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Polycoccum minutulum (Dothideales, Ascomycetes), a new lichenicolous fungus on Trapelia placodioides

JANA KOCOURKOVÁ[1] and FRANZ BERGER[2]

[1]National Museum, Václavské nám. 68, 115 79 Praha 1, Czech Republic
[2]A-4794 Kopfing 130, Austria

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A new lichenicolous fungus species, *Polycoccum minutulum* Kocourková et F. Berger is described from Central Europe. The combination of features of this species, such as discoloration of infected parts of the host, the formation of galls, the size of the halonate spores provided with verruculose epispore and also the host *Trapelia placodioides* Coppins et P. James, distinguishes it from other species of the genus *Polycoccum* Sauter ex Körb.

Key words: Lichenicolous fungi, Ascomycetes, Dothideales, *Polycoccum*, *Trapelia placodioides*, flora of Austria, flora of the Czech Republic.

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Nová lichenikolní houba *Polycoccum minutulum* Kocourková et F. Berger je popsána ze střední Evropy. Kombinace charakteristických znaků tohoto druhu jako jsou odbarvení napadených částí stélky, tvorba hálek, velikost halonátních spór s bradavičnatým episporem a hostitel *Trapelia placodioides* Coppins et P. James odlišuje tento druh od příbuzných druhů rodu *Polycoccum* Sauter ex Körb.

INTRODUCTION

In 1997 independently of each other both of us collected a lichenicolous fungus on *Trapelia placodioides*, which proved to be a still undescribed species of *Polycoccum*. The features of this new species are fitting well in the concept of the genus (Hawksworth and Diederich 1988). This species so far has not been found on other *Trapelia* species. It is supposed to be widespread but overlooked.

RESULTS AND DISCUSSION

Diagnosis

Polycoccum minutulum Kocourková et F. Berger sp. nov. Fig. 1–8.

Fungus lichenicolus, in thallo Trapeliae placodioides vigens, cecidia supra thallum crescentes, areolas lichenis decolorantes. Ascomata singularia (dispersa)

vel plerumque congregata, primum in cecidia immersa, maturitate erumpentia, obpyriformia, ostiolata, atra, 90–130 μm alta et (60-) 70–120 μm lata, (singularia majora). Paries e cellulis pseudoparenchymaticis applanatis compositus, in regione ostioli incrassatus et atrofusce pigmentatus, 18–20 μm crassus, ad basim subfuscus, 5 μm crassus; e 3 stratis cellularum formatus. Pseudoparaphyses parce ramosae et anastomosantes, septatae, 1–1.5 μm latae. Asci fissitunicati, clavati, basim breviter stipitati, 8-spori, 50–62 × 14–17 μm magni; in solutione iodina (sec. Lugol) non caerulescentes. Ascosporae 1-septatae, ellipsoideae, in asco irregulariter distichae, olivaceofuscae usque fuscae, ad septum leniter constrictae, parce halonatae, (11-) 12–16 × 5–6 (-7) μm; cum episporo verruculoso. Pycnidia desunt.

Typus: Bohemia centr., regio protecta Křivoklátsko, distr. Rakovník, prope pag. Roztoky, in valle rivuli Klucná, in clivo lapidoso ad merid.– occid. versus, ad saxa rhyolitica, matrix: *Trapelia placodioides*, alt. 280 m s.m., MTB 5949, 31.8.1997, leg. P. Kocourek et J. Kocourková (Holotypus – PRM 842975, isotype herb. Berger 11830).

Description

Lichenicolous fungus forming discoloured galls on infected areoles of *Trapelia placodioides*.

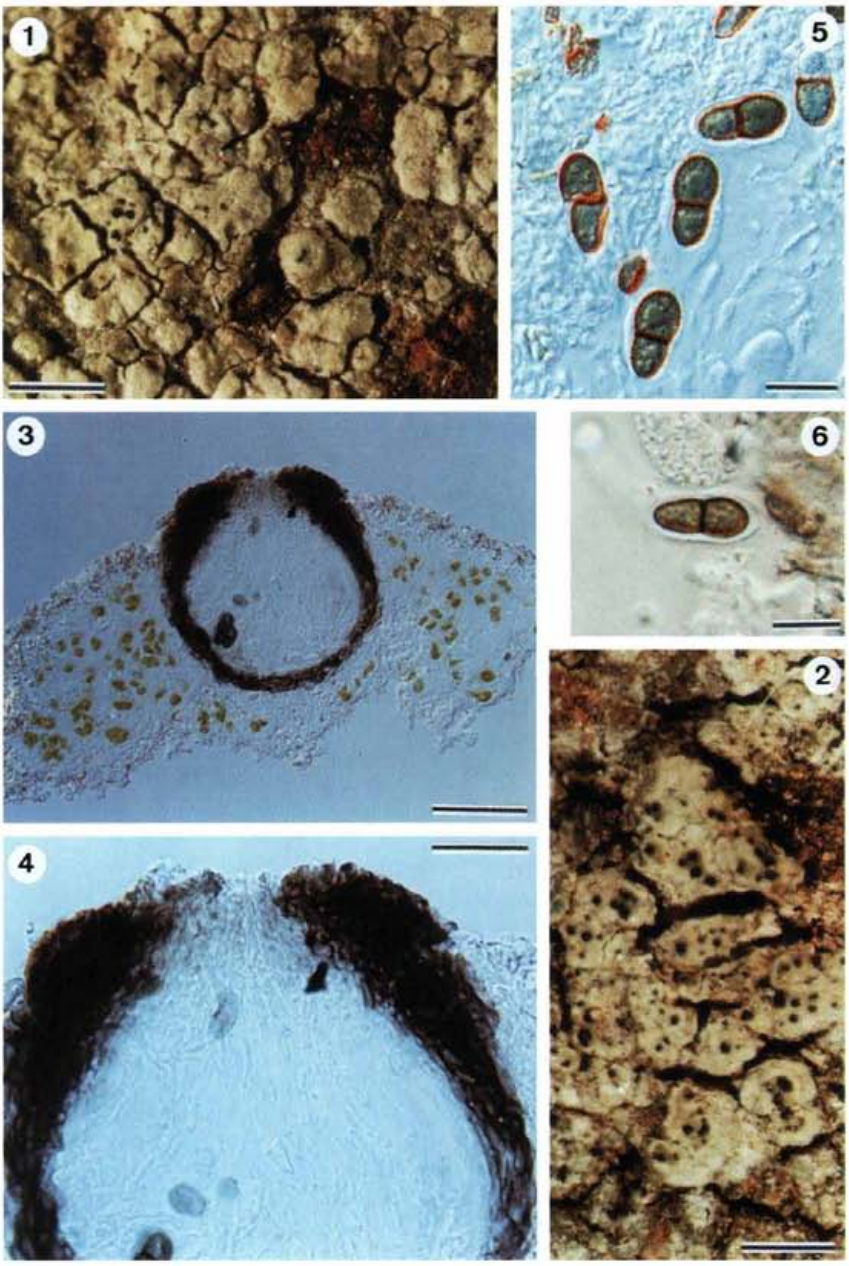
Ascomata arising singly or in groups of up to 20, usually about 5–10 in the infected areole, immersed to finally erumpent, at maturity only the upper part exposed, black, obpyriform, (60-) 70–120 μm wide, 90–130 μm tall; single ascomata always larger, ostiolum somewhat papillate. Wall composed of about 3 layers of flattened pseudoparenchymatous cells, pale olivaceous-brown below, 5 μm thick, around the ostiole expanded to 18–20 μm, dark brown.

Hamathecium of sparsely branched and anastomosing pseudoparaphyses, 1–1.5 μm wide, centrum I-, KI-, without periphyses.

Asci elongate clavate, short-stalked, 8-spored, 50–65 × 14–17 μm, thick-walled, with fissitunicate discharge, KI– apical dome, content of asci KI+ orange.

Ascospores irregularly to distichously arranged in the asci, 1-septate, ellipsoid, slightly constricted at the septum, with cells of somewhat different size, rounded at apices, olivaceous to dark brown at maturity, (12-) 13–16 (-17) × 5–6 (-7) μm; wall of ascospores composed of several layers, epispore coarsely verruculose, perispore developed as a gelatinous sheath usually 0.5–1.5 μm wide. Conidiomata not observed.

Etymology: The specific epithet "minutulum" is derived from the character of the ascomata, which are those of the most minute in the genus *Polycoccum*.



Figs 1–6. *Polycoccum minutulum* Kocourková et F. Berger (Holotype).
1–2. Habitus of infected host thallus of *Trapelia placodioides* with immersed ascomata. Scale = 0,5 mm. – **3.** Vertical section of ascoma immersed in host thallus. Scale = 50 μm. – **4.** Detail of ascoma showing structure of the ascomatal wall, ostiolum and hamathecium formed of paraphysoids. Scale = 20 μm. – **5.** Halonate ascospores with verruculose epispore. Scale = 10 μm. – **6.** Ascospore with extremely wide gelatinous sheath. Scale = 10 μm. (All preparations in water.)

Host and distribution

The only host lichen so far known is *Trapelia placodioides*.

This fungus was found in several localities in Central Europe (Austria, Czech Republic). It is restricted to areas with siliceous rocks, where *Trapelia placodioides* is abundant. Once recognized, we have been able to collect it in further 6 localities all together without great effort.

Observations

There is an interesting, not yet fully understood difference in the formation of galls between Czech and Austrian material. In the Bohemian and Moravian material white sphaerical galls can be seen without a lens on the grey thalli, giving them a powdered appearance. In the Austrian specimens the galls are very flat and inconspicuous also under a dissecting microscope. The anatomical features of both populations are identical. Generally the fungus seems to be a very aggressive commensalist, already colonizing thalli with a diameter of only 3 mm. In an early stage of development only a hue of white pruina can be seen on the infected, not yet discoloured thallus. Heavy infection causes a nodose appearance and a white discoloration of the host. This is not a bleaching process but is caused by confluence of pruinose areas. According to our observations no other damage of the host thallus occurs. On fertile specimens of *Trapelia placodioides*, found in two of the Austrian localities, *P. minutulum* has not been observed.

The host lichen has been recognized and described rather recently (Coppins and James 1984). Before obviously no one had paid much attention to searching lichenicolous fungi on this widespread, easily recognizable, mostly sterile and unattractive lichen. So we were able to find only two references in literature [*Pyrenidium actinellum* Nyl. (published by Hafellner and Mauer 1994: 129) and *Bispora lichenum* Diederich (Hawksworth 1994: 337)].

Discussion

The combination of features of *P. minutulum* such as the discolouration of infected parts of the host, the formation of galls, the size of the halonate spores with a verruculose epispore and also the host *Trapelia placodioides* Coppins et P. James, distinguishes it from other species of the genus *Polycoccum* Sauter ex Körb.

The anatomical features of *Polycoccum minutulum* well agree with those of the type species *P. trypethelioides* (Th. Fr.) R. Sant. *Polycoccum* is a genus with species characteristic in having a narrow host spectrum. Most of them, with the exception of *P. cladoniae* Diederich et D. Hawksw., *P. innatum* (Müll.

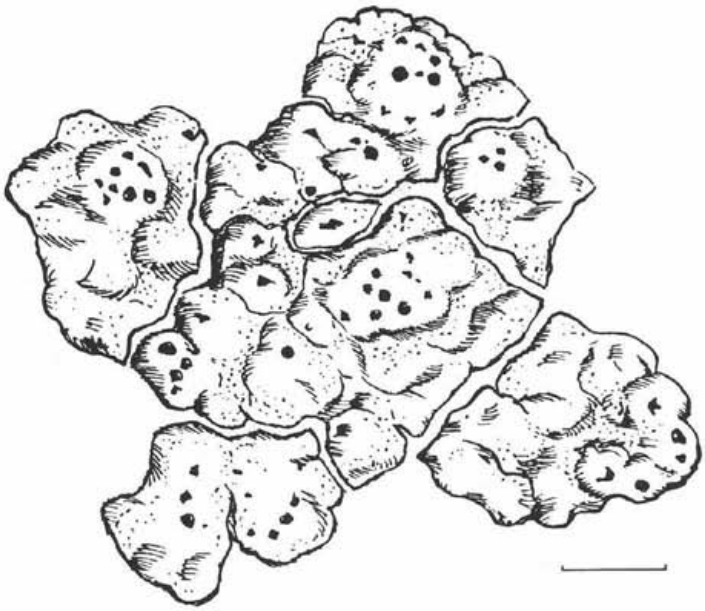


Fig. 7. *Polycoccum minutulum* Kocourková et F. Berger (Holotype). Detail of infected areoles of *Trapelia placodioides* enclosing ascomata in galls. Scale = 0,5 mm. Drawing by P. Kocourek.

Arg.) D. Hawksw., *P. montis-wilhelmii* Diederich, *P. peltigerae* (Fuckel) Vězda, *P. slaptoniense* D. Hawksw., *P. superficiale* D. Hawksw. et Miadl., *P. trypethelioides, P. umbilicariae* (Lindsay) D. Hawksw. and *P. vermicularium* (Lindsay) D. Hawksw., grow on saxicolous crustose lichens, just as the new species.

Among the 31 currently accepted species of *Polycoccum* 9 species are regularly causing the formation of galls on their hosts: *P. innatum, P. jamesii* D. Hawksw., *P. kerneri* Steiner, *P. peltigerae*, *P. pulvinatum* (Eitner) R. Sant., *P. serusiauxii* Matzer, *P. slaptoniense*, *P. trypethelioides* and *P. umbilicariae*. Also *P. sporastatiae* (Anzi) Arnold occasionally causes the formation of them. A verruculose spore ornamention is known in *P. bryonthae* (Arnold) Vězda, *P. cladoniae, P. evae* Calatayud et Rico, *P. marmoratum* (Kremp.) D. Hawksw., *P. microsticticum* (Leight. ex Mudd) Arnold, *P. montis-wilhelmi, P. rugulosarium* (Lindsay) D. Hawksw., *P. slaptoniense, P. trypethelioides* and *P. vermicularium*. The size of the ascospores is very similar to that of *P. rugulosarium* known from the Antarctic region and Tasmania only (Diederich and Hawksworth 1988: 304) and of *Polycoccum montis-wilhelmii* described from Papua New Guinea (Aproot et al. 1997: 141). Regarding the length, width and also the L/W ratio of the spore dimensions, none of the corresponding species can be identical with *P. minutulum*. *P. bryonthae* and *P. peltigerae* have monostichously arranged

spores. *P. rugulosarium*, growing on several closely related species of *Caloplaca* in the southern hemisphere, does not form galls. *P. umbilicariae* has equal-sized but smooth ascospores and grows only on *Lasallia pustulata*.

Additional specimens:

(all collections quoted are from *Trapelia placodioides*; J. K. = J. Kocourková, P. K. = P. Kocourek, F. B. = F. Berger)

Austria: Upper Austria, Donautal, Schlögener Schlinge, Steiner Fels, on granite rocks near the ground in *Cytiso-Pinetum*, 480 m, MTB 7549; 3.XII.1997, coll. F. B., Be 11754. – Donautal, Freizell, on granite rocks near the ground in *Cytiso-Quercetum*, 440 m, MTB 7549; 29.X.1997, coll. F. B., Be 11673. – Bezirk Grieskirchen, Natternbach, Leitenbachtal, SW exposed rock stream, 420 m, on granite boulders, 26.X.1997, coll. F. B., Be 11650.

Czech Republic: Central Bohemia, Distr. Rakovník, Protected Landscape Area Křivoklátsko, near the village of Roztoky and the settlement of Višňová, on rhyolite rock near road by the river Berounka, 250 m, MTB 5949; 24.IX.1997, coll. J. K. and P. K. (PRM 891427). – Distr. Rakovník, Protected Landscape Area Křivoklátsko, nature reserve Stříbrný luh, on W slope in mixed forest, on shale rocks, 280 m, MTB 5949; 10.I.1998, coll. J. K. and P. K. (PRM 758281). – South-western Moravia, Distr. Třebíč, near confluence of the rivers Chvojnice and Oslava, below the castle Ketkovický hrad, on NE exposed slope with boulder scree, on granulite boulder, 360 m, MTB 6863; 5.X.1998, coll. J. K. (PRM 892553).

Ecology and associated lichens

The Austrian material has been found on siliceous stones on the ground in broadleaved forests at colline and submontane elevations. Associated species in the Austrian localities are: *Rhizocarpon obscuratum, Trapelia obtegens, Porpidia soredizodes, Scoliciosporum umbrinum, Lepraria caesioalba* and *Acarospora fuscata*.

The type locality, Klucná valley in the Czech Republic, is situated in a rhyolite boulder field (*Aceri-Carpinetum*). *Porpidia tuberculosa, Rhizocarpon obscuratum, Trapelia obtegens, Lepraria* sp., *Lecanora polytropa, Scoliciosporum umbrinum, Rhizocarpon lavatum, Rhizocarpon oederi, Micarea sylvicola, Amandinea punctata, Psilolechia lucida* and *Bacomyces rufus* were found in close vicinity of the infected thalli (species are listed according to frequency). *Rhizocarpon lecanorinum, Porpidia crustulata, Lecanora soralifera, Miriquiridica leucophaea, Acarospora fuscata, Ochrolechia lactea* and *Diploschistes scruposus* were growing on adjacent boulders. *Trapelia obtegens, Placynthiella icmalea* and *Melanelia verruculifera* were associated with infected thalli of *Trapelia placodioides* on the

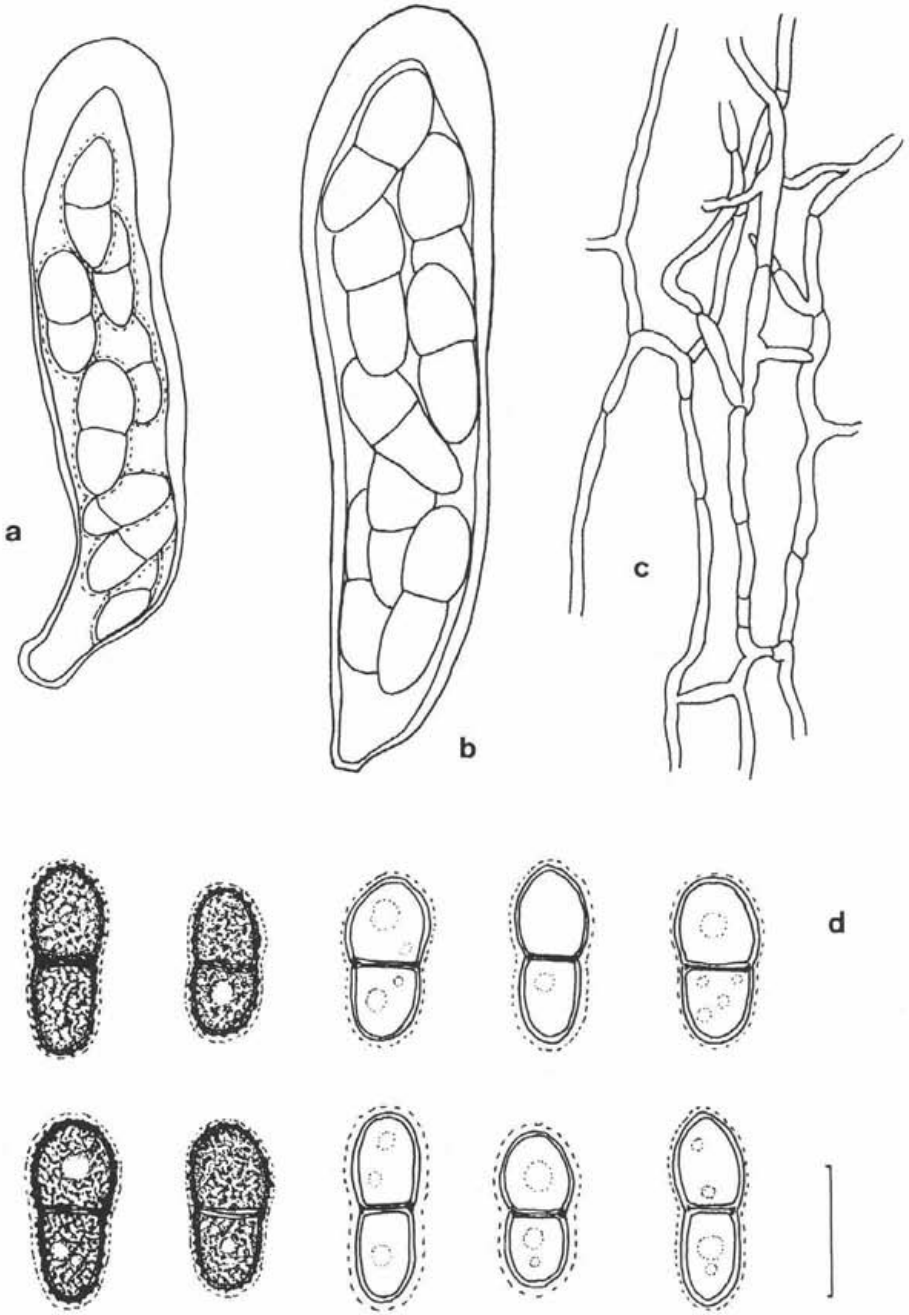


Fig. 8. *Polycoccum minutulum* Kocourková et F. Berger (Holotype). **a.** Immature ascus. **b.** Mature ascus. **c.** Trabeculate pseudoparaphyses (paraphysoids). **d.** Ascospores. Scale = 10 μm.

vertical wall of a rhyolite rock near the ground in the locality Višňová (*Sorbo-Quercetum*). *Rhizocarpon obscuratum, Melanelia verruculifera, Scoliciosporum umbrinum* and *Porpidia soredizodes* were found in the locality Stříbrný luh on small rocks of metamorphic shale along a forest path (*Sorbo-Quercetum*). All Czech and Moravian localities are situated on slopes of foggy river valleys or the cold and wet brook valleys (type locality) in an area otherweise rich in thermophytic flora with the occurrence of some montane elements.

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