

New data for *Rinodina flavosoralifera*

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Abstract: Well-developed ascospores of *Rinodina flavosoralifera* have been observed for the first time. The ascospores are described and illustrated and new data on the chemistry and distribution of this species are provided. New chorological data on *Rinodina disjuncta* are also included.

Key words: Canary Islands, chemistry, distribution, morphology, *Physciaceae*, rare lichens

Introduction

Rinodina flavosoralifera was first described by Tønsberg (1992). Although it has since been collected several times no specimen has been reported to have well-developed ascospores, an important character for distinguishing species of *Rinodina* and for segregating genera in the *Physciaceae*. The study of well-developed, fertile specimens from the Canary Islands has revealed that this species has typical *Polyblastidium*-type ascospores, an ascospore type previously known only in the genus *Heterodermia* in the *Physciaceae*. A brief description and drawings of the ascospores are presented here.

Methods

The specimens were examined by standard techniques using stereoscopic and compound microscopes. Ascospores were measured mounted in distilled water and ascus tip structures were observed after pretreatment with K and washing with distilled water before the

application of Lugol's iodine. The chemical constituents were identified by high performance liquid chromatography (HPLC) according to methods described by Elix *et al.* (2003).

The Species

Rinodina flavosoralifera Tønsberg

Sommerfeltia 14: 289–290 (1992); type: Norway, Hordaland, Bergen, Store Milde, Fana Folkehøgskole, 20–40 m, on a mossy trunk of *Prunus avium*, 1988, T. Tønsberg 11375 (BG—holotype!).

(Fig. 1)

Thallus morphology is totally in accordance with previous descriptions (Tønsberg 1992; Mayrhofer & Moberg 2002; Giavarini *et al.* 2009).

Apothecia lecanorine, 0.3–0.5 mm diam., sessile, constricted at the base. Thalline margin entire, thick, rather prominent, persistent, concolorous with the areolae. Proper margin visible as a ring within the thalline margin. Disc flat, brown, ± covered by a whitish pruina. *Excipulum thallinum* 55–70 µm thick laterally, expanded below to 80–120 µm. Cortex paraplectenchymatous, nearly indistinct to 10 µm wide laterally, expanded below to 45–60(–100) µm, I–. *Excipulum proprium* colourless, 10–20 µm wide laterally, expanded above to 30–60(–70) µm. *Hymenium* hyaline, up to 180 µm high. *Epihymenium* pale brown interspersed with crystals (pruina). *Hypothecium*

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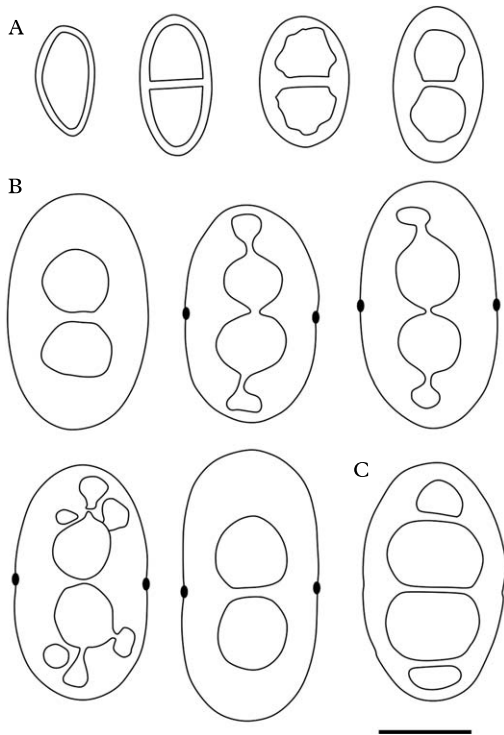


FIG. 1. Ascospore ontogeny and ascospore variability of *Rinodina flavosoralifera* (P. & B. v.d. Boom 42446, hb. v.d. Boom). A, Type A ontogeny and young colourless ascospores; B, mature ascospores of *Pachysporaria*-type and of *Polyblastidium*-type showing one or more sporoblastidia arising from each end of the two main lumina and a well developed torus; C, overmature, 3-septate ascospore. Scale = 10 μm .

hyaline, 40–60 μm deep. *Paraphyses* with pale brown apical cells, slightly enlarged, 2–3 μm wide. *Asci* *Lecanora*-type (Rambold *et al.* 1994), 8-spored. *Ascospores* colourless when immature, 12–17 \times 7–10 μm ; mature ascospores brown, 22–30 \times 11–17 μm , *Pachysporaria*-type at first but usually developing sporoblastidia and then becoming *Polyblastidium*-type (Kurokawa 1962); sporoblastidia arising from each end of the two main lumina, rarely from the lateral parts (Fig. 1B & C); overmature ascospores 3-septate (Fig. 1C) or even submuriform; walls not ornamented, torus well developed, ontogeny of type A (Giralt 2001) (Fig. 1A).

Pycnidia and *conidia* not seen in the material studied here. According to Tønberg

(1992), the only pycnidium observed was similar to the apothecia in form and size and the conidia were rod-shaped, 4–5 \times c. 1 μm .

Chemistry [*v. d. Boom* 42446]. Arthothelin [major], thiophanic acid [minor], 6-*O*-methylarthothelin [minor], 4,5-dichloronorlichexanthone [trace]. The latter two substances were not reported previously from this species.

Observations. As the morphology of the thallus, the chemistry and the immature ascospores are identical with that reported previously for this species, we are certain that the Canarian specimens belong to *R. flavosoralifera*. As a consequence, *R. flavosoralifera* can now be characterized by the yellowish thallus composed of sorediate areolae, the presence of the arthothelin chemosyndrome and the large *Pachysporaria*-type ascospores which develop sporoblastidia (*Polyblastidium*-type), have smooth walls and exhibit a very well-developed torus.

The *Polyblastidium*-type ascospore together with the presence of xanthonenes make *R. flavosoralifera* unique within the genus *Rinodina* and supports the uncertainty of its generic position as indicated by other authors (Mayrhofer & Moberg 2002; Giavarini *et al.* 2009).

According to the literature, typical *Polyblastidium*-type ascospores are only known from some species of the foliose genus *Heterodermia* Trevis. (*cf.* Kurokawa 1962; Poelt 1965). However, some other *Rinodina* species have been described with ascospores somewhat similar to the *Polyblastidium*-type, including *R. subanceps* (Nyl.) Zahlbr. (*cf.* Mayrhofer 1984), *R. verruciformis* Sheard (*cf.* Sheard & Mayrhofer 2002) and the *R. dolichospora*-group (*cf.* Giralt *et al.* 2009). As far as the chemistry is concerned, at present the only *Rinodina* species known to contain xanthonenes are *R. thiomela* (Nyl.) Müll. Arg. and *R. xanthomelana* Müll. Arg. from the Southern Hemisphere, the pantropical *R. lepida* (Nyl.) Müll. Arg. (all three contain thiomelin and various congeners, *cf.* Leuckert & Mayrhofer 1984; Trinkaus *et al.* 2002) and *R. efflorescens* Malme and *R. sheardii*

Tønsberg (both containing secalonic acid A, see Elix & Tønsberg 1999) from the Northern Hemisphere. A further *Rinodina* species probably contains xanthonenes, namely *R. chrysomelaena* (Ach.) Tuck., since it has a citrine thallus which reacts C+ faint orange (Lendemer & Sheard 2006). However, none of these *Rinodina* species have *Polyblastidium*-type ascospores.

Ecology and distribution. The specimen *v. d. Boom* 42446 was growing together with *Rinodina disjuncta* Sheard & Tønsberg, *Frullania* sp., *Hypogymnia tavaresii* D. Hawksw. & P. James, *Micarea peliocarpa* (Anzi) Coppins & R. Sant., *Placynthiella dasaea* (Stirt.) Tønsberg, *Trapeliopsis granulosa* (Hoffm.) Lumbsch and *Usnea* spp., on the main branches of *Erica arborea*, on a gently sloping hill with grassy undergrowth. Elsewhere trunks and branches of the same phorophyte have been found to support *Evernia prunastri* (L.) Ach., *Heterodermia obscurata* (Nyl.) Trevis., *Parmotrema perlatum* (Huds.) M. Choisy and *P. reticulatum* (Taylor) M. Choisy.

Rinodina flavosoralifera is known from Norway (Tønsberg 1992; Mayrhofer & Moberg 2002), from the western Pyrenees (van den Boom *et al.* 1995), from Alaska (Tønsberg 2002) and from England, Wales and Scotland (Coppins & O'Dare 1994; Giavarini *et al.* 2009). Previously *R. disjuncta* was known from Norway and the Pacific coast of North America, from Alaska to northern California (Tønsberg 1992; Sheard 1995; Mayrhofer & Moberg 2002).

Both *Rinodina flavosoralifera* and *R. disjuncta* show a western European – north-west North American disjunct distribution. Both are new records for the Canary Islands (*cf.* van den Boom *et al.* 2008) and for Africa and constitute the most southern known records for both species.

Additional specimens examined. **Canary Islands:** *El Hierro*: near top of mountain range, NNW of El Pinar, along road to El Pinar, c. 900 m S of crossing with road H1-1, SW of Montaña de la Fuente, rim of 'Fayal Brezal' forest, open area with scattered trees, 1300 m, on mature *Erica arborea* (together with *Rinodina disjuncta*), 17°59.70'W; 27°44.00'N, 2009, P. & B. van den Boom 42446 (hb. v.d. Boom). *Gran Canaria*: 30–

40 m (vertical) uphill from country road GC-216 between Artenara village and Mt Tamadaba, 28°01.508'N; 15°39.791'W, 1170–1180 m, corticolous near base of trunks of *Pinus canariensis* in *P. canariensis* forest in steep N-facing slope, 2007, T. Tønsberg 37706 (to be distributed in Tønsberg, *Lich. isid. sored. crust. exs.*), 37707 (BG, fertile).

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