

## ***Acaroconium punctiforme* gen. sp. nov., a new lichenicolous coelomycete on *Acarospora* species and *Sarcogyne regularis***

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**Abstract:** The coelomycete *Acaroconium punctiforme* gen. sp. nov. is described from four members of the lichen-forming family *Acarosporaceae*, three species of *Acarospora* and *Sarcogyne regularis*. The new fungus is characterized by pycnidial conidiomata with a distinct ostiolar collar, enteroblastic conidiogenesis, and the production of simple brown conidia. The separation of the fungus from other somewhat similar pycnidial fungi growing on lichens and plant material is discussed.

**Key words:** *Acarosporaceae*, Czech Republic, Germany, *Lichenocodium*, lichens, *Microsphaeropsis*, Slovakia, Thailand, USA

### Introduction

Lichens continue to be a source of novel genera of associated fungi, and here we report on an unusual coelomycete discovered on two genera of *Acarosporaceae*, *Acarospora* and *Sarcogyne*, and occurring in both central Europe and North America.

### Methods

Specimens were studied using a Nikon zoom stereomicroscope and an Olympus BH-2 research microscope fitted with Nomarski differential interference contrast optics and a drawing tube. Preparations and measurements were made on material mounted in water, and lactofuchsin and lactophenol Cotton blue, both after warming. Conidial measurements are given in the form '(minimum–) mean minus standard deviation—mean—mean plus standard deviation (–maximum)'; the number of conidia measured is indicated by 'n'.

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### Taxonomy

***Acaroconium* Kocourk. & D. Hawksw., gen. nov.**

Mycobank no.: MB511401

Generi *Lichenocodium* et *Microsphaeropsis* s. str. simile, sed differt pycnidiiis cum regionibus ostioliis atrobunneis, et conidiis latis ellipsoideis. Cellulae conidiogenae enteroblasticae et non annellatae, conidia laeves.

Typus: *Acaroconium punctiforme* Kocourk. & D. Hawksw. 2008

*Conidiomata* pycnidia, occurring singly but sometimes juxtaposed, black, subglobose, immersed to partly erumpent, ostiolate, with a distinctly thickened ostiolar collar; superficial mycelium absent. *Pycnidial wall* of polyhedral angular pseudoparenchymatous cells, individual cells reddish brown to brown. *Conidiophores* absent. *Conidiogenous cells* lining the inside of the pycnidial cavity, hyaline, broadly short-ampulliform, apex with a periclinally thickened collar, not proliferating and lacking annellations. *Conidia* enteroblastic, arising singly, not forming chains, broadly ellipsoid, non-septate, colourless at first but becoming pale brown inside the pycnidial cavity, smooth-walled, rounded at both ends and lacking any basal scar or frill.

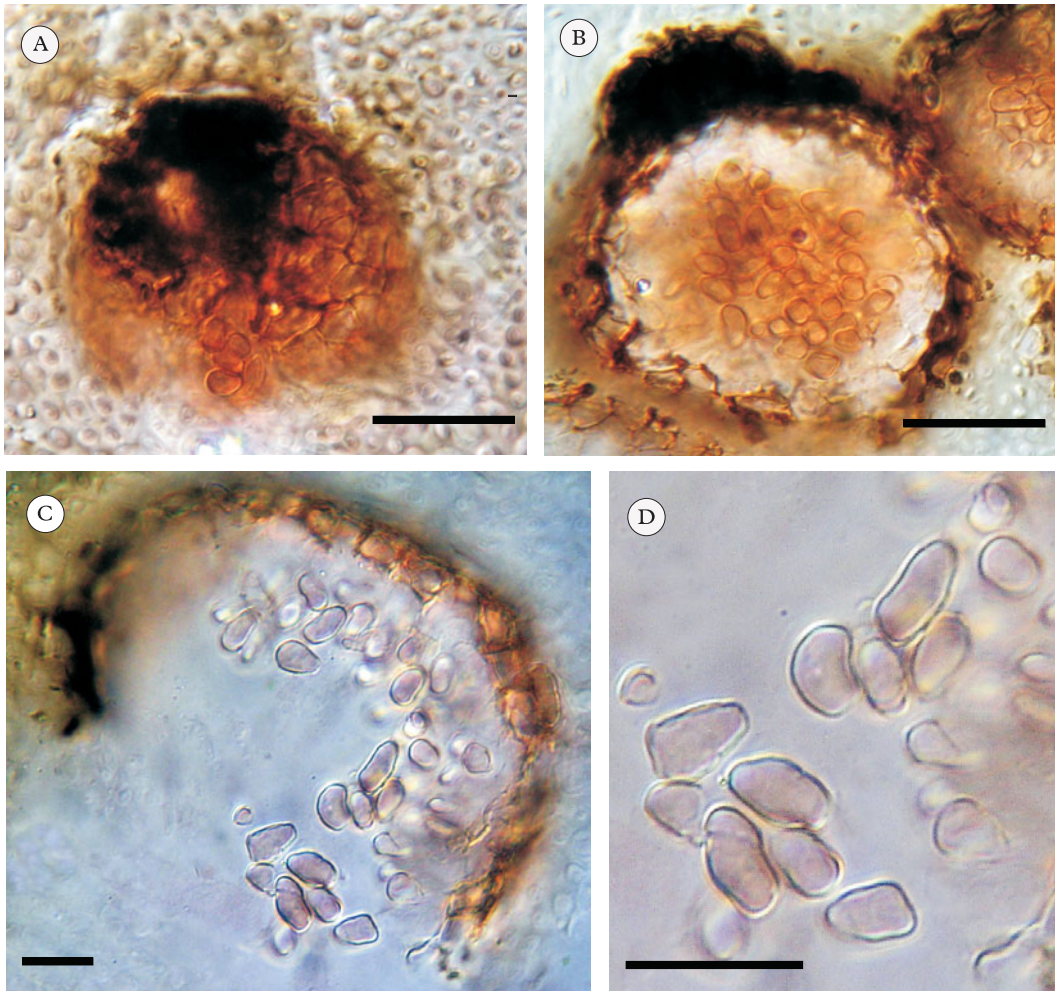


FIG. 1. *Acaroconium punctiforme* (holotype). A, pycnidium showing the dark ostiolar collar; B, vertical section of pycnidium with thickened and dark ostiolar collar; C, section of pycnidium showing the very thin wall and conidia; D, pale brown conidia. Scales: A–B=20  $\mu\text{m}$ ; C–D=10  $\mu\text{m}$ .

**Etymology.** The generic name recalls the family of the host lichens, *Acarosporaceae*, and is also suggestive of the superficial similarity to *Lichenocinium*.

**Observations.** The genus is monotypic.

***Acaroconium punctiforme* Kocourk. & D. Hawksw., sp. nov.**

Mycobank no.: MB511574

Fungus lichenicola, pycnidiiis 50–100  $\mu\text{m}$  in diametro, cellulis conidiogenis 6–7  $\times$  4.5–6.5  $\mu\text{m}$ , et conidiis (4.5–)5.5–6.8–7.5(–8.5)  $\times$  (3–)3.5–4.2–5(–6)  $\mu\text{m}$ .

Typus: Republica Cechica, Bohemia orientalis, montes Krkonoše, pag. Horní Maršov, in valle Vodvodní údolí, MTB 5360, alt. 610 m, ad *Acarospora macrospora* ad saxa calcarea, 27 April 1997, *J. Kocourková* & *P. Kocourek* (PRM 892643—holotypus).

(Figs 1 & 2)

*Conidiomata* pycnidia, arising in the apothecial discs and areoles of the host lichen, occurring singly but sometimes juxtaposed, punctiform, black in surface view, somewhat shiny, subglobose, immersed with the uppermost third to two thirds erumpent,

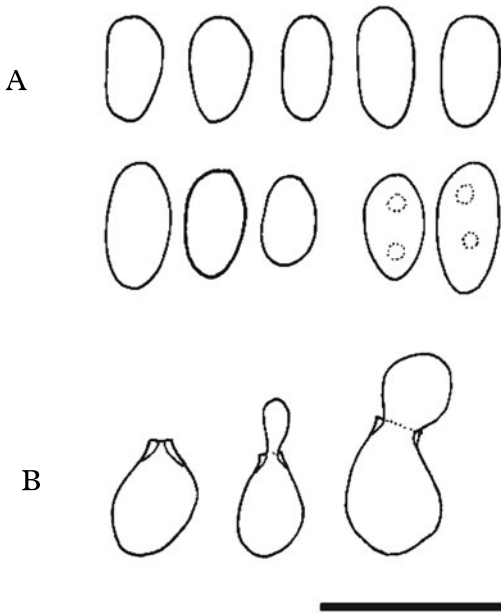


FIG. 2. *Acaroconium punctiforme* (holotype). A, conidia; B, conidiogenous cells. Scale = 10  $\mu$ m.

50–100  $\mu$ m diam. in surface view; ostiolate, with a distinctly thickened ostiolar collar, the ostiolar opening appearing as a white dot 9.5–20  $\mu$ m diam.; superficial mycelium absent. *Pycnidial wall* mainly 6–9  $\mu$ m thick, but around the ostiole up to 25  $\mu$ m thick, mainly composed of 1(–2) layers of polyhedral angular pseudoparenchymatous cells, but with 3(–4) layers around the ostiole, individual cells reddish brown to brown, 5–7  $\mu$ m diam. in surface view and somewhat radially compressed and 5–8  $\times$  5–6  $\mu$ m in vertical section, cells in the area around the ostiole more rounded but similar in size and darker brown to black with the walls more strongly pigmented. *Conidiophores* absent. *Conidiogenous cells* lining the inside of the pycnidial cavity, hyaline, broadly short-ampulliform, apex with a pericollum thickened collar, not proliferating and lacking annellations, 6–7  $\times$  4.5–6.5  $\mu$ m. *Conidia* filling the pycnidial cavity and evident through the ostiole through which they ooze out and can form short threads, enteroblastic, arising singly, not forming chains, broadly ellipsoid to somewhat irregular, not cylindrical, non-

septate, colourless at first but becoming very pale brown inside the pycnidial cavity, smooth-walled, rounded at both ends and lacking any basal scar or frill, often with 1–2 distinct rounded guttules, (4.5–) 5.5–6.8–7.5(–8.5)  $\times$  (3–) 3.5–4.2–5(–6)  $\mu$ m, length/breadth ratio 1.3–1.6–1.9(–2.1) ( $n=20$ ).

*Etymology.* The species epithet recalls the black-spotted appearance of the infected areoles and apothecia.

*Ecology.* On the areoles and apothecia of *Acarospora glaucocarpa*, *A. macrospora*, and *A. robiniae*, and directly on the thallus of *Sarcogyne regularis*. The conidiomata are not generally associated with any discoloration or necrosis, but in some cases they occur on decolorized or more brownish areoles or apothecial discs in the *Acarospora* species. As the fungus is evidently commensalistic in many cases, we are unclear whether it can become pathogenic or can just also grow on already deteriorated areoles and apothecial discs.

*Distribution.* Central Europe (Czech Republic, Germany, and Slovakia) and North America (USA, California).

*Additional specimens examined.* **Czech Republic:** northern Bohemia, Distr. Jablonec n. Nisou, Jizerské hory Protected Landscape Area, 3 km north north-east of Bedřichov, Blatná pond near Nová louka Nature Reserve, on dyke of brook flowing to Bedřichov water dam, MTB 5156, alt. 760 m, on *Acarospora macrospora* on concrete, 2005, *ř. Kocourková* 5867 (PRM 909033). —**Germany:** Hessen, Odenwald, TK 6320–1, 250 m, auf dem Lager von *Sarcogyne regularis*, ehemalige Kalkgrube südlich vom Friedhof Michelstadt, 10 iv 1988, *R. Cezanne & M. Eichler* (herb. Cezanne–Eichler 2872). —**Slovakia:** Slovakia septentrionalis, Montes Belianske Tatry, in valle Suchá dolina, in lapidis calcareis, matrix: *A. glaucocarpa*, alt. 915 m, 24 ix 1993, *ř. Horáková* (PRM 758315). —**USA:** California: Riverside Co., Peninsular Range, Santa Ana Mountains, Santa Rosa Plateau, wildlife corridor north-east of Tenja Road, on *A. robiniae* on granitic rocks in old pasture, 33° 30' 15" N 117° 21' 36" W, 606 m, 2006, *K. Knudsen* 7973 (PRM 857257, UCR).

## Discussion

This new genus recalls *Phoma* in producing conidiomata with a deeply pigmented region



around the well-defined ostiole. On the other hand it differs from all the lichenicolous species of this genus (Hawksworth & Cole 2004) in having conidia which become brown and which are more than 4 µm wide. Species of the plant-infecting *Phoma* sect. *Macrospora* have conidia which can be as broad or even broader, but they are much longer and in the range (7–)8–19(–25) × (2.5–)3–7(–9) µm, always colourless, and sometimes 1-septate (Boerema *et al.* 2004). The genus differs from *Lichenocodium* most importantly in that the conidia are produced enteroblastically and not holoblastically, in having conidiogenous cells that lack annellations, and further in the colourless to pale brown conidia which are not ornamented in any way, and do not show any basal truncation or frill; in addition it has a neat ostiole with darkly pigmented cells around it and not an irregular, little-differentiated and often gaping opening (Hawksworth 1977; Sutton 1980; Cole & Hawksworth 2004). In *Laeviomyces*, the conidiogenesis is also holoblastic and not enteroblastic, annellations are seen on the more elongated conidiogenous cells, which are also brownish, and further the conidiomata of that genus lack a differentiated ostiole (Hawksworth 1981).

Amongst pycnidial coelomycete genera with simple brown conidia occurring on hosts or substrata other than lichens, it differs from *Coniothyrium* in the enteroblastic conidiogenesis and the thin-walled conidia, and from *Microsphaeropsis* s. str. in the differentiated ostiolar collar, and the broadly ellipsoid to somewhat irregular conidia (Sutton 1980). *Microsphaeropsis* was treated in a broad sense by Sutton (1980) and is clearly artificial and heterogeneous as conceived by him. The type species of the genus, *M. olivacea*, is a widespread saprobe known from twigs and branches of various trees (Ellis & Ellis (1997) but has also been isolated from human skin; excellent drawings, photographs, and SEM micrographs are provided by de Hoog *et al.* (2000) who give the pycnidia as 200–240 × 160–200 µm and the conidia as ellipsoid to cylindrical and 5.5–6.5 × 3.2–3.4 µm. The fungus has also

been isolated from material of *Dirinaria applanata* from Thailand by Ek Sangvichien, and produces bioactive compounds including a new preussomerin isomer (Seephonkal *et al.* 2002, as “*Microsphaeropsis* sp.”; subcultures subsequently determined as *M. olivacea* by D.L.H.). *Acaroconium punctiforme* is not congeneric with *M. olivacea* because of the presence of the ostiolar collar as well as the large and differently shaped conidia. We considered describing the new fungus in *Microsphaeropsis*, but saw no value in further increasing the polyphyletic nature of that genus. Indeed, it would be misleading to imply by using that name that the new fungus was congeneric with *M. olivacea*.

We thank Marion Eichler and Rainer Cezanne (Darmstadt) for the loan of their specimen of the new species, to Ek Sangvichien (Bangkok) for making a subculture of the *Microsphaeropsis* isolated from *Dirinaria* available for study by D.L.H., and to Kerry Knudsen (Riverside, CA) for the donation of his specimen to PRM. Z. Pouzar (Praha) is thanked for reading through manuscript. Part of this study was supported financially by grants MK00002327201 from the Ministry of Culture of the Czech Republic to J.K.

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