

THE SPECIES OF THE GENUS *RINODINA* (LICHENIZED ASCOMYCETES, PHYSCIACEAE) CONTAINING PANNARIN IN EURASIA WITH A SPECIAL NOTE ON THE TAXONOMY OF *RINODINA GRANULANS*

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**ABSTRACT:** Six species of the genus *Rinodina* with thalli and/or discs PD+ orange due to the presence of pannarin are hitherto recognized in Eurasia. One is saxicolous, *R. santorinensis*, and five are corticolous, *R. dalmatica*, *R. efflorescens*, *R. excrescens*, *R. granulans* and *R. pruinella*. Notes on the taxonomy of *R. granulans* are provided. Descriptions and illustrations of this species and the also poorly understood *R. excrescens* are included. A key to the treated species is given. Other known species containing pannarin are briefly discussed.

## INTRODUCTION

The treated species are specially characterized by the content of pannarin. This lichen substance is usually concentrated in the thallus, in the thalline exciple and/or in the epihymenium which appear entirely interspersed with irregularly shaped and sized crystals. These crystals are clearly visible under polarizing light and dissolve after treatment with PD forming reddish-orange acicular crystals.

Depending on several characters the treated species can be included in four different groups:

*Rinodina efflorescens*, *R. excrescens* and *R. granulans* are very closely related. They have in common the following characters: (1) pannarin as a principle lichen substance concentrated in the thallus, the thalline exciple and the epihymenium; (2) a well developed thallus, composed of scattered to

contiguous areolae, appearing as minute flattened squamules which dissolve into soredia or blastidia; (3) an epihymenium with a granular and PD+ orange epipsamma (pannarin); (4) thalline exciple reacting I+ blue (5) asci of the *Lecanora*-type (HONEGGER 1978) and (6) ascospores of the *Physcia*-type with tendencies to the *Milvina*-type.

*Rinodina dalmatica* is separated from the first group only because of the *Pachysporaria*-type ascospores.

*Rinodina pruinella* differs from the species cited above in the following characters: (1) pannarin located only in the epihymenium. Atranorin constitutes the principle lichen substance; (2) thallus not composed of areolae and not developing vegetative propagules; (3) thalline exciple I- and (4) ascospores of the *Dirinaria*-type.

Lastly, *Rinodina santorinensis* s. lat. is distinguished by: (1) pannarin present only in the thallus and the thalline margin; (2) epihymenium PD-, without epipsamma and (3) habitat saxicolous and usually parasitic.

According to SHEARD (in lit.), the literature checked and our own investigations, other species hitherto described possessing pannarin but not present in the study area are: the saxicolous *Rinodina murrayii* H. MAYRHOFER, from Australasia, and the corticolous *R. adirondackii* H. MAGN., *R. granuligera* H. MAGN., *R. marysvillensis* H. MAGN. and *R. thujae* (H. MAGN.) SHEARD, all from North America. Complete descriptions of these species are given by MAYRHOFER (1983) and MAGNUSSON (1932, 1947b and 1953).

*R. murrayii* belongs to the same group that *R. excrescens*, *R. granulans* and *R. efflorescens*, but the thallus does not develop vegetative diaspores and is saxicolous. *R. adirondackii*, like *R. dalmatica*, is separated by its *Pachysporaria*-ascospores, but its thallus does not develop vegetative propagules. *R. granuligera* and *R. marysvillensis* are closely related to *R. pruinella* but their ascospores belong to the *Physcia*-type.

We cannot exclude the possibility that other pannarin containing species may exist because the PD reaction was often not checked by other authors.

The terminology employed for the vegetative propagules follows that of POELT (1980), HAWKSWORTH et al. (1983) and FOX & PURVIS (1992), for the ascospores MAYRHOFER (1982) and SCHEIDEGGER (1993) and for the asci HONEGGER (1978). For the identification of lichen substances the standardized methods for thin layer chromatography (TLC) were used (e.g. CULBERSON & AMMANN 1979).

## KEY TO THE SPECIES

- |    |   |                         |
|----|---|-------------------------|
| 1a | Saxicolous.   | 2                       |
| 1b | Corticolous or lignicolous.   | 3                       |
| 2a | Epihymenium PD-. Ascospores <i>Pachysporaria</i> -type with tendencies to <i>Physcia</i> -type, 14-22 x 7-14 $\mu\text{m}$ . Thallus parasitic or seldom autotrophic. Macaronesia and mediterranean region. | <i>R. santorinensis</i> |
| 2b | Epihymenium PD+ orange. Ascospores <i>Physcia</i> -type, 16-22 x 10-13 $\mu\text{m}$ . Thallus always autotrophic. Australasia.   | ( <i>R. murrayii</i> )  |

- 3a** Thallus lacking of vegetative propagules, PD+ faint yellow. Ascospores *Dirinaria*-type, 15-25 x 7-13  $\mu\text{m}$ . Maritime, southern mediterranean-atlantic. ***R. pruinella***
- 3b** Thallus sorediate or blastidiate, PD+ orange. Ascospores different. **4**
- 4a** Thallus sorediate. Soralia discrete, never forming a continuous leprose crust. Ascospores *Physcia*-type, 15-20 x 7-10  $\mu\text{m}$ . Oceanic, boreal and subboreal. ***R. efflorescens***
- 4b** Thallus blastidiate. Blastidia forming a more or less continuous granulose-isidiose or leprose crust. **5**
- 5a** Blastidia large, up to 60-80(-100)  $\mu\text{m}$  diam., forming a granulose-isidiose crust (appearing subsquamulose). Ascospores *Physcia*-type, 14-21 x 7,5-11  $\mu\text{m}$ . Boreal, subboreal and mediterranean ***R. excrescens***
- 5b** Blastidia small, up to 30  $\mu\text{m}$  diam, forming a continuous leprose crust. **6**
- 6a** Ascospores *Pachysporaria*-type, when young with polygonal lumina, 17-26 x 8-13  $\mu\text{m}$ . Maritime, mediterranean-atlantic. ***R. dalmatica***
- 6b** Ascospores *Physcia*-type, when young never with polygonal lumina, 18-25 x 10-14  $\mu\text{m}$ . Siberia. ***R. granulans***

## THE SPECIES

### 1) *RINODINA DALMATICA* ZAHLBR.

*Österr. Bot. Z.* **51**: 348 (1901); BOULY DE LESDAIN (1909: 170); HARMAND (1913: 902); MAGNUSSON (1947a: 313); GIRALT et al. (in prep.).

**Type**: **Croatia**: Dalmatia, "in peninsula Lapad prope Ragusa", 100 m, on *Pinus halepensis*, J. BAUMGARTNER (GZU, W, WU-isotypes).

**Exs.**: ZAHLBRUCKNER: Lich. rar. exs. 39 (GZU, W, WU).

*Rinodina dalmatica* is distinguished by the entirely blastidiate thallus forming a continuous leprose crust and the *Pachysporaria*-type ascospores, when young with typical polygonal lumina. It is unique amongst *Rinodina* species in having the latter feature.

**Selected specimens examined**: **CROATIA**: Dalmatia: Ragusa, Mte. Petka, 150 m, on *Pinus halepensis*, A. LATZEL (W). - **GREECE**: Korfu: Kerkyra, NW Ipsos, on *Olea*, 16-17.8.1970, J. POELT (GZU). - Peloponnes: Elis, Olympia, on *Pinus halepensis*, 14.4.1971, J. POELT (GZU). - **ITALY**: Latium: Roma, Tenuta di Caccia di Castel Porziano, SW Roma, 0-20 m, 8.5.1986, J. POELT (GZU). - **PORTUGAL**: Algarve: Sierra de Monchique, Caldas, Vale do Paraíso, on *Olea europaea*, 24.2.1946, C.N. TAVARES & L. SOBRINO (LISU). - Estremadura: Setúbal, Mata do Reboredo, on *Pinus halepensis*, 14.5.1944, C.N. TAVARES (LISU).

## 2) *RINODINA EFFLORESCENS* MALME

*Svensk Bot. Tidskr.* **21**: 251 (1927); MAGNUSSON (1947a: 229); HARRIS (1977: 129, as *Rinodina* sp. 1, according to SHEARD in lit.); COPPINS & JAMES (1979: 175); WITTMANN & TÜRK (1987: 394); DIEDERICH (1989: 204); ETAYO (1992: 192); FOX & PURVIS (1992: 548); TØNSBERG (1992: 286); WIRTH (1990: 328); WONG & BRODO (1990: 364, 1992: 70); GIRALT et al. (1993: in press.).

**Type:** Sweden: Västergötland, Habo, St. Kårr, on old *Fagus* in a shady place, 1923, G.O. MALME (S - not seen).

**Syn.:** *Rinodina hueiana* (HARM.) OLIV., *Bull. Acad. Internat. Geogr. Bot.* **15**: 211 (1905). - *Lecanora hueiana* HARM., *Bull. Soc. Sci. Nancy, ser. 2*, **15**: 195 (1898); HARMAND (1913: 883). - non *Rinodina hueana* VAIN., *Hedwigia* **37**: 38 (1898). - **Type:** France: Vosges, "en montant au Ballon d'Alsace depuis Saint Maurice, sur un Bouleau, parasite sur le thalle vieux du *Parmelia saxatilis*", HARMAND (ANGUC - not seen).

Discussion: The incorrectly spelled epithet *hueiana* [see recommendation 73C(c) of the I.C.B.N.] is only an orthographic variant of *hueana* and the combination *Rinodina hueiana* proposed by OLIVIER (loc. cit.) is a latter homonym of *Rinodina hueana* VAIN. DIEDERICH (1989) already listed *R. hueiana* as a synonym of *R. efflorescens*. WIRTH (1990) placed *R. efflorescens* in the synonymy of *R. hueiana* without further comments. Because of the mentioned criteria *R. efflorescens* is the correct name of this species.

**Exs.:** Lich. sel. exs. Upsalienses 71 (GZU).

The discrete soralia are diagnostic of *R. efflorescens*.

**Selected specimens examined:** AUSTRIA: Steiermark: Nördliche Kalkalpen, ca. 3 km W of Großreifling, ca. 640 m, on *Acer* sp., 26.10.1990, J. POELT, J. HAFELLNER & E. LOPEZ DE SILANES (GZU). - BRITISH ISLES: Isle of Wight: Borthood Copse, on *Quercus*, November 1977, F. ROSE (BM). - Main Argyll: Seil, Ballachuan, Pòrt Mòr, on *Sorbus aria*, 5.8.1980, P.W. JAMES (BM). - East Sussex: Eridge Old Park, on old oak, June 1968, F. ROSE & P.W. JAMES (BM). - FRANCE: South-Voges: Steinbach, Cernay, ca. 700 m, on *Quercus petraea*, 27.10.1968, V. WIRTH (STU). - GERMANY: Württemberg: Neckar, Leonberg, Warmbronn, Stöckach, 440 m, 16.10.1988, V. WIRTH (STU). Baden, Südschwarzwald, Schönau, 600 m, 30.9.1971, V. WIRTH (STU). - SPAIN: Navarra: Belabarce, 1100 m, on *Fagus sylvatica*, 25.7.1987, J. ETAYO 3313 (Etayo).

## 3) *RINODINA EXCRESCENS* VAIN.

*Ann. Acad. Sci. Fenn., Ser. A*, **27**: 84 (1928); MAGNUSSON (1947a: 237); GIRALT et al. (1993: 711).

**Type:** Siberia: "Sibiria Occidentali, Konda, ad lignum putridum in pineto prope Leunsk", 1880, E. VAINIO (TUR-V 08798-holotype).

*Thallus* (Figs. 1c; 2a,b) crustaceous composed of scattered to contiguous areolae. Areolae light grey to grey brown, plane to bullate, 0,1-0,5 mm diam., with the appearance of minute sublobate squamules, becoming more or less confluent, mostly developing ascending blastidia. *Blastidia* large, 60-100  $\mu\text{m}$  diam., scattered or confluent and then forming a continuous granulose-isidiose crust, concolorous with areolae. *Apothecia* (Figs. 1c; 2a) rare, sessile, scattered or contiguous, up to 1 mm. Thalline margin concolorous with thallus, at first thick, entire and prominent, becoming thinner and flexuose, often partially excluded. Disc plane, rarely convex, brown, slightly pruinose. Proper margin often visible as a ring within the thalline margin. *Excipulum thallinum* up to 80  $\mu\text{m}$  laterally, expanded to 100-110  $\mu\text{m}$  below, l+ blue, interspersed with crystals of pannarin. Cortex cellular, 15-20(-40)  $\mu\text{m}$  laterally, expanded to 40-60  $\mu\text{m}$  below, cells thin-walled. *Excipulum proprium* 10-15  $\mu\text{m}$  laterally, expanded to 25-40  $\mu\text{m}$  above. *Epiphymenium* reddish-brown, with a granular and PD+ orange epipsamma. *Hymenium* (60-)80-100  $\mu\text{m}$  high. *Hypothecium* colourless 40-110  $\mu\text{m}$  deep. *Paraphyses* ca. 1,5-2  $\mu\text{m}$  wide, apices capitate, 2,5-3,5  $\mu\text{m}$  wide. *Asci* 8-spored, *Lecanora*-type. *Ascospores* (Figs. 2c-e) *Physcia*-type, (15-)17-19(-21) x (7,5-)9-10(-11,5)  $\mu\text{m}$ , smooth (someones when overmature minutely warty), constricted at the septum, with a well developed torus (Fig. 2e). *Spermatia* not seen.

*Chemistry*: Thallus K+ yellow and PD+ orange; pannarin and atranorin by TLC.

**DISCUSSION:** This species is characterized by the thallus composed of discrete to contiguous areolae which partially develop ascending blastidia (isidia-like) and form a more or less continuous granulose-isidiose (appearing subsquamulose) crust (Fig. 2a-b). The large blastidia, up to 100  $\mu\text{m}$  diam., make this species morphologically distinct from its relatives.

*Rinodina thujae* (H. MAGN.) SHEARD, from North America, is closely related if not conspecific to *R. excrescens*. The holotype differs from the investigated specimens of *R. excrescens* exclusively in the areolae which do not build structures resembling blastidia (compare Fig. 1d and Fig. 2a-b). Another sample of *R. thujae* studied (WETMORE 32864) is somewhat intermediate between both species, with some areolae developing blastidia-like structures (=ascending and sublobate margins). After the study of this sample, and without having seen the holotype, this species was mentioned in GIRALT et al. (1993) as a possible synonym of *R. excrescens*. The study of further North American material of *R. thujae* is necessary in order to solve its taxonomical position definitively.

**HABITAT AND DISTRIBUTION:** *Rinodina excrescens* has hitherto been reported only from the type locality in West Siberia (VAINIO 1928, MAGNUSSON 1947a) and from Austria (GIRALT et al. 1993). According to SHEARD (in lit.) the record from North America reported by BRODO et al. (1987) and also cited in EGAN (1987) refers to another, undescribed *Rinodina* species.

**Additional specimens examined:** AUSTRIA: Steiermark: Gurktaler Alpen, Grebenzen, 6 km NW Neumarkt, 1 km NW Oberdorf, Dürberger Hochmoor, ca. 980 m. on *Juniperus communis*, 20.1.1988, W. OBERMAYER 2587 (GZU, Obermayer). Weststeirisches Hügelland, zwischen Deutschlandsberg und

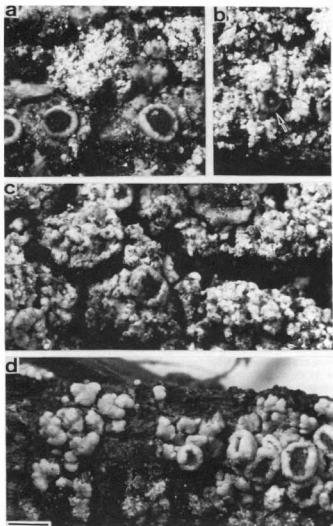


Fig. 1. Type specimens of *Rinodina granulans* (a,b), *R. excrescens* (c) and *R. thujae* (d); a. *R. granulans* (white sores) growing together with *R. archaea* agg. (3 apothecia). b. apothecium (arrow) of *R. granulans*. scale = 500  $\mu$ m.

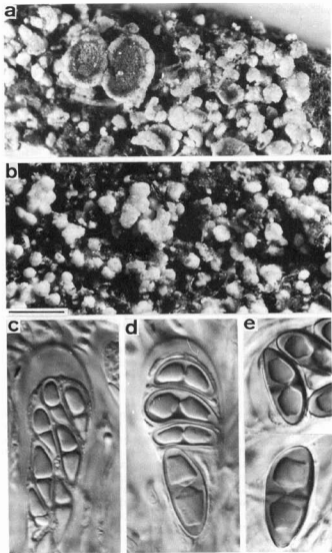


Fig. 2. *Rinodina excrescens* (OBERMAYER 2587). a. apothecia. b. blastidiate areoles, scale = 500  $\mu\text{m}$ . c-e. ascospore ontogeny (*Physcia*-type ascospores), scale = 10  $\mu\text{m}$ .

Schwanberg, ca. 390 m, on *Quercus robur*, J. HAFELLNER 23250 & M.E. LOPEZ de SILANES (GZU, Hafellner). - CROATIA, Insel Mljet, S Veliko Jezero, 0-30 m, on *Pinus halepensis*, 15.04.1979, O. BREUSS 954 (Breuß).

#### 4) RINODINA GRANULANS VAIN.

*Ann. Acad. Sci. Fenn., Ser. A*, 27: 83 (1928)

**Syn.:** *R. sibirica* var. *granulans* (VAINIO) H. MAGN., *Acta Horti Gothob.* 17: 272 (1947a). - **Type:** Siberia: "Sibiria Occidentali, Konda, in saepimento ligneo loco umbroso ad Tumynvatsk", 1880, E. VAINIO (TUR-V-08799 - holotype)

*Thallus* (Figs. 1a-b) crustaceous, composed of scattered to contiguous areolae. Areolae whitish, whitish-grey, whitish-green or brownish, matt, plane or slightly convex (0,1-)0,2-0,3(0,5) mm diam., usually becoming confluent, with the appearance of minute squamules, dissolving completely into small blastidia. *Photobiont* trebouxioid, cells 7-12(-15) mm diam. *Blastidia* small, 15-30(-50) µm diam., confluent, forming a continuous leprose crust, whitish (in the holotype) or with a ±dark brown tinge (in the other specimens examined), budding from the margins and surfaces of the areolae. *Apothecia* very rare, sessile or innate in a dense layer of blastidia, constricted at the base, up to 0,3 mm diam. (all of them are very young). Thalline margin persistent, smooth, concolorous with the areolae. Disc plane, reddish-brown. *Excipulum thallinum* 80-90 µm laterally, expanded to 130 µm below, I+ blue, interspersed with crystals of pannarin. Cortex cellular, 10-15 µm laterally, 30-50 µm at the base, cells thin-walled. *Excipulum proprium* indistinct laterally, expanded to 30-50 µm above. *Epihymenium* reddish-brown, with a granular and PD+ orange epipsamma. *Hymenium* 70-80 µm tall. *Hypothecium* colourless, ± 100 µm deep. *Paraphyses* 1,3-2 µm wide, apices capitate, 2,5-4 µm. *Asci* Lecanora-type. *Ascospores* *Physcia*-type with tendencies to *Milvina*-type, constricted at the septum, smooth, with a well developed torus, 18-25 x 10-14 µm. *Spermatia* not seen.

**Chemistry:** Thallus K+ faint yellow and PD+ orange; pannarin by TLC.

**DISCUSSION:** In the sample of the holotype of *R. granulans* there are two *Rinodina* species growing together (Fig. 1a). One species has a thallus consisting of discrete to contiguous areolae dissolving completely into small blastidia and forming a continuous leprose crust. This thallus contains pannarin (PD+ orange) and includes only very few apothecia, mostly very young and hidden between the blastidia. The excipulum thallinum is I+ blue and entirely interspersed with crystals PD+ orange (pannarin); the epihymenium is covered with a granular epipsamma, not dissolving in K and also PD+ orange; and the ascospores are *Physcia*-type, with tendencies to *Milvina*-type, with walls irregularly thickened.

The second species has a thin, smooth and continuous thallus without positive reactions. The apothecia are abundant and very well developed. The excipulum thallinum is I- and without any crystals; the epihymenium is covered with a coarsely granular epipsamma dissolving in K and PD-; and the



ascospores are *Physconia*-type, 18-21 x 8,5-10  $\mu\text{m}$ , with uniform walls (SCHEIDEGGER 1993). This species belongs to the *Rinodina archaea* group.

VAINO's original description includes characters of both species. Whereas the description of the thallus is based on the first species: "*Thallus verruculosorugulosus, .....verruculis dispersis aut contiguus, p. p. solediosofatiscentibus, farinosam confluentibus .....*", the description of the apothecia fits with the second one: "*Apothecia in partibus minus solediosis thalli sat crebre evoluta.... Margine tenui, integro.... Excipulum ....., jodo non reagens.... Sporae long 0,017-0,021, crass 0,09-0,011 mm, membrana sat aequaliter incrassata.....*".

According to the I.C.B.N. (art. 9.2, rec. 7B) we choose the species characterized by an entirely blastidiate and PD+ orange thallus and *Physcia*-type ascospores, as the lectotype of *R. granulans*.

*Rinodina granulans* is characterized by its small blastidia (soredia-like) forming a continuous,  $\pm$ brownish leprose crust and its *Physcia*-type ascospores grading into the *Milvina*-type. Apothecia were observed only in the type material (Fig. 1b).

**HABITAT AND DISTRIBUTION:** *Rinodina granulans* seems to be a widely distributed and quite common species in Siberia where it grows mostly on lignum and on small dry twigs, more seldom on smooth bark, associated with other lignicolous species such as *Rinodina archaea* agg., *Candelariella vitellina*, *Lecanora symmicta* and *L. varia*. Other associated species are: *Melanelia olivacea* coll., *M. exasperatula*, *Parmelia sulcata*, *Xylographa parallela*, *Cyphelium tigillare*, *Hypocenomyce scalaris*, *Calicium salicinum* and *Caloplaca cerina*.

**Additional specimens examined: SIBERIA:** Jenisejsk, Nasimova, on lignum, 28.6.1876, M. BRENNER (S). Jenisejsk, near the city of Jenisejsk, on lignum, 21.6.1876, M. BRENNER (S). Jenisejsk, Verst, N of Jenisejsk, on old cortex of *Prunus padus*, 26.6.1876, M. BRENNER (S). Jenisejsk, Novo Sjolovskoje, on lignum, 26.9.1876, M. BRENNER (S). Jenisejsk, Troitskij Klosterdorf, on lignum, 13.7.1876, M. BRENNER (S). Jenisejsk, Potkamina Tanguska, on lignum, 28.9.1876, M. BRENNER (S). Jenisejsk, Asinovo, on dry twigs, 4.7.1876, M. BRENNER (S). Jenisejsk, Vorogovø on lignum, 30.9.1876, M. BRENNER (S). Tobolsk, Kalimski, on lignum, dry twigs and *Betula* sp., 31.5.1876, M. BRENNER (S). Tomsk, Timskaja, on dry twigs, 1.6.1876, M. BRENNER (S).

##### 5) *RINODINA PRUINELLA* BAGL.

*Nuovo Giorn. Bot. Ital.* 11: 79 (1879); complete information about this species is given by GIRALT & MAYRHOFER (1994).

**Type: Italy:** Sardinia, Giorgino iuxta Cagliari, on *Ficus carica* CANEPA (MOD-holotype).

**Exs.:** SAMPAIO: Lich. de Portugal 192 (M, UPS).

Pannarin located only in the epihymenium, together with the thallus lacking of vegetative diaspores and K<sup>+</sup> yellow (atranorin) and the *Dirinaria*-type ascospores, are diagnostic for this species.

Among the species containing pannarin, *R. pruinella* and the North American *R. granuligera* and *R. marysvillensis* are unique in having this substance concentrated only in the epihymenium rather than in the thalline and other apothecial tissues. This feature easily separates these taxa from their relatives. *R. granuligera* and *R. marysvillensis* cannot be mistaken for *R. pruinella* because of their *Physcia*-type ascospores (see below).

The examined specimens are listed in GIRALT & MAYRHOFER (1994)

#### 6) *RINODINA SANTORINENSIS* J. STEINER s. lat.

*Verh. Zool.-Bot. Ges., Wien* **69**: 55 (1919); a complete information about this species is given by MAYRHOFER et al. (1993).

**Type: Greece:** Santorin Island, between Thira and Pyrgos, 4.1911, R. WETTSTEIN (W-lectotype).

**Exs.:** FOLLMANN: Lich. sel. exs. 219 (B, GZU, H, LD, W, as *R. confragosa*). - *Plantae Graecenses*, Lich. 504 (GZU). - VEZDA: Lich. rar. exs. 39 (ANUC, BM, DUKE, GZU, H, HO, M, PRM, STU, TSB, UPS, VBI, Kalb, Lumbsch and Vezda).

*Rinodina santorinensis* and the Australasian *R. murrayii* are the only saxicolous species hitherto known containing pannarin. For this reason the latter is also mentioned in the key. The PD- and I- reactions at the epihymenium and excipulum level, respectively, distinguish *R. santorinensis* not only from *R. murrayii* but also from the other treated species. On the other hand, the epihymenium lacking pannarin and the *Pachysporaria*-type ascospores show that *R. santorinensis* is more closely related to *R. beccariana* and to the corticolous *R. roboris* (MAYRHOFER et al. 1993) than to the taxa treated in this contribution.

The specimens examined are listed in MAYRHOFER et al. (1993).

#### OTHER *RINODINA* SPECIES CONTAINING PANNARIN NOT PRESENT IN THE STUDY AREA

*Rinodina adirondackii* H. MAGN., *Bot. Not.*: 48 (1947b). - **Type:** U.S.A.: New York, Adirondack Mountains, Chapel Pond, near St. Huberts, 1600ft, on cedar in gully, 1933, J.L. LOWE (UPS-holotype, not seen).

This species is distinguished by the thallus lacking vegetative propagules and the large *Pachysporaria*-type ascospores, 21-35 x 15-21  $\mu\text{m}$ . *Rinodina dalmatica* and *R. santorinensis* possess the same ascospore-type but in both species those are smaller. Furthermore *R. dalmatica* has a blastidiate thallus and *R. santorinensis* is saxicolous.

*Distribution:* Limited to America's northeastern states, Ontario and Quebec (SHEARD in lit). No specimen belonging to this species has been investigated. All information was provided by Dr. Sheard (Saskatoon).

***Rinodina granuligera* H. MAGN., Bot. Not.: 35 (1947b).** - **Type:** U.S.A.: Florida, Sanford, on trees, 1909, RAPP (UPS-holotype, not seen).

Pannarin located only in the epihymenium, together with the thallus lacking vegetative diaspores, K+ yellow (atranorin) and the *Physcia*-type ascospores of 15-18 x 6,5-8,5  $\mu\text{m}$ , distinguish this species from its relatives (see also *R. pruinella*).

*Distribution:* Southern and Eastern North America (SHEARD in lit.).

*Specimens examined:* **U.S.A.:** Louisiana: Baton Rouge, N of Terrebonne-Lafourche parish line on road 309, west of Thibodaux, on *Salix*, 11.10.1980, S.C. TUCKER (GZU). 4,7 miles n-NE of Chipola, on gravel road (Parrish road 1044), hardwood forest in ravine, 8.3.1973, S.C. TUCKER 11101B (Sheard). West Side of lake Bistineau, on dirt road parallel to lake edge, immature mixed *Pinus* sp.-*Quercus ilex* forest, 26.5.1973, S.C. TUCKER (Sheard).

***Rinodina marysvillensis* H. MAGN., Ann. Cryptog. Exot. 5: 31 (1932).** - **Type:** U.S.A.: Washington, Marysville, on *Salix* bark, 1927, GRANT (UPS-holotype).

The same characters cited for *R. granuligera* distinguish *R. marysvillensis* from the treated species. Both species are closely related but they can be mainly separated by the different ascospore size and shape being for *R. marysvillensis* larger [(16-)18-22 x (8-)10-11(-13)  $\mu\text{m}$ ] and more broadly ellipsoid. Their distribution it is also markedly different (see also *R. granuligera* and *R. pruinella*).

*Distribution:* Western North America (SHEARD in lit.).

*Additional specimens examined:* **U.S.A.:** California: Amador Co., on *Alnus rhombifolia*, riparian woodland along Sutter Creek between Sutter Creek and Volcano, ca. 2000 ft. alt, 15.3.1975, W.A. WEBER (SHEARD, as WEBER: Lich. exs. 474). San Francisco Co., San Francisco, Lands End, NE of Santa Cruz Peninsula, on *Alnus rubra*, 25.6.1974, I.M. BRODO 20481 & R.M. BROWN (CANL).

***Rinodina murrayii* H. MAYRHOFER, Lichenologist 15(3): 273 (1983).** - **Type:** New Zealand: South Island, Otago, Lee Stream Valley south west of Dunedin, 2 km north of Lee Stream School, ca. 490 m, 23.9.1981, H. MAYRHOFER 2199 (GZU-holotype; CHR, OTA-isotypes).

The saxicolous habitat together with the *Physcia*-type ascospores make this species distinct from its relatives (see *R. santorinensis*).

*Distribution:* New Zealand and Australia (MAYRHOFER 1983, 1984).

The specimens examined are listed in MAYRHOFER (1983).

***Rinodina thujae* (H. MAGN.) SHEARD, Bryologist 90: 164 (1987); *R. marysvillensis* var. *thujae* H. MAGN., Bot. Not.: 192 (1953).** - **Type:** U.S.A.: Wisconsin, Villas Co. Eagle River on *Thuja occidentalis*, 1946, J.W. THOMSON 2122 (UPS-holotype).

Only the larger areolae which do not dissolve into blastidia or soredia distinguish this species from the closely related *R. excrescens* and *R. granulans* (see comments made for these taxa).

*Distribution:* Great Lakes States and Canada (SHEARD in lit.).

*Additional specimens examined:* U.S.A.: Minnesota, St. Louis Co., Voyageurs National Park, 11.6.1978, C.M. WETMORE 32864 (MIN).

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