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The Status and Distribution of *Syntrichia virescens* var. *minor* (Pottiaceae, Musci)

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Abstract. Syntrichia minor *(Bizot)* stat. et comb. nov. *(basionym:* Tortula papillosissima *var.* minor *Bizot) is proposed at the rank of species and its geographical range is extended to Europe (Iberian Peninsula). The species is described, lectotypified, illustrated, and compared with* Syntrichia virescens *(De Not.) Ochyra, from which it can be distinguished by the type of papillosity.*

During a taxonomic revision of the genus *Syntrichia* Brid. in the Iberian Peninsula, we identified material belonging to *Syntrichia virescens* var. *minor* (Bizot) Ochyra, which was unknown for the European continent. This taxon was described by Bizot (1954) as *Tortula papillosissima* var. *minor,* based on material from the Middle East. Later, Bizot (1956) transferred this var. *minor* to *Tortula laevipila* (*Tortula laevipila* var. *minor* (Bizot) Bizot).

However, neither of these combinations seem appropriate at present. The leaves of *T. laevipila* possess several rows of dorsal stereids visible in a transverse section of the costa, and *T. papillosissima* (= *T. ruralis* var. *hirsuta* Venturi, *T. hirsuta* (Venturi) Laz., *Syntrichia ruralis* var. *hirsuta* (Venturi) Podp.) has leaves that are not constricted at the middle, recurved margins almost reaching leaf apex, and a costa with 3–4(5) dorsal stereids layers (Fig. 1). None of these characters appears in var. *minor,* although *T. papillosissima* shares with the taxon described by Bizot a similar type of leaf papillosity. However, this var. *minor* is clearly related to *T. virescens* (De Not.) De Not. because both taxa share constricted leaves, plane or scarcely recurved margins at the middle, a weakly spinulose hyaline hairpoint and 1–2(3) dorsal stereid layers in the costa (Fig. 2). Thus, Kramer (1980, 1988) and Ochyra (1988) considered the taxon described by Bizot to be related to *T. virescens.* Later, other taxonomic papers assigned this taxon to the genus *Syntrichia*: Ochyra (1992) as *Syntrichia virescens* var. *minor* (Bizot) Ochyra, and Zander (1993) as *Syntrichia virescens* var. *bizotiana* (W. A. Kramer) R. H. Zander *nom. illeg.*

Microscopic Study of Leaf Surfaces

After a study of leaf surfaces using light and scanning electron microscope (SEM), we were able to verify that the papillosity types of *S. virescens* and *S. virescens* var. *minor* differ markedly. *Syntrichia virescens* is characterized by laminal leaf cells with 2–4(5) bifurcate papillae, whose length does not exceed 5 μm (Figs. 3–4). The var. *minor* has only one mammilla per cell, which is pedicellate and branched at the apex, 12–17 μm in length (Figs. 5–7). This type of papillosity is close to that of *S. ruralis* var. *hirsuta* (Fig. 8) but, as mentioned above, no other characters are common to both taxa.

The morphology, size, and number of papillae per cell in *S. virescens* var. *minor* are constant features of the taxon, suggesting that these represent neither an adaptation to the environment nor an extreme of the range of papilla morphology. Thus, the papillosity could be considered a good taxonomic feature and, based on this character, the taxon can be elevated to the rank of species, as Lazarenko (1960) already suggested (as *Tortula bizotii* Laz.). Species that are very close, each with a markedly different papillosity, are a common occurrence in the genus *Tortula s.l.* (e.g., *T. israelis* Bizot & F. Bilewsky versus *T. muralis* Hedw. (cf. Cano et al. 1996; Guerra et al. 1992); *T. ruralis* Hedw. versus *T. papillosissima*; *T. echinata* Schiffn. versus *T. princeps* De Not. (cf. Lazarenko 1960).

In our opinion, the subspecific rank given by Ochyra (1988) (*T. virescens* subsp. *minor*) and Kramer (1980, 1988) (respectively, *T. virescens* subsp. *bizotii* and *T. virescens* subsp. *bizotiana*) cannot be maintained; although the taxonomic relationship with *S. virescens* is obvious, and the var. *minor* does not show any geographical or ecological isolation with respect to *S. virescens.* On the other hand, although the value of papillosity as a differential character might be a topic of debate, we think that in var. *minor* it is important enough to be considered as a good species marker. In our opinion, this taxon should be included in the concept of *Syntrichia* (Bridel 1801; Zander 1989). The main differences between *Syntrichia virescens* (De Not.) Ochyra and *Syntrichia minor* (Bizot.) *stat. et comb. nov* (= *S. virescens* var. *minor*) are shown in Table 1.

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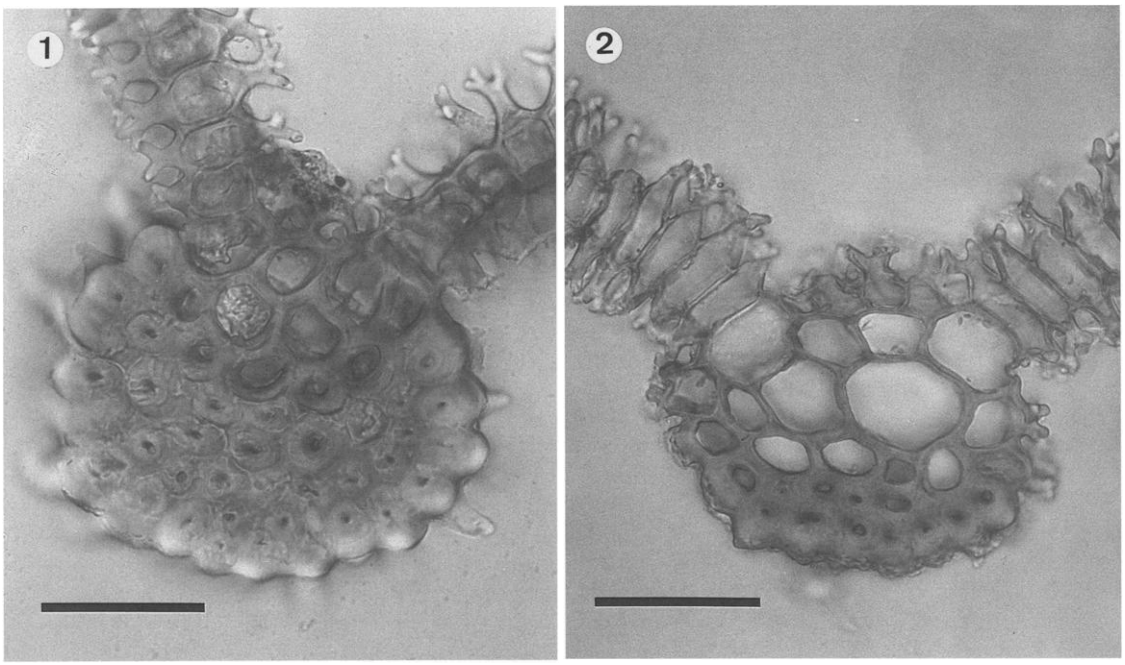


FIGURES 1–2. Transverse sections of leaves. — 1. *Syntrichia ruralis* var. *hirsuta*. — 2. *Syntrichia minor* (*S. ruralis* var. *hirsuta* from MUB 9001 and *S. minor* from MUB 8149). Scales = 35 μm.

NOMENCLATURE AND DESCRIPTION

Bizot (1954) did not fix any type material because the collection which he used for describing the taxon had no label. Thus, in the original description, it is only indicated that var. *minor* was from a Palestinian collection of *Reichert*. Kramer (1980) studied material from Bizot's Herbarium that he designated as the holotype. However, from our point of view, this is unsuitable, because the sample studied by Kramer (1980), which he has kindly loaned us for our study, had a label on which a locality is indicated (Syria, Liban Jebel, *Reichert*). We have studied many samples of this taxon from Herbarium Bizot in PC, with the same label indicated by Kramer (1980). We therefore cannot be sure that it is the material that Bizot used for the description of *T. papillosissima* var. *minor*. Consequently, we here designate a lectotype from this name.

SYNTRICHIA MINOR (Bizot) *stat. et comb. nov.*

FIGS. 1–8

Basionym: *Tortula papillosissima* (Copp.) Broth. var. *minor* Bizot, Rev. Bryol. Lichénol. 23: 268. 1954. TYPE: SYRIA. Liban Jebel, *Reichert 15* (hb. Bizot 8909 in PC!, lectotype selected here).

Tortula laevipila (Brid.) Schwaegr. var. *minor* (Bizot) Bizot, Rev. Bryol. Lichénol. 25: 270. 1956.

Tortula bizotii Laz., Vopr. Evol. Biogeogr. Genet. Sel. 145. 1960, *nom. inv.* (cf. Kramer 1988; Ochyra 1988).

Tortula virescens (De Not.) De Not. subsp. *bizotii* (Laz.) W. A. Kramer, Bryoph. Biblioth. 21: 102. 1980, *nom. inv.* (cf. Crosby et al. 1992; Ochyra 1988).

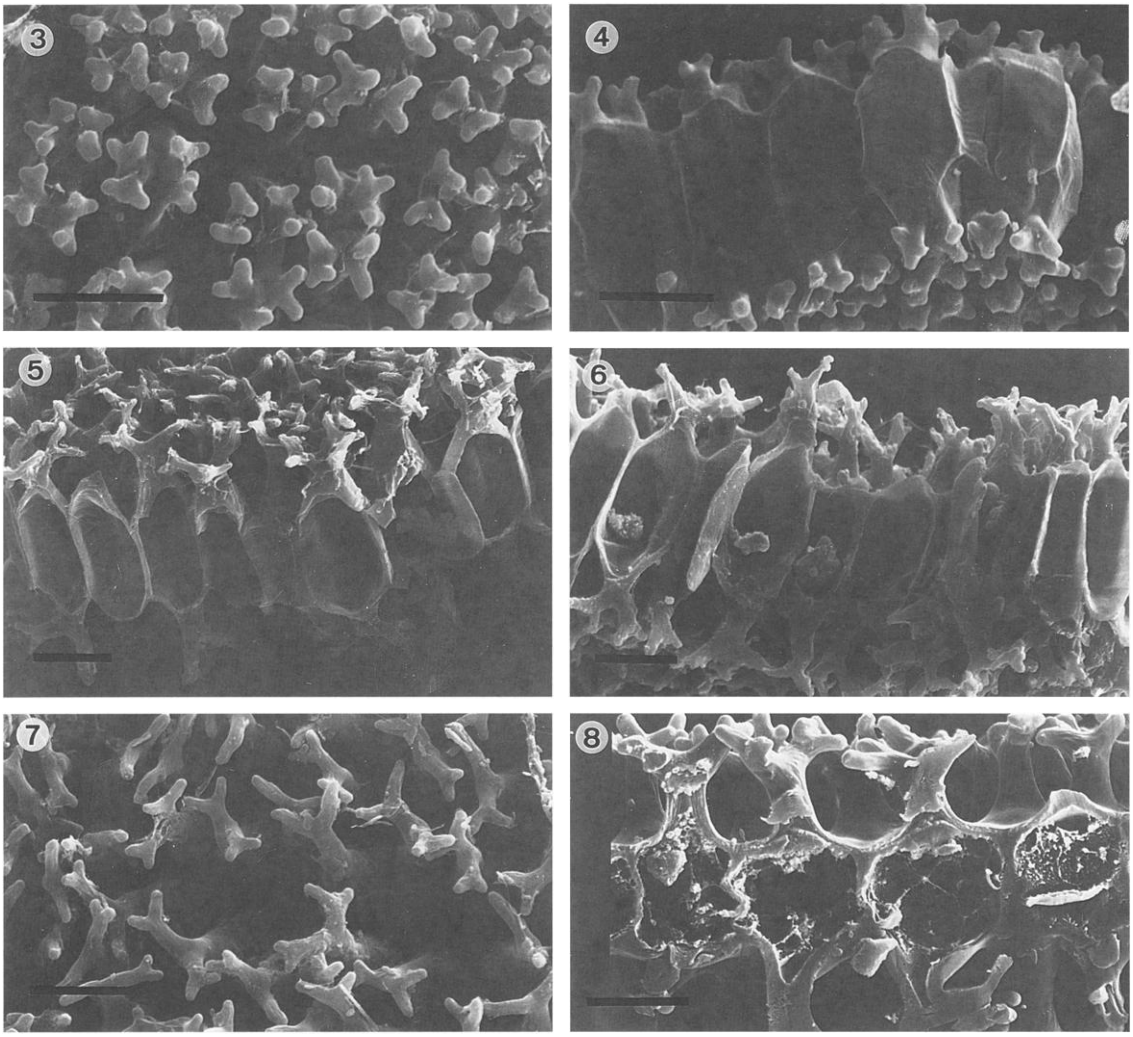
Tortula virescens (De Not.) De Not. subsp. *minor* (Bizot) Ochyra, J. Hattori Bot. Lab. 64: 343. 1988.

Tortula virescens (De Not.) De Not. subsp. *bizotiana* W. A. Kramer, J. Hattori Bot. Lab. 65: 123. 1988, *nom. inv.* (cf. Crosby et al. 1992).

Syntrichia virescens (De Not.) Ochyra var. *minor* (Bizot) Ochyra, Frag. Florist. Geobot. 37: 213. 1992.

Syntrichia virescens (De Not.) Ochyra var. *bizotiana* (W. A. Kramer) R. H. Zander, Bull. Buffalo Soc. Nat. Sci. 32: 270. 1993, *nom. illeg.* (cf. Crosby & Magill 1997).

Plants 0.3–1.0 cm high, in open, glaucous-green tufts. Leaves appressed when dry, recurved when moist, lingulate, unistratose, constricted at middle, 1.2–2.5 mm long, 0.4–0.9 mm wide; apex rounded; margins papillose-crenulate, plane or slightly recurved at middle of leaf; hyaline hair point long, 0.3–1.0 mm, spinulose. Costa 70–100 μm wide, in transverse section with 1–2 guide cells layers, 1–3 dorsal stereid layers crescent shaped with ± substereids and without hydroids; on ventral side simple or bifurcate papillae. Upper and middle laminal cells quadrate or quadrate-rectangular, 10.0–12.5 μm long and (7.5–)10.0(–12.5) μm wide, with one mammilla per cell branching as a star-shape, 10–15(–17.5) μm high; paracostal basal cells hyaline, rectangular, 37–45 μm long and 15–18 μm wide; marginal basal cells photosynthetic, rectangular, 15–18 μm wide and 10.0–12.5 μm long. Dioicous.



FIGURES 3–8. SEM micrographs of leaf surfaces. — 3–4. *Syntrichia virescens.* — 5–7. *Syntrichia minor.* — 8. *Syntrichia ruralis* var. *hirsuta.* (*S. virescens* from MUB 5846, *S. minor* from MUB 8149 and *S. ruralis* var. *hirsuta* from MUB 9001). Scales = 10 μm.

Seta straight, 7–9 mm long, twisted to right; capsule erect, ovoid-cylindric, reddish brown, 1.5–2.1 mm long, 0.6–0.7 mm wide; annulus with 2–3 rows of rectangular cells; peristome single of 32 papillose, spirally twisted teeth, 500–600 μm long; basal membrane 270 μm in height; operculum longly conic, 1.3 mm long. Spores 7.5–12.5(15.0) μm, papillose.

Ecology and distribution.—This species has always been found as an epiphyte in both Asia and Europe (Spain). In southern Spain, it was collected on trunks of *Quercus faginea*, *Quercus ilex*, *Olea europaea,* and *Pinus nigra* subsp. *salzmannii.*

In this paper, the distribution area of *S. minor* is extended to the southern part of the Iberian Peninsula. Previously, it had been reported from the Middle East (Iran and Lebanon) (cf. Frey & Kürschner 1991), but careful study of the sample from Iran (Damavend, E-Flanke, 2,800–3,000 m, *Frey,* 18-VIII-1969, hb. Frey 1–1663), confirms that it is actually *Syntrichia virescens.* At present, this taxon can be considered a mesogean element that could be present in other similar climatic areas of the Mediterranean Basin.

Specimens examined.—LEBANON. Lebanon ("Syrie"), Liban Jebel, n.d., *Reichert* (hb. Kramer), same locality (hb. Bizot *8908, 8910, 8911*–PC). SPAIN. CÁDIZ. Between Grazalema and Ronda, *Long,* 22-IV-1980 (E 9027). JAÉN. Sierra de Segura, Orcera, proximidades arroyo de las Herrerías, 1,300 m, U.T.M.: 30SWH3638, *Sánchez-Moya et al.,* 13-XI-1996 (MUB 8149); Sierra de Segura, Segura de la Sierra, El Yelmo, 1,700 m, 30SWH2934, *Sánchez-Moya et al.,* 14-XI-1996 (MUB 8150); river valley above Cazorla, *Long,* 16-IV-1981 (E 8938).

TABLE 1. Comparison between *Syntrichia virescens* and *S. minor*.

Character	*Syntrichia minor*	*Syntrichia virescens*
Number of papillae per cell	1	2–4 (5)
Shape of papillae	star-shaped at the apex	bifurcate
Length of papillae	12–17 μm	2.5–5.0 μm
Habitat	epiphyte	epiphyte or saxicolous

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