

## New *Rinodina* species from the Cape Verde Islands, with notes on some additional species

Mireia GIRALT and Pieter P. G. van den BOOM

**Abstract:** Examination of *Rinodina* specimens from the Cape Verde Islands revealed three new species, which are described here: *Rinodina capeverdeana* Giralt & van den Boom, *R. inspersoparietata* Giralt & van den Boom and *R. polymorphaespora* Giralt & van den Boom. Additional information is given for six further species, of which five are new records for the archipelago. *Rinodina punctosorediata* Aptroot & Sparrius was found to be conspecific with *R. stictica* Sheard & Tønberg.

**Key words:** Lecanoromycetes, lichenized fungi, new records, new species, taxonomy

### Introduction

The Cape Verde Islands are situated off the west coast of Africa, c. 500 km W of the Cap Verde in Senegal, 14°48' to 17°12' N; 25°42' to 22°41' W, in the North African arid and semiarid climatic regions. A checklist of lichens and allied fungi of these islands, published by Mies (1993), included four taxa of *Rinodina*: *R. atrocinerea* (Hook.) Körb., *R. corticola* (Arnold) Arnold, *R. intermedia* Bagl. and *R. cf. roboris* (Dufour ex Nyl.) Arnold. The material reported by Mies (1989, 1993) as *R. atrocinerea* and *R. intermedia*, could not be located; that reported as *R. corticola* (coll. Mies CV-3745, GZU) and *R. roboris* (coll. Mies CV-936, GZU; CV-1265, B) does not correspond to these species (see also under *R. capeverdeana*). An additional specimen identified as *Rinodina* sp. (coll. Mies CV-4690, GZU) has proved to be *Rinodina beccariana* Bagl. var. *lavicola* (M. Steiner) Matzer & H. Mayrhofer, which is reported here from Cape Verde for the first time.

In an attempt to find additional *Rinodina* material on the Cape Verde Islands, the second author visited three islands, Santiago, São Vicente and Santo Antão, and collected c. 25 specimens. These specimens represented nine species of which three, *R. capeverdeana*, *R. inspersoparietata* and *R. polymorphaespora*, are described below as new to science. A further three species, *R. algarvensis*, *R. colobinoides* and *R. guianensis*, represent new records for Africa.

### Materials and Methods

The study is based on specimens in the private herbarium of P.P.G. van den Boom, mostly collected in July 2006. They were examined using standard techniques with stereoscopic and compound microscopes. Current mycological terminology generally follows Kirk *et al.* (2001). Ascospores, mounted in water, were measured at ×1000 magnification; only free ascospores lying outside the asci were measured. The terminology used for the apothecia follows Dughi (1952), for asci (Rambold *et al.* 1994) and for ascospore types and ascospore ontogenies (Giralt 2001).

Chemical constituents were identified by the standard methods of thin-layer chromatography (TLC) (e.g. Culberson & Ammann 1979; Culberson *et al.* 1981; Culberson & Johnson 1982).

The following type specimens were studied for comparison: *Rinodina geesteranii* H. Mayrhofer: **South-Africa:** *Western Cape:* Wynberg Flats, SE of Cape Town, on granite outcrop near dusty road, 19 xii 1949, *R. A. Maas Geesteranus* (GZU, isotype).

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*Rinodina griseosquamosa* Vain.: **Brazil:** Rio de Janeiro, in rupe granítica, 1885, *E. Wainio* 220, 172 (TUR-V 12480—lectotype!, 12478—isolectotype!, here designated).

*Rinodina placynthielloides* Aptroot: **Taiwan:** Taichung County: 30 km ENE of Taichung, 7 km NW of Kukwan, along mountain trail, 1000–1300 m, 51RTG9279, on granite of wall along path, 20 x 2001, *Aptroot* 53451 (B—holotype).

*Rinodina punctosorediata* Aptroot & Sparrius: **Taiwan:** Hualien County: 43 km WNW of Hualien, Meifeng, roadside with relict mature trees, 2250 m, 51RUG1666, on *Castanopsis*, 11 x 2001, *Sparrius* 6117 (B—holotype).

*Rinodina scabridula* Matzer & H. Mayrhofer: **South Africa:** Transvaal: Northern Province Dist. Zoutpansberg, Louis Trichard, near 'The Punch-bowl', ± 4500 ft, on sandstone rocks, 8 x 1953, *O. Almborn* 6169 (GZU—holotype).

## The Species

### *Rinodina algarvensis* Giralt, Barbero & van den Boom

*Rinodina algarvensis* is characterized by its bluish grey thallus composed of discrete to contiguous areolae which often become sorediate, its large *Pachysporaria*-type ascospores, 19–25 × 11–16 µm, with polygonal lumina when immature, often grading into the *Mischoblastia*- or *Physcia*-type when young and, especially, by its particular chemistry with stictic acid (and the related substances cryptostictic, norstictic and menegazziac acid) in addition to atranorin, chloratranorin and zeorin. For additional information see Giralt *et al.* (1996a). Up to now, *R. algarvensis* has been known only as a saxicolous lichen.

The other two *Rinodina* species known to possess stictic acid and atranorin/choratranorin as major secondary compounds are the North American *R. stictica* Sheard & Tønsberg (Sheard & Tønsberg 1995) and *R. verruciformis* Sheard. The former species differs from *R. algarvensis* because its ascospores do not exhibit polygonal lumina when young and the latter species lacks soredia (Sheard & Mayrhofer 2002).

The holotype of *R. punctosorediata* Aptroot & Sparrius, a recently described, sorediate species from Taiwan, growing either on bark or rock (Aptroot & Sparrius 2003) also con-

tains atranorin and stictic acid. As with *R. stictica*, *R. punctosorediata* also differs exclusively from *R. algarvensis* by the absence of polygonal lumina during its ascospore ontogeny, a fact that makes it clearly conspecific with *R. stictica*.

*Ecology and distribution.* The Cape Verde specimens constitute additional records for the species hitherto known only from the type locality in southern Portugal. The Cape Verde habitats include a trail along a lightly cultivated mountain slope and a cultivated area with many terraces. In both situations, there were only a very few accompanying lichen species such as an *Acarospora* sp. (brown) and a *Trapelia* sp. The most remarkable record is *v. d. Boom* 36685, which was found corticolous in a rich lichen community on bark of *Pinus* (for additional data see under *Rinodina colobinoides*). The type collection (Portugal) is from a maritime lowland area, but the Cape Verde records are from c. 1000 m altitude and are new to Africa.

*Material examined:* *Santo Antão:* S of Ribeira Grande, SE of Corda, trail 203 from Cha de Mato to Losna, outcrops near Cha de Mato with shrubs and small trees, 1095 m, 25°04.7'W; 17°07.6'N, 2006, *P. & B. van den Boom* 36741 (hb. v.d. Boom); NW of Corda, trail 205 in NW direction, to Figueiral, cultivated area with many walls of stones, on S exposed vertical surface of stone, 970 m, 25°05.4'W; 17°08.3'N, 2006, *P. & B. van den Boom* 36637 (hb. v.d. Boom); Corda, centre of village, outcrops and roadside trees along main road, on *Pinus*, 1060 m, 25°05.3'W; 17°07.9'N, 2006, *P. & B. van den Boom* 36685 (hb. v.d. Boom).

### *Rinodina colobinoides* (Nyl.) Zahlbr.

*Rinodina colobinoides* is characterized by its entirely leprose thallus (blastidiate), the yellowish orange, K+ purple-rose pigment in the thalline and apothecial tissues, and by the *Pachysporaria*-type ascospores, 15–21 × 6.5–10 µm, which are constricted at the septum, smooth and with a well-developed torus. Further information may be found in Giralt *et al.* (1995, 1996b).

*Ecology and distribution.* *Rinodina colobinoides* was found on the bark of a mature *Pinus* in a rather rich lichen community, associated with *Heterodermia leucomelos* (L.)

Poelt, *Lecanora* sp., *Normanina pulchella* (Borrer) Nyl., *Phaeophyscia hispidula* (Ach.) Moberg, *Ramalina farinacea* (L.) Ach., *Rinodina algarvensis*, *Teloschistes flavicans* (Sw.) Norman and *Usnea* spp. In mainland Europe, it is known from two localities in Portugal (Giralt *et al.* 1996b) and also from the British Isles (Coppins 2002). This corticolous species seems to be an oceanic species with a tropical and subtropical distribution (Giralt *et al.* 1995, 1996b). New to Africa.

*Material examined.* Santo Antão: S of Ribeira Grande, Corda, centre of village, outcrops and roadside trees along main road, on *Pinus*, 1060 m, 25°05.3'W; 17°07.9'N, 2006, P. & B. van den Boom 36678, 36684 (hb. v.d. Boom).

### Rinodina guianensis Aptroot

The Cape Verde specimens are poorly developed, damaged and not very fertile, but they show an isidiate thallus and *Pachysporaria*-type ascospores following a type B ontogeny. The ascospores are smooth, without a torus, and include minute, scattered and globular 'inclusions' within the spore wall. All these characters are diagnostic for *R. guianensis*. Nevertheless, in contrast to *R. guianensis*, these specimens lack the yellow pigment reacting K+ purple in the apothecium (Giralt *et al.* 1995). Although other species containing this or similar pigments (e.g. *R. intermedia*, *R. canariensis* and *R. alba*) do not consistently possess it, the specimens studied cannot be assigned with total certainty to *R. guianensis*.

The peculiar globular 'inclusions' within the spore wall have been observed in other species of *Rinodina*, such as *R. dolichospora* Malme and *R. intermedia*, that are closely related to *R. guianensis*. Photographs illustrating this feature may be found in Mayrhofer *et al.* (1999, under *R. dolichospora*) and in M. Giralt, K. Kalb and H. Mayrhofer (unpublished). The new saxicolous species *R. inspersoparietata* described below shares the same feature.

*Ecology and distribution.* In the study area *R. guianensis* has been found corticolous on a trunk of a ?*Mangifera* tree and on small trunks of *Coffea* shrubs. In the field, it is easily

mistaken for *Rinodina isidioides* (Borrer) H. Olivier, an atlantic species occurring locally rather abundantly in the western Iberian Peninsula (Giralt 2001). The lichen community on *Coffea* (v.d. Boom 36865) was rather rich in *Bacidia* sp. and *Physcia atrostriata* Moberg. New to Africa.

*Material examined.* Santo Antão: SW of Vila das Pombas, Figueiral de Paúl, NE part of the valley, area of Lombo de Luzia, different plantations, scattered mixed trees, acidic outcrops and walls, on ?*Mangifera*, 180 m, 25°02.7'W; 17°07.8'N, 2006, P. & B. van den Boom 36889, 36906 (hb. v.d. Boom); SW of Vila das Pombas, Figueiral de Paúl, SW part of the valley, Cha de Padre, small coffee plantation, scattered mixed trees, acidic outcrops and walls, on *Coffea*, 195 m, 25°03.0'W; 17°07.0'N, 2006, P. & B. van den Boom 36865 (hb. v.d. Boom).

### Rinodina intermedia Bagl.

*Rinodina intermedia* is easily recognized by its crustose to subsquamulose, ochraceous to brownish thallus containing deoxylichesteric acid and growing on soil or terricolous mosses, and by its large, non-ornamented, (4–)6–11(–12)-loculate submuriform ascospores with type A ontogeny. Detailed information of this species is given in Mayrhofer *et al.* (2001).

*Ecology and distribution.* The collecting site of *Rinodina intermedia* was rich in lichens, including members of the genera, *Caloplaca*, *Lecidella*, *Parmotrema*, *Phaeophyscia*, *Physcia*, *Ramalina* and *Toninia*. *Rinodina intermedia* has previously been reported from the island Fogo (Mies 1989, 1993).

*Material examined.* Santo Antão: S of Ribeira Grande, NW of Corda, trail 205 in NW direction to Figueiral, area with terrace cultivation, many walls, some outcrops and scattered trees, on N vertical soil among outcrop, 970 m, 25°05.4'W; 17°08.3'N, 2006, P. & B. van den Boom 36648 (hb. v.d. Boom).

### Rinodina oleae Bagl.

The crustose thallus lacking secondary lichen substances, the small, abundant and confluent apothecia with plane, dark brown to black discs together with the I+ blue apothecial cortex and the *Dirinaria*-type ascospores (= *Physcia*-type thickenings but ontogeny of type B), are diagnostic for this

species. Detailed information of *R. oleae* is given in Giralt & Mayrhofer (1995), Kaschik (2006) and Trinkaus *et al.* (1999, under *R. gennarii* Bagl.).

**Ecology and distribution.** *Rinodina oleae* has been found in a poorly developed lichen community with a sorediate *Physcia* sp. Although this species is very common in many places in Europe and occurs on a wide range of substrata, on the Cape Verde islands it seems to be rather rare.

**Material examined.** *Santiago*: W of Sao Domingos, Rui Vaz, centre of village, mixed trees and outcrops along small road, on ?*Mimosa*, 825 m, 23°36.0'W; 15°02.1'N, 2006, P. & B. van den Boom 36337 (hb. v.d. Boom).

***Rinodina oxydata* (A. Massal.) A. Massal. s. lat.**

Under *Rinodina oxydata* s. lat. we have included saxicolous specimens with a thallus containing atranorin, cryptolecanorine to lecanorine apothecia, which often become pseudolecanorine, and large *Mischoblastia*-type ascospores. As has already been noted by several authors (e.g. Matzer & Mayrhofer 1996; Giralt 2001), *R. oxydata* should be treated as a species aggregate until a thorough worldwide revision is carried out.

**Ecology and distribution.** All three collecting sites of *R. oxydata* s. lat. were rather rich in *Trentepohlia*-containing lichens, especially species of *Bactrospora*, *Lecanographa*, *Opegrapha*, as well as species of *Caloplaca*, *Dirinaria* and *Pyxine*.

**Material examined.** *Santiago*: W of Sao Domingos, WNW of Rui Vaz, "Monte Tchopa", near telecommunication station, hilly area with low exposed outcrops on slope, steep N exposed outcrops and mixed trees, S sloping outcrops, 1085 m, 23°37.5'W; 15°02.2'N, 2006, P. & B. van den Boom 36389 (hb. v.d. Boom). *Santo Antão*: SW of Ponta do Sol, Fontainhas, S side above village, N exposed slope with acidic outcrops along trail, N vertical rock, 245 m, 25°06.2'W; 17°11.2'N, 2006, P. & B. van den Boom 36821 (hb. v.d. Boom); SW of Ribeira Grande, Ribeira de Duque, trail 205a, southern part, between Cha de Rocho and Meio de Questin, north-south trail with steep outcrops, E exposed steep (80°) rock, 160 m, 25°05.3'W; 17°09.8'N, 2006, P. & B. van den Boom 36933 (hb. v.d. Boom).

**The New Species**

***Rinodina capeverdeana* Giralt & van den Boom sp. nov.**

*Rinodina dalmatica* similis, sed differt thallo pannarino destituto, apotheciis minoribus c. 0.2–0.5 mm latis et ascosporis minoribus c. 14–22 × 7–10.5 µm. Conidia 3–5 × 1 µm.

Typus: Cape Verde Islands, Santo Antão, SW of Ribeira Grande, Ribeira de Duque, trail 205a, southern part, between Cha de Rocho and Meio de Questin, north-south trail with steep outcrops, N exposed steep (70°) rock and N vertical outcrop, 160 m, 25°05.3'W; 17°09.8'N, 22 July 2006, P. & B. van den Boom 36927 (B—holotypus; LG, hb. v.d. Boom—isotypi).

(Figs 1 & 2)

*Thallus* crustose, composed of areolae with the appearance of minute sublobate squamules, up to 150 µm thick, greenish to olivaceous. Areolae discrete to usually contiguous, becoming partly or entirely blastidiate and then forming a rather continuous leprose crust. Thalline cortex paraplectenchymatous, 20–25 µm, covered by an epinecral layer of 5–10 µm. Algal layer continuous, 50–100 µm, photobiont cells 7–13 µm diam. Medulla indistinct to 10 µm thick. Blastidia pale greenish, olivaceous to brownish, 25–50 µm diam.

*Apothecia* lecanorine, immersed to subimmersed, becoming pseudolecanorine, adnate to sessile, prominent and constricted at the base, 0.2–0.3(–0.55) mm wide. Thalline exciple 60–70(–100) µm thick, with a well-developed, paraplectenchymatous cortex. Proper exciple nearly indistinct laterally, expanded above to 30–50 µm. Disc dark brown to black, flat to rarely subconvex. Thalline margin thin, blastidiate or not, usually excluded. Proper margin thin, not persistent. *Hymenium* 80–100 µm high, colourless. *Hypothecium* 70–120 µm high. *Asci* of *Lecanora*-type, 8-spored. *Epithymenium* dark-brown. Apical cells of the paraphyses 3–5.5 µm diam., not separating easily, with dark-brown caps. *Ascospores* *Pachysporaria*-type, (14–)16–19(–22) × (7–)8–10.5 µm, not ornamented, when mature with a well-developed torus and slightly constricted; young ascospores with very characteristic polygonal lumina. Ascospore ontogeny of type A.

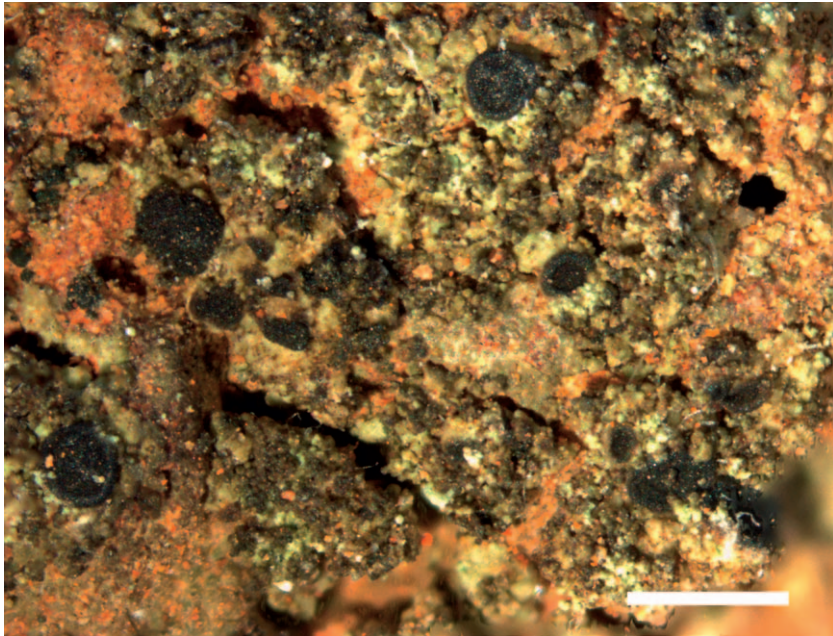


FIG. 1. *Rinodina capeverdeana*, habitus (holotype). Scale = 1 mm.

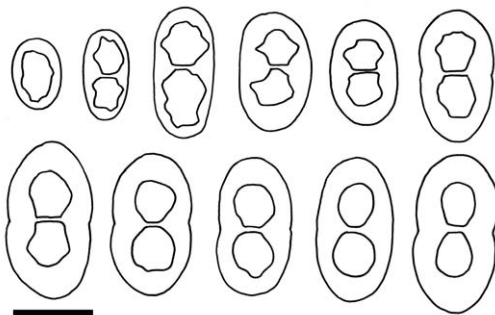


FIG. 2. *Rinodina capeverdeana*, ascospore ontogeny and variability (holotype). Scale = 10  $\mu$ m.

*Pycnidia* abundant, globose and prominent, dark-brown. *Conidia* bacilliform, 3–5  $\times$  1  $\mu$ m.

*Chemistry.* All spot tests negative. No lichen substances detected by TLC.

*Ecology and distribution.* *Rinodina capeverdeana* is known only from the type locality, where it was growing abundantly in association with *Caloplaca* sp., *Endocarpon pusillum*

Hedw., *Peltula* sp., *Pertusaria* sp., *Pyxine* cf. *cocoes* (Sw.) Nyl., *R. inspersoparietata*, *Trentepohlia* sp. and cyanobacteria, on steep (70°) N-exposed outcrops of rather soft rock, in a small valley not particularly rich in lichens.

A corticolous specimen examined (coll. Mies CV-1265, hb. Follmann, B), identified by Mies as *R. cf. roboris*, probably belongs to *R. capeverdeana* (but see below). An additional specimen of *R. cf. roboris* (coll. Mies CV-936, GZU), also collected on the Island of Santiago, does not belong to this species. The specimen mentioned from Fogo Island by Mies (1989, 1993) could not be located.

*Observations.* *Rinodina capeverdeana* is characterized by its thallus lacking secondary lichen substances and composed of partially to entirely blastidiate areolae and a well-developed paraplectenchymatous cortex, its small lecanorine apothecia often losing the thalline margin and becoming pseudo-lecanorine, its abundant, globose pycnidia and its *Pachysporaria* type ascospores, when young with typical polygonal lumina.

The corticolous specimen (coll. *Mies* CV-1265, hb. Follmann, B) differs from the saxicolous one in possessing a better developed not so continuously leprose thallus, more and larger usually persistently lecanorine apothecia (up to 0.7 mm diam.) and smaller pycnidia. Although microscopically both specimens are very similar, there are too many thalline and apothecial differences to include them with certainty within the same taxon, particularly when *R. capeverdeana* is saxicolous and its habit variability still unknown. The specimens reported in *Mies* (1989, 1993) as *R. cf. roboris* (coll. *Mies* CV-936, GZU) and *R. corticola* (coll. *Mies* CV-3745, GZU) both belong to a species with *Physcia*-type ascospores close to *R. exigua*, but lacking atranorin.

The blastidiate thallus, the lecanorine apothecia becoming pseudolecanorine and, especially, the *Pachysporaria*-type ascospores when young with polygonal lumina, are all characters close to those of *R. dalmatica* Zahlbr. However *R. dalmatica* is only known to be corticolous, contains pannarin and has larger apothecia and ascospores, 17–26 × 8–13 μm (Giralt *et al.* 1995). The ascospores of *R. capeverdeana* are similar in appearance to those of *R. dalmatica* in Giralt *et al.* (1995, fig. 2, p. 7). According to Sheard & Mayrhofer (2002), the recently described North American *R. perreagens* Sheard, is closely related to *R. dalmatica*, but differs mainly by its slightly larger ascospores, 21.8–31.8 × 13.4–16.2 μm (Sheard & Mayrhofer 2002). It differs from the new species by the same characters as *R. dalmatica*.

Other saxicolous, blastidiate species, *R. blastidiata* Matzer & H. Mayrhofer, *R. furfurea* H. Mayrhofer & Poelt, *R. obnascens* (Nyl.) H. Olivier and *R. scabridula* Matzer & H. Mayrhofer, apart from other differential characters, never possess polygonal lumina in the young ascospores (see Matzer & Mayrhofer 1994, 1996).

The holotype of *R. placynthielloides*, a saxicolous, isidiate species recently described from Taiwan (Aptroot & Sparrius 2003), has been studied for comparison. Although in the envelope containing the type specimen there is a drawing of an ascospore, we were

unable to find apothecia corresponding to the isidiate thallus of *R. placynthielloides*. We did however, identify small, K+ yellow thalli (atranorin) with pseudolecanorine apothecia belonging to *R. oxydata* mixed up with the thallus of *R. placynthielloides*. As the thalli of *R. placynthielloides* and *R. capeverdeana* are clearly different and, according to Aptroot & Sparrius (2003), the apothecia of *R. placynthielloides* are lecideine and its asci 4-spored, we reject the possibility that this species is conspecific with *R. capeverdeana* with lecanorine apothecia (often becoming pseudolecanorine) and 8-spored asci.

*Rinodina capeverdeana* is somewhat similar in habit to poorly developed specimens of *Hyperphyscia* and *Phaeophyscia* species.

*Additional material examined.* Santiago: Milho Branco, 300 m, an Borke eines alten *Ziziphus* spec., 1986, *B. Mies* 322b (coll. *Mies* CV- 1265, hb. Follmann, B).

### ***Rinodina inspersoparietata* Giralt & van den Boom sp. nov.**

*Rinodina dolichospora* similis, sed differt thallo saxicola, apotheciis pseudolecanorinis et ascosporis minoribus, c. 17–23 × 7.5–12 μm, ontogenia typo B. Conidia 3–4.5 × 1 μm.

Typus: Cape Verde Islands, Santo Antão, SW of Ribeira Grande, Ribeira de Duque, trail 205a, southern part, between Cha de Rocho and Meio de Questin, north-south trail with steep outcrops, N exposed steep (70°) rock and N vertical outcrop, 160 m, 25°05.3'W; 17°09.8'N, 22 July 2006, P. & B. van den Boom 36926 (B—holotypus; LG, hb. v.d. Boom—isotypi; 36919, 36927a, 36928—topotypi).

(Figs 3 & 4)

*Thallus* crustose to subsquamulose, ochraceous, olivaceous to brownish, areolate to rimose-areolate. Photobiont cells usually 5–7 μm diam., with some larger, up to 12 μm.

*Apothecia* from the beginning pseudolecanorine, sessile, prominent, up to 0.7 mm diam. Proper exciple (40–)70–100 μm, basal part including algal cells, external part brown-pigmented, internal part colourless, paraplectenchymatous. Proper margin not persistent, black. Disc flat to convex, dark-brown to black. *Hymenium* colourless, (80–) 100–120 μm high. *Hypothecium* colourless to

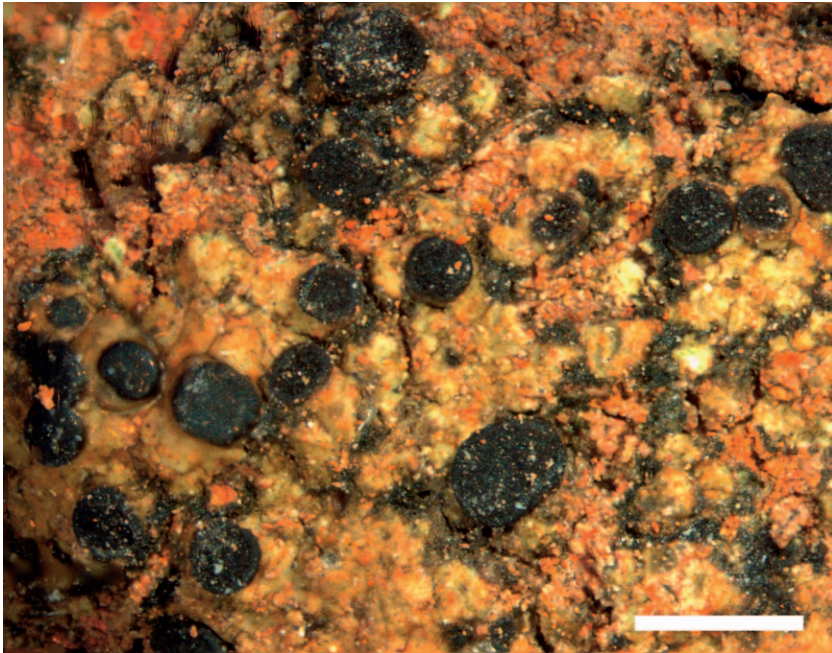


FIG. 3. *Rinodina intersoparietata*, habitus (holotype). Scale = 1 mm.

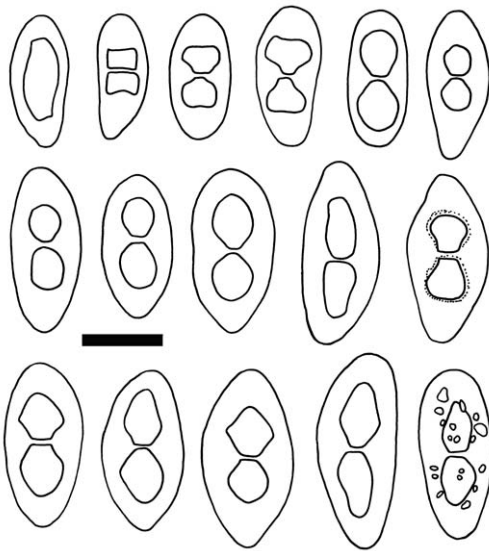


FIG. 4. *Rinodina intersoparietata*, ascospore ontogeny and variability (holotype). Scale = 10  $\mu$ m.

pale yellowish brown, up to 150  $\mu$ m thick. *Epihymenium* orange-brown. *Asci* *Lecanora*-type, 8-spored. Oil *paraphyses* abundant;

apical cells 3–4  $\mu$ m diam., with brown caps. *Ascospores* *Pachysporaria*-type or  $\pm$  *Physconia*-type, (17–)19–21(–23)  $\times$  (7.5–) 9–10(–12)  $\mu$ m, with young intermediates of the *Physcia*-type, including globular inclusions within the spore wall, not ornamented, torus absent or poorly developed, ontogeny of type B.

*Pycnidia* immersed, rare. *Conidia* bacilli-form, 3–4.5  $\times$  1  $\mu$ m.

*Chemistry*. All spot tests negative. No lichen substances detected by TLC.

*Ecology and distribution*. Known from the same type locality as *R. capeverdeana*, with which *R. intersoparietata* was growing abundantly on steep (70°) N exposed outcrops of rather loose-textured (soft) rocks, in a rather small valley, not particularly rich in lichens. Closely associated with *Caloplaca* sp., *Endocarpon pusillum*, *Peltula* sp., *Pertusaria* sp., *Pyxine* cf. *cocoes*, *Trentepohlia* sp. and cyanobacteria. It seems to be rather widely distributed in the Cape Verde archipelago, being known from the two largest islands, Santiago in the south and Santo Antão in the north.

*Observations:* *Rinodina inspersoparietata* is characterized by its saxicolous crustose to subsquamulose, ochraceous to olivaceous thallus lacking secondary lichen substances, its pseudolecanorine and sessile apothecia and its *Pachysporaria*-type non-ornamented ascospores, 17–23 × 7.5–12 µm, with a poorly developed torus, including globular inclusions in the spore wall and following a type B ontogeny.

The presence of the globular inclusions within the spore wall, clearly allies this species with the corticolous *R. dolichospora* and *R. guianensis* and with the terricolous *R. intermedia*. Among all species of *Rinodina* hitherto known they are unique in possessing this character. This group of species also shares other particular characters (e.g. ochraceous thallus, small photobiont cells, epihymenium orange-brown, etc.) (M. Giralt, K. Kalb & H. Mayrhofer, unpublished). Apart from the different habitat, these species can be separated from *R. inspersoparietata*: *R. dolichospora* by its larger ascospores with type A ontogeny; *R. guianensis* by the presence of isidia and *R. intermedia* by its submuriform ascospores.

The type material of the South African *R. geesteranii* and the Brazilian *R. griseosquamosa* were studied for comparison. In contrast to *R. inspersoparietata*, both taxa lack globular inclusions in the ascospores. Furthermore, *R. geesteranii* has finely ornamented ascospores, which are intermediate between the *Milvina*- and the *Pachysporaria*-type and develop after a type-A ontogeny, and *R. griseosquamosa* possesses a thallus composed of thicker, larger, imbricate, whitish grey squamules and larger, crytolecanorine apothecia. For more details see also Matzer & Mayrhofer (1996), Wainio (1890) and Malme (1902).

*Rinodina inspersoparietata* could be mistaken for *R. oxydata* in the study area because of its pseudolecanorine apothecia, but the latter species possesses atranorin and has *Mischoblastia*-type ascospores, developing after a type A ontogeny.

*Additional material examined.* Santiago: SE of Tarrafal, along road to Fundura, N side of serra Malagueta, vertical shaded and overhanging rocks along road, E

& NW exposed vertical rock, 640 m, 23°42.0'W; 15°12.5'N, 2006, P. & B. van den Boom 36536, 36528 (hb. v.d. Boom); SE of Tarrafal, along road to Fundura, S rim of Serra Malagueta, N of Fundura, vertical outcrops on W exposed slope, W exposed vertical, 675 m, 23°41.6'W; 15°10.5'N, 2006, P. & B. van den Boom 36553 (hb. v.d. Boom); W of Sao Domingos, S side of Rui Vaz, low exposed outcrops along field and steep N exposed outcrops on top of hill, N vertical outcrop, 815 m, 23°35.8'W; 15°01.7'N, 2006, P. & B. van den Boom 36376 (hb. v.d. Boom).

### ***Rinodina polymorphaespora* Giralt & van den Boom sp. nov.**

Thallus corticola, crustacea, effusa, grisea ad griseo-fusca, granulosa. Apothecia lecanorina, sessilia, 0.2–0.3(–0.5) mm diametro, disco plano vel subconvexo, nigrobrunneo. Ascospores (14–)15.5–19(–23) × (6–)7–9(–10.5) µm, typo *Physcia*-, *Physconia*- et *Pachysporaria*, 1(–2–3)-septata, toro non vel vix evoluto. Pycnidia non visa.

Typus: Cape Verde Islands, Santiago, W of Sao Domingos, Rui Vaz, centre of village, mixed trees and outcrops along small road, on *Casuarina*, 825 m, 23°36.0'W; 15°02.1'N, 7 July 2006, P. & B. van den Boom 36334 (B—holotypus; hb. v.d. Boom—isotypus).

(Figs 5 & 6)

*Thallus* crustose, thin, continuous, smooth to minutely granulose, pale greyish to greyish brown. Photobiont cells up to 25 µm diam. Prothallus absent.

*Apothecia* lecanorine, sessile, 0.2–0.3(–0.5) mm diam. Thalline exciple well developed, up to 60 µm. Proper exciple indistinct to 10 µm wide laterally, expanded up to 30 µm above. Thalline margin thin, smooth, usually persistent, concolorous with thallus. Proper margin often visible as a ring within the thalline margin. Disc dark-brown to black, flat to subconvex. *Hymenium* colourless. *Hypothecium* colourless. *Epihymenium* dark-brown. *Asci* *Lecanora*-type, 8-spored. Oil *paraphyses* often present; apical cells of the paraphyses dark-brown pigmented, 4–4.5 µm diam. *Ascospores* (14–)15.5–19(–23) × (6–)7–9(–10.5) µm (mean = 17.3 ± 1.9 × 8.2 ± 0.9; n = 118), with internal wall thickenings of the *Physcia*-, *Physconia*- or *Pachysporaria*-type, some with tendencies to the *Callispora*-type, often with lumina protruding towards the spore ends, rarely becoming 2–3-septate, torus absent or poorly



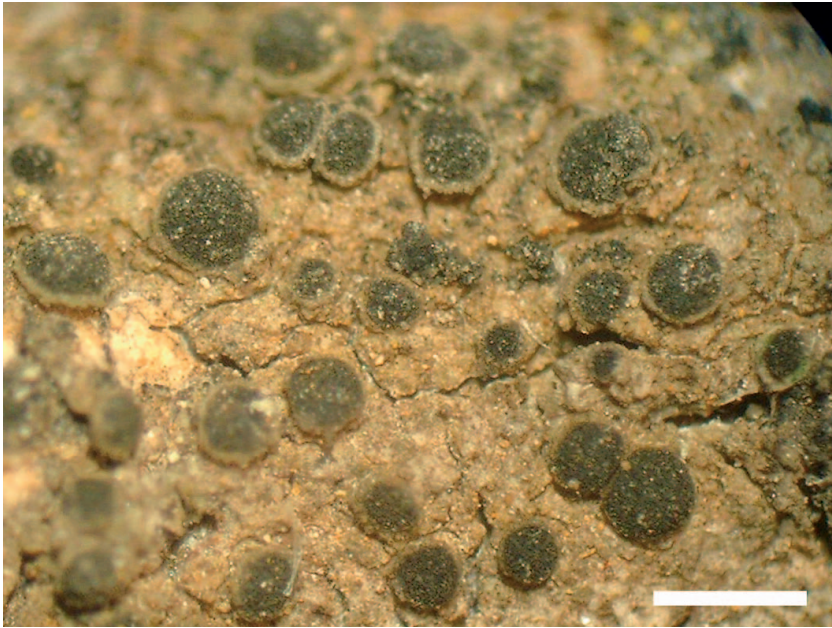


FIG. 5. *Rinodina polymorphaespora*, habitus (holotype). Scale = 0.5 mm.

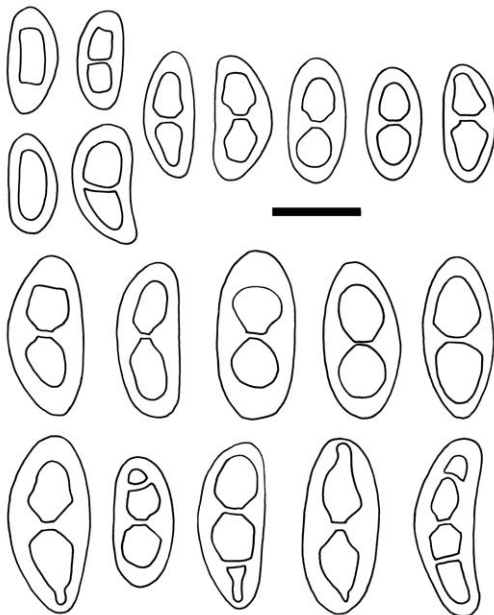


FIG. 6. *Rinodina polymorphaespora*, ascospore ontogeny and variability (holotype). Scale = 10  $\mu$ m.

developed, usually not ornamented but a few overmature ones showing a scabrid surface,

ontogeny mostly of type B, sometimes seemingly of type A.

*Pycnidia* and *conidia* not seen.

*Chemistry.* All spot tests negative. No lichen substances detected by TLC.

*Ecology and distribution.* *Rinodina polymorphaespora* is known from a rather wide range of substrata such as *Acacia* and *Eucalyptus* trees and also various shrubs. At the type locality it was growing on a *Casuarina* tree, together with a *Bacidia* sp., a sorediate *Caloplaca* sp., and a sorediate *Physcia*, probably *P. poncinsii* Hue. *Rinodina polymorphaespora* is widely distributed in the Cape Verde archipelago, from the southern island Santiago to the northern island Santo Antão.

*Observations:* *Rinodina polymorphaespora* is characterized by its crustose thallus lacking secondary lichen substances, its small, lecanorine apothecia and its peculiar ascospores, (14–)15.5–19(–23)  $\times$  (6–)7–9(–10.5)  $\mu$ m. In contrast to the constant macroscopical thalline and apothecial characters, the ascospores of *R. polymorphaespora* show a wide

variation in internal wall thickenings. They can be assigned to the *Physcia*-, *Physconia*- or *Pachysporaria*-type, and may also show tendencies towards the *Callispora*-type. Furthermore, they can develop after an ontogeny of type A or B, may become 2–3-septate and can be smooth or ornamented. Nevertheless they always present lumina protruding towards the spore ends. This variability can be observed in a single apothecial section.

Similar, remarkable variability in the spore thickenings has been reported in the corticolous species, *R. confusa* H. Mayrhofer & Kantvilas and *R. abolescens* H. Magn. (cf. Mayrhofer *et al.* 1999; Giralt & Mayrhofer 1995). The sporadic presence of 2–3-septate ascospores also allies *R. polymorphaespora* with species of *Rinodina* with 3-septate ascospores, such as *R. conradii* Körb., *R. connectens* Malme, *R. homobola* (Nyl.) Vain. and *R. homoboloides* Vain. However, all these taxa possess larger ascospores that, except in *R. conradii*, develop only after a type A ontogeny.

*Rinodina polymorphaespora* seems to be related to *R. oleae*, *R. boleana*, *R. pyrina* and even to *R. conradii*, since, apart from being very similar in habit, it has all ascospore-types of these species. However, its ascospores are significantly larger than in the first three taxa and smaller and more rarely 2–3-septate than in *R. conradii* (cf. Kaschik 2006; Giralt & Mayrhofer 1991, 1995; Mayrhofer *et al.* 1999).

*Additional material examined.* Santiago: W of Sao Domingos, N of Rui Vaz, along village, on rocky mountain, with some shrubs, on ?*Acacia*, 855 m, 23°35.7'W; 15°02.3'N, 2006, P. & B. van den Boom 36509 (hb. v.d. Boom); W of Sao Domingos, WNW of Rui Vaz, "Monte Tchopa", near telecommunication station, hilly area with low exposed outcrops on slope, steep N exposed outcrops and mixed trees, on *Eucalyptus*, 1085 m, 23°37.5'W; 15°02.2'N, 2006, P. & B. van den Boom 36404 (hb. v.d. Boom). Santo Antão: S of Ribeira Grande, SE of Corda, trail 203 from Cha de Mato to Losna, outcrops near Cha de Mato with shrubs and small trees, on shrub on N slope, 1095 m, 25°04.7'W; 17°07.6'N, 2006, P. & B. van den Boom 36751, 36752 (hb. v.d. Boom); S of Ribeira Grande, NW of Corda, trail 205 in NW direction to Figueiral, area with terrace cultivation, many walls, some outcrops and scattered trees, on *Acacia*, 970 m, 25°05.4'W; 17°08.3'N, 2006, P. & B. van den Boom 36641 (hb. v.d. Boom).

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