

Tortula mucronifera (Pottiaceae, Musci), a new xerophytic species of the Arabian Peninsula and Jordan

Studies in Arabian bryophytes 18

by

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With 13 figures

Frey, W., H. Kürschner, R.M. Ros, J. Guerra & M.J. Cano (1994): *Tortula mucronifera* (Pottiaceae, Musci), a new xerophytic species of the Arabian Peninsula and Jordan. Studies in Arabian bryophytes 18. - Nova Hedwigia 59: 345-351.

Abstract: A new xerophytic pottiaceous species, *Tortula mucronifera* is described from the Arabian Peninsula and Jordan. Because of its mucronate leaves, the ventrally thickened costa by a row of 3-4 elongated, swollen, papillose cells, 2-3(-4) guide cells and the dorsal stereid band, 3-4 cells thick, it belongs to the section *Crassinerves* of the genus *Tortula*. In habit it resembles a member of the genus *Pottia*, while the peristome (32 filiform, not spirally twisted teeth on a short basal membrane) shows affinities to the genus *Desmatodon* s.l. It differs from *Desmatodon* s.str. by its peristome teeth, rising directly from the very short basal membrane. From *Tortula atrovirens*, *T. brevissima* and *T. revolvens* var. *obtusata* it can be easily distinguished by the ovate-elliptic to spatulate leaves and the strong mucro. *Tortula mucronifera* is adapted to very dry regions of the Arabian Peninsula with less than 150 mm rainfall per year.

Zusammenfassung: *Tortula mucronifera* wird als eine neue xerophytische Pottiaceae von der Arabischen Halbinsel und aus Jordanien beschrieben. Aufgrund der stachelspitzigen Blätter, der ventral stark verdickten Blattrippe durch 3-4 verlängerter, geschwollener, papillöser Zellen, den 2-3(-4) Deuterzellen und dem dorsalen, 3-4 Zellreihen hohen Stereidenband gehört die neue Art zur Sektion *Crassinerves* der Gattung *Tortula*. Im Aussehen erinnert sie an eine Sippe der Gattung *Pottia*, während das Peristom (32 fadenförmige, nicht spiralig gedrehte Zähne auf sehr kurzer Grundhaut) Ähnlichkeiten mit der Gattung *Desmatodon* s.l. aufweist. Die neue Art unterscheidet sich aber von *Desmatodon* s.str. durch die vollständig geteilten Peristomzähne, die der kurzen Grundhaut entspringen. Von *Tortula atrovirens*, *T. brevissima* und *T. revolvens* var. *obtusata* kann die neue Art leicht durch die oval-elliptischen bis spatelförmigen Blätter und die als lange Stachelspitze austretende Blattrippe unterschieden werden. *Tortula mucronifera* besiedelt auf der Arabischen Halbinsel sehr trockene Standorte mit Jahresniederschlägen von weniger als 150 mm.

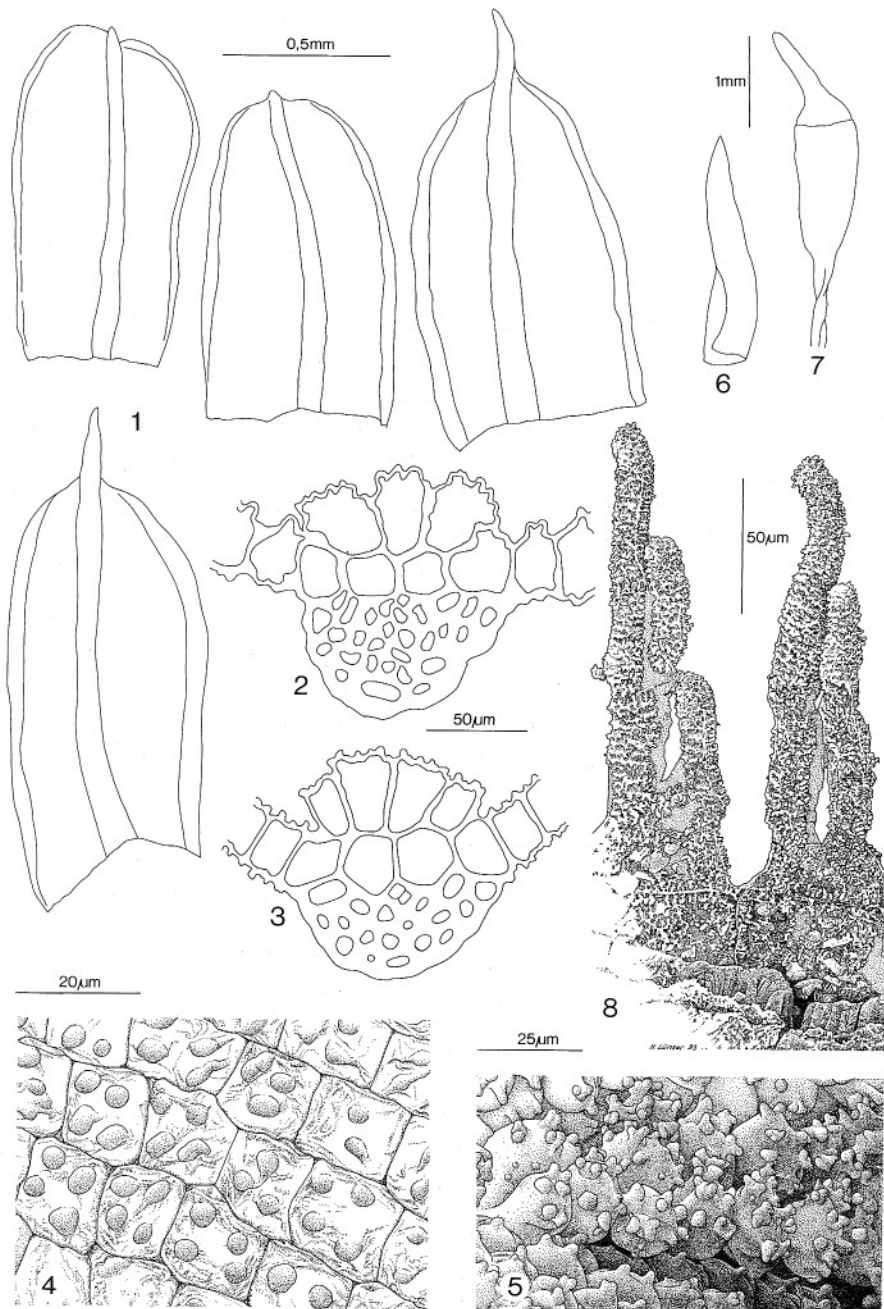
Plantae parvae, in caespitibus, ad 4-5 mm altae, cum seta et capsula 7-8 mm; folia ovata-elliptica vel lingulata-spathulata, 1.0-1.2 × 0.5-0.6 mm; margines revoluta; apex acuta, mucronata, mucro ad 40-120 μm longa; costa 50-55 μm lata, in sectione transversale cum 3-4 cellulis ventralibus elongatis, papillosisque, 2-3(-4) duces et 3-4 strata stereidarum (sect. *Crassinerves*); cellulae superiores hexagonales, 14-20 μm , dense papillosae, vel 2-3(-4) papillae simplices vel dichotomae; seta ad 2-3 mm longa; capsula erecta et cylindrica; operculum rostratum, 700-900 μm longa; peristomium c. 180 μm , dentes peristomii 32, in tubo basilari brevi (ad 40 μm), irregulariter papillosae, non contortae; sporae inconspicue papillosae, 14-18 μm diametentes.

Plants small, gregarious or in dense short-turfs, up to 7-8 mm high (including sporophyte); terricolous; stems short, in section partly with central strand; leaves ovate-elliptic to lingulate-spathulate, 1.0-1.2 × 0.5-0.6 mm, with revolute margins; apex short-acute, mucronate or ending in a 40-120 μm long mucro (Fig. 1); costa percurrent, 50-55 μm wide, thickened on the ventral side because of protruding cells (Figs. 2-3, 5, 11); costa in cross-section overlaid by 3-4 elongated, papillose, enlarged surface cells; guide cells (Deuter) 2-3(-4), dorsal stereid band 3-4 cells thick (Figs. 2, 3); upper lamina-cells roundish, 14-20 μm , strongly papillose, with 2-3(-4) simple or forked papillae (Figs. 4, 12); basal cells rectangular, greenish, 23-24 × 8.7-26 μm , with thickened transversal walls. Sporophytes frequent; seta erect, c. 2-3 mm long; capsule erect and cylindrical; operculum rostrate, rostrum 700-900 μm long (Fig. 7); calyptra smooth (Fig. 6). Peristome up to 180 μm , consisting of 32 filiform, irregularly papillose teeth on a short, 40 μm high basal membrane; teeth irregular broken, not twisted (Figs. 8-10); annulus present. Spores weakly papillose, 14-18 μm in diameter.

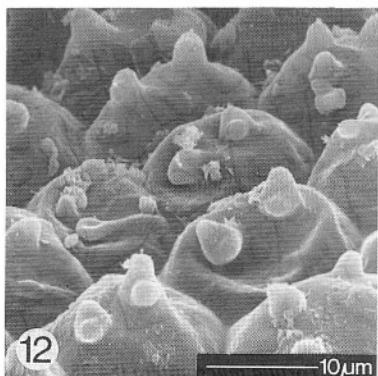
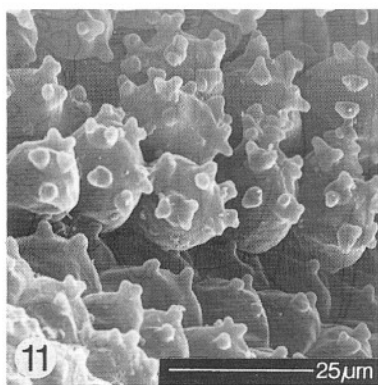
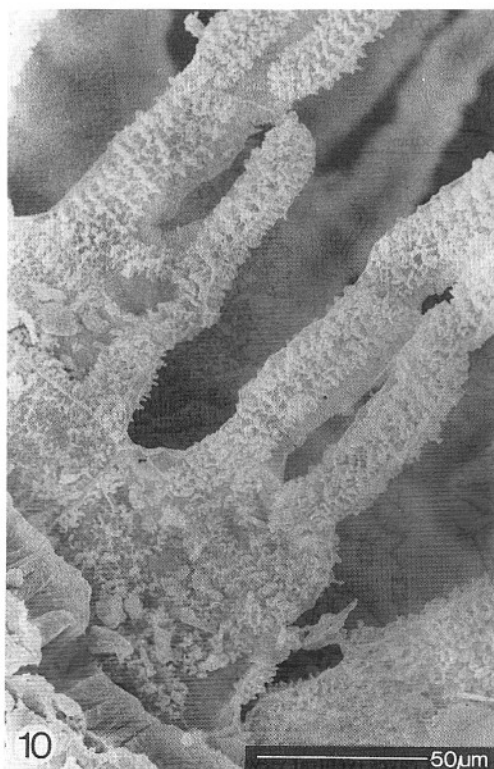
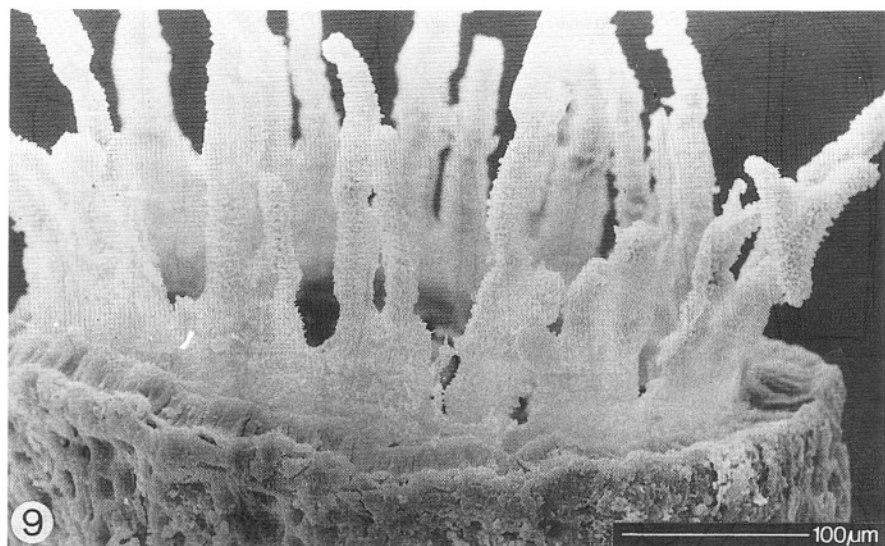
Type: Central Saudi Arabia: Tuwayq, Wadi al-Birikh (al Kharj - al Aflaj road), 600 m, on soil, Tuwayq limestone, W. Frey & H. Kürschner, 21 March 1984 (84-78); B (holotype), MUB, Frey, Kürschner (isotypes).

Further collected specimens [Fig. 13, previously recorded as *Tortula cf. nana* (C. Muell.) Broth. by Frey & Kürschner 1988]: SAUDI ARABIA: Between Buraydah and Riyadh, near Rabewa, 550 m, on calcareous soil (Tuwayq escarpment), W. Frey & H. Kürschner, 10 March 1988 (88-278); 120 km northwest of Riyadh, near Tumair, 550 m, on calcareous soil between limestones (Tuwayq escarpment), W. Frey & H. Kürschner, 10 March 1988 (88-306a); Thumama, 70 km northeast of Riyadh, 630 m, on soil among limestones, H.U. Baierle & H. Kürschner, 20 Febr. 1985 (85-112); dito, 600 m, on soil among sandstones, H.U. Baierle & W. Frey, 10 March 1985 (85-263); Tuwayq, Wadi al-Hawtah (al Kharj - al Aflaj road), 650 m, on soil, Tuwayq montane limestone, W. Frey, 12 March 1985 (85-271); Tuwayq, Wadi al-Birikh (al Kharj - al Aflaj road), 570 m, on soil among limestones, Jubaila limestone, W. Frey, 20 Febr. 1987 (87-12, 87-16b); Asir Mts., 12 km east of Zahran al-Janub, 2100 m, on soil among sandstones, W. Frey & H. Kürschner, 25 March 1984 (84-164, with long mucro). OMAN: Muscat area, Qurm, 10 m, on soil, W. Frey & H. Kürschner, 17 Febr. 1983 (83-251); Muscat area, between Bawshahr and Madinat Qabos, 300 m, on soil among limestone, W. Frey & H. Kürschner, 20 Febr. 1983 (83-390). JORDAN: 8 km north of Azraq in direction to Safawi (H5), 540 m, fine-earth between basalt rocks on the fringe of a small wadi, W. Frey & H. Kürschner, 27 March 1990 (90-179).

Tortula mucronifera was collected from several xeric sites in the central parts of Saudi Arabia (mainly the Tuwayq escarpment), Oman and the basalt plateau of north-eastern Jordan (Fig. 13). In habit it resembles a member of the genus *Pottia* (very small, lingulate to spathulate, strongly papillose and mucronate leaves), in the costa morphology (thickened by a unicellular row of papillose, elongated surface cells on the ventral side of the costa) a taxon of *Tortula* sect. *Crassinerves* (Mild.) Wijk



Figs. 1-8. *Tortula mucronifera* (84-78, Holotype). 1. Leaves (ventral view). 2-3. Cross-section of leaves. Middle part of costa. 4. Lamina cells of central part of leaf. 5. Papillose and swollen cells of the thickened costa. 6. Calyptra. 7. Capsule. 8. Part of the peristome.



Figs. 9-12. *Tortula mucronifera* (84-78, Holotype; SEM photos). 9. Capsule with peristome. 10. Part of the peristome. 11. Papillose and swollen cells of the thickened nerve. 12. Lamina cells of central part of leaf.

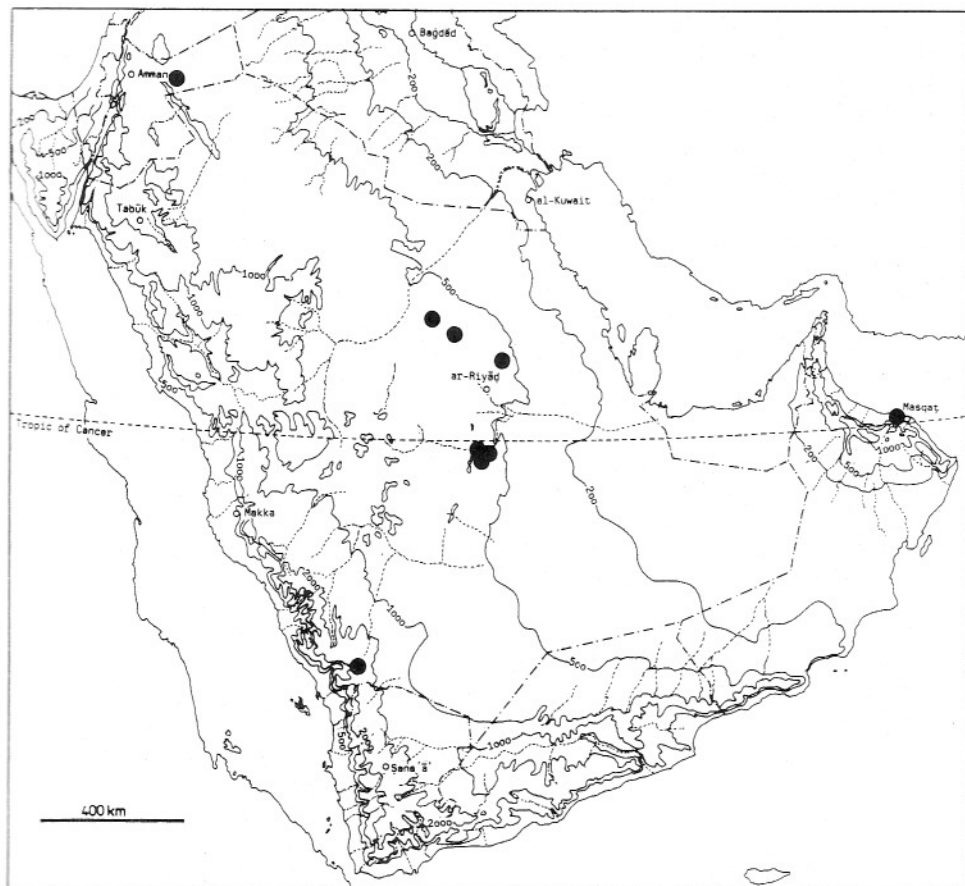


Fig. 13. *Tortula mucronifera*. Distribution in the Arabian Peninsula and Jordan.

et Marg. (Syn.: sect. *Crassicostatae* Schimp., *Pachyneurum* Amann), while the peristome (32 filiform, not spirally twisted teeth on a short basal membrane) shows affinities to the genus *Desmatodon*.

A classification within the genus *Pottia* can be excluded, because the peristome within this genus, if present, shows 16 flat, irregularly 2-3 forked, perforated teeth. New studies on the peristome of *Desmatodon* (Granzow & Mishler, pers. comm.) have shown, that in *Desmatodon* s.str. the filiform peristome teeth are tapering above, before becoming divided into two filaments. In contrast, within the genus *Tortula* sect. *Crassinerves*, the filiform peristome teeth have parallel margins or split directly from the short basal membrane. Additional, in *Desmatodon* s.str. the spores generally are large ($>22 \mu\text{m}$) and the capsules short-ovoid (Granzow & Mishler, pers. comm.).

The peristome morphology, the smaller spores ($\leq 18 \mu\text{m}$), the cylindrical capsule

and the conspicuous elongated, papillose surface cells on the ventral side of the costa indicates, that the new taxon belongs to the genus *Tortula* sect. *Crassinerves*. Within this section, *Tortula atrovirens* (Sm.) Lindb., *T. brevissima* Schiffn. and *T. revolvens* (Schimp.) G. Roth var. *obtusata* Reim. have a wider distribution in the Near and Middle East (Frey & Kürschner 1991). They all are typical of xeric habitats and show, like the new taxon, the characteristic thickened costa. Among other characters, this xerophytic adaptation enables them to survive and evolve under desert conditions ("xeropotitoid life-syndrome", Frey & Kürschner 1988).

T. mucronifera can be separated from these taxa easily by its strong and sharp mucro. From *T. atrovirens* var. *gasilieni* (Vent.) Limpr. (Basionym: *Desmatodon gasilieni* Vent.) reported by Venturi (1894) from the "bord de la mer à Boulogne" (Holotype: Herb. Venturi, Trento) it differs by shorter, lingulate to spathulate, strongly papillose leaves, a shorter mucro and the rostrate operculum (*T. atrovirens* var. *gasilieni*: Leaves lanceolate, up to 1.5 mm, only weakly papillose, mucro about 1/4 of the length of the leaf, operculum short-conical).

Ecology: Terricolous, mainly on calcareous (and sandy) soils, between limestones and basalt rocks (marly crusts), normally in extremely dry areas with less than 150 mm rainfall per year.

In most sites of the Jebel Tuwayq escarpment (central Saudi Arabia), *T. mucronifera* is accompanied by *Bryum bicolor*, *Crossidium squamiferum* var. *pottioidium*, *Riccia trabutiana*, *Tortula atrovirens*, *Trichostomopsis aaronis* and *Weissia condensa*, forming a typical desert bryophyte synusia (*Tortula atrovirens*-*Crossidium squamiferum* synusia, Frey & Kürschner 1987). Similar ecological conditions and accompanying species occur at the sites near Muscat (Oman) and Zahran al-Janub (Asir Mts., Saudi Arabia). In Jordan, the new species was found sporadically within the *Trichostomopso-Barbuletum trifariae* (Frey & Kürschner 1992) which is characteristic of the limestone crusts between the basalt rocks of the north-eastern basalt plateau (Harrat-er Rujeita).

Acknowledgements

We are grateful to the Curator of the herbarium Müller (in BM) for the loan of the type specimen of *Barbula nana*, to Dr. C. Cortini (Camerino) who made possible the study of the type specimen of *Desmatodon gasilieni* (herbarium Venturi in TR), to Dr. T. Engel (Berlin) for the Latin diagnosis, Dr. J.S. Carrión (Murcia) and Miss C. Grüber (Berlin) for the technical assistance (SEM), Mr. H. Lünser (Berlin) for drawing the Figs. 4, 5 and 8, and to D.G. Long (Edinburgh) for comments on the English manuscript.

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