic; anthers cordate, somewhat apiculate, insertion peridiscal. Styles 3, clavate, ovary stipitate, c. 2 mm long. Capsule 4–5 mm long, c. 1 mm broad.

Distribution. Russia, Iran, Afghanistan and Pakistan.

Pakistan. Quetta Dist.: Quetta - Chaman, between Sarana and Qila Abdullah, c. 70 km from Quetta, ± 1400 m, Jennifer Lamond 1024 (KUH, E); *ibid.*, K. H. Rechinger 29868 (W); Spin Karez, near Quetta, 1800–1900 m, Jennifer Lamond 1146 (KUH, E); 20 km S. W. of Quetta, K. H. Rechinger 27261 (W); Jangle Bagh, Sariab, collector unknown, 15.3 1953 (RAW); 14 miles from Quetta on way to Ziarat, Sultanul Abedin 4670, 4671 (KUH); Beeloochist~ (Baluchistan), J. E. Stocks 1851 (K); *ibid.*, Ginghin 1226 (K); 35 miles from Ziarat on way to Quetta, Sultanul Abedin 4779 (KUH). — Kalat Dist.: Mastung, R. R. Stewart 814 (K).

16. *Tamarix androssowii* Litw. var. *transcaucasica* (Bge.) Qaiser, *comb. nov.* (Fig. 5, I–M).

Tamarix androssowii Litw. var. *transcaucasica* (Bge.) Qaiser, *comb. nov.*

— Holotype: Persia, Distr. Khoy, Province Aderbeidjan, Szovits 137 (LE n. v.); Iso. (P!, BM!, K!).

T. laxa Willd. var. *transcaucasica* Bge., Tentamen 35 (1852).

T. laxa Willd. var. *parviflora* Litw., Sched.

Herb. Fl. Ross. 5:79 (1905).

— Holotype: Turkestan, dominatio ad fluv. Amu-Darya pr. Farab, 6 April 1900 (flowering), 1 May 1900 (fruiting), Androssow 1418 (LE n. v.); Iso. (B!, G!).

T. litwinowii Gorshk., Sched. Pl. Herb. Fl. SSR10(61-64): 24 (1936). — Holotype: In arenosis pr. pag. Farab, 23 April 1903, Androssow 3048 (LE n. v.); Iso. (BM!, G!, K!, W!).

2-3 m tall shrub with brown to reddish brown bark. Leaves ovate-oblong acute, 1-2 mm long, 0.5 mm broad. Racemes 0.5-4 cm long, 2-4 mm broad, fasciculate at the apex, i. e. forming an umbel-like structure with 2-4 flowers. Pedicel 0.75-1.5 mm long; bracts ovate lanceolate, 0.75-2 mm long, 0.25-0.75 mm broad. Flowers tetramerous, calyx lobes ovate or triangulate ovate, 0.75-1.25 mm long, 0.5-0.75 mm broad, finely denticulate, acute. Petals oblong, 1.25-2 mm long, 0.5-1 mm broad. Stamens 4, filaments confluent with the discal lobes, 3-3.5 mm long, anthers short, obtuse. Ovary oblong ovate, c. 3 mm long, styles 4, short.

Distribution. Russia, Iran and Pakistan.

Pakistan. Quetta Dist.: Quetta, J. F. Duthie 8622 (K).

(1). This taxon is reported for the first time from Pakistan.

(2). Bunge (1852) described *T. laxa* Willd. var. *transcaucasica* Bge. but a careful study of the isotype of this taxon suggests its close relationship to *T. androssowii* Litw. and not to *T. laxa* Willd. It can easily be differentiated from the latter by the 3-5 mm broad racemes,

1.25-2 mm long petals, epilophic disc, while in *T. laxa* Willd. the racemes are 6-8 mm broad, the petals 2.5-3 mm long and the disc is mesodiscine.

(3). *T. androssowii* Litw. var. *transcaucasica* (Bge.) Qaiser differs from var. *androssowii* in minute characters only, i. e. in having somewhat umbel-like structure formed at the apex of each raceme and somewhat longer bracts, while on the other hand both varieties resemble each other in all other morphological characters, such as length and breadth of racemes, tetramerous flowers, epilophic disc. Moreover the pollen grains of both varieties have elevated muri and no difference was found in phenolic constituents of the taxa (Qaiser 1976). Therefore var. *transcaucasica* (Bge.) Qaiser is best retained under *T. androssowii* Litw. The varieties seem to intergrade with each other.

(4). Gorshkova (1936) raised *T. laxa* Willd. var. *parviflora* Litw. to *T. litwinowii* Gorshk. and cited the former as a synonym. A critical study of the types of both taxa revealed that they are to be included in *T. androssowii* Litw. var. *transcaucasica* (Bge.) Qaiser.

17. *Tamarix kotschyi* Bge.

Tamarix kotschyi Bge., Tentamen 30 (1852); Boiss., Fl. Or. 1:770 (1867); Gorshk. in Shishkin & Bobrov, Fl. USSR 15:301 (1949); Parsa, Flore de l'Iran 1(1):1277 (1951); Baum, Monog. *Tamarix* 120 (1966), excl. syn. *T. leptopetala* Bge. — Lectotype: Ad rivulos in montibus prope pagum Gere inter Abuschir et Shiras, 24 March 1842, Kotschy

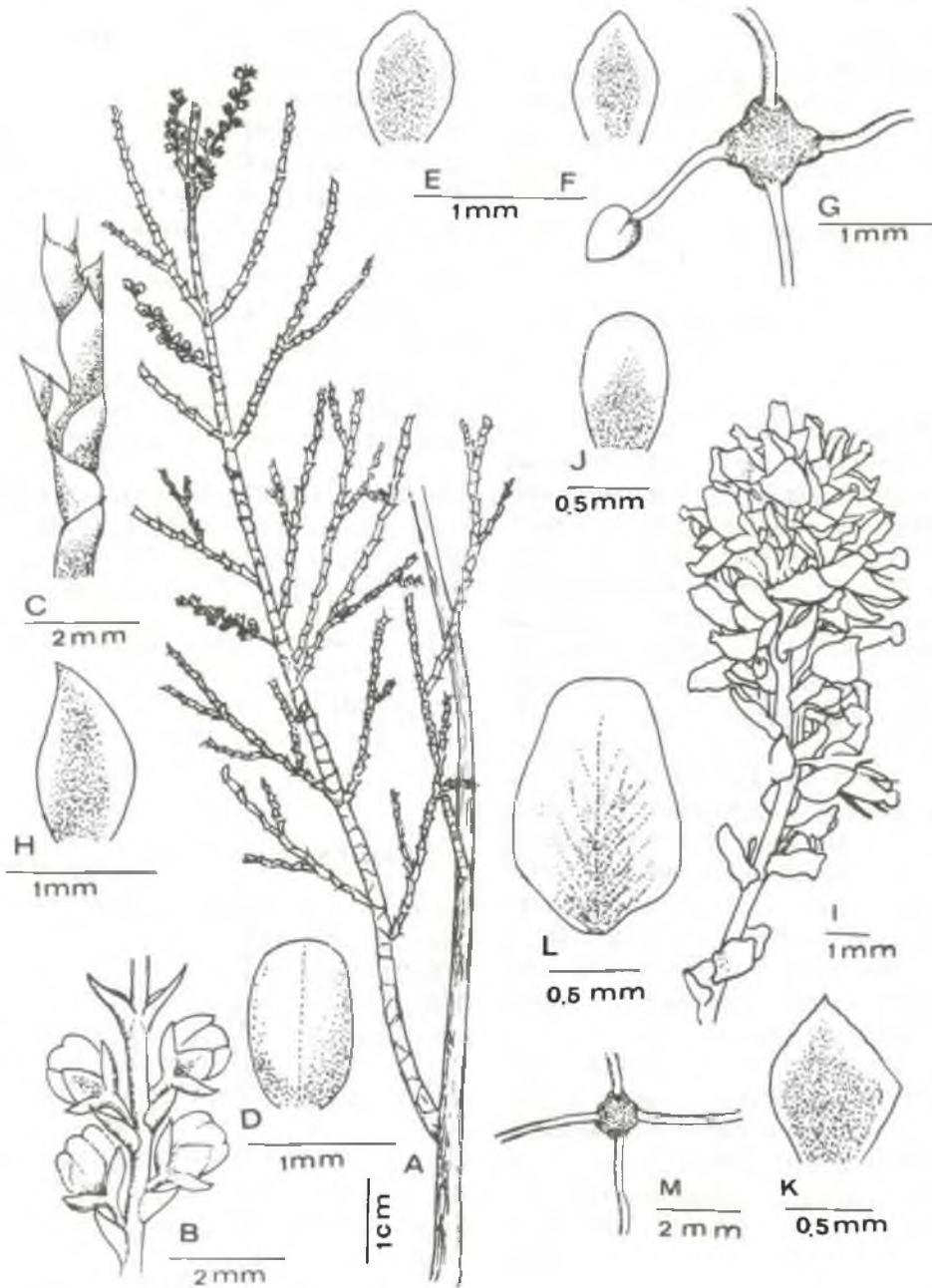


Fig.5. *Tamarix androssowii* var. *androssowii*. — A. Twig. — B. Part of raceme. — C. Leaves. — D. Petal. — E—F. Sepals. — G. Disc. — H. Bract. — *T. androssowii* var. *transcaucasica*. — I. Raceme. — J—K. Sepals. — L. Petals. — M. Disc.

100 (P!); Iso. (G!, K!).

T. tetrandra Pall. var. *parviflora* Boiss. ex Bge., l. c., pro syn. *T. laxa* Willd. var. *araratica* Bge., l. c. 35. — Lectotype: Am Araxes Ufer, 21.4 1847, Buhse 114 (P!); Iso.: (K!).

T. kotschyi Bge. var. *rosea* Litw., Trav. Mus. Bot. Acad. Imp. St. Petersburg. 3:112 (1907).

T. araratica (Bge.) Gorshk., Soviet. Bot. 4:118 (1936).

A medium-sized shrub, c. 2 m tall with greyish brown to deep purplish brown bark, almost glabrous, younger parts very minutely papillose. Leaves sessile, broadly ovate, 1–2 mm long, c. 1 mm broad, acute with scarious white margins, the younger leaves somewhat amplexicaul. Racemes vernal and aestival, vernal simple, aestival compound, 1–4 cm long, 3–4 mm broad; peduncle densely covered with somewhat ovate-lanceolate, acutish scales. Bracts 1.25–1.5 (–2) mm long, membranous, diaphanous, ovate or somewhat ovate lanceolate, boat-shaped, ending in a blunt point; pedicel 0.75–1.25 mm long. Flowers tetramerous, pinkish or white. Sepals broadly ovate, 0.75–1 mm long, 0.5 mm broad, with denticulate margin, the outer 2 more acute than the inner ones. Petals elliptic obovate, (1.75–)2–2.25 mm long, 1 mm broad, obtuse, caducous. Stamens 4, filaments c. 2 mm long with obtuse anthers, confluent with the dilated lobes of the disc (epilophic). Styles 3, obovate, connivent, ovary conical, c. 1 mm long. Capsule pyramidal, 2.5–4 mm long, 1.5 mm broad.

Distribution. Russia, Iran, Afghanistan and Pakistan.

Pakistan. Quetta Dist.: Surkhab valley, Baluchistan, Lace 3711 (E). — Kalat Dist.: Mastung, M. A. Farooqi 12.4 1971 (KUH). — Sibi Dist.: 35 miles from Ziarat on way to Quetta, Sultanul Abedin 4780 (KUH); Kach, between Ziarat and Quetta, Jafri & Akbar 2411 (KUH).

(1). This species is closely related to *T. androssowii* Litw. but can readily be distinguished from both its varieties by its bracts which are longer than the pedicel. In *T. androssowii* Litw. the bracts are shorter than the pedicel.

(2). Baum (1966) erroneously included *T. leptopetala* Bge. under the synonymy of *T. kotschyi* Bge. (for details see discussion under *T. mascatensis* Bge.).

(3). I have not seen the holotype of *T. kotschyi* Bge. var. *rosea* Litw. (in Leningrad) but judging from the description the identity with *T. kotschyi* is beyond question.

18 *Tamarix dioica* Roxb. ex Roth

Tamarix dioica Roxb. ex Roth, Nov. Pl. Ind. Or. 185 (1821); Bge., Tentamen 75 (1852); Dyer in Hook. f., Fl. Brit. Ind. 1:249 (1874); Talbot, For. Fl. Bomb. Pres. Sind 1:85 (1911); Cooke, Fl. Pres. Bomb. 1:75 (1958, repr. ed.); Schiman-Czeika in Rech. f., Fl. Iranica 4:(1964); Baum, Monog. *Tamarix* 80 (1966). — Neotype: Wallich No. 3756 B, Gualpooren (K–W!); Iso. (BM!).

T. dioica Roxb., Hort. Beng. 22 (1814), nom. nud.

T. longe-pedunculata Blatt. & Hallb. in J. Ind. Bot. 1:86 (1919).

Shrub or very small tree with reddish

bark, entirely glabrous. Leaves vaginate, abruptly acuminate, 1.5–3 mm long, with a broad whitish margin. Plants dioecious. Racemes aestival, simple or loosely compound, male racemes 3–8 cm long, 7–8 mm broad, compact, female raceme as long as or somewhat longer than the male raceme, 3–5 mm broad. Flowers pentamerous, purple or purplish pink, subsessile. Bracts semiamplexicaul, triangular, acuminate, 2.5–3 mm long, 1 mm broad. Sepals 5, ovate to broadly ovate or somewhat orbicular, c. 2 mm long, c. 1.5 mm broad, almost entire, obtuse. Petals 5, free, obovate, 2.5 mm long, 1–1.25 mm broad, entire, obtuse. Stamens 5, filaments filiform, 1.75–2 mm long, inserted in between the notches of the disc (mesodiscine disc), notches almost entire to slightly emarginate, anthers obtuse, ± sagittate; stamens abortive in the female flowers. Styles 3, as long as the ovary or slightly shorter, exerted, ovary triquetrous 1–1.5 mm long, abortive or absent in male flowers.

Distribution. Pakistan, Iran, Afghanistan, India, Nepal, Bangla Desh and Burma.

Pakistan. Peshawar Dist.: Common by the stream of Peshawar, where soil saline, Stewart 227/8 (K); *ibid.*, Harold Deane (K); Naushera, N. W. Province, S. M. Toppin 2010, 2011 (K); Malakand, a shrub or small tree, S. M. Toppin 2013 (K); Charsadda near Neguman bridge, B. L. Burt B-975 (E); Punjab, T. Thomson s. n. (BM, C); *ibid.*, Falconer 269 (K). — Rawalpindi Dist.: J. E. Aitchison 340 (K); Ayub Park, M. A. Siddiqui 1502 (RAW). — Zhob Dist.: 4–6000, J. F. Duthie 15.5 1896 (C); *ibid.*, Harsukh 20486 (RAW, K). —

Muzaffarabad Dist.: Lei, Multan, 36 without collector (E). — Multan Dist.: Multan, Edgeworth 3011 (K). — Mianwali Dist.: 4 miles from Kalabagh on way to Bannu, Sultanul Abedin & M. Qaiser 9312, 9313 (KUH). — Lahore Dist.: Lahore, Cleghorn 1896 (E); *ibid.*, T. Thomson 1896 (K); Lahore Forest Div., collector unknown (E); Ravi Bank, Lahore, R. R. Stewart 15366 (RAW). — Jhang Dist.: c. 4 miles from Chauk Munda on way to Rangpur (D. I. Khan—Jhang Road), M. Qaiser 2578 (KUH). — Sibi Dist.: Sibi, J. H. Lace 3384 (E). — Makran Dist.: 19 miles from Mand on way to Turbat, S. I. Ali, S. A. Faruqi & Sultanul Abedin 1978 (KUH); 13 miles from Hoshab on way to Turbat, S. I. Ali, Sultanul Abedin & S. A. Faruqi 1479 (KUH); coast of Baluchistan, G. Pierce 11/80 (K); Bakra, Baluchistan, J. H. Lace 3384 (K); near Panjgur, ± 900 m, stony hills and wadis, G. Popov 115 (BM). — Sukkur Dist.: 30 km N. W. of Sukkur, by swamp, with red flowers, J. S. Anderson & Peterson 481 (C, W, E). — Lasbella Dist.: On way to Sona Pass from Karachi, Manzoor A. Zaidi 150 (KUH); 3 1/2 miles from Lasbella on way to Jhaljhao, Sultanul Abedin & M. Qaiser 7489 (KUH); Lasbella, S. I. Ali, S. A. Faruqi & Sultanul Abedin 1423 (KUH); 1 mile from Bella on way to Khuzdar, M. Qaiser & A. Ghafoor 1143, 1144 (KUH); 10 miles from Bella on way to Uthal, M. Qaiser & A. Ghafoor 1144A (KUH); 45 1/2 miles from Bella on way to Karachi, Sultanul Abedin & M. Qaiser 7414, 7415 (KUH, E); near river Bella, Sultanul Abedin & M. Qaiser 7448, 7455 (KUH). — Karachi Dist.: Karachi University Campus, Abrar Hussain 1.7 1974 (KUH). — Dadu Dist.: Khadeji Fall, S.

I. Ali 9.5 1964 (KUH). — Thatta Dist.: Haleji Lake, M. Qaiser 4278 (KUH).

(1). This taxon is generally attributed to Roxburgh, but his *T. dioica* was simply a nomen nudum. Roth (1821) validated *Tamarix dioica* Roxb. ex Roth, but his actual description was based upon the specimen supplied by Heyne from India Orientalis as indicated by him (Nov. Pl. Or. 1821). According to Buchenau (1868) and Stafleu (1967), Roth's herbarium was in Oldenburg, and was later on acquired by Berlin and finally destroyed in Second World War. There is no indication whether Roth has seen Roxburg's specimen or not.

Baum (1966) selected the holotype of *T. dioica* Roxb. ex Roth from BM (Roxburgh, *T. dioica* ♂ et ♀, BM; duplicate in K). According to R. Smith of Kew (personal communication) the handwriting on this sheet is most probably not of Roxburgh and it is not confirmed, whether Roxburgh had seen this specimen or not. Therefore selection of such a doubtful specimen as a holotype is not justified.

The author has tried to search the specimens collected by Heyne from India in Kew, BM, W, P, G, B and C, but all in vain. In the absence of any authentic type material, specimen from Wallich's herbarium 3756B is therefore selected as neotype until authentic material is traced.

(2). Blatter & Hallberg (1919) described a species, *T. longe-pedunculata* Blatt. & Hallb., from Baluchistan distinguished from *T. dioica* Roxb. ex Roth by its longer peduncle and somewhat orbicular sepals.

According to P. V. Bole (personal

communication) of St. Xavier College, Bombay, the type is not traceable but a critical study of the large number of specimens from many herbaria suggests that the variation in peduncle length and sepals shape from ovate to orbicular is continuous. Therefore, it is not possible to segregate a taxon on the basis of these characters.

19. *Tamarix sultanii* Qaiser, sp. nov. (Fig. 6)

Tamarix sultanii Qaiser, sp. nov. — Holotype: Pakistan, 10 miles from Keti Bunder on way to Gharo, Sultanul Abedin, M. Qaiser & A. Ghafoor 9410 (KUH).

Frutex 1.5–3 m altus, cortice fusca. Rami glabri. Folia vaginantia, apice breviter spinosa, 1–2 mm longa. Inflorescentiae aestivales; racemi laxi, 5–10 mm longi, 8 mm lati, rachide glabra. Flores pentameri, rosei. Bracteeae c. 1 mm longae, 0.5–0.75 mm latae, trullato-ovatae, subamplexicaules, crenato-denticulatae. Pedicelli 1.25–1.5 mm longi. Sepala 1.75–2 mm longa, 1 mm lata; duo exteriora oblongo-ovata, obtuse, praecipue apicem versus subtiliter denticulata; tria interiora trullato-ovata, obtusa, denticulata. Petala 5, elliptico-oblongo-obovata, apice cuneata, 3 mm longa, 1.5–1.75 mm lata. Stamina 5, 2 mm longa; filamenta 1 mm longa, antherae oblongae, nec apiculatae; discus confluens epilophus-mesodiscinus, insertione peridiscali. Styli 3, plus minusve claviformes. Ovarium stipitatum, ovatum, 1.5 mm longum; capsula pyramidata, 4–6 mm longa, 2 mm lata.

Shrub 1.5–3 m tall with brownish bark, glabrous. Leaves vaginate ending abruptly in a short spine, 1–2 mm long. Racemes

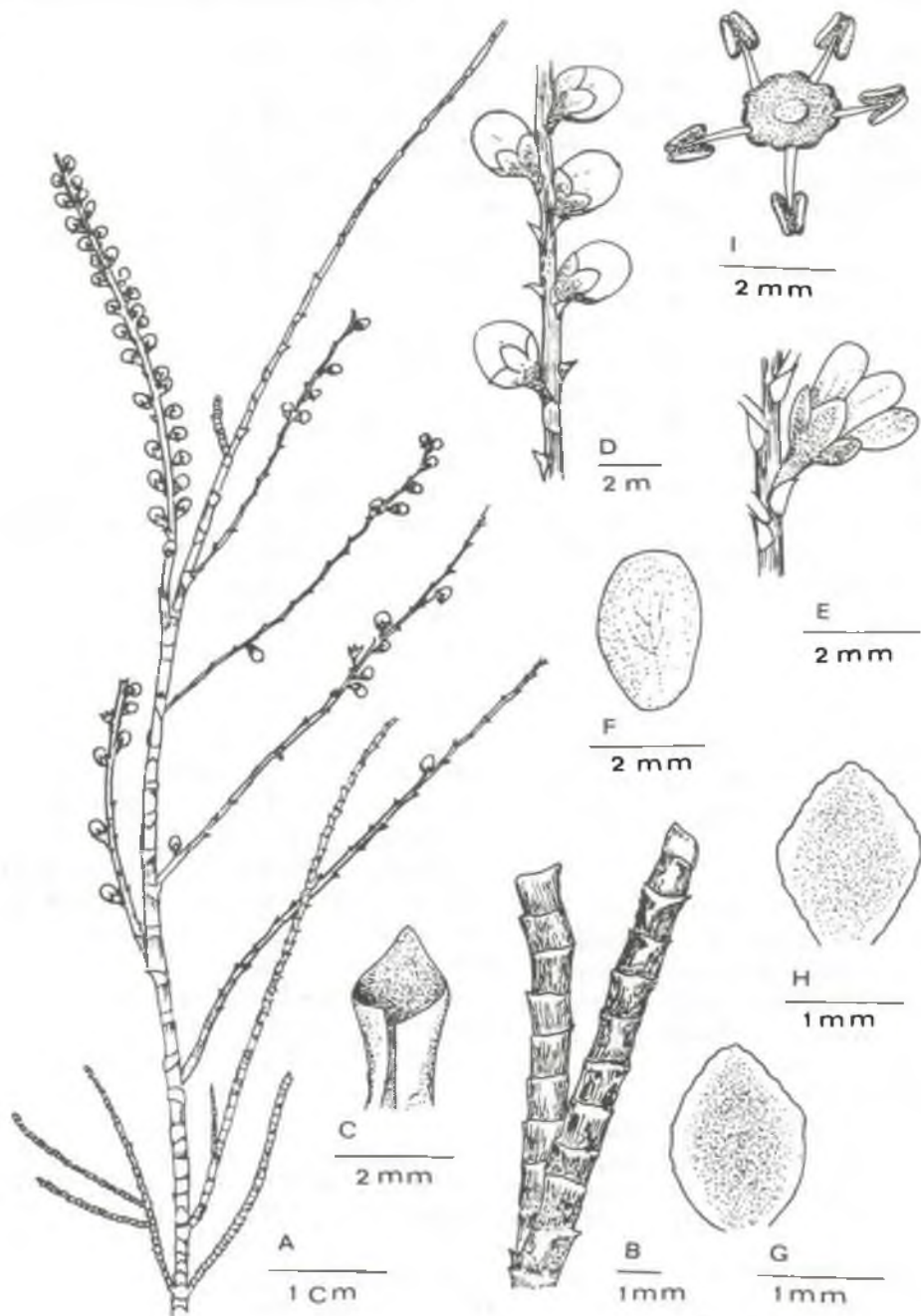


Fig. 6. *Tamarix sultanii*. — A. Twig. — B. Leaves. — C. Leaf. — D. Part of raceme .
 — E. Flowers. — F. Petal. — G—H. Sepals. — I. Disc.

aestival, lax, 5–10 mm long, 8 mm broad, entirely glabrous. Flowers pentamerous, pink. Bracts c. 1 mm long, 0.5–0.75 mm broad, trullate ovate, subamplexicaul, crenate-denticulate; pedicel 1.25–1.5 mm long. Sepals 1.75–2 mm long, 1 mm broad, outer 2 oblong-ovate, obtuse, finely denticulate, especially towards the apex, inner 3 ovate, obtuse, denticulate. Petals 5, elliptic oblong-ovate, cuneate at the apex, 3 mm long, 1.5–1.75 mm broad. Stamens 5, 2 mm long before anthesis, filaments 1 mm long, anthers oblong, not apiculate, disc confluent epilophic-mesodiscine, insertion peridiscal. Styles 3, \pm clavate, ovary stipitate, ovate, 1.5 mm long, capsule pyramidal, 4–6 mm long, 2 mm broad.

Distribution. Known only from Lower Sind.

Pakistan, Thatta Dist.: 11 miles from Ketu Bunder on way to Gharo, Sultanul Abedin & M. Qaiser 4131 (KUH); Goth Dorian near Gharo, Sultanul Abedin 4139 (KUH).

(1). This interesting taxon resembles much *T. stricta* Boiss. in its general habit, inflorescence and vaginate leaves but differs in having constantly 5 stamens, confluent epilophic-mesodiscine disc, distinct columellae inside the luminae of pollen grains and beaded ridges on the seed coat. *T. stricta* Boiss. has 10 stamens, epilophic disc, no columellae inside the luminae of pollen grains and ridges on the seed coat not beaded (Qaiser 1976).

(2). *T. sultanii* Qaiser also resembles *T. aphylla* (L.) Karst. and *T. kermanensis* Baum in having vaginate leaves but differs in having broader (8 mm broad) racemes

and a different type of disc. In *T. aphylla* (L.) Karst. and *T. kermanensis* Baum, the racemes are 4–6 mm broad and discs are mesodiscine and epilophic, respectively. The beaded ridges on the seed coat of *T. sultanii* Qaiser are also absent from both these species (Qaiser 1976).

20. *Tamarix aphylla* (L.) Karst.

Tamarix aphylla (L.) Karst., Deutsche Fl. 641 (1882); Schiman-Czeika in Rech. f., Fl. Iranica 4:13 (1964); Baum, Monog. *Tamarix* 75 (1966); Stewart in Nasir & Ali, Ann. Cat. Vasc. Pl. W. Pak. Kash. 489 (1972); Zohary, Fl. Palest: 2:359 (1972). — Holotype: Egypt 1136/3 (LINN!). *Thuja aphylla* L., Cent. Plant 32 (1755) p. p., Amon, Acad. 4:295 (1759), excl. syn. Shaw, Cat. Pl. Afr. 188 f. 188 (1738).

Tamarix orientalis Forssk., Fl. Aegypt. - Arab. 206 (1775). — Lectotype: *Kahirae hortensis* Forsskål (C - FORSSK!). *T. articulata* Vahl, Symb. Bot. 2:48 (1791); Bge., Tentamen 73 (1852); Dyer in Hook. f., Fl. Brit. Ind. 1:249 (1874), nom. illegit. — Lectotype: same as that of *T. orientalis* Forssk.

T. aphylla (L.) Lanza, Boll. R. Orto Bot. Palermo 8:82 (1909).

T. aphylla (L.) Warb., Beitr. Kent. Sinai 139 (1929).

Tree or tall shrub, up to 12 m high with reddish brown to grey bark, entirely glabrous. Leaves vaginate, abruptly mucronate, 1.5–2(–3) mm long, hoary due to the salt deposition from the impressed punctate glands. Racemes mostly aestival, simple or compound, 2–6 cm long, (2–) 3–4 (–5) mm broad, spirally curved.

Flowers pentamerous, bisexual, subsessile, pinkish white, pedicel less than 1 mm long. Bracts vaginate, ovate, acuminate, 1.25–1.5 mm long, 0.5 mm broad. Sepals 5, free, 1.5 mm long, c. 1 mm broad, almost entire, obtuse, broadly ovate to elliptic, outer 2 somewhat smaller than the inner 3. Petals 5, elliptic oblong to obovate, 2–2.5 mm long, 1 mm broad. Stamens 5, filaments filiform, 2 mm long, anthers cordate, somewhat apiculate. Disc deeply 5-lobed, filaments inserted in between the lobes of the disc (mesodiscine), insertion peridiscal. Stigmas 3 or 4, discoid, styles half as long as the ovary, ovary conical, 1.75–2 mm long. Capsule pyramidal, rounded at the tip, 2.5–3.5 mm long, c. 1.5 mm broad.

Distribution. Africa (Morocco, Algeria, Tunisia, Libya, Egypt, Senegal, Sudan, Ethiopia, Eritrea, Somaliland, Kenya), Middle East (Israel, Jordan, Saudi Arabia, Yemen, Iraq, Kuwait, Iran), Pakistan, India, and Afghanistan.

Pakistan. Swat Dist.: 27 miles from Pir Baba on way to Saidu, Sultanul Abedin 8539 (KUH). — Kohat Dist.: 5 miles from Kohat on way to Bannu, Sultanul Abedin & M. Qaiser 9291, 9293, 9294 (KUH); 10 miles from Khushhal Garh on way to Kohat, Sultanul Abedin & M. Qaiser 9286 (KUH). — Bannu Dist.: About 30 miles from Bannu on way to D. I. Khan, M. Qaiser & A. Ghafoor 1621 (KUH); 5 miles from Bannu on way to Kohat, M. Qaiser & A. Ghafoor 1622 (KUH). — Campbellpur Dist.: 1 mile from Chakwal on way to Choa Saidan Shah, S. A. Faruqi & M. Qaiser 2889, 2891 (KUH); 25 miles from Jand on way to Rawalpindi, Sultanul Abedin & M. Qaiser 9284 (KUH); 9 miles from Chakwal on

way to Rawalpindi, S. A. Faruqi & M. Qaiser 2901 (KUH). — Peshawar Dist.: Peshawar, Schlagintweit 2585 (BM); Naushera, S. M. Toppin 2012, 2013 (K); Cherat, near Pubbi, B. L. Burt B-995 (E). — Jhelum Dist.: c. 1000 m, ad radices mt. Salim in Jhelum prope Salimas, Kheora, J. R. Drummond 14641 (K). — Rawalpindi Dist.: Rawalpindi, R. P. Cult 341 (K). — Quetta Dist.: Ranikhet Quetta, M. Konieczny 7 May 1958 (KUH). — Zhob Dist.: 40 miles from Fort Sandeman on way to Quetta, M. Qaiser & A. Ghafoor 1564 (KUH). — Loralai Dist.: Gambaz, M. Qaiser & A. Ghafoor 1518 (KUH). — Multan Dist.: Multan, Edgeworth (K). — Dera Ismail Khan Dist.: 3 miles from Duggi on way to D. I. Khan, M. Qaiser & A. Ghafoor 1168 (KUH); 4 miles from Draban on way to D. I. Khan, M. Qaiser & A. Ghafoor 1606 (KUH). — Mianwali Dist.: About 12 miles from Kushab on way to Sargodha, M. Qaiser 2728–2730 (KUH); Chunnian, Sultanul Abedin 7561–7563 (KUH). — Sahiwal Dist.: 8 miles from Mian Chunu on way to Sahiwal, Sultanul Abedin & M. Qaiser 9537 (KUH); Pak Pattan, Griffith 965 (K). — Jhang Dist.: About 10 miles from Rangpur on way to Jhang, M. Qaiser 2580 (KUH); 20 miles from Rangpur on way to Jhang, M. Qaiser 2583, 2584 (KUH). — Lahore Dist.: About 7 miles from Pattoki on way to Lahore, M. Qaiser 3555 (KUH); Lahore, Cleghorn 1896 (E); Lahore, road-side tree, A. P. Young, 26 July 1888 (BM); Lahore Division, Forest Dept., Faras (E); Changa Manga, Lahore, J. S. Gamble 22494 (K); *ibid.*, S. B. Akhtar August 1956 (PFI-B); *ibid.*, R. N. Parker April 1925 (K); about 4 miles from Pattoki on way to Multan, M. Qaiser

3583 (KUH); Pirawala, Ishtiaq Hussain, July 1954 (PFI-B). — Chagai Dist.: 20 miles from Duki on way to Yetabad, M. Qaiser & A. Ghafoor 1516 (KUH).—Sibi Dist.: About 4 miles from Sibi on way to Quetta, M. Qaiser 2243, 2244 (KUH); Sibi, J. H. Lace 1889 (E); *ibid.*, J. H. Lace 2.1 1889 (E). — Jacobabad Dist.: Kashmore, Sind, C. Ritchie 1850 (E). — Bahawalpur Dist.: Sahiwala, 45 miles away from Bahawalpur, S. Manzoor Ashraf Zaidi 151 (KUH). — Dadu Dist.: Budhapur at Manghand, K. H. Rechinger 28666 (W); 15 km S. of Sehwan, K. H. Rechinger 28699(W); about 1 mile from Sann on way to Sehwan, S. A. Faruqi & M. Qaiser 2188, 2189 (KUH). — Kalat Dist.: Health Centre Khuzdar, M. Qaiser & A. Ghafoor 1201 (KUH); 15 miles from Wadh on way to Porali and Bella, M. Qaiser & A. Ghafoor 1168 (KUH). — Nawabshah Dist.: 64 miles from Khairpur on way to Nawabshah, M. Qaiser & A. Ghafoor 3618, 3619 (KUH). — Khairpur Dist.: Khairpur, Upper Sind, Ritchie March 1937 (E); 2 1/2 miles away, near rice field and water, Khairpur, S. M. H. Jafri 2417 (K). — Lasbella Dist.: 1 mile from Uthal on way to Karachi, 10—11 ft., M. Qaiser, Asad Raza & Abrar Hussain 712 (KUH); 42 miles from Bella on way to Karachi, Sultanul Abedin & M. Qaiser 7507 (KUH); Qasim Garden, Bella, Sultanul Abedin & M. Qaiser 7434, 7435, 7436 (KUH, E); near Bella river, Sultanul Abedin & M. Qaiser 7447 (KUH); 15 miles from Bella on way to Awaran, Sultanul Abedin & M. Qaiser 7458 (KUH); 3 miles from Bella on way to Khuzdar, M. Qaiser 1146, 1147 (KUH). — Karachi Dist.: Karachi, A. R. Beg 25705 (K).—Hyderabad Dist.: Ranipur, M. Qaiser & A. Ghafoor 3615 (KUH); 6 miles from

Hyderabad, near G. M. Barrage, M. Qaiser, Asad Raza & Abrar Hussain 602 (KUH).

(1). In the Linnaean herbarium (LINN), there is a sterile specimen of *Tamarix aphylla* (L.) Karst. labelled *Thuja aphylla* in the handwriting of Linnaeus, bearing the number 1136.3, collected by Hasselquist from Egypt. This specimen is regarded as the holotype of *Thuja aphylla* L. by the students of *Tamarix* such as Hunt (1963) and Baum (1966) due to the handwriting of Linnaeus.

Linnaeus actually misidentified the sterile *Tamarix* species as a conifer, earlier described by Shaw [Cat. Pl. Afr. 185, F. 188 (1738)]. After going through the original protologue of Linnaeus, it is noteworthy that the first two words, i. e. “Frondes filiformes” are taken from Shaw and the remaining description is strictly applicable to *Tamarix* and in the end he states “fructum non vidi”. Therefore his identification with Shaw’s Cupressus is erroneous. Vahl (1791) pointed out the mistake of Linnaeus and transferred his *Thuja aphylla* to *Tamarix* and named it *Tamarix articulata* Vahl but also included *T. orientalis* Forssk. in the synonymy, thus making the new name illegitimate.

(2). In Copenhagen (Forsskål’s Herbarium) there are five sheets of *T. orientalis* Forssk. all belonging to the type collection and on the back of each sheet *T. articulata* is written in Vahl’s handwriting. One sheet bears the label of *Kahirae hortensis*, this sheet is selected as lectotype for *T. orientalis* Forssk. and *T. articulata* Vahl.

(3). This is our largest and most common species, often planted as a roadside tree.

The bark and irregularly rounded galls (Sakun in Sindh) are used in tanning.

21. *Tamarix alii* Qaiser, sp. nov. (Fig. 7)

Tamarix alii Qaiser, sp. nov. — Holotype: Pakistan. Near Saren Lake, M. Qaiser, A. Ghafoor & Abrar Hussain 3737 (KUH).

Frutex 1–2.5(–3) m altus. Cortex rubro-fuscus. Rami glabri. Folia vaginantia, 2 mm longa, apice breviter spinosa. Inflorescentiae aestivales, compositae, laxae, 2.5–9 cm longae, 5–7 mm latae, rachide glabra. Flores pentameri, rosei. Bracteeae c. 1.5 mm longae, c. 1 mm latae, subamplexicaules vel amplexicaules, ovatae vel triangulari-ovatae. Pedicelli 1 mm longi. Sepala 5, ovata, obtusa, denticulata, interiora ovata vel orbicularia, 1–1.25 mm longa, c. 1 mm lata. Petala 5, obovata vel elliptico-oblonga, 2–2.25 mm longa, 1 mm lata, apice cuneata, recurvata. Stamina 5, 4 mm longa; antherae exapiculatae, cordatae, exsertae. Discus confluent epilophus. Styli tres, oblongi; ovarium ovatum, 2–2.5 mm longum.

Shrub, 1–2.5 (–3) m tall with reddish brown bark, glabrous. Leaves vaginate with a short spine, 2 mm long. Racemes aestival, compound, lax, 2.5–9 cm long, 5–7 mm broad; rachis glabrous. Flowers pentamerous, pink. Bracts c. 1.5 mm long, c. 1 mm broad, subamplexicaul or amplexicaul, ovate-triangular to ovate; pedicel 1 mm long. Sepals 5, ovate, obtuse, denticulate, inner ovate or orbicular, 1–1.25 mm long, 1 mm broad. Petals 5, obovate or elliptic oblong, 2–2.25 mm long, 1 mm broad, cuneate at the apex, recurved. Stamens 4 mm long,

anthers exapiculate, cordate, exserted, disc confluent epilophic. Styles 3, oblong, ovary ovate, 2–2.5 mm long.

Distribution. Known from Sind only.

Pakistan. Thatta Dist.: Gujjo, Jam Branch, M. Qaiser & M. Saleem 4292 (KUH). — Tharparker Dist.: Near Saren Lake, S. I. Ali, S. A. Faruqi & Sultanul Abedin 3738 (KUH); Jatrai, Ranger's Post, M. Qaiser, A. Ghafoor & Abrar Hussain 3891, 3896 (KUH); Virava, Nagar Parker Road, M. Qaiser, A. Ghafoor & Abrar Hussain 4148 (KUH).

(1). This interesting taxon resembles much *T. sultanii* Qaiser in having vaginate leaves and broad racemes but differs by its recurved petals, orbicular sepals, long exserted stamens and clearly confluent epilophic disc. In *T. sultanii* Qaiser, the petals are erect, the sepals ovate, the stamens not exserted, and the disc mesodiscine-epilophic. The pollen grains of the two taxa are also different. In *T. alii* Qaiser, the luminae are indistinct at the edge of the furrows while in *T. sultanii* Qaiser they are clearly defined at the edges of furrows (Qaiser 1976).

(2). *T. alii* Qaiser also resembles *T. aphylla* (L.) Karst. and *T. kermanensis* Baum by having vaginate leaves but differs from both these species by broader racemes (5–7 mm broad), recurved petals, and confluent epilophic disc. In *T. kermanensis* Baum and *T. aphylla* (L.) Karst. the racemes are 3–5 (–6) mm broad, the petals erect and the discs epilophic and mesodiscine, respectively. In fact the new taxon is distinctive in the series *Vaginatae* by the recurved petals and confluent epilophic disc, cha-

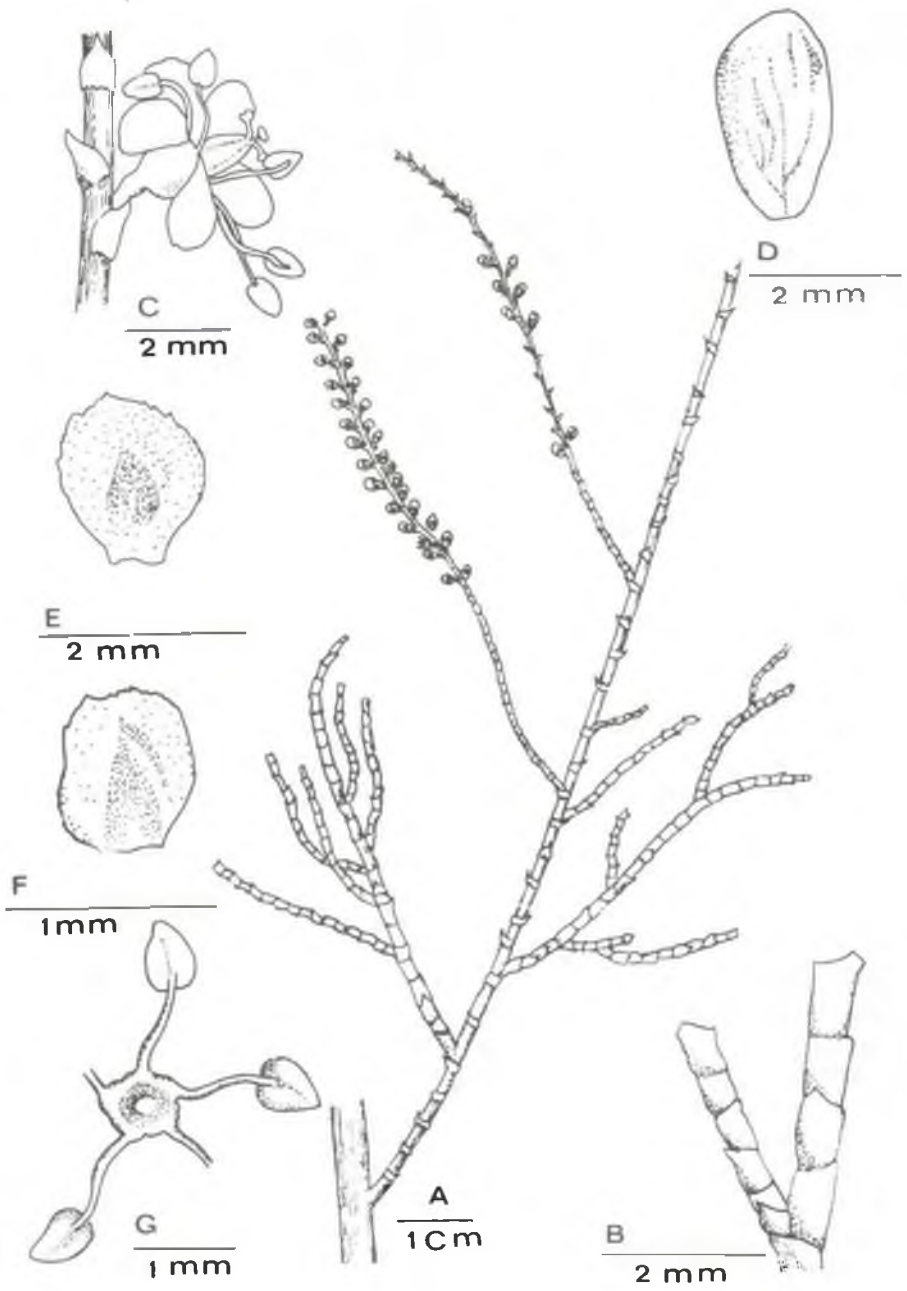


Fig. 7. *Tamarix alii*. — A. Twig. — B. Leaves. — C. Flower. — D. Petal. — E-F. Sepals. — G. Disc.

racters not present in any other species of this series.

22. *Tamarix kermanensis* Baum

Tamarix kermanensis Baum in Österr. Bot. Zeit. 114 (4/5):379 (1967). — Holotype: Described from Iran (Kerman): ad marginem austro-orientalem deserti Lut, SW. Nosratabad, Sipi, 27.3 1965, Rechinger 2713 (W!).

Shrub, 2 m tall, with somewhat blackish brown bark, glabrous. Leaves vaginate, ending abruptly in a short spine, 1–1.5 (–2) mm long with somewhat papillose margin. Racemes aestival, simple, 4–8 cm long, 5(–6) mm broad with glabrous rachis. Flowers pentamerous, pink to purplish pink. Bracts triangulate, amplexicaul, minutely denticulate, acute, 1–1.25 mm long; pedicel slightly shorter than bract. Sepals ovate, finely denticulate, obtuse, c. 1 mm long, slightly less than 1 mm broad, outer sepals slightly keeled. Petals oblong, obovate or narrowly elliptic, unequilateral, sometimes emarginate or notched at the apex, c. 2 mm long, 1 mm broad. Stamens 5, filaments filiform, passing into the lobes of the disc, i.e. epilophic, anthers ovate, slightly apiculate, c. 0.7 mm long. Stigma discoid, ovary conical, somewhat bottle-shaped, c. 2 mm long. Capsule 6–7 mm long, 2–3 mm broad, purplish pink.

Distribution. South-Eastern Iran and Pakistan (Makran).

Pakistan. Makran Dist.: On sand dunes, Pasni, S. I. Ali, S. A. Faruqi & Sultanul Abedin 761, 762 (KUH).

(1). This species is reported for the first time from Pakistan.

23. *Tamarix stricta* Boiss.

Tamarix stricta Boiss., Diagn. Pl. Or. Nov. 2:57 (1856). Fl. Or. 1:778 (1867); Talbot, For. Fl. Bomb. Pres. 1:14(1911); Cooke, Fl. Bomb. Pres. 1:76 (1958, repr. ed.); Schiman-Czeika in Rech. f., Fl. Iranica 4:14 (1964); Baum, Monog. *Tamarix* 147 (1066). — Holotype: Scinde and Baluchistan, Stocks 274 (G-BOISS!); Iso. (G!, K!, P!, W).

3–5 m tall, tree or shrub, glabrous, with brownish grey bark. Leaves closely sheathing (vaginate), with punctate glands, (2–) 3–4 mm long, abruptly ending in a small acute point. Flowers sessile, pedicel less than 1 mm long. Bracts triangular, auriculate, entire, acuminate, shorter than the flowers. Sepals 5, united at the base, the outer 2 smaller, broadly ovate, the inner 3 larger, obovate, cuneate, denticulate at the apex only, c. 1.75 mm long, c. 1 mm broad, obtuse. Petals 5, free, elliptic-obovate, sometimes very minutely toothed at the apex, entire, pink, to purplish pink. Stamens 10, alternately (indistinctly) long and short, antisealous larger, antipetalous shorter, 3–4 mm long, anther c. 1 mm long, oblong, acute. Disc 10-lobed, lobes confluent with the slightly dilated lobes of the filaments, i. e. epidiscine. Styles 3, sessile, ovary 1.5 mm long. Capsule conical, dull white, 5 mm long, 1–1.5 mm broad, with persistent petals, many-seeded, seeds ovate, shallowly curved, brown to light brown, 0.75–1 mm long, 0.35–0.45 mm broad.

Distribution. Pakistan (Baluchistan) and southern Iran. Common in the dry river beds of lower altitudes of Baluchistan.

Pakistan. Makran Dist.: 30 miles from

Gishkore on way to Hoshab, A. Ghafoor & M. Qaiser 57 (KUH); 30 miles from Turbat on way to Pasni, A. Ghafoor & M. Qaiser 128 (KUH); about 1 mile from Awaran on way to Hoshab, Sultanul Abedin & M. Qaiser 7486 (KUH); 24 miles from Turbat—Panjgur Road, S. I. Ali, S. A. Faruqi & Sultanul Abedin 854 (KUH); 20 miles from Mand, river bed, S. I. Ali, S. A. Faruqi & Sultanul Abedin 1086 (KUH); about 35 miles from Sunstar on way to Mand, M. Qaiser, Asad Raza & Abrar Hussain 1031, 1032 (KUH); 50 miles from Mand on way to Sunstar, Sultanul Abedin & Abrar Hussain 6285, 6291 (KUH); c. 12 miles from Mand on way to Sunstar, M. Qaiser, Asad Raza & Abrar Hussain 1060 (KUH); 13 miles from Pasni on way to Turbat, Sultanul Abedin & Abrar Hussain 6471, 6472, 6473 (KUH); near Rest House Sunstar, S. I. Ali, S. A. Faruqi & Sultanul Abedin 1132 (KUH); 30 miles from Mand on way to Sunstar, A. Ghafoor & M. Qaiser 253 (KUH); 30 miles from Pansi on way to Turbat, A. Ghafoor & M. Qaiser 161 (KUH). — Lasbella Dist.: 6 miles from Jhaljao on way to Awaran, Sultanul Abedin & M. Qaiser 7471—7473 (KUH); 1 mile from Awaran on way to Bella, Sultanul Abedin & M. Qaiser 4701, 7490—7492 (KUH); 33 miles from Hoshab on way to Panjgur, Sultanul Abedin & Abrar Hussain 6594, 6595 (KUH); about 3 miles from Bella on way to Khuzdar, M. Qaiser 1146 (KUH); Hub river, S. M. H. Jafri April 1950 (KUH); *ibid.*, S. M. H. Jafri 1362 (KUH); 16 miles from Hub river on way to Shah Noorani, M. Qaiser et al. 505 (KUH); 4 miles from Shah Noorani on way to Karachi, M. Qaiser & Asad Raza 515 (KUH).

(1). In Boissier's herbarium there are 2 sheets of Stocks 274, one bearing the autograph of Boissier and the other sheet without Boissier's handwriting. The specimen with Boissier's handwriting is regarded as the holotype.

(2). The type locality of *T. stricta* Boiss. was indicated by Stocks as Sind and Baluchistan. After seeing a considerable number of herbarium specimens, and during repeated and frequent collection trips, the species has only been found in dry river beds in Baluchistan. It is therefore logical to conclude that the species does not occur in Sind or elsewhere in Pakistan (except in Baluchistan).

(3). It is hardly put to any use in Pakistan, though it is extensively used in sandy areas of Iran as a sand dune stabilizer (Niknam & Ahranjani 1975).

24. *Tamarix ericoides* Rottl. & Willd.

Tamarix ericoides Rottl. & Willd., Ges. Naturf. Freunde Berlin, Neue Schr. 4: 214 T. 4 (1803); Bge., Tentamen 80 (1852); Dyer in Hook. f., Fl. Brit. Ind. 1:249 (1874); Talbot, For. Fl. Bomb. Pres. 1:76 (1958, repr. ed.); Baum, Monog. *Tamarix* 136 (1966). — Lectotype: The illustration in Tab. 4 in Rottl. & Willd. Ges. Naturf. Freunde Berlin, Neue Schr. 4: 214 (1803).

T. mucronata Smith in Rees Cyclop. 35 (1): 70 (1817). — Holotype: *T. mucronata* Smith 383. 4 (LINN!).

Myricaria vaginata Desv. in Ann. Sc. Nat. Bot. 1(4):350 (1824). — Holotype: Habitat India Orientali, Desvaux (P!).

Tamarix tenacissima Buch., Ham. ex

Wall., Cat. 131, no. 3757 (1831), nom. nud. — Holotype: e bank, Wall. 3757 (K - W!).

Trichaurus ericoides (Rottl.) Arn. in Wight & Arn., Prodr. Fl. Ind. Or. 1:40 (1834); Dalz. & Gibson, Bomb. Fl. 14 (1861).

Trichaurus vaginata (Desv.) Walp., Rep. Bot. Syst. 2:115 (1843).

2-4 m tall shrub with blackish bark, glabrous to subglabrous, somewhat papillose. Leaves vaginate in the lower part, subamplexicaul in the upper part, ovate, lanceolate, long acuminate, 3-7 mm long, with punctate salt glands. Racemes vernal and aestival, simple 5-15 (-20) cm long, 8-10 mm broad. Bracts 2.25-3 mm long, c. 2 mm broad, subamplexicaul, acute to acuminate, triangular, somewhat denticulate at the margins. Pedicel 2 mm long, flowers 6 mm across, pale rose pink. Calyx 5-lobed, sepals 2-2.5 mm long, ovate, minutely and irregularly denticulate at the margin, the outer 2 more acute than the inner 3. Petals 5, free, elliptic to obovate 4-5 (-6) mm long, c. 4 mm broad, very finely and irregularly denticulate at the margin. Stamens 10, alternating with sepals and petals, the antipetalous stamens somewhat shorter than the antisepalous stamens, 3-4 mm long. Disc cup-shaped, fleshy, forming a somewhat membranous torus. Ovary ovate, c. 1 mm long, capsule 1.25 cm long, c. 4 mm broad.

Distribution. India, Ceylon, Bangla Desh and Pakistan.

Pakistan. Sargodha Dist.: Shahpur, Kabir, 17 Sept. 1902 (K, KUH).

(1). **Typification:** The German missio-

nary Rottler travelled from Tranquebar 24 Sept. 1799 to Madras and returned to Tranquebar on 16 Jan. 1800 (Clarke & Stapf 1896). Rottler's herbarium was acquired by Kew from King's College, London in 1872. The type of *Tamarix ericoides* Rottl. & Willd. was collected on the banks of river Searu near Uttamerur (Chinlgeput Dist.), S. W. of Madras on January 2 1800 by Rottler. Presently the type of this taxon is untraceable even at Berlin and Kew (Meikle, personal communication). However there is a small sterile specimen of *T. ericoides* Rottl. & Willd., mounted along with other specimens from Herbarium Rottlerianum bearing the same locality and date, i. e. January 2 1800. The description and the excellent illustration in Table IV published by Rottl. & Willd. in their paper do not match the specimen present in Kew and hence cannot be regarded as holotype. Therefore in the absence of any holotype, Rottl. & Willd. l. c. T. 4 is designated as lectotype.

Baum (1966) designated the specimen, present in Kew, collected by Heyne from Maysore, 25 April, 1801, as holotype. Inadvertently he might have mistaken the label as "May or April 25, 1801" instead Maysore, April 25, 1801. This specimen is mounted along with the sterile specimen of Rottler. It is likely that Baum (1966) might have selected this specimen due to the label of Herbarium Rottlerianum. However, this specimen cannot be taken as holotype.

(2). There seems to be some controversy about the authority citation of this taxon. De Candolle (1828) and Bunge (1852) attributed this taxon to Willdenow. Dyer (1874), Cooke (1903), Talbot (1911),

Baum (1966), and Stewart (1972) accepted Rottler as its author. According to Clark & Stapf (1894), Rottler wrote an account of his 'Journey from Tranquebar to Madras' giving descriptions of his new species, which was published in *Neue Schriften der Gesellschaft Naturforschender Freunde zu Berlin*, IV (1803) and *Nov. Act. Nat. Cur. Berol.* 4 (1803) under German and Latin title respectively, edited by Willdenow, who added a commentary of his own, containing improved diagnoses, new names etc. Since both the authors are jointly involved in this publication and it is probably now impossible to say, how much was contributed by either, this taxon should better be attributed to both the authors, i. e. *Tamarix ericoides* Rottl. & Willd.

(3). Arnott in Wight & Arnott (l. c.) kept this species under a separate genus *Trichaurus* and made the following remarks: "This genus (viz. *Trichaurus*) is mostly allied to *Myricaria*, but differs from it by the distinct styles and stigmas torus being only expanded into a tooth instead of a connecting membrane, between the stamens. From *Tamarix*, the beaked seeds and other characters will readily distinguish it". But later botanists such as Bunge (1852), Dyer (1874), Cooke (1903), Talbot (1911), Baum (1966) and Stewart (1972) have included *Trichaurus* in *Tamarix*. During the present study large number of seeds of *Tamarix ericoides* Rottl. & Willd. were studied but I have failed to observe the beaked seeds in this species.

(4). Baum (1966) and Stewart (1972) have cited a specimen collected by Schlagintweit from Kohat to Kalabagh on the left side of Indus (BM, E). I have

examined these specimens, which are in seedling stage and it is impossible to say, whether it is *T. ericoides* Rottl. & Willd. or not. Even there may be doubts, if the specimens belong to *Tamarix* at all.

25. *Tamarix passerinoides* Del. ex Desv. var. *macrocarpa* Ehrenb.

Tamarix passerinoides Del. ex Desv. var. *macrocarpa* Ehrenb. in *Linnaea* 2:276 (1827); Zohary, *Fl. Palest.* 2:362 (1972). — Isotypes: In Aeg. Deserto inter San et Salahie am 1820—1826 April, C. G. Ehrenberg (K!, P! W!).

Tamarix passerinoides Del. ex Desv. in *Ann. Sc. Nat. Bot.* 1(4):349 (1825). — Holotype: Jomarad, Fajum, Redoute, Terrane (MPU, n. v.).

T. macrocarpa (Ehrenb.) Bge., *Tentamen* 79 (1852); Baum, *Monog. Tamarix* 141 (1966), excl. syn. *T. arvensis* Zoh. including var. *patentissima* Zoh. and var. *micrantha* Zoh.

T. pauciovulata J. Gay ex Coss. in *Ann. Sc. Nat. Bot.* 4(4):283 (1855); nom. nud. *T. balansae* J. Gay ex Coss., l. c., nom. nud.

T. pauciovulata J. Gay ex Batt. & Trab., *Fl. Alg.* 1(2):322 (1889); Baum, *Monog. Tamarix* 134 (1966), syn. nov. — Holotype: Maris Sale pres la fontaine Chande a Biska, 10.4 1852, P. Jamin 240 (K!); Iso. (C!, P!).

T. balansae J. Gay ex Batt. & Trab., *Fl. Alg.* 1(2):322 (1889); Baum, *Monog. Tamarix* 134 (1966), syn. nov. — Holotype: Bords des ruisseaux environs de fontaine Chande pres Biska, 20 March 1853, Balansa 987 (K!); Iso. (C!, P!).

T. balansae J. Gay ex Batt. & Trab. var. *microstyla* Maire, *Bull. Soc. Hist. Nat.*

Afr. Nord. 22:30 (1931), syn. nov. — Holotype: Sahara occidental meridional, region du Tiris Sebkhah d'Oum Dferat, Murat 1426 (P!).

T. pauciovulata J. Gay ex Batt. & Trab. var. *micrantha* Corti, Fl. Veg. Fezzan 191 (1942). — Holotype: Fezzan occidentale, Reg. di Gat., dune N: E. di Gat. 26.2 1931, Corti 1532 (Fl. n. v., photo!). *T. macrocarpa* (Ehrenb.) Bge. var. *micrantha* (Corti) Baum, Monog. *Tamarix* 143 (1966).

A medium sized shrub. 1–2 (–3) m tall with greyish brown to blackish brown bark, younger parts pubescent. Leaves amplexicaul to semiamplexicaul, somewhat ovate with spreading apex, 1–2.5 mm long (on the older branches 3–3.5 mm long), 1–1.5 mm broad with punctate glands. Racemes mostly aestival, 2–4 (–5) cm long 6–8 mm broad with papillose to almost glabrous rachis. Flowers pentamerous, pinkish to purplish pink. Bracts amplexicaul to semiamplexicaul, triangular, acuminate (1–) 1.25–1.75 mm long, c. 1 mm broad; pedicel usually shorter than bract, c. 1 mm long. Sepals 5, slightly connate at the base, 2 mm long, slightly more than 1 mm broad, outer 2 more acute, ovate, finely denticulate, inner 3 trullate-ovate, obtusish. Petals 5, elliptic obovate to slightly ovate, entire, 3–4 (–5) mm long, 1.75–2 (–2.5) mm broad. Stamens 7–10, usually less than 10, inconspicuously alternately long and short, longer 3 mm long, shorter stamens 2.5–2.75 mm long, anthers apiculate, cordate, less than 0.75 mm long, filaments confluent with the discal lobes, disc epidiscine. Styles 3, short, stigma discoid, ovary bottle-shaped, 2.5 mm long. Capsule ovate-pyramidal, 8–10

(–12) mm long, 2.5–3 mm broad rupturing by 3 valves, seeds somewhat oblong.

Distribution. Egypt, Israel, Jordan, Kuwait, Morocco, Algeria, Iraq, Iran, Russia and Pakistan.

Pakistan. Northern Baluchistan, J. E. Aitchison 32 (K). — Thatta Dist.: Gujjo Jam branch, M. Qaiser & Saleem 4293–4295, (KUH); 2 miles from Chilya Band on way to Thatta, A. Ghafoor & M. Qaiser 393, 394, 395, 396, 397, 398, (KUH); Haleji Lake, M. Qaiser 4283 (KUH); Kalari Lake, S. A. Faruqi & M. Qaiser 615 (KUH). — Tharparkar Dist.: Saren, 8 miles from Diplo on way to Nagar parker, Sultanul Abedin 4330, 4332, 4338, 4339 (KUH); Saren, Sultanul Abedin 4350, 4353, 4355, 4356 (KUH); c. 1 mile from Saren on way to Diplo, M. Qaiser, A. Ghafoor & Abrar Hussain 3764, 3765 (KUH). — Hyderabad Dist.: Rest House, Badin, 24.8 1968 Maqsood (KUH).

(1). *T. passerinoides* Del. ex Desv. var. *passerinoides* does not occur in the area under consideration.

(2). Ehrenberg's original herbarium was in Berlin and was destroyed during Second World War. Fortunately he has distributed his specimens to different herbaria. The author's conception of *T. passerinoides* Del. ex Desv. var. *macrocarpa* Ehrenb. is strictly based upon the isotypes present in Kew, Paris and Vienna.

(3). There seems to be a good deal of controversy about the taxonomic assessments of the two taxa, *T. passerinoides* Del. ex Desv. and *T. macrocarpa* (Ehrenb.) Bge. Ehrenberg (1827) and Zohary (1972) accepted the latter taxon as

variety of the former, on the other hand, Bunge (1852), Boissier (1867), Niedenzu (1895), Schiman-Czeika (1964) and Baum (1966) treated them as two distinct species. Gorshkova (1949), Burt & Lewis (1954) and Stewart (1972) included the latter taxon under the synonymy of *T. passerinoides* Del. ex Desv. Bunge (1952) and other botanists who have treated them as distinct taxa, used proportions of the length of pedicel to that of the bract and the size of the capsule. Furthermore Baum (1966) also used the number of stamens in distinguishing *T. macrocarpa* (Ehrenb.) Bge. and *T. passerinoides* Del. ex Desv., while Burt & Lewis (l. c.) indicated that the bract characters vary on the same plant, hence they could not use them for discriminatory purposes.

A critical study of the large number of specimens, present in different herbaria from the entire range of distribution suggests that though the variation in the bract length is continuous, yet the two taxa can be differentiated on the basis of capsule size and number of stamens. The latter two characters are inversely correlated. Thus separating two distinct varieties, the type variety *passerinoides* has smaller capsules (6–8 mm long) with constantly 10 stamens and var. *macrocarpa* (Ehrenb.) Bge. has larger capsules (8–12 mm long) with 7–10 stamens within the same raceme.

(4). A careful examination of the types of *Tamarix pauciovulata* G. Gay ex Coss., *T. balansae* G. Gay ex Batt. & Trab. and *T. balansae* G. Gay ex Batt. & Trab. var. *microstyla* Maire suggests that they exactly match the isotypes of *T. passerinoides* Del. ex Desv. var. *macrocarpa*

Ehrenb. Not only the shape of the leaves, but the size and shape of sepals, petals, number of stamens and disc shape are exactly similar to var. *macrocarpa* Ehrenb. Therefore it is concluded that all these are to be included in this taxon.

(5). Baum (1966) has erroneously included *T. aravensis* Zohary [holotype: Arava valley, Ein (Ghadian) Yotvata in a water, 29.12 1952 Tadmore 748 (HUJ n. v., Iso. W!)] under the synonymy of var. *macrocarpa* in spite of the fact that it has deflexed petals, sessile leaves and triangular laceolate bracts. In var. *macrocarpa* Ehrenb. the petals are erect, the leaves and bracts are amplexicaul to subamplexicaul.

26. *Tamarix sarenensis* Qaiser, sp. nov. (Fig. 8)

Tamarix sarenensis Qaiser, sp. nov. — Holotype: Pakistan, Saren Lake, near Diplo, S. I. Ali, S. A. Faruqi & Sultanul Abedin 4335 (KUH). Suffrutex, 1–1.5 m alta. Cortex rubrofusus. Rami glabri; folia vaginantia, breviter spinosa, 1.5–2 mm longa, junioria imbricata. Inflorescentiae aestivales; racemi laterales, simplices vel compositi, 2–5(–6) cm longi, 6–7 mm lati, rachide glabra. Bracteae 1.75–2 mm longae, c. 1 mm latae, amplexicaules, triangulato-ovatae, acutae vel acuminatae; pedicelli 1–1.5 (–1.75) mm longi. Flores pentameri, rosei. Sepala 5, 1.5–1.75 mm longa, 1 mm lata, ovata, subintegra vel integra, exteriora dua acuta, interiora tria obtusa. Petala 5, elliptica vel elliptico-obovata, 2.25–2.75 mm longa, c. 1 mm lata, obtusa. Stamina 6–9 (–10), antipetalia breviora, 2 mm longa; antherae

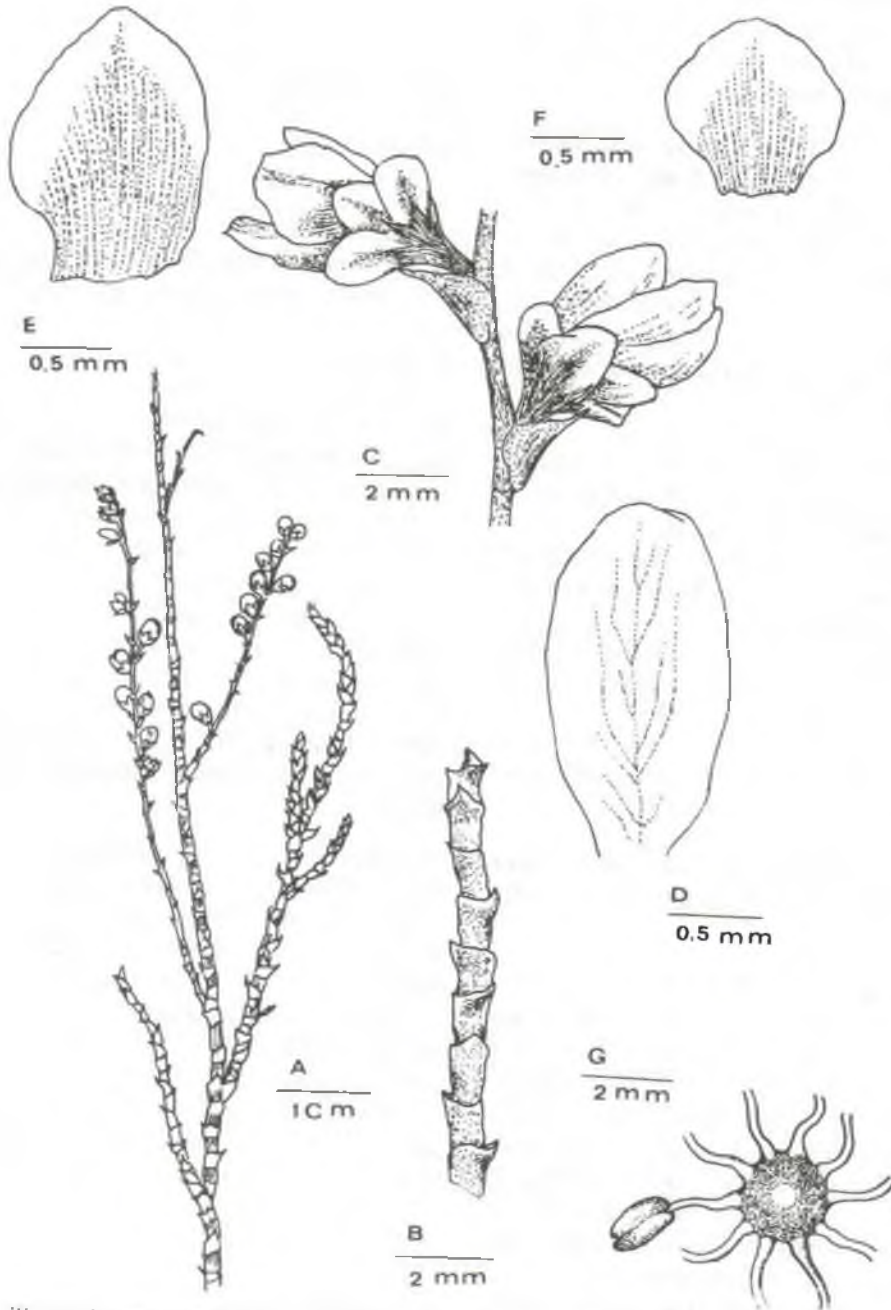


Fig. 8. *Tamarix sarenensis*. — A. Twig. — B. Leaves. — C. Part of raceme. — D. Petal. — E—F. Sepals. — G. Disc.

obovatae, apiculatae; discus epilophicus. Styli 3, claviformes; ovarium stipitatum, 2 mm longum, pyramidatum.

1–1.5 m tall shrub with reddish brown bark, entirely glabrous. Leaves vaginate, abruptly ending in a short spine, 1.5–2 mm long, younger leaves imbricate. Racemes aestival, simple or compound, 2–5 (–6) cm long, 6–7 mm broad with glabrous rachis. Pedicel 1–1.5 (–1.75) mm long, bracts amplexicaul, acute-acuminate, triangulate ovate, 1.75–2 mm long, c. 1 mm broad. Sepals 5, 1.5–1.75 mm long, 1 mm broad, ovate, entire to subentire, outer two more acute than the inner three. Petals 5, elliptic or elliptic obovate, 2.25–2.75 mm long, c. 1 mm broad, obtuse. Stamens 6–9 (–10), antipetalous ones somewhat shorter; 2 mm long, anthers obovate, apiculate, disc epilophic. Styles 3, clavate, ovary stipitate, 2 mm long, pyramidal.

Distribution. Known from the type locality only.

Pakistan. Tharparkor Dist.: Near Diplo, S. I. Ali, S. A. Faruqi & Sultanul Abedin 4336 (KUH).

(1). This taxon resembles *T. stricta* Boiss. in having vaginate leaves but differs in having younger leaves imbricate, broader raceme (6–7 mm broad), subentire to entire sepals and only partially diplostemonous androecium with 6–9 (–10) stamens. In *T. stricta* Boiss., all leaves are vaginate, the racemes 4–5 mm broad, the sepals finely denticulate, the androecium completely diplostemonous, and the stamens constantly 10 in number. The pollen grain of the two species are different, the luminae are larger (0.3–0.5

μ long) and arranged in a definite pattern in *T. stricta* Boiss. while in *T. sarenensis* Qaiser, luminae are smaller in size (0.1–0.2 μ long) with no definite pattern (Qaiser 1976).

(2). *T. sarenensis* Qaiser differs from the rest of the species of *Vaginatae* except *T. kermanensis* Baum, by having partially diplostemonous androecium and epilophic disc. But from this species it differs by its broader raceme (6–7 mm), imbricate young leaves, subentire to entire sepals and partially diplostemonous to completely diplostemonous androecium. In *T. kermanensis* Baum the racemes are 4–5(6) mm broad, all leaves vaginate, sepals finely denticulate, and androecium completely haplostemonous. The pollen grains of both the species are quite different. In *T. sarenensis* Qaiser columellae are absent from luminae, while in *T. kermanensis* Baum columellae are present in luminae. Phenolic constituents of both taxa are quite different (Qaiser 1976).

(3). The species also resembles *T. pakistana* Qaiser in having younger leaves imbricate and older vaginate and in having broad racemes but differs by its entirely glabrous rachis, partially diplostemonous androecium (6–9 stamens) and epilophic disc. In *T. pakistana* Qaiser the rachis and the branches are densely papillose, the stamens always 5 in number and the disc is confluent epilophic to epilophic. The pollen grains and phenolic constituents are also different (Qaiser 1976).

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