

## OCTOSPORA ERZBERGERI (PYRONEMATACEAE), A BRYOPHILOUS ASCOMYCETE IN HUNGARY

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**Abstract:** New occurrences, macroscopic and microscopic features, and ecological aspects of *Octospora erzbergeri*, an obligate bryophilous ascomycete, parasitising exclusively on the moss *Pseudoleskeella nervosa* are discussed. Furthermore, illustrations regarding circumstances of Hungarian occurrences, microscopic characters including spore ornamentation and infection structure as well as illustrations of the possibly co-occurring species are provided. Apart from the SEM pictures of spores, each photographic illustration of the species is published here for the first time.

**Key words:** bryophilous Pezizales, *Pseudoleskeella nervosa*, Pyronemataceae, rhizoid galls, taxonomy, Wrightoideae

### INTRODUCTION

Due to their diminutive, not rarely microscopic appearance, special ecology, and predominantly winter seasonality, bryophilous fungi are often overlooked and somewhat neglected by mycologists and they are mostly spotted and collected by bryologists. By means of special parasitising structures (appressoria and haustoria) they are intimately attached to various bryophyte taxa. Host specificity is generally high, especially within the bryophilous Pezizales, with many taxa restricted to one or very few closely related host species (DÖBBELER 1997).

Organic connection between fungi and bryophytes had been long presumed (KARSTEN 1887, HENNINGS 1904, KIRSCHSTEIN 1906), but details of this close parasitic relationship had not been revealed before the works of RACOVITZA and RACOVITZA (1945), RACOVITZA (1946, 1959), DÖBBELER (1978, 1979), which established the new interdisciplinary science of bryomycology.

Bryophilous cup fungi of the order Pezizales represent a special branch within the family Pyronemataceae. With *ca* 150 species (KIRK *et al.* 2008) they are classified to seven genera such as *Filicupula* Y. J. Yao et Spooner, *Lamprospora* De Not., *Moravecchia* Benkert, Caillet et Moyne, *Neottiella* (Cooke) Sacc., *Octospora* Hedw., *Octosporella* Döbbeler, and *Octosporopsis* U. Lindem. et M. Vega, of which genera *Octospora* and *Lamprospora* have the highest number of species and varie-

ties (WANG and KIMBROUGH 1992, SCHUMACHER 1993, ECKSTEIN 2016). They can be characterised by cup-like, sessile, less frequently sessile apothecia or perithecium-like apothecia 0.5–20 mm in diameter, mostly with inconspicuous to pronounced fimbriaceous, more rarely hairy or glabrous margin. The hymenium is characteristically orange to red. The 4–8 ascospores are uni- or biserially arranged in asci. Spores are globose to ellipsoid or fusiform with one to several oil droplets and a smooth or ornamented surface. They have a very specific infectious structure: from a one- to few-celled appressoria a haustorium grows into the host cell penetrating the host cell wall with an infection peg (DÖBBELER 1979, 2002). The infection affects mostly the rhizoids (e.g. BENKERT 2006, ECKSTEIN and ECKSTEIN 2009), rarely rhizoid tubers (BENKERT 1998), stems, and leaves (BENKERT and BROUWER 2004) as well as infrequently the protonema (ECKSTEIN and ECKSTEIN 2013, DÖBBELER and FACHER 2014, VEGA *et al.* 2015).

Because of their difficult perceptibility, most of bryophilous Pezizales are underrecorded worldwide and they have so far not been detected in many countries (ECKSTEIN 2016). However, there are 15 species of bryophilous Pezizales known from Hungary (BENKERT 2007, TÓTH 2003), mainly collected by P. Erzberger and identified by D. Benkert. During his numerous bryological field trips not just in Hungary, but also all over the Balkan Peninsula, Peter Erzberger collected tiny cup fungi growing on miscellaneous mosses as well and as usual, passed them to Dieter Benkert for further investigation. One of these collections made in Serbia proved to be new to science and was named after him as *Octospora erzbergeri* Benkert (BENKERT 2006). In the subsequent year, Peter Erzberger collected this fungus in Hungary on the Naszály Hill as well. This fungistic novelty was, however, published fairly marginally under the section *Pseudoleskeella nervosa* (Brid.) Nyholm in the bryological chapter of the natural history monograph of Mt Naszály (Erzberger in Szűcs 2010).

In the last years, plenty of new occurrences of bryophilous Pezizales were detected by the author in Hungary. Some of them are of special importance regarding their poorly known European and even global distribution, with only a few records worldwide. *Octospora erzbergeri* is one of these species, known from only two localities so far. Furthermore, with the exception of SEM pictures of spores each photographic illustration of the species is published here for the first time.

## MATERIAL AND METHODS

Geographic coordinates and altitudes were determined using Garmin eTrex Legend GPS. For the macroscopic photo documentations Canon D1000 camera with Canon EF-S 18–55 mm f/3.5–5.6 IS II and Canon EF 100 mm F/2.8 Macro USM objective as well as Olympus SZH10 stereo microscope with Zeiss AxioCam HRc digital camera were used. Microscopic photographs were taken with Zeiss

AxioCam HRc digital camera attached to Zeiss AXIO Imager A2 research microscope. Spore size and other microscopic quantitative characters were measured by means of AxioVision 4.8.2 microscope software. Scanning electron micrograph (SEM) was taken with a Zeiss EVO 40 SEM machine from air-dried sample.

Microscopic examinations were carried out on samples immersed in tap water. Staining with methylene blue was used to study spore ornamentation and infection structure.

Abbreviation 'FCsN' refers to the private fungarium of the author. The nomenclature of the fungi and bryophytes follow ECKSTEIN (2016) and HILL *et al.* (2006), respectively.

New Hungarian occurrences were displayed in a grid-cell map based on Central European Mapping Scheme ('KEF',  $5 \times 3 = 5.5 \times 6.5$  km) giving the cell numbers in square brackets in the enumeration section.

## RESULTS

### Macroscopic features

Apothecia up to 2 mm in diameter, discoid in shape at maturity (Figs 1*e–h*, 2*a–d*), bearing long, dense, up to 320  $\mu\text{m}$  long and 4–7  $\mu\text{m}$  wide, rigid hyaline marginal hairs (Fig. 3*c–e*), appearing almost closed when dry due to incurved margins (Fig. 2*e–f*). Hymenium yellowish to pale-orange.

### Microscopic features

Excipulum of *textura intricata* and margins of *textura porrecta* (Fig. 3*a–b*). Paraphyses septate, 4–7  $\mu\text{m}$  wide occasionally slightly widened up to 9  $\mu\text{m}$  at apical region (Fig. 3*f–h*). Asci cylindric, 160–180  $\times$  15–17  $\mu\text{m}$ , 8-spored, with spores arranged uniseriately (Fig. 3*g*). Ascospores broadly ellipsoid to subglobose, 13–15(–15.5)  $\times$  11–13(–14)  $\mu\text{m}$  ( $Q = 1.17$ ) with one oil droplet 8–9  $\mu\text{m}$  in diameter (Figs 3*g–h*, 4*c*). Spore ornamentation consists of isolated, rounded warts (Figs 3*g*, 3*i*, 4, 8).

### Infection structure

Infection structure consists of appressoria connected to spherical, unicellular galls induced in end-cells of rhizoids covered with interwoven hyphae (Fig. 5).

### Habitat, host, and ecology in Hungary

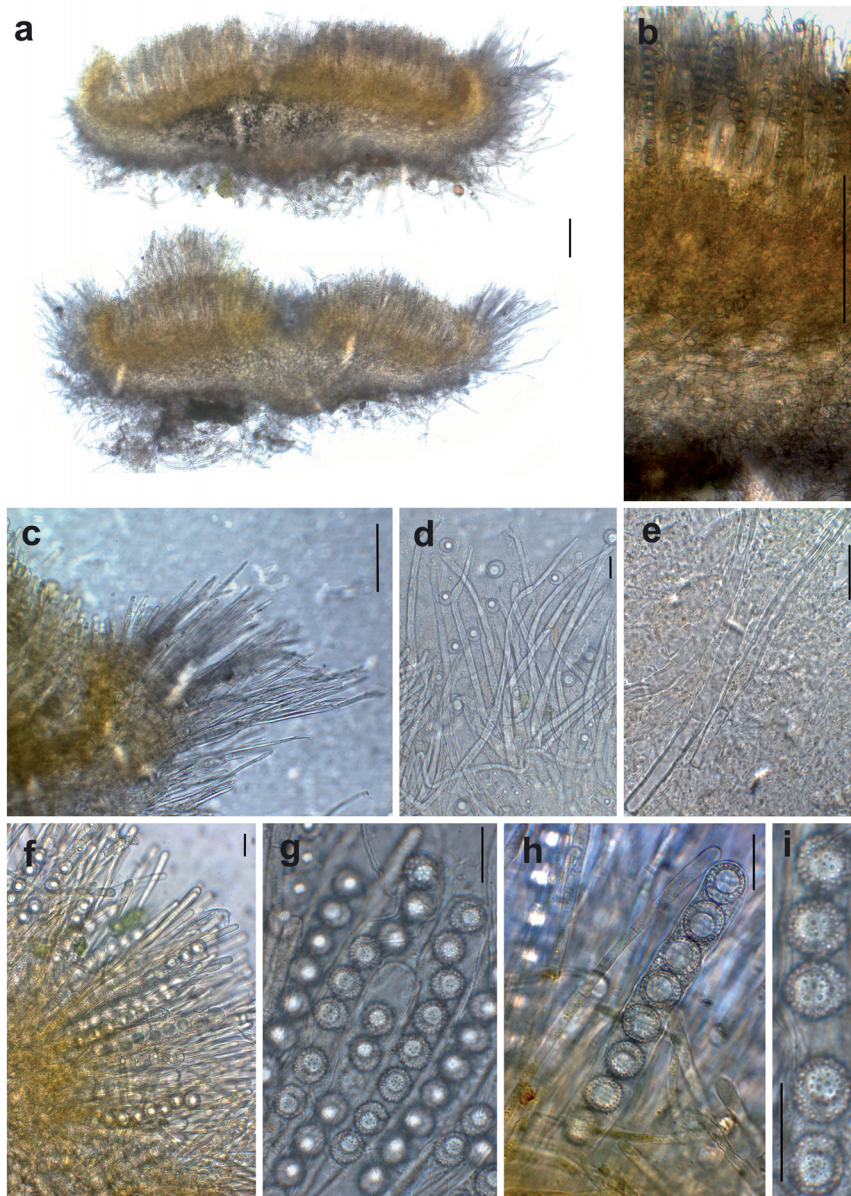
*Octospora erzbergeri* was observed fruiting on *Pseudoleskeella nervosa*, a moss species growing on bark of miscellaneous trees and shrubs such as *Acer campestre*,



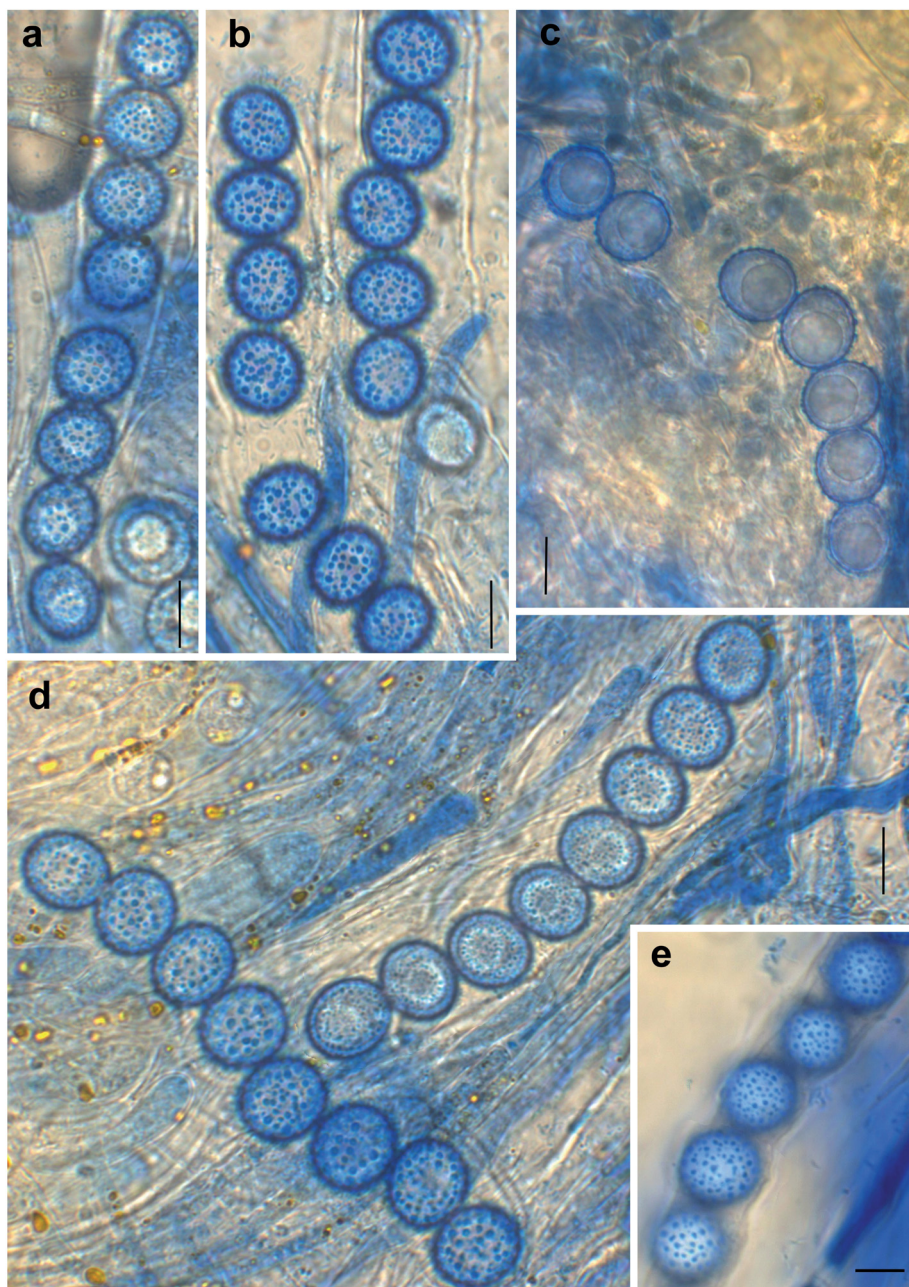
**Fig. 1.** Habitat of *Octospora erzbergeri*. – a, b: on bark of *Tilia platyphyllos* with *Pseudoleskeella nervosa*, Vértes Mts, Holdvilág Valley (FCsN 7972, FCsN 7973); c, d: on dolomite rock with *Pseudoleskeella nervosa* and *Schistidium crassipilum*, Vértes Mts, Holdvilág Valley (FCsN 7974); e, f: on bark of *Fraxinus excelsior* and *Cornus mas*, respectively, with *Pseudoleskeella nervosa*, Bakony Mts, Burok Valley (FCsN 7431, FCsN 7437); g: on bark of *Acer platanoides* with *Pseudoleskeella nervosa*, Vértes Mts, Kotló Hill (FCsN 7451); h: on bark of *Quercus pubescens* with *Pseudoleskeella nervosa* and *Frullania dilatata*, Vértes Mts, Csatorna Valley (FCsN 8483) (Photos by Cs. Németh).



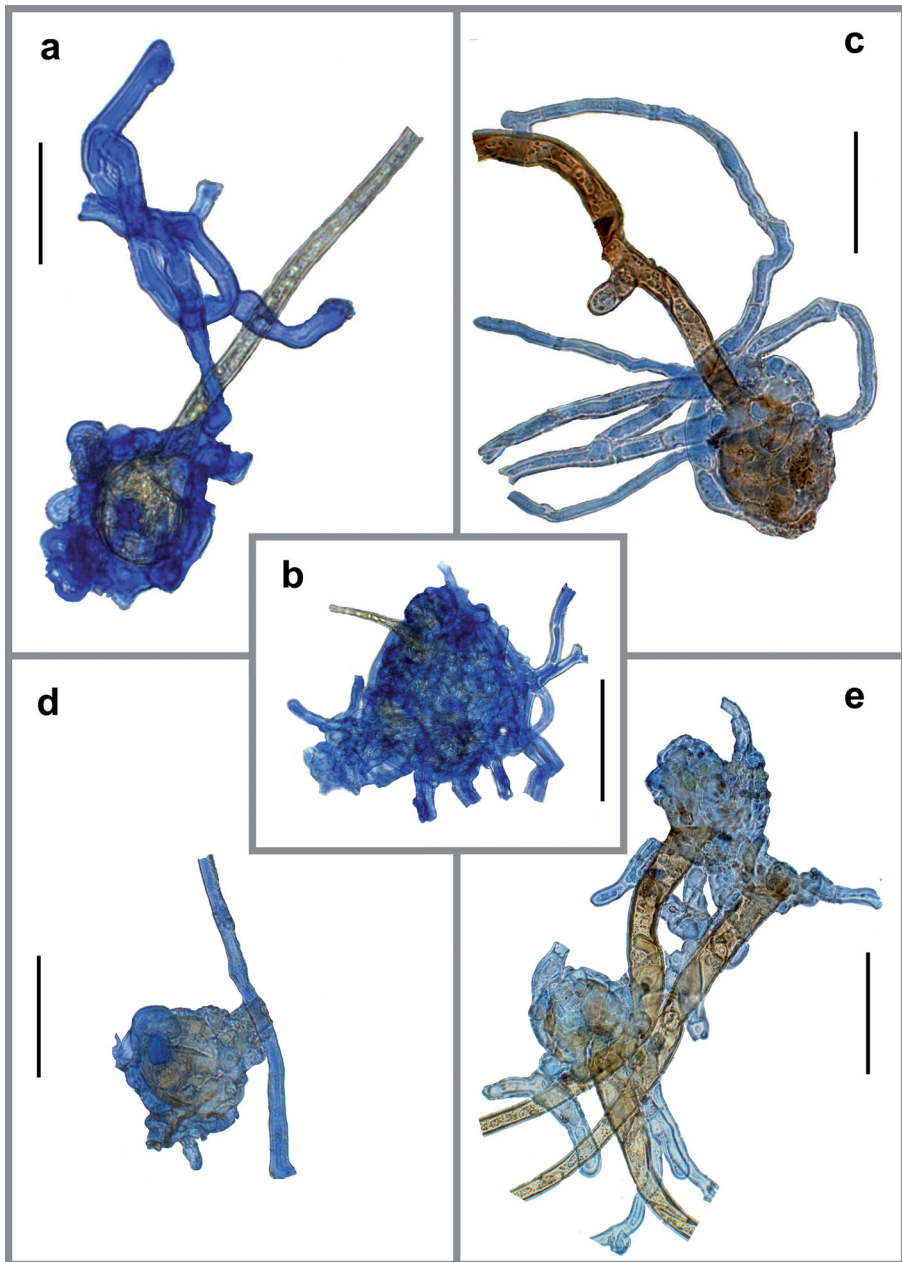
Fig. 2. Apothecia of *Octospora erzbergeri*. – a: Gerecse Mts, Öreg-kő (FCsN 7566); b: Vértes Mts, Kotló Hill (FCsN 7451); c, d: Bakony Mts, Burok Valley (FCsN 7431); e, f: Bakony Mts, Burok Valley (FCsN 7437); scale bars 0.5 mm (Photos by Cs. Németh).



**Fig. 3.** Microscopic features in tap water. – a, b: cross section of apothecium, Vértes Mts, Csatorna Valley (FCsN 8483); c, d, e: hyaline hairs on the margin of apothecium, Vértes Mts, Csatorna Valley (FCsN 8483); f: asci and paraphyses, Bakony Mts, Burok Valley (FCsN 7437); g: ascospores in asci Vértes Mts, Holdvilág Valley (FCsN 7973); h: paraphyses and spores with one large oil droplet, Bakony Mts, Burok Valley (FCsN 7437); i: spores ornamented with isolated warts, Vértes Mts, Holdvilág Valley (FCsN 7973); scale bars: a–c: 100  $\mu$ m, d–i: 20  $\mu$ m (Photos by Cs. Németh).

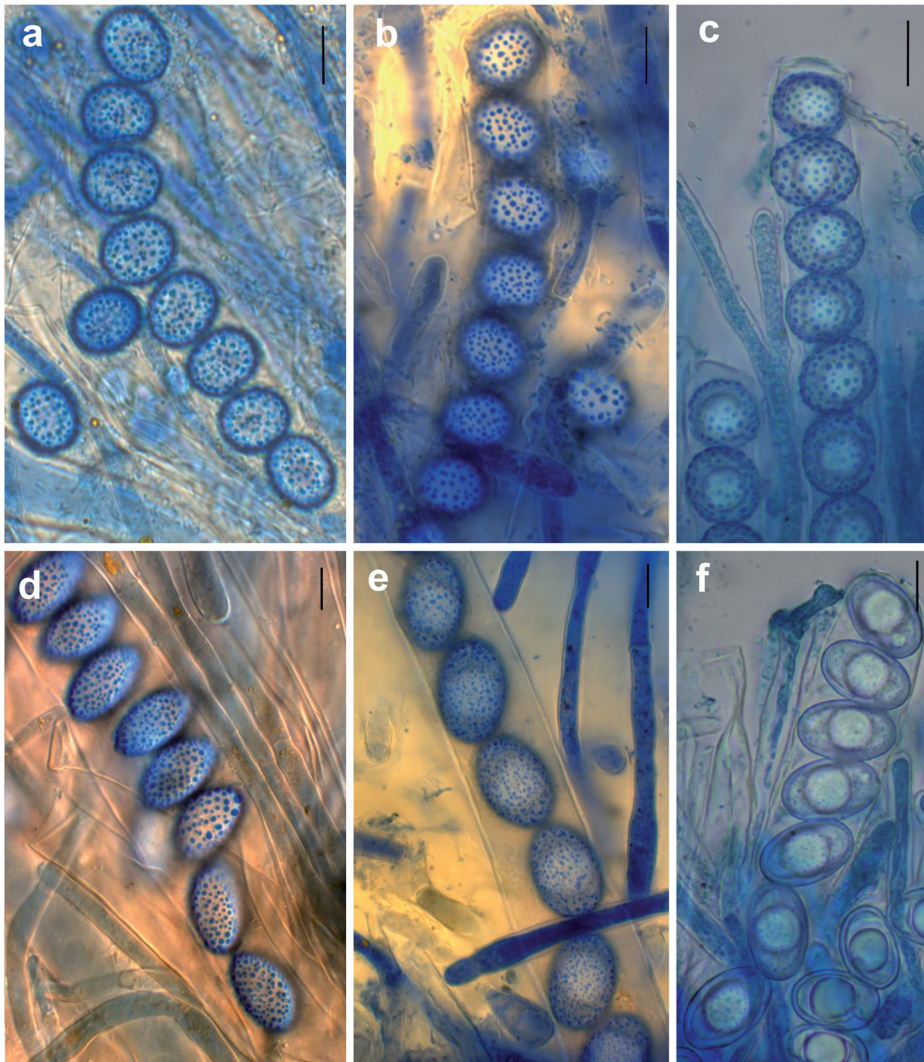


**Fig. 4.** Spores of *Octospora erzbergeri* stained with methylene blue. – a, b, d: Vértes Mts, Holdvilág Valley (FCsN 7973); c: Bakony Mts, Burok Valley (FCsN 7437); e: Gerecse Mts, Öreg-kő (FCsN 7548); scale bars 10  $\mu$ m (Photos by Cs. Németh).



**Fig. 5.** Infection structures of *Octospora erzbergeri*; induced spherical galls on rhizoid tips of *Pseudoskeella nervosa* covered with interwoven hyphae. – a, b: Gerecse Mts, Öreg-kő (FCsN 7566); c: Gerecse Mts, Öreg-kő (FCsN 7563); d, e: Vértes Mts, Csatorna Valley (FCsN 8483) (stained with methylene blue); scale bars 50  $\mu\text{m}$  (Photos by Cs. Németh).





**Fig. 6.** Spores of *Octospora erzbergeri* and possibly co-occurring congener species with ornamentation of isolated warts. a: *O. erzbergeri*, Hungary, Vértes Mts, Holdvilág Valley (FCsN 7973); b: *O. wrightii*, Hungary, Gerecse Mts, Pisznice (FCsN 7595); c: *O. affinis*, Germany, Niedersachsen, Stadtfriedhof Göttingen (Coll. J. Eckstein); d: *O. orthotrichi*, Hungary, Budapest, Óbuda (FCsN7669, Coll. J. Nagy); e: *O. pseudoampezzana*, Hungary, Gerecse Mts, Óreg-kő (FCsN 7567); f: *O. meslinii*, Germany, Rheinland-Pfalz, Naturpark Pfälzer Wald (Coll. H. Itzerott); scale bars 10  $\mu$ m; (Photos: a, b, d, e by Cs. Németh, c, f by Jan Eckstein).

*A. platanoides*, *Cornus mas*, *Fagus sylvatica*, *Fraxinus excelsior*, *F. ornus*, *Pyrus pyraister*, *Quercus* spp., *Tilia cordata*, *T. platyphyllos* in ecologically diverse plant communities (e.g. mixed forests of rocky slopes, in thermophilous oak woodlands, forests of ravines, submontane beech forests) (Fig. 1a-b, 1e-h) as well as on decaying fallen tree trunks. It was twice collected on dolomite rock outcrops in the Vértes Mts as well (Fig. 1c-d).

*Octospora erzbergeri* seems to be quite a specialist parasitising exclusively on *Pseudoleskeella nervosa*, a boreal-montane bryophyte element (DÜLL 1985) being widespread throughout the northern hemisphere (HODGETTS 2015, SPENCE 2014) therefore *O. erzbergeri* may be much more frequent than it appears to be on the basis of its known occurrences. *P. nervosa*, a pleurocarpous moss belongs to the family Leskeaceae. It tends to grow as olive-green to brownish patches on tree barks and calcareous rocks and often produces readily detachable flagelliform branchlets crowded amongst upper leaf axils as asexual reproduction structures.

In connection with the seasonality of producing fruit bodies by *O. erzbergeri* it is worth mentioning that Öreg-kő where the species was recorded in great abundance on tree barks on 12 January 2016 was revisited on 24 March 2016 when searching for the fungus only a few apothecia were observed. However, presumably due to the favourable weather conditions with prolonged rainfall period in the summer of 2016 the species was encountered abundantly at the beginning of June in the Vértes Mts as well and was also collected even in July of 2016 in the Bükk Mts. In any case it might be stated that the greatest chance to find apothecia of *O. erzbergeri* appears to be in the period from autumn to spring.

Distinguishing features and possibly co-occurring similar congeners in Hungary

The conspicuously long hairy margin of apothecia differentiates *O. erzbergeri* from other similar species, which have short cilia or fimbriate margin at the edge of their cups.

*Octospora erzbergeri* belongs to the section Wrightoideae including species parasitising on pleurocarpous mosses (BENKERT 1998). Spore features of other species from this section are very similar, namely ellipsoid to broadly ellipsoid shape and warted ornamentation. Q values, however, differ from that of *O. erzbergeri* and they are associated with different pleurocarpous mosses and most of them inhabit different habitats. All members of section Wrightoideae share the type of infection galls on the tips or intercalary parts of the rhizoids of the host moss that are densely covered with hyphae (DÖBBELER 1979, BENKERT 1998, 2006). Other gall inducing species of *Octospora* and *Lamprospora* differ even more in spore features and also have different hosts (DÖBBELER 1979, DÖBBELER and ITZEROTT 1981, ITZEROTT and DÖBBELER 1982, BENKERT 1998, ECKSTEIN and ECKSTEIN 2009, VEGA *et al.* 2016).

Table 1 summarises the characteristics of related species which can be confused with *O. erzbergeri* and potentially inhabit similar habitats, on the bark of trees and shrubs (owing to epiphytic occurrence of their host bryophytes) as well as on rock-inhabiting bryophytes. The spores of these species are illustrated in Figs 6–7. Interestingly, none of these species has so far been observed co-occurring with *O. erzbergeri* in Hungary, or at least not on the same tree or rock outcrop.

Distribution  
(Fig. 9)

Old occurrences

Serbia (BENKERT 2006), Hungary, Naszály Mt (ERZBERGER in SZŰCS 2010).

New occurrences (Hungary)

Bakony Mts: Fejér county, Isztimér, Burok Valley, FCsN 7431, 47.269083° N, 18.167056° E, ca 255 m, on bark of *Fraxinus excelsior* with *Pseudoleskeella nervosa*; FCsN 7436, 47.26975° N, 18.165333° E, ca 262 m, on bark of *Tilia* sp. with *Pseudoleskeella nervosa*; FCsN 7437, 47.269667° N, 18.164833° E, ca 279 m, on bark of *Cornus mas* with *Pseudoleskeella nervosa*; FCsN 7439, 47.270222° N, 18.16225° E, ca 315 m, on bark of *Quercus* sp. with *Pseudoleskeella nervosa*, 19.12.2015, leg. Cs. Németh and A. Kovács, det. Cs. Németh [8774.2, 8775.1]. – Fejér county, Bakonykúti, Baglyas Hill, FCsN 7615, 47.22775° N, 18.204028° E, ca 270 m, on tree bark with *Pseudoleskeella nervosa*, 06.02.2016, leg. Cs. Németh and A. Kovács, det. Cs. Németh [8775.3].

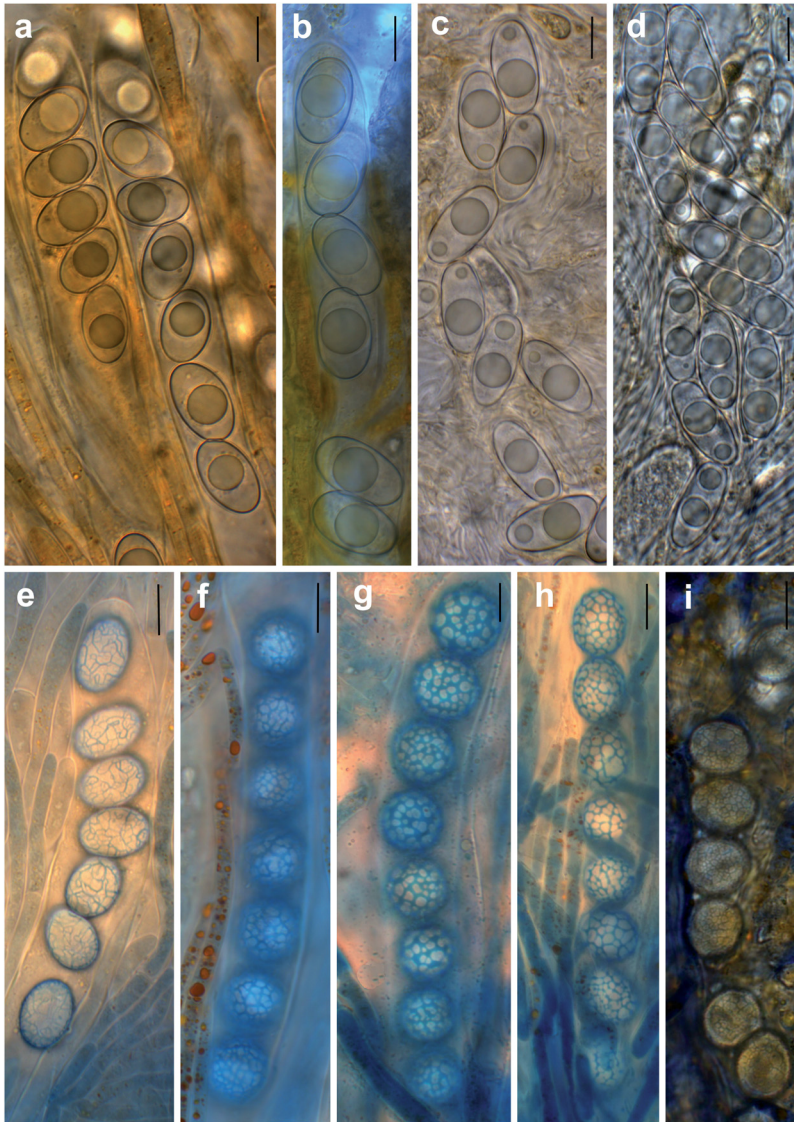
Vértés Mts: Fejér county, Csákvár, Kotló Hill, FCsN 4835, 47.421333° N, 18.44075° E, ca 326 m, 04.05.2013, on bark of *Acer platanoides* with *Pseudoleskeella nervosa*, leg. and det. Cs. Németh; FCsN 7444, 47.422306° N, 18.432639° E, ca 334 m, on bark of *Acer platanoides* with *Pseudoleskeella nervosa*; FCsN 7451, 47.421333° N, 18.44075° E, ca 326 m, on bark of *Acer platanoides* with *Pseudoleskeella nervosa*, 23.12.2015, leg. Cs. Németh, Z. Barina, A. Kovács and A. Rigó, det. Cs. Németh [8576.4]. – Fejér county, Mór, Csóka Hill, FCsN 7535, 47.37175° N, 18.246528° E, ca 309 m, on bark of *Fraxinus ornus* with *Pseudoleskeella nervosa*; FCsN 7536, 47.370444° N, 18.249722° E, ca 406 m, on bark of *Quercus pubescens* with *Pseudoleskeella nervosa*; FCsN 7537, 47.369917° N, 18.251861° E, ca 401 m, on bark of *Quercus pubescens* with *Pseudoleskeella nervosa*; FCsN 7538, 47.368806° N, 18.251639° E, ca 332 m, on bark of *Quercus pubescens* with *Pseudoleskeella nervosa*, 31.12.2015, leg. and det. Cs. Németh [8675.1, 8675.2]. – Fejér county, Szár, Holdvilág Valley, FCsN 7972, FCsN 7973, 47.474722° N, 18.456778° E, ca 346 m, on bark of *Tilia platyphyllos* with *Pseudoleskeella nervosa*; FCsN 7974,

Table 1. *O. erzbergerei* and possibly co-occurring *Octospora* and *Lamprospora* species on tree bark and rock in Europe.

| Fungus  | Host moss   | Spore features; shape/size/ornamentation/oil droplets (based mainly on ECKSTEIN 2016)  | Habitat potentially sharing with <i>O. erzbergerei</i> | Fig |
|---|---|--|--|-----|
| <i>O. erzbergerei</i> Benkert   | <i>Pseudoleskeella nervosa</i> (Brid.) Nyholm   | broadly ellipsoid to subglobose/13–15(–15.5) × 11–13(–14)/isolated, rounded warts/one oil droplet 8–9 μm in diameter         | tree bark or rock                                      | 6/a |
| <b>Species with spore ornamentation consisting of isolated warts</b>      |   |  |  |     |
| <i>O. wrightii</i> (Berk. et M. A. Curtis) J. Moravec                     | <i>Amblystegium serpens</i> (Hedw.) Schimp, <i>Amblystegium varium</i> (Hedw.) Lindb. | subglobose/(11–)12–14(–15) × (9–)11–12.5(–13.5)/rounded, isolated warts/one oil droplet                                      | tree bark or rock                                      | 6/b |
| <i>O. affinis</i> Benkert et L. G. Krieglst                               | <i>Orthotrichum affine</i> Schrad. ex Brid.   | broadly ellipsoid/(14–)14.5–16.5(–17) × (12–)12.5–13.5(–14.5)/rounded, isolated warts/one oil droplet of 9–11 μm in diameter | tree bark  | 6/c |
| <i>O. orthotrichi</i> (Cooke et Ellis) K. B. Khare et V. P. Tewari        | <i>Orthotrichum diaphanum</i> Schrad. ex Brid.  | ellipsoid to broadly ellipsoid/(15–)17–19(–20) × 10–12(–13)/isolated warts/one or two oil droplets                           | tree bark or rock                                      | 6/d |
| <i>O. pseudoampezzana</i> (Svrček) Caillet et Moyné                       | <i>Schistidium crassipilum</i> H. Blom  | ellipsoid/20–22 × 14.5–16/isolated warts/one large oil droplet   | rock   | 6/e |
| <i>O. meslinii</i> (Le Gal) Svrček et Kubička                             | <i>Grimmia pulvinata</i> (Hedw.) Sm.  | ellipsoid/(16–)18–21(–22) × 10–13(–14)/isolated warts/one large oil droplet  | rock   | 6/f |
| <b>Species with smooth spore surface or reticulate ornamentation</b>      |   |  |  |     |
| <i>O. gyalactoides</i> Svrček et Kubička                                  | <i>Tortula muralis</i> Hedw.  | ellipsoid to small ellipsoid often on one side or both fusiform/(15–)17–22(–23) × 9–13/smooth/one large oil droplet          | rock   | 7/a |
| <i>O. grimmiae</i> Dennis et Itzerott                                     | <i>Grimmia pulvinata</i> (Hedw.) Sm.  | ellipsoid/(18–)20–24(–25) × 12–14(–15)/smooth/one large oil two smaller droplets   | rock   | 7/b |
| <i>O. musci-muralis</i> var. <i>neglecta</i> (Dennis et Itzerott) Benkert | <i>Schistidium</i> spp.   | ellipsoid to subcylindrical with broadly rounded ends/19–25 × 9–11(–12)/smooth/one or two large oil droplets                 | rock   | 7/c |

Table 1. (continued).

| Fungus   | Host moss  | Spore features; shape/size/ornamentation/oil droplets (based mainly on ECKSTEIN 2016)  | Habitat potentially sharing with <i>O. erzbergeri</i> | Fig |
|--|--|--|---|-----|
| <i>O. musci-muralis</i> Graddon                        | <i>Grimmia pulvinata</i> (Hedw.) Sm.   | ellipsoid to subcylindrical with almost parallel sided walls in the middle and broadly rounded ends/ (20–)21–28(–30) × (9–)10–11(–12)/smooth/one or two large oil droplets                                       | rock  | 7/d |
| <i>O. neerlandica</i> Benkert et Brouwer               | <i>Syntrichia virescens</i> (De Not.) Ochyra, <i>Syntrichia ruralis</i> agg. | ellipsoid/(15–)16–19(–20) × (10–)11–12(–13)/irregular reticulum with curved meshes/one oil droplet often accompanied by several smaller ones   | tree bark or rock                                     | 7/e |
| <i>L. ditrichi</i> Benkert                             | <i>Ditrichum flexicaule</i> (Schwägr.) Hampe                                 | globose/16–17 µm in diameter/ridges about 0.5 µm wide, forming an areolate reticulum with 6–9 meshes/diameter. The ridges are often discontinuous and then forming an incomplete reticulum/one large oil droplet | rock  | 7/f |
| <i>L. tortulae-ruralis</i> Benkert                     | <i>Syntrichia ruralis</i> agg.   | globose/(15–)16–19(–21) µm in diameter/ridges 0.5–1(–1.5) µm broad, forming an alveolate reticulum with 8–12 meshes/diameter/one large oil droplet   | rock  | 7/g |
| <i>L. retispora</i> (Itzerott et Thate) T. Schumacher. | <i>Syntrichia ruralis</i> , <i>Syntrichia virescens</i>                      | subglobose to broadly ellipsoid/17–21 × 14–16(–17) µm/ridges about 0.5 µm wide, forming an ± regular, areolate reticulum with 8–12 meshes/diameter/one large oil droplet   | rock  | 7/h |
| <i>L. dictydola</i> Boud.                              | <i>Tortula muralis</i> Hedw.   | subglobose/14–16(–17) × 13–15(–16)/ridges ca. 0.3 µm wide, forming a fine-meshed reticulum with (9–)11–15(–20) meshes/diameter/one large oil droplet   | rock  | 7/i |



**Fig. 7.** Spores of congener taxa possibly co-occurring with *O. erzbergeri* having smooth spore surface or reticulate ornamentation. – a: *O. gyalectoides*, Hungary, Budapest, Botanic Garden of Loránd Eötvös University (FCsN 7644); b: *O. grimmiae*, Hungary, Vértes Mts, surrounding of Bucka Hill (FCsN 7468); c: *O. musci-muralis* var. *neglecta*, Hungary, Gerecse Mts, Pisznice (FCsN 7580); d: *O. musci-muralis*, Hungary, Buda Mts, Gellért Hill (FCsN 8493); e: *O. neerlandica*, Hungary, Gerecse Mts, Öreg-kő (FCsN 7565); f: *Lamprospora ditrichi*, Hungary, Bakony Mts, Gaja Gorge (FCsN 7413); g: *L. tortulae-ruralis*, Gerecse Mts, Öreg-kő (FCsN 7561); h: *L. retispora*, Hungary, Vértes Mts, Kotló Hill (FCsN 7450); i: *L. dictydiola*, Hungary, Gerecse Mts, Neszmély, Vár Hill (FCsN 7809); scale bar 10  $\mu\text{m}$ ; (Photos by Cs. Németh).

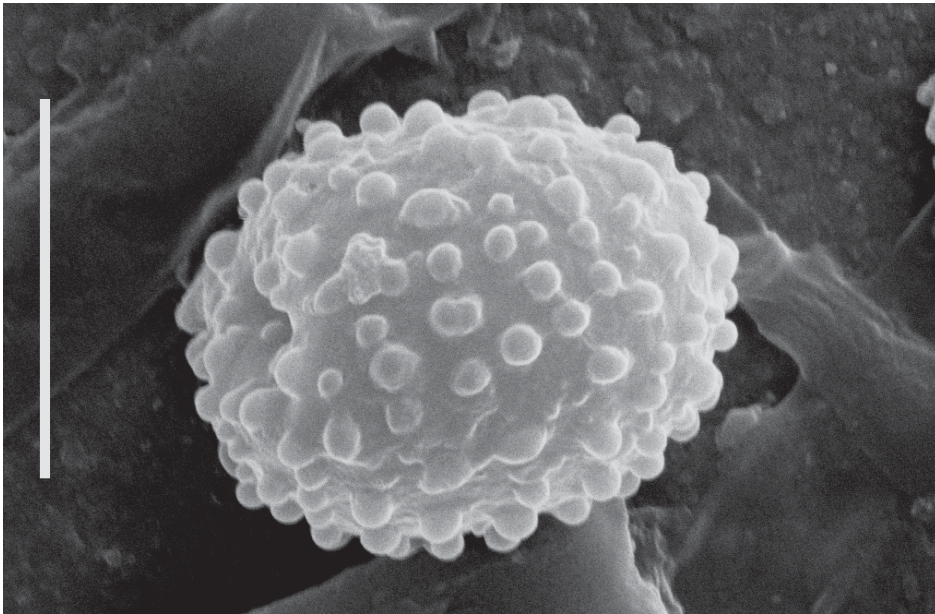


Fig. 8. SEM picture of an ascospore of *Octospora erzbergeri*; scale bar 10  $\mu\text{m}$  (Photo by L. Szabó).

47.474722° N, 18.456778° E, ca 346 m, on dolomite rock with *Pseudoleskeella nervosa*, 04.06.2016, leg. and det. Cs. Németh [8576.2]. – Fejér county, Szárliget, Vinya-bükk Valley, FCsN 7977, 47.489778° N, 18.47125° E, ca 376 m, on dolomite rock outcrop with *Pseudoleskeella nervosa*, 04.06.2016, leg. and det. Cs. Németh [8576.2]. – Fejér county, Csákberény, Csatorna Valley, FCsN 8483, 47.359694° N, 18.310167° E, ca 366 m, on bark of *Quercus pubescens* with *Pseudoleskeella nervosa*, 25.12.2016, leg. Cs. Németh and Á. Király, det. Cs. Németh [8675.2]. – Fejér county, Csákberény, Juhdöglő Valley, FCsN 8627, 47.37920° N, 18.32623° E, ca. 340 m a.s.l., on bark of *Fagus sylvatica* with *Pseudoleskeella nervosa*, 28.04.2017, leg. and det. Cs. Németh [8675.2]. – Fejér county, Mór, Harmatos Valley, FCsN 8640, 47.37903° N, 18.24225° E, ca. 320 m a.s.l., on bark of *Fraxinus ornus* with *Pseudoleskeella nervosa*; FCsN 8641, 47.37850° N, 18.24231° E, ca. 310 m a.s.l., on bark of *Pyrus pyraeaster* with *Pseudoleskeella nervosa*; FCsN 8642, 47.37856° N, 18.24356° E, ca. 315 m a.s.l., on bark of *Acer campestre* with *Pseudoleskeella nervosa*; FCsN 8643, 47.37833° N, 18.24369° E, ca. 300 m a.s.l., on bark of *Quercus cerris* with *Pseudoleskeella nervosa*; FCsN 8645, 47.37789° N, 18.24428° E, ca. 340 m a.s.l., on bark of *Acer platanoides* with *Pseudoleskeella nervosa*; FCsN 8648, 47.37789° N, 18.24428° E, ca. 340 m a.s.l., on decaying fallen tree with *Pseudoleskeella nervosa*; FCsN 8650, 47.37775° N, 18.24619° E, ca. 380 m a.s.l., on surface roots of *Fagus sylvatica* with *Pseudoleskeella nervosa*; FCsN 8651, 47.37775° N, 18.24619° E, ca.



Fig. 9. Occurrences of *Octospora erzbergeri* in Europe and Hungary – ● old record, ○ new record.

380 m a.s.l., on bark of *Tilia platyphyllos* with *Pseudoleskeella nervosa*; 13.05.2017, leg. and det. Cs. Németh [8675.1].

Gerecse Mts: Komárom-Esztergom county, Bajót, Öreg-kő, FCsN 7548, on tree bark with *Pseudoleskeella nervosa*, 28.12.2015, leg. Z. Barina and G. Somogyi, det. Cs. Németh; FCsN 7562, 47.725028° N, 18.568167° E, ca 286 m, on tree bark with *Pseudoleskeella nervosa*; FCsN 7563, 47.725500° N, 18.573583° E, ca 329 m, on tree bark with *Pseudoleskeella nervosa*; FCsN 7566, 47.724694° N, 18.574444° E, ca 352 m, on tree bark with *Pseudoleskeella nervosa*; 12.01.2016, leg. and det. Cs. Németh; FCsN 7907, 47.722694° N, 18.574806° E, ca 381 m, on tree bark with *Pseudoleskeella nervosa*, 24.03.2016, leg. Cs. Németh and A. Kovács, det. Cs. Németh [8277.3].

Börzsöny Mts: Pest county, Kemence, Esztergályos, FCsN 8356, 47.962167° N, 18.932194° E, ca 835 m, on bark of *Fagus sylvatica* with *Pseudoleskeella nervosa*, 24.09.2016, leg. J. Nagy, det. P. Erzberger [8079.2].



Bükk Mts: Borsod-Abaúj-Zemplén county, Cserépfalu, Hór Valley, FCsN 8430, 47.970056° N, 20.535306° E, ca 425 m, on bark of *Quercus pubescens* with *Pseudoleskeella nervosa*, 11.07.2016, leg. B. Papp and E. Szurdoki, det. Cs. Németh [8089.1].

## DISCUSSION

After the type collection made in 2004 in Serbia and a subsequent find in 2007 on the Hungarian Naszály Hill new occurrences published here represent the third worldwide observation of *O. erzbergeri*. Our experience allows us to conclude that *O. erzbergeri* can putatively be a frequent species and conscious examination of *Pseudoleskeella nervosa* patches on tree barks and rocks, particularly during thaw in winter period will probably reveal numerous additional new occurrences not just in Hungary but in other European countries as well.

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**Összefoglaló:** A mindössze egy évtizede Szerbiából leírt *Octospora erzbergeri* egy erősen specialista mohaparazita csészegomba faj, mely a kortikol-szaxikol karakterű *Pseudoleskeella nervosa* lombosmoha fajhoz, mint gazdához obligát módon kötődik. A gazda-parazita kapcsolat ún. appressóriumok segítségével a gomba által a moha rhizoidjainak terminális sejteiben indukált, hifával sűrűn beszótt, gömb alakú gubacsokon valósul meg.

A faj hosszú ideig a szerbiai típus lelőhelyén kívül csak a váci Naszály-hegyről volt ismert. Célzott terepi kutatások eredményeként, illetve korábban begyűjtött *P. nervosa* herbáriumi példányok mikroszkópos vizsgálatával az elmúlt években további 12 hazai előfordulását sikerült kimutatni a Bakony, a Vértes, a Gerecse, a Börzsöny és a Bükk területéről. Tekintve a gazda moha széles földrajzi elterjedését, az *O. erzbergeri* ismert hazai és európai előfordulásai a jövőben valószínűleg még tovább fognak gyarapodni.

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