NEW SPECIES AND NEW COMBINATION
IN THE FUNGAL GENUS OCTOSPORA FROM ANTARCTICA

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ABSTRACT

A new species of cup fungus, \textit{Octospora arctowskii} Olech and Mleczo, from South Shetland Islands (Antarctica) is described in this paper. \textit{Octospora miniataopsis} (Spooner) Olech and Mleczo comb. nov. is reported for the first time from South Shetland Islands. Brief notes on their ecology and distribution are also provided.

KEY WORDS: Ascomycotina, taxonomy, distribution, \textit{Octospora arctowskii} sp. nov., \textit{Octospora miniataopsis} comb. nov., Antarctic, South Shetland Islands.

INTRODUCTION

Small fruit-bodies of cup fungi, growing on soil and tussocks of mosses, were found during recent studies on the colonization and succession on the contemporary moraines in Antarctica. The research was carried out during the XVI and XX Polish Antarctic Expeditions to the Henryk Arctowski station in 1991/93 and 1995/96 which were organized by the Polish Academy of Sciences. The examination of the collected material has revealed two species: a very rare taxon \textit{Octospora miniataopsis} comb. nov. (syn. \textit{Lamprospora miniataopsis}), and a new species of \textit{Octospora}, which is described in this paper.

The flora of the Antarctic macromycetes is rather poor (Singer 1967; Pegler et al. 1980; Horak 1982; Agerer 1984; Gumińska et al. 1994) and there are only scarce data on the diversity and distribution of Ascomycotina in this region (Pegler et al. 1980; Schumacher 1986; Gamundi and Spini 1988). The genus \textit{Octospora} has been intensively studied during the past few decades (Caillet and Moyné 1980; Caillet and Moyné 1987; Dennis and Itzerott 1973; Jakobson et al. 1998), however, most of the information obtained concerns the northern hemisphere. The species of the southern hemisphere are poorly known (e.g. Gamundi 1960; Rifai 1968; Pegler et al. 1980; Schumacher 1986).

MATERIAL AND METHODS

The material was collected in austral summer of 1992/93 and 1995/96 on the western shores of Admiralty Bay (King George Island). The study area is located within the Site of Special Scientific Interest (SSSI) No. 8, in the vicinity of the Henryk Arctowski station. A description of climatological conditions, soil and vegetation of the site is given in the papers by Rakusa-Suszczewski et al. (1993), Taur (1989) and Olech (1989, 1993).

Species determinations are based on dry material and on the observations of fresh specimens in situ. The sections of apothecia were mounted either in water or in glycerine and investigated under a light microscope using the Nomarski interference contrast (NIC). The air-dried asci and ascospores were also observed and photographed on Jeol JSM-35 and Philips LX 30 scanning electron microscopes.

Samples of moss rhizoids taken from beneath or from the immediate vicinity of \textit{Octospora} fruit-bodies were stained in lactophenol-cotton blue for the presence of intracellular and external hyphae.

RESULTS

\textit{Octospora arctowskii} Olech and Mleczo sp. nov. (Figs 1, 2a and 3)

\textbf{Apothecia} turbinata, late sessilia et semiimmersa, 1.0-1.5 mm diam., glabra marginata, integra, tota aurantia (in statu sicco pallide aurantia), cum thecio primum plano dein sat profunde concavo; \textit{excipulum medullosum} textura intricata compositum, hyphis cylindraceis, 2.1-8.7 (9.5) μm diam; \textit{exicipulum externum} textura globulosa, e cellulis subglobosis ad irregularibus compositum, 15.4-32.0 (46.3) μm diam., non-nunquam crassioribus tunicatis instructum; \textit{margo excipuli} e hyphis parallelis, cylindraceis, 3.8-5.1 (6.8) μm diam., apice clavato-incassatae usque ad 9.5 mm crassis, theca ad 2 mm lata. \textbf{Asci} cylindracei, 240.0-307.0 × (16.4) 17.1-20.9 (25.0) μm, octospori (sporis monostichis), infra in bases attenuatii;
Fig. 1. *Octospora arctowskii* – the structure of apothecium.

a. Schematic drawing of the fruit-body with references to the photos of apothecial structures.

b. The apices of asci and paraphyses.

c. The subhymenial region with basal parts of asci.

d. Medullar and ectal excipula in sections.

(all Figs. from the type collection, Sph. 552, in the herbarium of the Institute of Botany, Jagiellonian University – KRA).
Fig. 1. cont.
e. The margin of the apothecium (textura porrecta) in plan view.
f. The region beneath the margin (dense textura intricata).
g. The structure of ectal excipulum on the bottom side of the apothecium in plan view (textura globulosa).
h. Emanating hyphae growing out from ectal excipulum.
(all Figs. from the type collection, Sph. 552, in the herbarium of the Institute of Botany, Jagiellonian University - KRA).
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**Fig. 2.**

a. The spore of *Octospora arctowskii* (SEM, from type collection, Sph. 552, in the herbarium of the Institute of Botany, Jagiellonian University – KRA).

b. The spore of *Octospora miniatopsis* (SEM, from the type collection, Sph. 552, in the herbarium of the Institute of Botany, Jagiellonian University – KRA).

**paraphyses** filiformes, sepathae, apice rectae, clavato-incrasatae (usque ad 3.1 μm late), granulis aurantiacis impletae. **Sporae** 15.0-19.1 × 13.6-15.1 μm, late ellipsoideae, glabrae, guttula unica magna instructae. **Habitatio** ad terram humidem inter muscosam.

**Type:** Antarctica, South Shetland Islands, King George Island, Admiralty Bay region, forefield of Sphinx Glacier, on soil, 26 January 1996, leg. M. Olech, coll. design. Sph. 552 (KRA – holotypus).

**Apothecia** sessile and gregarious, discoid and flat, concave when dried, 1.1-1.5 mm in diameter, orange (paler when dry), deeply mounted in substratum. The external surface smooth or minutely downy, margin smooth and slightly raised above the hymenium. The basal part tomentose due to the hyphae anchoring the fruit-body in the substratum.

**Exciplulum in section distinctively two layered. Medullary exciplulum together with subhymenium composed of a textura intricata of densely interwoven, hyaline and thin-walled, sepathae hyphae, 2.1-8.7 (9.5) μm in diameter. The border between the meddulary and the exciplulum is not clear-cut.**

**Fig. 3.** Hymenial structures of *Octospora arctowskii* (a – asci, b – paraphyses, c – spores).

The hyphae become irregular in shape and their diameter increases gradually. **Ectal exciplulum** is a textura globulosa, however, the shape of hyphal cells may vary from oval to irregularly lobed or somewhat elongated. Hyphae range from 15.4 to 32.0 (46.3) μm long and 10.0-24.5 (37.6) μm in diameter, the walls up to 2.9 (3.5) μm thick. The hyphae in deeper layers of the ectal exciplulum thin-walled. The hyphal cells of the outermost layer of the exciplulum bare branched, septated hyphae at 4.2-5.6 (6.0) μm in diameter, with walls up to 1.6 (2.0) μm thick, which anchor the fruit-body into the substratum.

**The margin** of apothecium is formed by textura intricata composed of interwoven hyphae, 3.8-5.1 (6.8) μm in diameter, with walls up to 2.0 μm thick. The hyphae arranged parallelly towards the edge of the margin to form a textura porrecta, composed of clavate hyphae, up to 9.5 μm in diameter at their tips.

**The hymenium** 201-288(384) μm thick. The asci operculate, J', cylindrical and thin-walled, are up to (240) 307 μm long and (16.4) 17.1-20.9 μm in diameter at maturity. Opened asci wider, up to 25.2 μm. The basal part constricted and elongated, bent or curved. Asci normally 8-spored, however, aborted spores sometimes occur. **Paraphyses** filiform, clavate, straight, septated, usually without side branches, up to 278 μm long and 2.5-3.1 μm in diameter. The apices of paraphyses rounded, slightly swollen, up to 4.7 (6.2) μm wide.
Paraphyses and hyphae of the excipulum filled with pigmented (orange) droplets which dissolve quickly in lactic acid but remain preserved in glycerine. Spores uniseriate which are broadly oval, 15.0-19.1 μm long and 13.6-15.1 μm wide, smooth and hyaline, contain one large guttule.

Ecology: The fruit-bodies were growing on sandy-gravel soil on the flat ground of the glacier forefield, at a distance of approx. 20 m from the sea shore, and approx. 550 m from the glacier. The pH (H₂O) of the soil was 8.95. The area is periodically inundated by a small, temporary stream and sprayed by sea water, which creates special and very characteristic environmental conditions. The ground was 50% covered by mosses and the fungus was found among Hemmediella antarctica (Angrst.) Ochrya and Matteri and Bryum pseudoirrigatum (Hedw.) C.F. Gaertn., B. Mey and Schreb.

Note: The species is well characterised by smooth, broad ellipsoid spores possessing one large guttule. This is a structure of ectal exipulum which consists of inflated, globular to irregular in shape hyphal cells and margin of the apothecium made up of parallel hyphae with slightly thickened walls glued together. The species is also characterised by the unique habitat. The species belongs to the group of Octospora producing oval and smooth spores (together with O. leucoloma Hedw.: Gray, the type species, e.g. Caillet and Moxne 1987). O. rubens (Boud.) M. Moser and O. rustica (Velen.) J. Moravec seem to be related but they differ in the structure of excipulum (medullary excipulum - textura intricata with slightly swollen hyphal cells, ectal excipulum - textura intricata), the colour (red in O. rubens) and spore dimensions (O. rubens: 15-19 × 9-10 μm, O. rustica: 13-16 (18) × 9-11 μm). However, some discrepancies in descriptions of these species occur according to different authors (regarding the structure of excipulum layers; e.g. Itzerrott 1981; Caillet and Moxne 1987; Yao and Spooner 1996; Jakobson et al. 1998).

Gamundi (1960) found that a South American discomycete, Humaria argentina Speg., is an Octospora species. This seems to be the closest relative to the new species from Antarctica. However, the apothecia of O. argentina can reach 5 mm in diameter, and possess asci which are less than 180 mm long. Additionally, the spores of O. argentina are longer (reaching up to 24.7 μm) and its paraphyses are densely separated.

The species of Octospora are closely associated with mosses, their relationships ranging from neutral to parasitic (Benkert 1995). The hyphal structures formed by the fungi on rhizoids, cauloids and sometimes leaves of mosses have been studied by Dobbeler (1979, 1993), Dobbeler and Itzerrott (1981) and Itzerrott and Dobbeler (1982). They found that the structure of fungal appresoria, haustoria and hyphae growing inside plant cells may be used as an additional character in systematics of the genus. In the present study, however, no clear evidence was found for the parasitic relationship between O. arctowski and surrounding mosses.

Octospora miniatusis (Spoonr) Olech and Mleczko, comb. nov. (Figs 2b and 4)


The description of apothecial structure and species ecology can be found in the papers of Pegler et al. (1980) and Schumacher (1986).

Ecology: The specimens of Octospora miniatusis from King George Island were found on scree slopes, generally exposed to the south, at elevations of between 15 m and 90 m a.s.l., several hundred meters from the sea.

The fruit-bodies were growing on moss Syntrichia princeps (de Not.) Mitt. or soil among mosses in specific ecological conditions. They occurred in coves between or under stones. Such sheltered, protected habitats provide special microclimatic conditions. Octospora miniatusis was often associated with such lichen species as: Bacidia trachona (Ach.) Lettau; bryophytes: Bartramia patens Brid., Barbilophozia hatcheri (Evans.) Loeske, Cephalozia variaxa (Gott.) Steph.; and algae: Muriella terestris Boye-Pet. Pseudococcomyxa simplex (Mainx) Fott, Lobococcus irregularis (Boy-Pet.) Reig.

Notes: Octospora miniatusis is associated with mosses of the genus Syntrichia (Tortula) eg. S. saxicola (South Orkney Islands – Pegler et al. 1980), S. filaris (Bouvetoya – Schumacher 1986) and S. princeps (South Shetland Islands – Olech, Mleczko).

The genus Lamprospora De Not. has been treated for a long time as a separate taxon, closely related to Octospora, Inermisia, Leucoscypha and Neotiella (e.g. Dennis and Itzerrott 1973; Benkert 1976, 1987, 1990, 1995; Schumacher...
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1993). In recent taxonomic revisions of Caillet and Moyne (1980) and Wang and Kimbrough (1992) it has been transferred to Octospora, which was done earlier by Le Gal (1969) and suggested by Korf (1973). They pointed out that no differences could be found concerning excipulum structure in these two genera. The only difference is the shape and ornamentation of spores but even these features are highly variable. Additionally, Wang and Kimbrough (1992), after cladistic analysis, stated that Lamprospora forms a paraphyletic group if treated separately from Octospora. Therefore, in this work we suggest to transfer Lamprospora miniatopsis into genus Octospora.

Distribution: the species was known to date from two sites in Antarctica: South Orkney Islands (Pegler et al. 1980) and Bouvetoya (Schumacher 1986).

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LITERATURE CITED

NOWY Gatunek I NOWA KOMBINACJA
W OBREBIE RODZAJU OCTOSPORA Z ANTARKTYKI

STRESZCZENIE

Z terenu Wyspy Króla Jerzego (Szetlandy Południowe, Antarktyka) opisano nowy dla nauki gatunek workowca Octospora arctowskii. Owocniki występowały na przepołudniowym, w bliskim sąsiedztwie morza, na glebie wśród mechów Hennediella antarctica i Bryum pseudotrigueta. Charakterystyczne dla tego gatunku są gładkie, szerokoeliptyczne zarodniki z jedną dużą kroplą łuszczową.

Drugi z podanych gatunków, Octospora miniatopsis (syn. Lamprospora miniatopsis), dotychczas znany jedynie z Orkadow Południowych i Wyspy Bouveta, został znaleziony na Wyspie Króla Jerzego na kilku stanowiskach. Na badanym terenie występował na mchu Syntrichia princeps, w bardzo charakterystycznych mikrosiedliskach.

SŁOWA KLUCZOWE: Ascomycotina, taksonomia, rozmieszczenie, Octospora arctowskii sp. nov., Octospora miniatopsis comb. nov., Antarktyka, Szetlandy Południowe.