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Octospora pulchrispora (*Pezizales*) – a new bryophilous species on *Cynodontium polycarpon*

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Octospora pulchrispora Sochorová et Eckstein is described as a new species based on finds from the Czech Republic. It features a remarkable ascospore ornamentation formed by low, branching, cyanophilous ridges. It parasitises the acrocarpous moss *Cynodontium polycarpon* (*Rhabdoweisiaceae*) and induces galls on the rhizoids. In the phylogenetic analysis based on the LSU, SSU and EF1α loci, *O. pulchrispora* formed a highly supported clade with *Octospora gyalectoides* agg., *O. leucoloma*, *O. gemmicola*, *O. axillaris*, *O. excipulata*, *O. bridei* and two undescribed *Octospora* species.

Key words: bryoparasitic *Pezizales*, bryophilous ascomycetes, *Rhabdoweisiaceae*, rhizoid galls, vital taxonomy.

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Sochorová Z., Eckstein J., Sochor M. (2024): *Octospora pulchrispora* (*Pezizales*) – nový bryofilní druh na *Cynodontium polycarpon*. – Czech Mycol. 76(1): 45–62.

Octospora pulchrispora Sochorová et Eckstein (zemnička krásnovýtrusá) je popsána jako nový druh pro vědu podle nálezů z České republiky. Vyznačuje se zajímavou ornamentikou výtrusů, která je tvořena nízkými, větvenými, cyanofilními hřebínky. Parazituje na akrokarpním mechu psízubci mnohoplodém – *Cynodontium polycarpon* (*Rhabdoweisiaceae*), na jehož rhizoidech indukuje tvorbu hálek. Ve fylogenetické analýze založené na lokusech LSU, SSU a EF1α tvořila *O. pulchrispora* silně podpořený klad s *Octospora gyalectoides* agg., *O. leucoloma*, *O. gemmicola*, *O. axillaris*, *O. excipulata*, *O. bridei* a dvěma nepoposanými druhy rodu *Octospora*.

INTRODUCTION

Octospora Hedw. (*Pezizales*, *Pyronemataceae*) is a species-rich and diverse genus of bryophilous ascomycetes, typified by *Octospora leucoloma* Hedw. Although *Octospora* was described over 200 years ago (Hedwig 1788), its diversity remains underexplored. Contemporary studies have revealed hyper-diversity in the group (Janošík et al. 2023), with new species found in different geographical regions, including Europe, which is relatively well studied (Döbbeler et Facher 2014, Egertová et al. 2018a, Vega et al. 2018, Sochorová et al. 2019, 2021, Döbbeler et al. 2021, Eckstein et al. 2021, Suárez et al. 2023).

While searching for ascomycetes in sandstone areas in North Bohemia, an undescribed species of *Octospora* with a remarkable ascospore ornamentation consisting of low, branching, cyanophilous ridges was discovered in the forest theatre at Sloup v Čechách (Česká Lípa District), a picturesque setting of sandstone rocks in a forest dominated by pine (Fig. 1). Later, it was also collected in the former sandstone quarry of Střelnice located not far from the forest theatre, and on rocks between these two localities. It infects the acrocarpous moss *Cynodontium polycarpon* (Hedw.) Schimp., which was not known as a host of bryophilous *Pezizales* before, and induces galls on its rhizoids. It is introduced in this contribution as *Octospora pulchrispora* sp. nov.

Fig. 1. Forest theatre at Sloup v Čechách, type locality of *Octospora pulchrispora*, in autumn (17 November 2023). Photo Z. Sochorová.

MATERIAL AND METHODS

Sample collection and observation. Apothecia were collected together with the host. The description of macroscopic characters is based on fresh apothecia, microscopic characters were observed on vital (indicated ^{v}) and additionally also on rehydrated (indicated ^{r}) material. Vital vs dead cells were differentiated following the methods described by Baral (1992). Microscopy was performed employing an Olympus CX21 microscope with magnifications of 40×, 100×, 400× and 1000×. Apothecial characters were observed in tap water (H_2O), 3% potassium hydroxide (KOH), Lugol's solution (IKI), Brilliant Cresyl Blue (CRB), and Lactic Acid Cotton Blue (LACB). Infection was studied on rehydrated material in tap water and LACB. Unless stated otherwise, the features were measured in tap water on photographs using the Piximètre 5.10 software (Henriot et Cheype 2020). Measurements of living, freshly ejected ascospores were made on fully mature, normally developed ascospores. The size of ascospores is given as (minimum measured value) 1st decile – arithmetic mean – 9th decile (maximum measured value) excluding ornamentation; Q = length/width ratio (n = sample size). Vouchers are deposited in the herbarium of the Mycological Department of the National Museum, Prague (PRM), Czech Republic. Nomenclature of bryophytes follows Hodgetts et al. (2020).

DNA extraction, PCR amplification and sequencing. DNA was extracted from dried apothecia using the CTAB method as outlined by Doyle et Doyle (1987). Apothecia were homogenised using a pestle, incubated in 300 µl of extraction buffer at 65 °C for one hour, and the extract was subsequently purified in a chloroform-isoamyl alcohol mixture, precipitated by isopropanol, and finally dissolved in water and incubated with RNAse for 30 min at 37 °C. DNA quality was checked on agarose gel. Molecular sequence data were generated for four loci: the internal transcribed spacers (ITS) of ribosomal DNA (ITS1-5.8S rDNA-ITS2 region) were amplified with primers ITS1F (Gardes et Bruns 1993) and ITS4 (White et al. 1990), the 28S subunit of ribosomal DNA (LSU) with primers LR0R and LR6 (Vilgalys et Hester 1990), the 18S subunit of rDNA (SSU) with primers NS1 and NS6 (White et al. 1990), and translation elongation factor-1alpha (EF1α) with primers EF1-983F and EF1-1567R (Rehner et Buckley 2005). PCR was performed with Kapa polymerase (Kapa Biosystems, Wilmington, USA) following a standard protocol with 37 cycles and an annealing temperature of 54 °C. The PCR products were purified by precipitation with polyethylene glycol (10% PEG 6000 and 1.25M NaCl in the precipitation mixture) and sequenced from both directions using the same primer pairs by the Sanger method at Macrogen Europe (Amsterdam, The Netherlands).

Phylogenetic analysis. Specimens used in the phylogenetic analysis are listed in Tab. 1. Newly generated sequences have been completed with sequences obtained in previous studies (Egertová et al. 2018a, 2018b, Sochorová et al. 2019, 2020, 2021, 2023, Vega et al. 2019, 2021, Eckstein et al. 2021, 2022, Janošík et al. 2022, 2023). Sequences were edited in the Geneious software (ver. 7.1.7, Biomatters, Auckland, New Zealand) and aligned using its MAFFT v7.017 plugin. Bayesian phylogeny inference (BI) was computed in MrBayes (ver. 3.2.4, Ronquist et al. 2012) using the GTR+I+G substitution model, as determined by AICc in PartitionFinder 2.1.1 (Lanfear et al. 2017). The analysis was run for 15 million generations in four independent runs, sampling every 1000th generation and excluding the first 50% of generations as burn-in. ITS sequences were not included in the analysis, but are presented for the purposes of barcoding.

Tab. 1. Specimens included in the phylogenetic analysis and their GenBank accession numbers. Newly generated sequences are given in bold.

Species	Herbarium code	Geographic origin, collector	Host	GenBank accession numbers		
				LSU	SSU	EF1α
Filicupula suboperculata	GG12	Great Britain, G. Greiff	*Frullania tamarisci*	OQ077718	OQ077717	
Lamprospora aneurae	B 70 0005997 (holotype)	Germany, D. Benkert	*Aneura pinguis*	MZ343191	MZ343180	MZ336038
Lamprospora dictydiola	PRM 945794	Czech Republic, Z. Egertová	*Tortula muralis*	MF754056	MK569365	MF754054
Lamprospora gibbosa	B 70 0100017 (holotype)	France, M. Vega	*Fissidens crassipes*	MT792691	MT792712	MT783997
Lamprospora hispanica	B 70 0100986	Spain, M. Vega	*Aloina ambigua*	MN394599	MW242827	MN366468
Lamprospora miniata	PRC 4122	Slovakia, L. Janošík	*Tortula protobryoides*	MH818444	ON087214	ON093901
Lamprospora sylvatica	PRM 946415 (holotype)	Ukraine, Z. Egertová & M. Sochor	*Dicranum montanum*	MG947604	MK569367	MK569290
Lamprospora verrucispora	HBG-1412 (holotype)	Germany, M. Vega	*Campylopus pyriformis*	MN994551	MN994527	MN990993
Neottiella albocincta	PRC 4935	Germany, M. Vega	*Atrichum undulatum*	ON087103	ON087181	ON093872
Neottiella vivida	PRM 945797	Czech Republic, Z. Egertová	*Polytrichum piliferum*	MF066068	MK569337	MF754051
Octospora affinis	PRM 945798	Czech Republic, A. Polhorský, L. Janošík & Z. Egertová	*Lewinskya affinis*	MF754075	MK569347	MF754045
Octospora americana	S F43718 (holotype)	USA, G. Thor	*Forsstroemia trichomitria*	MN967346	MN994516	MT078729
Octospora axillaris	PRM 954016	Czech Republic, Z. Egertová	*Tortula acaulon*	MW242829	MW242828	MW430761
Octospora bridei	PRM 935151	Czech Republic, Z. Egertová	*Ephemerum serratum*	MF754061	MT001890	
Octospora conidiophora	PRM 951743 (holotype)	South Africa, Z. Egertová & M. Sochor	*Trichosteleum perchlorosum*	MK569321	MK569351	MK569297
Octospora doebbeleri	PRM 954007 (holotype)	Czech Republic, Z. Egertová & M. Sochor	*Dicranoweisia cirrata*	MW152148	MW152156	MW159137
Octospora erzbergeri	PRM 945799	Czech Republic, Z. Egertová	*Pseudoleskeella nervosa*	MF754068	MK569340	MF754042
Octospora excipulata	PRM 945800	Czech Republic, Z. Egertová	*Funaria hygrometrica*	MF754062	MK569369	MF754047
Octospora fissidentis	PRM 945801	Czech Republic, Z. Egertová	*Fissidens bryoides*	MF754073	MK569341	MF754044
Octospora gemmicola	PRC 4945	Czech Republic, L. Janošík	*Bryum* cf. *radiculosum*	ON087113	ON087189	
Octospora gyalectoides agg.	B 70 0100075	Germany, J. Eckstein	*Tortula lindbergii*	MT001891	MT001889	MN990995
Octospora hetieri	B 70 0108147	Germany, J. Eckstein	*Funaria hygrometrica*	ON087091	ON087174	ON093867
Octospora humosa agg.	PRM 945802	Czech Republic, Z. Egertová	*Polytrichum piliferum*	MF754074	MK569343	MF754043
Octospora hygrohypnophila	PRM 953064	France, M. Vega	*Hygrohypnum luridum*	MN994543	MN994520	MN990988

Species	Herbarium code	Geographic origin, collector	Host	GenBank accession numbers		
				LSU	SSU	EF1α
Octospora ithacaensis	PRM 945803	Czech Republic, Z. Egertová	*Marchantia polymorpha*	MF754071	MK569346	MF754053
Octospora kelabitiana	PRM 945781	Malaysia, Z. Egertová & M. Sochor	*Riccardia* sp.	MF754065	MK569372	MF754048
Octospora leucoloma	PRC 4952	Czech Republic, L. Janošík	*Bryum argenteum*	ON087120	ON087195	ON093885
Octospora lilacina	PRC 4954	Slovakia, L. Janošík	*Dicranella heteromalla*	ON087122	ON087197	ON093887
Octospora meslinii	PRM 954637	Hungary, C. Németh	*Grimmia pulvinata*	MW152147	MW152158	MW159139
Octospora neerlandica	PRC 4691	Germany, M. Vega & T. Richter	*Syntrichia ruralis* agg.	MZ343185	MZ343176	MZ336035
Octospora cf. *orthotrichi*	CNF 2/10561	Croatia, Z. Egertová & M. Sochor	*Orthotrichum diaphanum*	MK569314	MK569342	MK569311
Octospora oscarii	PRM 955619	Czech Republic, Z. Sochorová	*Pseudotaxiphyllum elegans*	MZ343189	MZ343179	MZ336037
Octospora pannosa	PRC 4687	Czech Republic, L. Janošík & K. Daňková	*Brachytheciastrum velutinum*	MZ343193	MZ343181	
Octospora phagospora	PRM 945805	Germany, M. Vega	*Pohlia lutescens*	MF754072	MK569344	MF754046
Octospora pseudoampezzana	PRM 935156	Czech Republic, Z. Egertová & M. Sochor	*Schistidium crassipilum*	MF754069	MK569339	MF754050
Octospora pulchrispora	PRM 956942 (holotype)	Czech Republic, Z. Sochorová	*Cynodontium polycarpon*	ON087097[#]	ON087176[#]	ON093869[#]
Octospora pulchrispora	PRM 960694	Czech Republic, Z. Sochorová	*Cynodontium polycarpon*	**OR878661**	**OR882845**	**OR886065**
Octospora rubens agg.	PRM 954641	Spain, M. Vega	*Ceratodon purpureus*	MW221931	MW206790	MW219144
Octospora similis agg.	PRC 4667	Slovakia, L. Janošík	*Ptychostomum* cf. *rubens*	MT766281	MT766280	MT759840
Octospora sp.	JE 66616	Germany, J. Eckstein	*Tortula lindbergii*	ON087083	ON087168	ON093864
Octospora sp.	PRC 4983	Austria, L. Janošík & M. Vega	*Bryoerythrophyllum ferruginascens*	ON087082		
Octospora svrcekii	PRM 951720	Croatia, Z. Egertová, N. Matočec & I. Kušan	*Cratoneuron filicinum*	MN967348	MN994518	MN974532
Octospora wrightii	PRM 945807	Czech Republic, Z. Egertová	*Amblystegium serpens*	MF754070	MK569345	MT078728
Octosporella australis	AD-C61399	Australia, L. Janošík	*Lethocolea pansa*	OM991664	OM991697	ON012511
Octosporella erythrostigma	PRC 4919	Austria, L. Janošík	*Frullania dilatata*	OM991674	OM991704	
Octosporella ornithocephala	PRC 4918	France, J.P. Priou	*Radula complanata*	OM991673	OM991703	ON012515
Octosporella perforata	PRM 945808	Czech Republic, Z. Egertová	*Porella platyphylla*	MF754060	MK569368	MF754052
Octosporopsis erinacea	PRM 945774 (isotype)	Malaysia, Z. Egertová & M. Sochor	*Dumortiera hirsuta*	MF754057	MK569338	MF754041
Octosporopsis nicolai	PRC 4962	Spain, M. Vega	*Lunularia cruciata*	ON087132	ON087206	ON093894
Otidea leporina	CNF 2/9962	Kyrgyzstan, Z. Egertová & M. Sochor		MK569335	MK569371	MK569312

[#] These sequences were already published by Janošík et al. (2023), assigned to *Octospora* sp.

RESULTS

PHYLOGENY

In the Bayesian analysis based on the LSU, SSU and EF1α sequences, *Octospora pulchrispora* formed a highly supported clade with *O. gyalectoides* agg., *O. leucoloma* (type species of the genus), *O. gemmicola* Benkert, *O. axillaris* (Nees) M.M. Moser, *O. excipulata* (Clem.) Benkert, *O. bridei* Caillet et Moyne, and two undescribed *Octospora* spp., one on *Tortula lindbergii* Kindb. ex Broth. and one on *Bryoerythrophyllum ferruginascens* (Stirt.) Giacom. (Fig. 2). Nevertheless, *O. pulchrispora* is genetically quite isolated from all other species of the aforementioned clade. Most of the related species possess smooth ascospores and only *O. bridei* has fusiform to lemon-shaped ascospores ornamented with isolated, pointed warts.

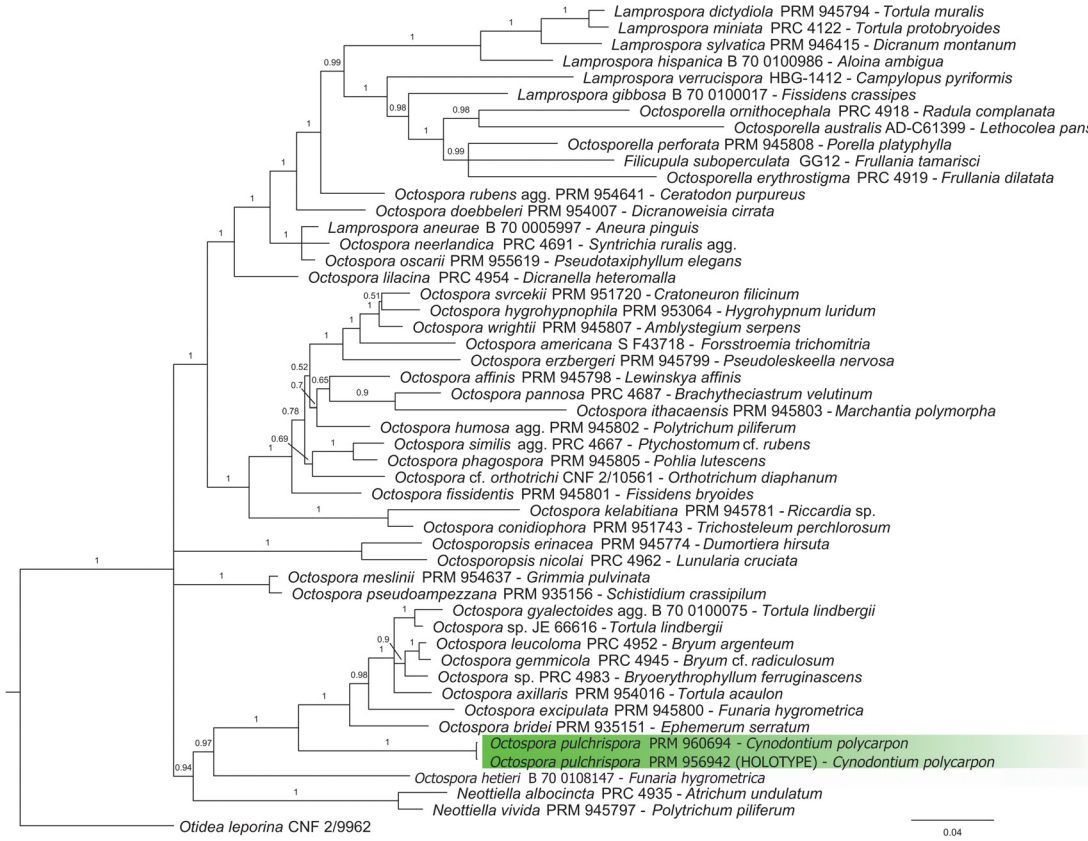

Fig. 2. Bayesian phylogeny inference, based on concatenated alignment of LSU, SSU, and EF1α sequences. Bayesian posterior probabilities are shown above the branches; *Otidea leporina* was used as an outgroup.

TAXONOMY

Octospora pulchrispora Sochorová et Eckstein, **sp. nov.**

MycoBank no: MB 852169

Holotype: Czech Republic, Sloup v Čechách (Česká Lípa District, Liberec Region), forest theatre, 50°43'57.4" N, 14°34'56.5" E, 325 m a.s.l., on *Cynodontium polycarpon* on a sandstone rock, 28 October 2020, leg. Z. Sochorová (ZS 99/2020, herb. PRM 956942; GenBank – ITS: PP479815, LSU: ON087097, SSU: ON087176, EF1α: ON093869).

Host: *Cynodontium polycarpon* (*Rhabdoweisiaceae*)

Etymology: *pulchrispora* – from pulcher (Lat.) = beautiful, spora (Gr.) = spore; relating to the ornamentation of the ascospores.

Description. Macroscopic characters (Figs 3–6). Apothecia initially globose or barrel-shaped, later turbinate to saucer-shaped, sessile, pinkish orange, 0.8–1.3 mm broad, up to 0.7 mm high, hymenium plane, roughened by protruding asci, margin thin, irregular, paler than the disc, often uplifted, hairless. Growing scattered between shoots of *Cynodontium polycarpon*.

Fig. 3. *Octospora pulchrispora* – apothecium in situ (holotype ZS 99/2020, herb. PRM 956942). Photo Z. Sochorová.

Fig. 4. *Octospora pulchrispora* – apothecium in situ (ZS 104/2020, herb. PRM 960688). Photo Z. Sochorová.

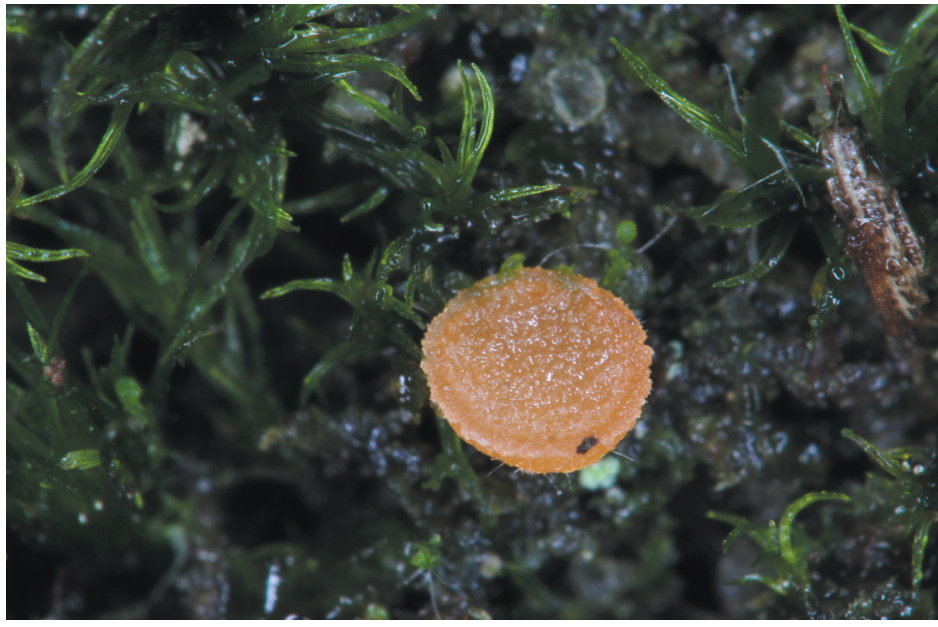

Fig. 5. *Octospora pulchrispora* – apothecium in situ (ZS 104/2020, herb. PRM 960688). Photo Z. Sochorová.

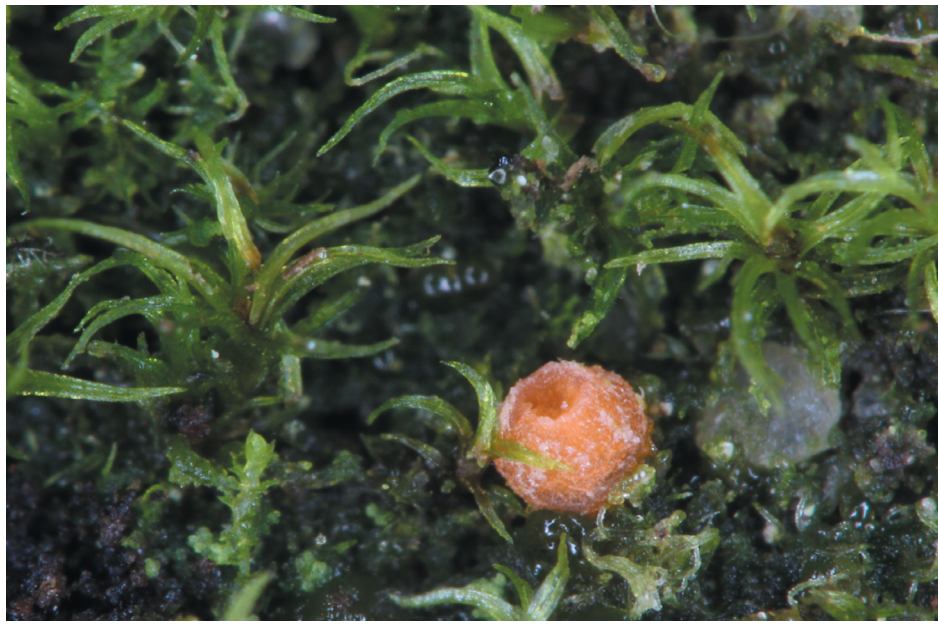

Fig. 6. *Octospora pulchrispora* – young apothecium among shoots of *Cynodontium polycarpon* (ZS 39/2021, herb. PRM 960690). Photo Z. Sochorová.

Microscopic characters (Figs 7–8). Asci unitunicate, cylindrical, *278–380 × 20–26 µm, operculate, inamyloid, containing 8 ascospores with uniseriate or less often sub-biseriate arrangement, pars sporifera *98–117 µm when all eight ascospores are fully developed, †100–121 µm; arising from croziers, rich in glycogen, especially in the basal part; apex *hemispherical to slightly truncate, †truncate, *exceeding paraphyses for up to 50 µm.

Ascospores ellipsoid, less often broadly ellipsoid or narrowly ellipsoid, thin-walled, hyaline, in H_2O *(16.2)17.2–18.4–19.7(20.8) × (10.8)11.4–12.4–13.6(14.9) µm, Q = (1.33)1.41–1.49–1.57(1.71) (n = 150), in heated LACB †(14.2)15–16.4–18.3(19.5) × (9.1)10.3–10.9–12(12.7) µm, Q = (1.3)1.39–1.5–1.62(1.84) (n = 115), containing a single large lipid body *8.8–10.3–12.1 µm in diam. Ornamentation consisting of branched, straight or curved ridges *0.2–0.7 µm wide, 0.2–0.8 µm high, cyanophilous, dissolving in 3% KOH.

Paraphyses filiform, septate, without vacuolar bodies, apical cells uninflated cylindrical to clavate, mostly bent, *30–100 × 5–10 µm, †29–64 × 2.8–7 µm, lower cells *3–3.7 µm wide, †2–3.6 µm wide, sometimes anastomosing or having short lateral projections, sometimes wavy in lower parts, only with a low content of carotenoid pigment mostly concentrated in the top of the apical cell and turning green in IKI. Cytoplasm cyanophilous, walls cyanophobic.

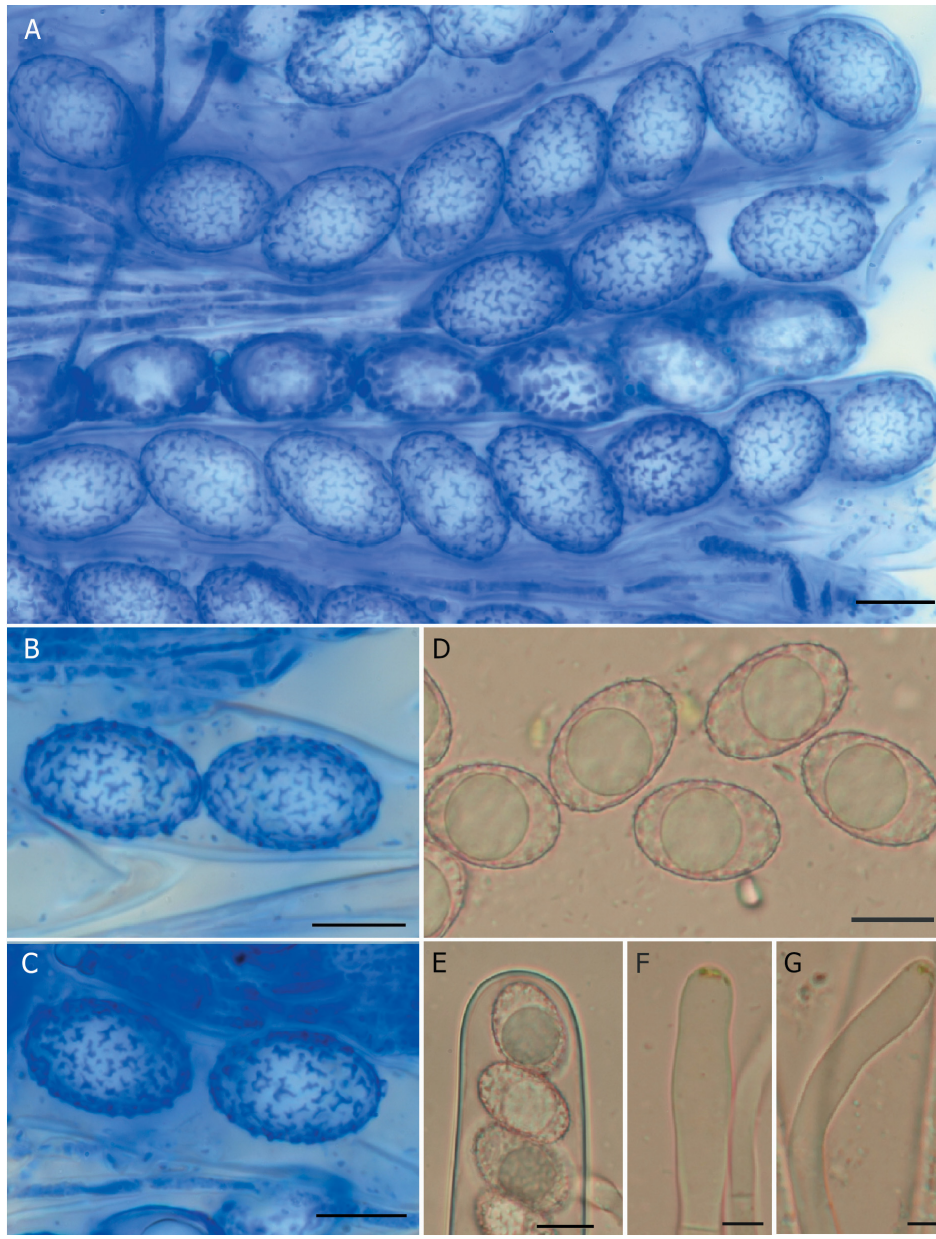

Fig. 7. *Octospora pulchrispora* – microscopic characters (holotype ZS 99/2020, herb. PRM 956942). **A–C** – ascospores stained in LACB; **D** – ascospores in tap water; **E** – apical part of ascus in tap water; **F, G** – paraphyses in tap water. Scale bars: A–E = 10 µm, F, G = 5 µm.
Photos J. Eckstein (A–C), Z. Sochorová (D–G).

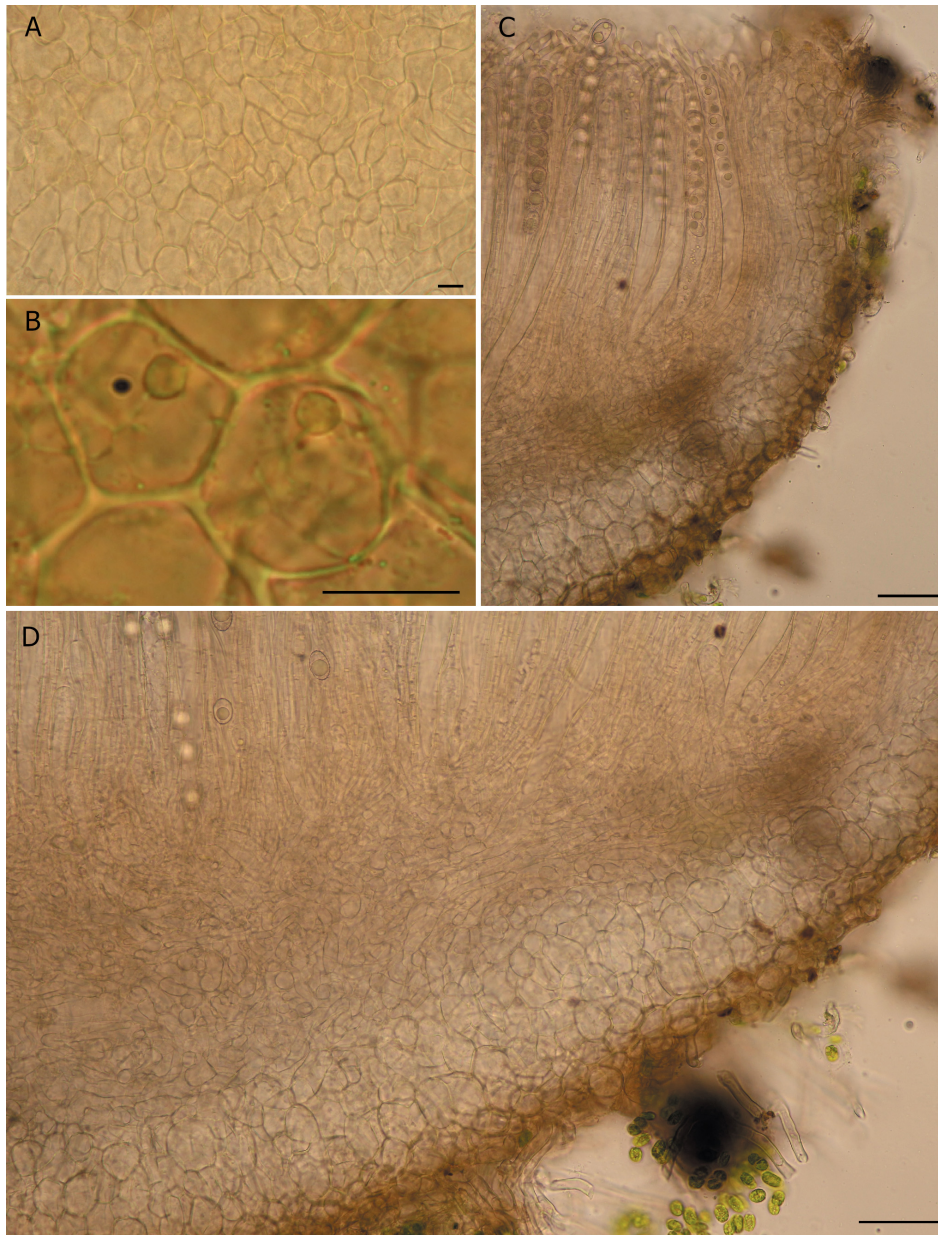

Fig. 8. *Octospora pulchrispora* **–** microscopic characters. **A** – ectal excipulum, view from outside, in tap water (ZS 1/2021, herb. PRM 960689); **B** – detail of ectal excipulum showing contrasting bodies inside cells, in IKI (ZS 43/2023, herb. PRM 960693); **C** – marginal part of apothecium in section, in tap water (holotype ZS 99/2020, herb. PRM 956942); **D** – section of apothecium showing lower part of hymenium, subhymenium, medullary and ectal excipulum, in tap water (holotype ZS 99/2020, herb. PRM 956942). Scale bars: A, B = 10 µm; C, D = 50 µm. Photos Z. Sochorová.

Subhymenium *12–20 µm thick, individual cells of variable shape, thin-walled, *6.5–12 × 4.5–8 µm.

Medullary excipulum composed of a textura intricata, in the thickest part up to *180 µm thick, at flanks *72–110 µm, individual cells cylindrical, *16–57.5 × 4–18 µm, containing globose bodies *2.3–4 µm in diameter, 0–3 per cell, more contrasting in IKI, pale greyish violet in CRB, disappearing after adding 3% KOH (Fig. 8B).

Ectal excipulum at base *90–180 µm thick, at flanks *35–90 µm, inner layer composed of a textura angularis-globosa, subhyaline, with cells thin-walled, *8–35 × 7–22 µm, outer layer a textura angularis-prismatica, pale orange, cells thick-walled, *(7)14–27(30) × (4)8–20 µm, †7–24 × 4–20 µm; both layers containing the same type of bodies as the medullary excipulum.

Margin formed by mostly cylindrical cells which are often branched or anastomosing, cells *19–70 × 6–10(20) µm, apical cells *(13)20–42(113) × 5.5–18 µm, †18–33(90) × 5–15 µm, clavate, pyriform or cylindrical.

Anchoring hyphae *3–8.5 µm wide, †3–7 µm, thick-walled (wall †0.4–1 µm thick), branching, septate, hyaline, abundant.

Anamorph not observed.

Infection (Fig. 9). *Octospora pulchrispora* infects rhizoids of the acrocarpous moss *Cynodontium polycarpon*, most often the initial cell of side branches or the terminal cell of short side branches of the main rhizoids. The infection causes the rhizoid cell to swell and to form a one-celled, spherical to pyriform gall. The linear growth of the infected cell is stopped, resulting in a terminal position of the gall. The galls measure †30–65(80) µm in diameter and have hyaline walls contrasting in colour with the brown unaffected rhizoid parts. At first, the galls are only partly covered by hyphae †4–7 µm wide, which are later glued together forming a complete coat around the gall. One of the attached hyphal cells surrounding the gall is the appressorium, which is †12–15 µm wide. From the appressorium, a haustorium grows into the gall. The haustorium is thin-walled, contorted, and strongly ramified and fills the gall up to half of its volume. Some weak septa were seen within the haustorium. Some green content was observed inside the gall. The infection does not weaken the host discernably.

Drought tolerance: Over 90% of ascospores vital after 11 months, other structures dead.

Phenology: X–II(V)

Geology: quartz sandstone of the Březno formation (Cretaceous; Česká geologická služba on-line).

Other specimens examined

Type locality: 25 December 2020, leg. Z. Sochorová (ZS 104/2020, herb. PRM 960688); ibid., 1 January 2021 (ZS 1/2021, herb. PRM 960689); ibid., 8 May 2021 (ZS 39/2021, herb. PRM 960690); ibid.,

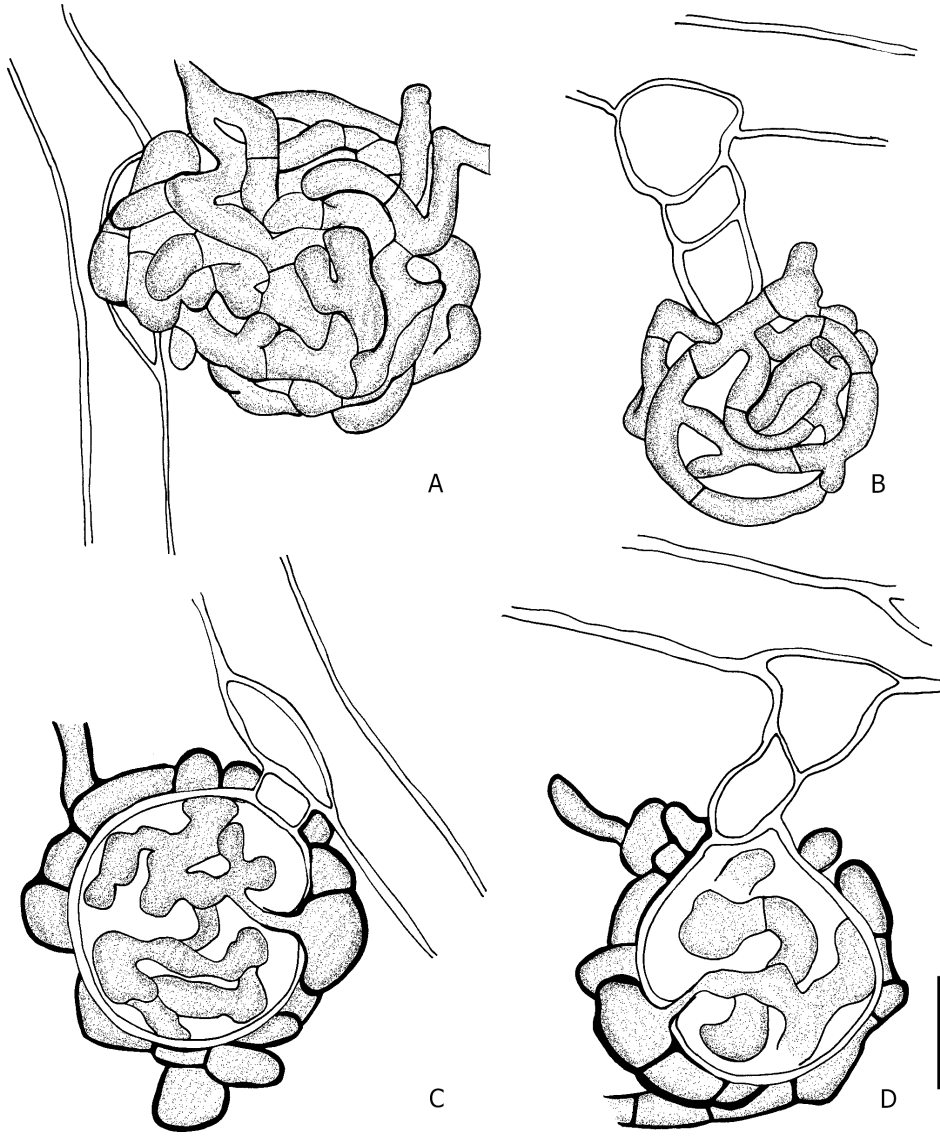

Fig. 9. *Octospora pulchrispora* – infection structure, fungal cells dotted (holotype ZS 99/2020, herb. PRM 956942). **A, B** – young rhizoid galls completely (A) or partly (B) coated by hyphae, surface view; **C, D** – young rhizoid galls in optical section, showing appressorium and haustorium. Scale bar = 20 µm. Illustration J. Eckstein.

29 December 2021 (ZS 161/2021, herb. PRM 960691); ibid., 19 November 2022 (ZS 140/2022, herb. PRM 960692); ibid., 17 November 2023 (ZS 43/2023, herb. PRM 960693)

Other localities: Sloup v Čechách, Střelnice quarry, 50°43'48.5" N, 14°35'10.3" E, 340 m a.s.l., on *Cynodontium polycarpon*, 1 January 2021, leg. Z. Sochorová (ZS 3/2021, herb. PRM 960694; GenBank – ITS: PP479816, LSU: OR878661, SSU: OR882845, EF1α: OR886065); ibid., 28 February 2021 (ZS 12/2021, herb. PRM 960695). – Sloup v Čechách, between the forest theatre and the Střelnice quarry, 50°43'56" N, 14°35'00.5" E, 340 m a.s.l., on *Cynodontium polycarpon*, 28 February 2021, leg. Z. Sochorová (ZS 13/2021, herb. PRM 960696).

DISCUSSION

Due to its rather unique ascospore ornamentation, *Octospora pulchrispora* is an easily identifiable species. The most similar ornamentation among bryophilous *Pezizales* can be found in *Octospora pannosa* T. Richter, M. Vega et D. Savić, but this species differs distinctly in having broadly ellipsoid ascospores sized 13.5–14.5 × 12.5–13.5 µm (without ornamentation) with a Q-value range of (1.03)1.06–1.14, ornamented mainly by ridges of variable height and breadth, forming a ragged reticulum. *Octospora pannosa* is associated with the pleurocarpous moss *Brachytheciastrum velutinum* (Hedw.) Ignatov et Huttunen (Vega et al. 2018) and differs considerably from *O. pulchrispora* also in phylogenetic position (Fig. 2).

Octospora pulchrispora is the first species of bryophilous *Pezizales* known to infect *Cynodontium polycarpon*, an acrocarpous moss of the family *Rhabdoweisiaceae*. The host moss has a European boreal-montane distribution centered in Fennoscandia to Central Europe reaching northern Spain, Sardinia, central Italy, the Balkans, the Carpathians, and South Ural. It occurs furthermore in the Caucasus to Azerbaijan, Himalaya, Siberia and East Asia. Its distribution in North America is unknown because of confusion with *C. jenneri* (Schimp.) Stirt. (Blockeel et al. 2014). Therefore, other localities of the newly described species can be expected in some of these regions.

The induction of rhizoid galls has been observed in several other species of *Octospora* s.l., especially in the section *Wrightoideae* comprising the species *O. wrightii* (Berk. et M.A. Curtis) J. Moravec, *O. americana* Benkert, *O. erzbergeri* Benkert, *O. hygrohypnophila* Dissing et Sivertsen, *O. svrcekii* Benkert, *O. texensis* Benkert, and *O. tucumanensis* Catania et G.M. Suárez (Benkert 1998, Sochorová et al. 2020, Suárez et al. 2023). Additionally, gall formation occurs in *O. orthotrichi* (Cooke et Ellis) K.B. Khare et V.P. Tewari (Senn-Irlet 1988), *O. 'melina'* Velen. (Itzerott 1983a; the identity of this species is unclear at the moment), *O. meslinii* (Le Gal) Svrček et Kubička (Itzerott et Döbbeler 1982, Németh et al. 2022), *O. pseudoampezzana* (Svrček) Caillet et Moyne (Sochorová et al. 2020, Németh et al. 2022), *Lamprospora verrucispora* M. Vega, Eckstein et Van der Kolk (Vega et al. 2016), *L. esterlechnerae* Benkert ex F. Hampe et Kleine (L. Janošík pers. comm.), and *L.* aff. *tuberculata* (Egertová et al. 2015, L. Janošík pers. comm.). All the above-mentioned species induce spherical galls more or less

completely covered by hyphae and therefore similar to those in *O. pulchrispora*. A somewhat different form of gall formation with galls not covered by hyphae occurs in *O. rubens* (Boud.) M.M. Moser (Itzerott et Döbbeler 1982), *O. canariensis* Benkert (Benkert 1997), and *O. humosa* (Fr.) Dennis (Döbbeler et Itzerott 1981). Formation of galls which are sometimes covered by hyphae was reported in *O. rustica* (Velen.) J. Moravec (Itzerott 1983b). Galls partly covered by hyphae can be occasionally also observed in *O. phagospora* (Flageolet et Lorton) Dennis et Itzerott (Sochorová et al. 2020). Gall formation has probably evolved several times independently because the above-mentioned species of bryoparasitic *Pezizales* are scattered in the phylogenetic tree of this group.

Some more bryophilous ascomycetes can be found in the same habitat as *O. pulchrispora*, i.e. on sandstone rocks covered by bryophytes. One of them is *Octospora doebbeleri* Sochorová et Eckstein, a parasite of *Dicranoweisia cirrata* (Hedw.) Lindb. ex Milde, which was also described from North Bohemia (Sochorová et al. 2021). Furthermore, recent finds by the authors include *Lamprospora campylopodis* (unpublished record from Hruboskalsko Nature Reserve, PRM 960011), *Mniaecia jungermanniae* (Fr.) Boud. (Egertová et al. 2016), *Bryoscyphus turbinatus* (Fuckel) Spooner (unpublished record from Široký kámen Nature Reserve, PRM 960004), and *Bryorutstroemia fulva* (Boud.) Sochorová, Baral et Priou (Baral et al. 2023).

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