**Rinodina degeliana**: a corticolous lichen species overlooked in Poland

DARIUSZ KUBIAK

Department of Mycology, Warmia and Mazury University in Olsztyn
Oczapowskiego 1A, PL-10-957 Olsztyn, darkub@uwm.edu.pl


New localities of *Rinodina degeliana* in Poland are described. The morphology, chemistry, distribution and ecology of the species are discussed and characters that help to differentiate *R. degeliana* from similar lichens are presented. The species is relatively frequent in lime-hornbeam forests of northern and central Poland.

**Key words**: lichenized fungi, sorediate species, *Rinodina*-group, localities, N, C Poland

**INTRODUCTION**

The genus *Rinodina* (Ach.) Gray was represented by 33 species, including 12 epiphytic species, in Poland (Faltnowicz 2003). Two further taxa, *R. griseosoralifera* Coppins and *R. degeliana* Coppins, were reported by Czarnota and Kukwa (2007) and by Kukwa & Kubiak (2007), respectively. New localities of *Rinodina degeliana*...
were recorded during extensive lichenological studies in lime-hornbeam forests in the Masurian Lakeland, N Poland (Fig. 1). Further localities of the species were recorded in two forest reserves in Central Poland. The species seems to be relatively frequent in northern and Central Poland, especially in well preserved lime-hornbeam forests, and may also be frequent in other parts of Poland. *R. degeliana* may be overlooked or not distinguished because of its fine, inconspicuous sterile thalli.

The aim of this study is to describe *R. degeliana* and to indicate the most important diagnostic characters helpful in its identification during field studies and in the analysis of the herbarium material.

**MATERIAL AND METHODS**

The material was collected between 2006 and 2009. Morphological and biochemical characters of the specimens collected were examined using standard lichenological assessment analyses. Thin layer chromatography in solvent C was used in chemical analyses to differentiate secondary metabolites (Orange et al. 2001). The nomenclature of lichens follows Fałtynowicz (2003), Blanco et al. (2004) and Kauff & Büdel (2005). The material is deposited in the Herbarium of the Department of Mycology, Warmia and Mazury University, Olsztyn (OLTC-L), and in the Herbarium of the University of Łódź (LOD-L).

**RESULTS AND DISCUSSION**


**Thallus** epiphyloedic, growing irregularly, composed of compact or scattered areoles. **Prothallus** not evident. **Areoles** whitish grey to greenish grey, dull or slightly shiny, irregularly roundish or ± polygonal, flat but often slightly raised at their margins, 0.2−0.5 (−0.7) mm diam. (Fig. 2A). **Soralia** scattered, less frequently confluent, forming on the underside of raised areole margins, ± labriform, concolourous with the thallus or lighter – usually pure white (Fig. 2B). **Soredia** granular, 20−30 (−40) μm. **Apothecia** rare or absent. Not recorded in the Polish material.


**Ecology.** *R. degeliana* has been recorded almost exclusively on the bark of deciduous trees of the genera *Acer*, *Betula*, *Carpinus*, *Corylus*, *Quercus*, *Sorbus*, *Tilia*, mostly on *Alnus* and *Salix* in northern Europe (Tønsberg 1992; Mayrhofer, Moberg 2002). It has exceptionally been recorded on the bark of coniferous shrubs (*Juniperus*). This paper presents the first record of the species on wood. *R. degeliana* has
Fig. 2. *Rinodina degeliana*: A – areolate thallus with few marginal soralia OLTC L-3296; B – thallus with numerous scattered soralia OLTC L-3297. Scale bars = 1 mm.
been recorded both in open areas and in mixed or deciduous forests, often in shady and humid sites, e.g. in river valleys.

In Poland, the lichen has been recorded in old deciduous forests (lime-hornbeam forest, heliophilous oak forest) in places usually moderately humid and shaded, exceptionally on the bark of trees growing along roads within or on the edges of forests.

**World Distribution.** *Rinodina degeliana* is a relatively rare lichen, widespread in the Northern Hemisphere. Outside Europe, the species is known from north-eastern (NE USA, SE Canada) and north-western North America (McCune 2006; Esslinger 2007), and central-eastern Asia (Hauck, Javkhlan 2006; Hauck et al. 2007).

In Europe, the species is known from Sweden (Coppins 1983), Norway (Tønsberg 1992), Great Britain (Coppins et al. 1995), Finland (Vitikainen et al. 1997), Austria (Tønsberg et al. 2001), Estonia (Aptroot et al. 2005), Lithuania (Motiejūnaitė et al. 2005), Poland (Kukwa, Kubiak 2007) and Russia (Stepanchikova et al. 2008). Due to regionally few localities, the lichen has the status of a threatened species in some countries. It is known from only one locality in Great Britain and is classified as a vulnerable species, VU (Woods, Coppins 2003).

**Distribution in Poland.** *Rinodina degeliana* is known from 11 localities in northern and central parts of Poland.

**Specimens Examined.** ATPOL grid square Be 52 – Pojezierze Olsztyńskie Lakeland: Kudypy, Forest Arboretum, lime-hornbeam forest, on *Carpinus betulus*, together with *Puccinea psilica, Lecanora expallens, Lepraria elobata, Melanelixia fuliginosa, Pseudosagina aenea* and *Rinodina efflorescens*, 24 May 2006, leg. D. Kubiak (OLTC-L 3307). Be 59 – Pojezierze Mrągowskie Lakeland: ca 1 km W of the Krutyś village, near the road to the Mokre lake, maple-sycamore alley, inside the lime-hornbeam forest, on *Acer pseudoplatanus*, together with *Bacidia cf. subincompta, Lecanora expallens, Lepraria lobifrons, Melanelixia fuliginosa, Pertusaria coccodes, Phlyctis argena* and *Physconia sp.*, 17 July 2008, leg. D. Kubiak (OLTC-L 3301). Be 62 – Pojezierze Olsztyńskie Lakeland: Las Warmiński nature reserve, forest section No. 657b, 53°40′20.6″N, 20°30′06.7″E, lime-hornbeam forest, on *Carpinus betulus*, together with *Biatora efflorescens, Buellia griseovirens, Lepraria elobata, L. incana, Melanelixia fuliginosa* and *Parmelia sulcata*, 21 June 2008, leg. D. Kubiak (OLTC-L 3302); on *Carpinus betulus*, together with *Biatora efflorescens* and *Buella griseovirens*, 21 June 2008, leg. D. Kubiak (OLTC-L 3303); forest section No. 650a, 53°40′25.6″N, 20°30′26.7″E, lime-hornbeam forest, on *Carpinus betulus*, together with *Biatora efflorescens, Hypogymnia physodes, Lecanora expallens, Lepraria incana, L. rigidula, Parmelia sulcata, Ramalina farinacea* and *Rinodina efflorescens*, 21 June 2008, leg. D. Kubiak (OLTC-L 3304); forest section No. 705a, 53°38′54.5″N, 20°30′24.7″E, on the bark of *Carpinus betulus*, together with *Cladonia sp*, *Coeogonium pineti, Physconia sp.*, 9 July 2008, leg. D. Kubiak (OLTC-L 3305); forest section No. 104, 53°40′20.2″N, 20°30′38.5″N, on the bark of *Carpinus betulus*, together with *Lepraria expallens, Lepraria incana, Micarea prasina* s.l., 26 September 2009, leg. D. Kubiak (OLTC-L 3412); forest section No. 507g, 53°36′35.9″N, 20°30′09.9″E, on wood, together with *Parmelia sulcata* and *Placynthiella icmecae*, 26 September 2009, leg. D. Kubiak (OLTC-L 3413). Be 63 – Las Warmiński nature reserve, forest section No. 177/215, 53°39′44.6″N, 20°31′16.7″E, roadside trees, near the forest border, on *Acer platanoides*, together with *Candelariella reflexa, Caloplaca holocarpa, Lecanora hagenii* and *Phaeophyscia orbiculata*, 14 Sept. 2008, leg. D. Kubiak (OLTC-L 3300); forest section No. 252n, 53°38′54.5″N, 20°30′24.7″E, lime-hornbeam forest, on *Carpinus betulus*, together with *Lepraria incana* and *Rinodina efflorescens*, 10 Oct. 2008, leg. D. Kubiak (OLTC-L 3306). Be 83 – Pojezierze Olsztyńskie Lakeland: Deby Napiadowkie nature reserve, oak-hornbeam forests, on *Quercus robur*, together with *Anisomeridium polyphori, Lepraria elobata, L. incana, Phlyctis argena* and *Physconia sp.*, 30 July 2008, leg. D. Kubiak (OLTC-L 3295); on *Quercus robur*, together with *Cladonia sp., Coenogonium pineti, Hypogymnia physodes, Lepraria lobifrons, Micarea prasina* s.l., *Parmelia sulcata, Phlyctis argena* and *Rinodina efflorescens* (OLTC-L 3296); on *Quercus robur*, together with *Lepraria elobata, L. incana, Phlyctis argena* and *Rinodina efflorescens*, 30 July 2008, leg. D. Kubiak (OLTC-L 3297), on *Carpinus betulus*, together with *Biatora efflorescens, Lepraria elobata* and *L. incana*, 30 July 2008, leg. D. Kubiak (OLTC-L 3294); on *Carpinus betulus*, together with *Phlyctis argena*, 30

Note. The following localities: Be 68 – Bory Tucholskie Forests: ca 2.5 km W of the Stara Rzeka village, 53°39’22”N, 18°16’40”E, on Tilia cordata, 14 June 2004, leg. M. Kukwa (UGDA-L 11794); Be 52 – Pojezierze Olsztyńskie Lakeland: Kudypy, Forest Arboretum, 53°46’N, 20°22’E, on Carpinus betulus, 24 May 2006, leg. D. Kubiak (OLTC-L 3312); Be 83 – Pojezierze Olsztyńskie Lakeland: Dęby Napiwodzkie nature reserve, on Corylus avellana, 17 Sept. 2005, leg. D. Kubiak (OLTC-L 2158), were reported by Kukwa & Kubiak (2007), while Ce 61 – Równina Raciąska Plain: Dziektarzewo nature reserve, lime-hornbeam forest, on the slope of the Wkra river valley, on Fraxinus excelsior, 26 April 2008, leg. D. Kubiak (OLTC-L 3097) was reported by Kubiak (2009), cf. Figure 1.

Discussion. Rinodina degeliana produces diminutive, inconspicuous thalli that are difficult to distinguish among other crustose sorediate lichens in the field. A considerable part of the specimens reported here was collected by the author accidentally together with other lichens. The species can relatively easily be distinguished in the laboratory. It is characterised by, for instance, crustose to subsquamulose areoles of the thallus, marginal, mostly labriform soralia and atranorin and zeorin content (Tab. 1).

<table>
<thead>
<tr>
<th>Features</th>
<th>Species</th>
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<tbody>
<tr>
<td>Thallus</td>
<td><em>Rinodina degeliana</em></td>
</tr>
<tr>
<td></td>
<td>crustaceous to subsquamulose, areolate, areoles up to 0.7 mm diam.,</td>
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<tr>
<td></td>
<td>more or less flat, adnate to raised at their edge, whitish grey to</td>
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<tr>
<td></td>
<td>greenish grey (never tinged bluish or brownish), prothallus not</td>
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<tr>
<td></td>
<td>evident</td>
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<tr>
<td>Soralia</td>
<td><em>Rinodina griseosorafera</em></td>
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<td></td>
<td>discrete, rounded, flat to convex, erupting from the upper surface of</td>
</tr>
<tr>
<td></td>
<td>the areoles, occasionally confluent into larger sorediate patches,</td>
</tr>
<tr>
<td></td>
<td>whitish to blue-grey (external exposed soredia)</td>
</tr>
<tr>
<td>Chemistry (major compounds)</td>
<td><em>Rinodina efflorescens</em></td>
</tr>
<tr>
<td></td>
<td>scattered, bursting from areoles or substratum, flat to convex,</td>
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<tr>
<td></td>
<td>occasionally confluent but never forming a continuous leprose crust,</td>
</tr>
<tr>
<td></td>
<td>whitish, greenish or yellowish, tinged brown</td>
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<tr>
<td></td>
<td><em>Buellia griseovirens</em></td>
</tr>
<tr>
<td></td>
<td>mostly discrete, roundish, convex, plane or fissure-shaped, sometimes</td>
</tr>
<tr>
<td></td>
<td>few becoming confluent, greyish, yellowish or bluish tinged</td>
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Table 1
Distinguishing features between *Rinodina degeliana* and superficially similar species (acc. to various sources)
The chemistry of only one sorediate lichen, *Rinodina griseosoralifera* Coppins, is identical to that of *R. degeliana*. However, *R. griseosoralifera* differs by a lower concentration of atranorin, which results in the absence of a strong reaction with K and a usually weak reaction with PD (Coppins 1989; Czarnota, Kukwa 2007). *R. griseosoralifera* is additionally differentiated by flat to ± convex, oval areoles of the thallus and blue-grey superficial soralia. *R. degeliana* is often accompanied by *R. efflorescens* in the Polish material. The latter sorediate species sometimes produces soralia on the margins of small areoles; however, it never forms soralia on their underside (labriform soralia). *R. efflorescens* is additionally distinguished by its chemistry. It contains pannarin (and additional substances) which causes a colour PD reaction (PD+ orange-red) of the soralia, usually green- or brown-pigmented. Because of a similar yellow PD reaction of the soralia, *R. degeliana* may be mistaken with *Buellia griseovirens* (Turner et Borrer ex Sm.) Almb. *B. griseovirens*, however, differs by its chemistry (norstictic acid, stictic acid compound), usually a more or less continuous thallus and roundish, surface soralia, often grey- or bluish tinged. Some strongly sorediate specimens of *R. degeliana* may resemble powdery thalli of lichens belonging to the genus *Lepraria* Ach. *R. degeliana* differs from them by a colour reaction with PD: a distinctly yellow reaction with PD is not obtained for any of the representatives of the genus *Lepraria* with granular soredia (only *L. elobata* has a PD+ orange reaction).

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**REFERENCES**


Streszczenie

*Rinodina degeliana* jest stosunkowo rzadkim porostem, rozpowszechnionym na Północnej Półkuli, poza Europą znany z Ameryki Północnej i Azji. Z Polski gatunek ten znany był dotychczas z trzech stanowisk w północnej (Bory Tucholskie, Pojezierze Olsztyńskie) oraz jednego w centralnej części kraju (Równina Raciąska). W latach 2006-2009 stwierdzono sześć nowych stanowisk tego porostu na obszarze Pojezierza Mazurskiego oraz jedno na Równinie Pietrówskiej. Uzyskane wyniki wskazują, iż *R. degeliana* jest porostem prawdopodobnie częstym w eutroficznych lasach liściastych północnej i centralnej Polski. Takson ten nie był dotychczas wyróżniany w terenie lub był przeoczany w materiale zielnikowym ze względu na drobne, sterile plechy. Można przypuszczać, iż dalsze badania w podobnych warunkach ekologicznych, także w innych częściach kraju, pozwolą odszukać kolejne jego stanowiska. W pracy przedstawiono charakterystyczne cechy diagnostyczne pozwalające odróżnić ten gatunek od innych podobnych porostów (Tab. 1). Zaliczyć można do nich: areolokwaty typ plechy, brzeźne, ± wargowe soralia oraz obecność wtórnych metabolitów – atranoryny i zeoryny.