

Coprophilous pyrenomycetes *s.l.* new to Italy after “Fungi Fimicoli Italici”

Bull. mycol. bot. Dauphiné-Savoie, 191, p. 71-96 (2008)

by **Francesco DOVERI**
Via Baciocchi, 9
I-57126 LIVORNO
f.doveri@sysnet.it

Résumé :

l'auteur, après avoir mentionné toutes les nouvelles espèces coprophiles trouvées en Italie après sa monographie, décrit et illustre huit Pyrénomycètes *s. l.* Il les compare également avec les espèces similaires, s'arrête sur leur distribution et les place dans des clés mises à jour.

Summary:

the author, after mentioning all new coprophilous species found in Italy after his monograph, describes and depicts eight Pyrenomycetes *s.l.* He also compares them with similar species, dwells upon their spread and inserts them in updated keys.

Keywords:

Pleosporales, Sordariales, Xylariales; new keys; recombinations.

Introduction

In our monograph on coprophilous fungi from Italy, *Fungi Fimicoli Italici* (DOVERI, 2004a), we described and discussed 90 basidiomycetes and 217 ascomycetes (90 discomycetes *s.l.*; 127 pyrenomycetes *s.l.*) facultatively or obligately living on faecal material. We have been since lucky enough to observe in the field or isolate from moist chamber cultures 5 additional taxa of basidiomycetes [**Coprinellus sassii* (M. Lange & A.H. Sm.) Redhead *et al.*; **Coprinosia luteocephala* (Watling) Redhead *et al.*; ***Coprinus doverii* L. Nagy; *Panaeolus alcis* M.M. Moser; *Psilocybe subcoprophila* (Britzelm.) Sacc.] and 31 taxa of ascomycetes. Some of the latter are discomycetes [****Ascobolus reticulatus* Brumm.; ****Coprotopus niveus* (Fuckel) Kimbr. *et al.*; *°Thecotheus formosanus* Y.-Z. Wang f. *collariatus* Doveri & Coué; *°T. neoapiculatus* Doveri & Coué; ****Thelebolus caninus* (Auersw.) Jeng & J.C. Krug; ****T. crustaceus* (Fuckel) Kimbr., in Kobayasi *et al.*], the others are plectomycetes or pyrenomycetes [*°°Aphanoascus fulvescens* (Cooke) Apinis; *°°°Chaetomium carinthiacum* Sörgel; *°°°C. gangligerum* L.M. Ames; *°°°C. homopilatum* Omvik; *°°°C. spinosum* Chivers; *°°°C. subaffine* Sergeeva; *°°°C. variostiolatum* A. Carter; *°°Gymnoascus devroeyi* (G.F. Orr) Arx; *°°G. reessii* Baran.; *■Podospora alexandri* Doveri; *■P. dasypogon* N. Lundq.; *■Schizothecium curvuloides* (Cain) L. Cai var. *megasporum* Doveri & Coué; *●Sporormiella gigantea* (E.C. Hansen) Doveri; *●●S. hololasia* Doveri; *°°Xanthothecium peruvianum* (Cain) Arx & Samson] already described by us, so they are not dealt with in this article. One new *Gymnoascus* sp. and one new hypocrealean genus will be published in a short time. The eight remaining pyrenomycetes are described and discussed here.

Materials and methods

We studied fresh material, either on samples in the field or in moist chamber cultures.

The non-sterilised moist chambers were prepared following the methods suggested by RICHARDSON & WATLING (1997) and RICHARDSON (2001), slightly modified by DOVERI (2004).

The cultured material was examined with a stereomicroscope (magnification $\times 7$ –45) and the microscopic study carried out with a binocular microscope, with 10 $\times$ eyepieces and 4 $\times$, 10 $\times$, 40 $\times$, 100 $\times$ (oil immersion) lenses, using water as mounting medium, Indian ink and methyl blue as stains.

Spore size was calculated by twenty measurements at least on free spores or rarely in asci with all the spores completing their maturity.

The symbols next to taxa mentioned in the introduction mean they were described in the following references: * = DOVERI *et al.* (2005); ** = NAGY (2006); *** = DOVERI (2008c); ° = DOVERI & COUÉ (2008b); °° = DOVERI (2006); °°° = DOVERI (2008a); ■ = DOVERI (2004b); ■■ = DOVERI (2008b); ■■■ = DOVERI & COUÉ (2008a); ● = DOVERI (2007b); ●● = DOVERI (2005).

The systematic position of each species, placed before its description in the chapter “Taxonomy”, follows LUMBSCH & HUHDORF (2007).

Taxonomy

Cercophora gossypina N. Lundq., *Symb. Bot. Upsal.*, 20 (1), p. 107 (1972). — **Fig. 1**

Original diagnosis

Perithecia subglobosa vel late ovoidea, 530–720 $\times$ 480–625 μ , *tomento albo vel dilute flavo-viridi ubique oblecta, collo conico parvo excepto*. *Peridium membranaceum, semipellucidum, ochraceum vel flavidum, tristratum, in collo brunneum subopacum, cellulis externis angulatis*, 8–18 μ *diam.* *Contentum perithecii dilute luteum. Paraphyses filiformi-ventricosae. Asci 8-spori*, 170–250 $\times$ 17–25 μ , *anguste clavati, annulo apicali incrassato, simplici*, 2–2.5 μ *diam. instructi; globulus subapicalis verruculosus*, 3.5–5 μ *diam.* *Sporae 2–3-seriatae, in statu hyalino unicellulares, cylindraceae, vermiformes, leves*, 41–50 $\times$ 3.5 μ , *guttis oleiferis plerumque magnis uniseriatis repletae, demum sursum tumescentes, transversaliter uniseptatae; cellula superior brunnea*, 13–17 $\times$ 6–9 μ , $\pm$ *equilateralis, $\pm$ ellipsoidea, basi truncato, apice conico vel umbonato, poro germinali subapicali instructa; pedicellus 24–29 $\times$ 3.5 μ , hyalinus, cylindraceus, deorsum geniculatus, collabens. Cauda gelatinosa attenuata, solida, in extremis sporae affixa*, 20–25 $\times$ 1.5 μ . *Fimicola.*

Systematic position: Sordariomycetes *s.* O.E. Erikss. & Winka 1997; Sordariomycetidae O.E. Erikss. & Winka; Sordariales Chad. ex D. Hawksw. & O.E. Erikss.; Lasiosphaeriaceae Nannf.; *Cercophora* Fuckel.

Description of the Italian collection

Perithecia 500–750 $\times$ 400–600 μ m, subglobose to subpyriform, non-stromatic, wholly whitish tomentose, except in the neck region, membranous, pale brown, semitransparent, with a papillate, coriaceous-carbonaceous, black neck. Perithecial contents yellow. **Peridium** three-layered, with a pseudoparenchymatous exostratum, of pale-brown, fairly thin-walled, polygonal cells, 9–18 $\times$ 9–12 μ m, not interspaced with carbonaceous deposits, dark brown and more elongated at the neck. Mesostratum of almost parallel, thin-walled, pale, elongated cylindrical cells. Endostratum of pale, thin-walled, polygonal cells, similar in size to exostratum. **Tomentum** of hyaline, thin-walled, interwoven hyphae, 1–1.5 μ m diam. **Paraphyses** numerous, exceeding the asci, cylindric-filiform, septate, somewhat constricted at septa, 3–5 μ m diam., tapering towards apex, containing



Fig. 1 – *Cercophora gossypina*

Photos – F. DOVERI

a: peritheciium in water; b-d: spores in different stages; e: asci; f-g: details of asci (in “f” a subapical globulus is observable).

Scale bars: a = 150 µm; b-d = 15 µm; e = 35 µm; f-g = 30 µm.

many hyaline vacuoles. **Asci** 160–180 × 13–20 µm, unitunicate, anamyloid, 8-spored, cylindric-claviform, slightly flattened at the apex, with a simple apical ring, a patent, verruculose, subapical globulus, 4–5 µm diam., and a long, lobate stalk. **Spores** bi- triseriate, hyaline at first, vermiform-sigmoid or cylindric-geniculate, (41–) 42–48 (–50) × 4–4.5 µm, one-celled, often septate, containing many large oil drops, finally two-celled. Upper cell 15–17 × 7–9 µm at maturity, ellipsoidal, often subumbonate, equilateral, dark brown, flattened at the base, thick-walled, with a slightly eccentric germ pore; lower cell (pedicel) 26–33 × 4–4.5 µm, hyaline, cylindric, often geniculate. A central, lash-shaped, gelatinous cauda is observable at each spore end from the early stages.

Examined material: Italy, L'Aquila, Magnola-Ovindoli, 1 400 m, about twenty gregarious, sometimes crowded, superficial specimens on cattle dung, *leg.* D. Garofoli, 10.6.2006, 368.1-Ovindoli, CLSM 003.06.

Observations

More than thirty *Cercophora* spp. are known to grow on dung, only six with the combination of 8-spored asci, a glabrous neck, and a tomentose peridium. Three of them, namely *C. aggregata* N. Lundq., *C. californica* (Plowr.) N. Lundq., *C. coprophila* (Fr. : Fr.) N. Lundq., have an opaque or subopaque peridium with scarce to abundant carbonaceous deposits (FRIES, 1823; LUNDQVIST, 1972), while *C. citrina* (Petch) N. Lundq., *C. gossypina*, and “*Bombardia*” (= *Cercophora mutabilis* Cailleux have a membranous, semitransparent peridium, lacking carbonaceous deposits (CAILLEUX, 1971; LUNDQVIST, 1972). *C. gossypina* differs from *C. citrina* in having a whitish or greenish yellow rather than reddish yellow tomentum and hyaline rather than yellowish, quite shorter, immature spores, and differs from *B. mutabilis* in having asci with a subapical plasma globulus, spores with an eccentric germ pore, ascomata never cleistothecial, and an usual growth on pellets of rabbit and hare in northern areas rather than on warthog and hippopotamus dung in Africa. We also mention *C. grandiuscula* A. Bell, a recently established species (BELL, 2005) collected from wombat dung in Tasmania. It shares a white tomentose peridium with *C. gossypina*, from which, however, is easily distinguishable by its hairy perithecial neck and very large spores (upper cell 27–32 × 15–16 µm; pedicel 45–55 × 4 µm). *C. gossypina* has also been recorded by FURUYA & UDAGAWA (1973) from hare dung in Japan. Their description, however, differs from ours and the protologue in the large perithecial neck and long caudae. One collection of *C. gossypina* from Taiwan (CHANG & WANG, 2005) on yellow ox dung and our collection from Italy on cattle, together with LUNDQVIST’s (1972) on porcupine, prove this rare species not to be restricted to leporid dung.

A new key to coprophilous species of *Cercophora* from Italy

- 1) Peridium membranous, non-areolate (lacking carbonaceous deposits). Asci with a subapical plasma globulus. 2
- 1*) Peridium slightly (sometimes indistinctly) areolate owing to the presence of some carbonaceous deposits. Perithecial neck more or less glabrous. Asci lacking a plasma globulus..... 4
- 2) Neck glabrous. Perithecia 500–750 × 400–600 µm, covered with a white tomentum. Perithecial contents yellow. Spore head 15–17 × 7–9 µm (13–17 × 6–9, LUNDQVIST, 1972), spore pedicel 26–33 × 4–4.5 µm. Often on leporid dung. *C. gossypina*
- 2*) Neck with a palisade or tufts of dark, agglutinated hairs. Perithecia non-tomentose, but with flexuous, brown, hyphoid hairs. Perithecial contents hyaline..... 3

- 3) Perithecia 700–1000 × 300–700 μm, with a non-grooved neck. Spore head 20–23.5 × 11–13.5 μm (15–21 × 9–11, LUNDQVIST, 1972), spore pedicel 34–45 × 5–6.5 μm. Caudae usually equal in size. On cattle dung. *C. mirabilis* Fuckel
- 3*) Perithecia 400–520 × 300–400 μm, with a longitudinally grooved neck. Spore head 14.5–16.5 × 6.5–7.5 μm (19 × 8, LUNDQVIST, 1972), spore pedicel 25–31 × 3.5–4 μm. Upper cauda shorter. On cattle and horse dung. *C. anisura* N. Lundq.
- 4*) Neck longitudinally ridged. Perithecia 420–750 × 300–500 μm, with long flexuous hairs. Peridium violet. Spore head often with a subequatorial septum, 14–16 × 7.5 μm (15.5–18 × 7–8.5, LUNDQVIST, 1972), pedicel 23.5–25.5 × 3.5–4 μm. On horse dung. *C. septentrionalis* N. Lundq.
- 4) Neck non-ridged. Perithecia 750–1000 × 500–750 μm, with a whitish tomentum. Peridium brown. Spore head one-celled, 19–21 × 9.5–10.5 μm (17–25 × 8.5–13, LUNDQVIST, 1972), pedicel 33.5–42 × 4–5 μm. On cattle dung. *C. coprophila* (Fr. : Fr.) N. Lundq.

Delitschia vulgaris Griffiths, *Mem. Torrey Bot. Club*, 11 (1), p. 104 (1901). — **Fig. 2**

≡ *Phorcis vulgaris* (Griffiths) Höhn., *Sitzb. Akad. Wiss. Wien, Math.-Naturw. Kl. Abt.*, 1, 129, p. 158 (1920).

Original diagnosis

Perithecia scattered, sunken, subglobose to pyriform with a long cylindrical curved or twisted beak which is densely covered with short wavy brown sparingly septate hairs, 375–450 μ × 600–750 μ, thin membranaceous, brown to black and opaque. Asci 8-spored, cylindrical, broadly rounded above and contracted below into a stout tapering stipe, persistent, 24–27 μ × 185–215 μ; paraphyses filiform, septate, abundant, longer than the asci and mixed with them. Spores obliquely uniseriate, two-celled, broadly rounded at the ends, constriction broad and shallow, 13–16 μ × 27–30 μ, ranging from hyaline when young through yellow to dark brown and opaque; hyaline envelope prominent and swelling greatly in water.

Distinctive characters: Long hairy beak and oval spores.

Cultivated specimens: Frequent on horse and cow dung, New York city and Ft. Lee, N.J., summer and autumn, 1899; cow dung, Auburn, Ala., Aug. 1899 (Earle).

Systematic position: Dothideomycetes s. O.E. Erikss & Winka 1997; Pleosporomycetidae Schoch, Spatafora, Crous & Shoemaker; Pleosporales Luttrell ex M.E. Barr; Delitschiaceae M.E. Barr; *Delitschia* Auersw.

Description of the Italian collection

Pseudothecia ostiolate, 1020 × 380 μm, subpyriform, membranous, dark brown with reddish shades, opaque, even, with a long, coriaceous, slightly curved, cylindric neck, covered with dense, wavy, septate, dark brown hairs, 2–3 μm diam., up to 400 μm long, rounded or slightly pointed at their tips. **Peridium** pseudoparenchymatous, apparently two-layered: 1) endoperidium a *textura angularis* of hyaline, polygonal cells, somewhat larger than exoperidial cells; 2) exoperidium with polygonal, dark-walled cells, 7–12 μm diam., from which many septate, often branched, hyphoid hairs, 2–3 μm diam., arise, pale brown towards the base, darker and darker upwards. **Pseudoparaphyses** filiform, up to 2.5 μm diam., septate, containing abundant hyaline vacuoles, branched and anastomosed, building up a very close net, roundish at tips. **Asci** 238–260 × 20–22 μm, bitunicate, inamyloid, usually 8-spored, sometimes 5- to 7-spored, cylindrical, hardly pointed at apex, with a patent apical apparatus, short-stalked. **Spores** (28–) 30–33 (–35) × 15–17 μm, obliquely uniseriate, yellowish and distinctly granulose at first, quite dark

brown with reddish shades at maturity, fully enveloped by a gelatinous sheath, slightly or not narrowed at all in the middle, more or less ellipsoidal, subdivided by a transverse septum into two, usually equal in size, hardly separable cells, slightly pointed or rounded at their apex, both fully crossed by a parallel or slightly oblique, longitudinal slit.

Examined material: Italy, L'Aquila, Piani del Sirente, 1 050 m, one fully immersed (except for the neck) specimen, on cattle dung in a moist chamber culture, *leg.* F. Doveri, 9.6.2006, 368.1-Ovindoli, CLSM 005.06.

Observations

D. vulgaris can be recognised by the association of densely hairy pseudothecia and transversely septate, symmetrical spores, shallowly constricted at their septa, with cells hardly separable at maturity. Apparently it is a cosmopolitan species, preferably growing on cattle (sometimes horse) dung (GRIFFITHS, 1901; CAIN, 1934; AHMED & ASAD, 1969; ERIKSSON, 1992). It resembles *D. mesostenospora* Jeng, Luck-Allen & Cain, which has, however, longer spores ($40\text{--}45 \times 13\text{--}15 \mu\text{m}$, Jeng et al., 1977).

Spores of our collection are somewhat larger than those described in the protologue (GRIFFITHS, 1901), whereas spores described by BELL (2005) are longer.

Key to coprophilous species of *Delitschia* from Italy

- 1) Pseudothecia almost glabrous. Spores less than $30 \mu\text{m}$ long 2
- 1*) Pseudothecia hairy or tomentose. Spores more than (27--) $30 \mu\text{m}$ long 3
- 2) Spores uniseriate, $10.5\text{--}12 \times 4.5\text{--}5.5 \mu\text{m}$ ($10\text{--}12 \times 5\text{--}6$, LUCK-ALLEN & CAIN, 1975), with a shallow septal constriction, so with hardly separable cells.
..... *D. marchalii* Berl. & Voglino
- 2*) Spores biseriate, $24\text{--}26 \times 5.5\text{--}6.5 \mu\text{m}$ ($20\text{--}25$ long, LUCK-ALLEN & CAIN, 1975), with a deep septal constriction, so with easily separable cells *D. leptospora* Oudem.
- 3) Spores obliquely septate. 4
- 3*) Spores transversely septate. 5
- 4) Spores uniseriate, $42\text{--}45 \times 13\text{--}15 \mu\text{m}$ ($35\text{--}50$, LUCK-ALLEN & CAIN, 1975), with a deep septal constriction. Cells easily separable..... *D. didyma* Auersw.
- 4*) Spores biseriate, $45.5\text{--}52 \times 14\text{--}18 \mu\text{m}$ ($48\text{--}54 \times 16\text{--}18$, LUCK-ALLEN & CAIN, 1975), sometimes transversely septate, non- or only slightly constricted at the septa. Cells hardly separable..... *D. intonsa* Luck-Allen
- 5) Spores (sub)fusiform, more than $70 \mu\text{m}$ long. 6
- 5*) Spores more or less ellipsoidal, less than $70 \mu\text{m}$ long. 7
- 6) Spores $74\text{--}95 \times 21\text{--}25.5 \mu\text{m}$ ($82\text{--}88$ long, LUCK-ALLEN & CAIN, 1975). Usually on leporid dung..... *D. gigaspora* Cain var. *gigaspora*
- 6*) Spores $71\text{--}80.5 \times 23\text{--}26 \mu\text{m}$. On horse dung. *D. gigaspora* var. *ceciliae* Doveri
- 7) Spores $30\text{--}33 \times 15\text{--}17 \mu\text{m}$ ($27\text{--}32 \times 13\text{--}16$, LUCK-ALLEN & CAIN, 1975).
..... *D. vulgaris*
- 7*) Spores larger..... 8
- 8) Spores $55\text{--}66 \times 23.5\text{--}28 \mu\text{m}$ ($55\text{--}62 \times 24\text{--}28$, LUCK-ALLEN & CAIN, 1975).
..... *D. winteri* Plowr. ex G. Winter
- 8*) Spores $42\text{--}49.5 \times 16\text{--}20 \mu\text{m}$ ($42\text{--}55 \times 16\text{--}21$, LUCK-ALLEN & CAIN, 1975).
..... *D. patagonica* Speg.

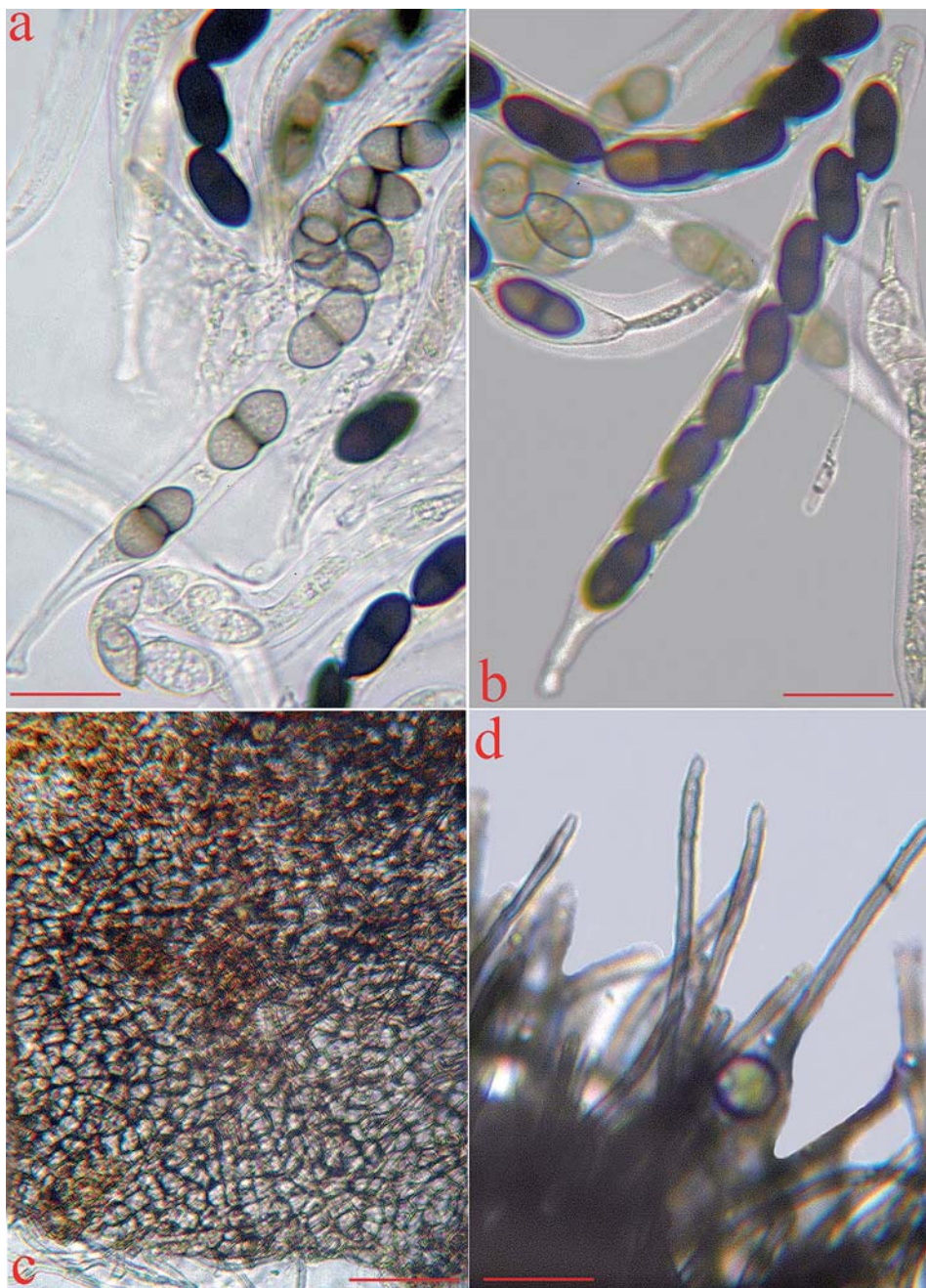


Fig. 2 – *Delitschia vulgaris*

Photos – F. DOVERI

a-b: asci with spores in different stages; c: detail of exoperidium; d: neck hairs.

Scale bars: a-b = 35 μm ; c = 40 μm ; d = 20 μm .

Fimetariella microsperma J.C. Krug, *Can. J. Bot.*, 73, p. 1911 (1995). — **Fig.3**

Original diagnosis

Perithecium dispersa, levia, denudata, e semisuperficiali ad erumpentem positionem pertinentia, ovoidea, 390–500 × 310–375 µm magna; perithecii collum breve, tholiforme, nigrum, distinctum, papillis praeditum; peridium brunneum, subcoriaceum, 30–35 µm crassum, e stratis tribus compositum. Asci octospori, cylindracei, 115–185 × 9.5–12.5 µm magni, in apice rotundati, basin versus in stipitem 60–100 µm longum attenuati; annulum apicale indistinctissimum. Paraphyses numerosae, filiformes, septatae, hyalinae. Ascospores oblique uniseriales, unicellulares, vagina hyalina gelatinosa 5 µm lata postremo circumdatae, ellipsoideae, apicibus rotundatis sed saepius attenuatioribus, 12–14 × (7–) 7.5–9 (–9.5) µm magnae, primum hyalinae vel fulvibrunneae, maturitate confirmata atribrunneae et opacae, foramen germinale distinctum, circa 2 µm diametro crassum et foramen apicale minus exhibentes.

Holotypus: in Alcis alcis fimo lectus est, apud Little White River, in twp. Poulin (1B) vocato, in Algoma comitatu, in Ontario provincia Canadensis regni, 14 Sept. 1956, Cain, TRTC 32615. In Museo Regi Ontarioensis Cryptogamarum herbario.

Systematic position: Sordariomycetes s. O.E. Erikss. & Winka 1997; Sordariomycetidae O.E. Erikss. & Winka; Sordariales Chad. ex D. Hawksw. & O.E. Erikss.; Lasiosphaeriaceae Nannf.; *Fimetariella* N. Lundq.

Description of the Italian collection

Ascomata perithecioid, 520–600 × 300–350 µm, pyriform, membranous, brown, densely covered with hyphoid hairs, particularly below the neck, with a well differentiated, blackish, dome-shaped, coriaceous neck, up to 180 × 180 µm. **Peridium** three-layered: endostratum and mesostratum not sharply differentiated from each other, of pale, thin-walled, elongated, more or less cylindrical cells, 12–20 × 2–3 µm (somewhat longer and wider in endostratum); exostratum pseudoparenchymatous, of medium brown, thick-walled, polygonal cells, 7–13 × 5–8 µm (*textura angularis*), at intervals of wavy, polymorphous cells (*textura epidermoidea*), at the neck formed of blackish, thick-walled, roundish, papillate cells (elongated and claviform around the ostiole). Numerous pale, hyphoid hairs, 2–3 µm diam., arise from the outermost exoperidial cells, particularly below the neck. **Paraphyses** abundant, exceeding the asci and mixed with them, 1.5–7 µm diam., filiform, septate (somewhat constricted at the septa), sometimes branched, tapering upwards, containing hyaline vacuoles. **Asci** 150–200 × 9–11 µm, unitunicate, anamyloid, 8-spored, cylindrical, long-stalked, without a patent apical apparatus. **Spores** one-celled, obliquely to almost vertically uniseriate, individually surrounded by an ephemeral, quite broad gelatinous envelope, sometimes invaginating opposite the larger germ pore, (12.5–) 13.5–14.5 (–15.5) × (6.5–) 7–8 (–8.5) µm, hyaline at first, becoming yellowish, finally dark brown, ellipsoidal to narrowly ovoid ($Q = 1.64–1.87$; $Q = 1.76$), slightly narrowing at one or both ends, smooth, with two end germ pores, the larger of which usually basal in the upper four spores, apical in the lower four, the smaller observable in the immature, scarcely pigmented spores. No additional pore has been seen. **Anamorph** not observed.

Examined material: Italy, Palermo, Montaspro (Parco delle Madonie), 800 m, several scattered specimens on cattle dung after 25 days in damp chamber culture, *leg.* M.J. Richardson, 8.4.2005 and also in E. (Edinburgh herbarium), 609.1–Collesano, Richardson's sample no. MJR 8/05 + CLSM 011.05.

Observations

Fimetariella, like *Bombardioidea* C. Moreau, has a somewhat anomalous position inside the Lasiosphaeriaceae owing to its spore features, which are surrounded by a gelatinous

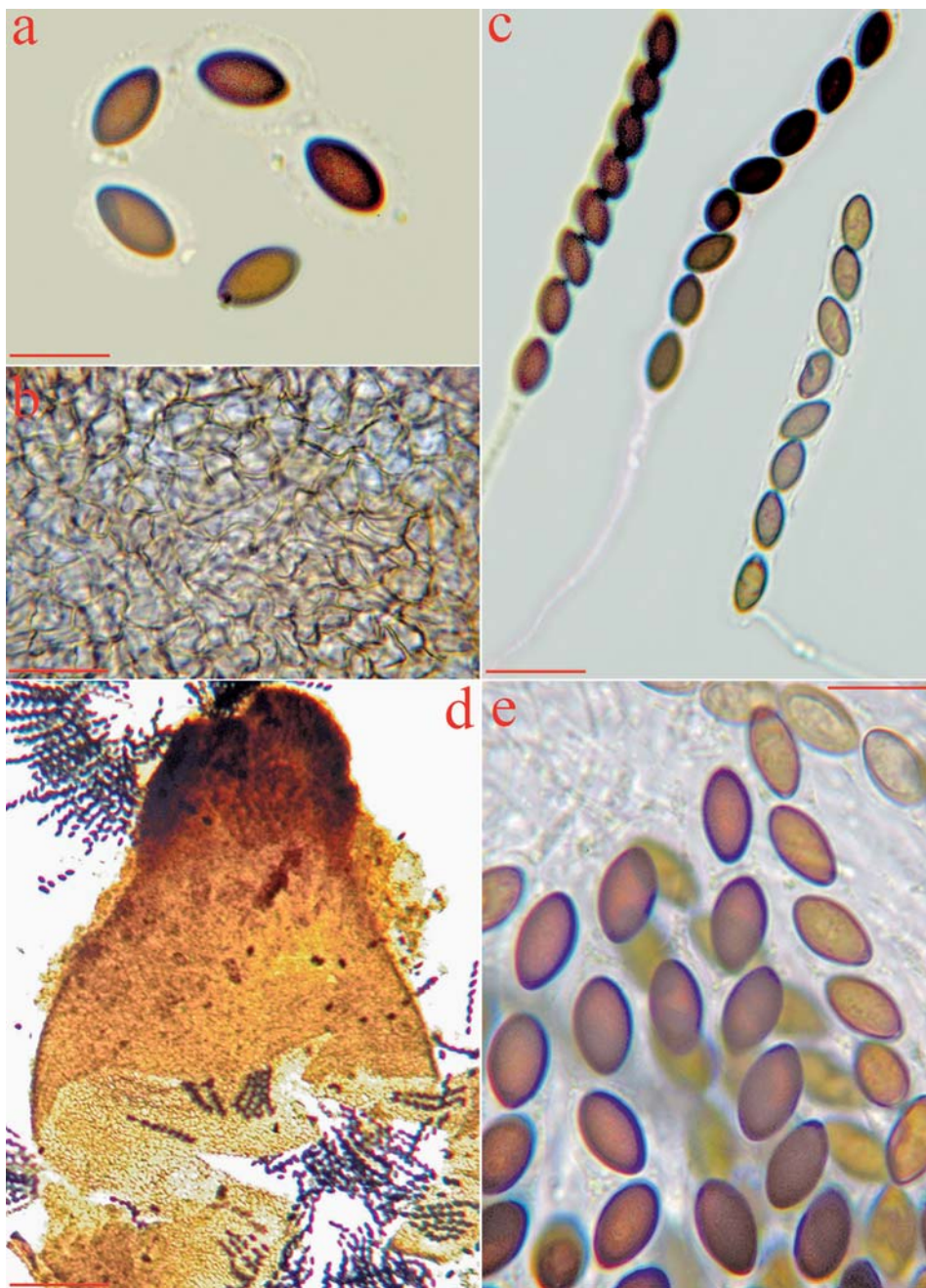


Fig. 3 – *Fimetariella microsperma*

Photos – F. DOVERI

a: mature spores; b: detail of exoperidium; c: asci with spores in different stages; d: perithecium squashed in water; e: uniseriate spores inside the asci.

Scale bars: a, e = 15 μm ; b = 20 μm ; c = 10 μm ; d = 75 μm .

sheath, lack caudae, and are one- instead of two-celled. It differs, however, from *Bombardioidea* in having gregarious to scattered, not fasciculate perithecia, which lack a stroma and do not narrow at their base.

Cylindrical rather than clavate asci and uniseriate and not papillate rather than biseriate and papillate spores are useful features to distinguish *Fimetariella* from *Periamphispora* J.C. Krug (1989).

Fimetariella is also characterised by growth on dung, membranous to semicoriaceous, more or less glabrous perithecia, a pseudoparenchymatous exoperidium, filiform paraphyses, dark pigmented spores with two main end germ pores and often with minor pores, and a phialidic anamorph.

Besides *F. microsperma*, seven *Fimetariella* spp. are known at the present: five of them [*F. dolichopoda* J.C. Krug; *F. dunarum* (Mouton) J.C. Krug; *F. macromischa* J.C. Krug; *F. rabenhorstii* (Niessl) N. Lundq.; *F. tetraspora* J.C. Krug] are easily distinguishable by their 4-spored asci with a thickened and patent apical ring (KRUG, 1995). The other three, *F. microsperma* included, have 8-spored asci: *F. brachycaulina* J.C. Krug & J.H. Mirza differs from *F. microsperma* in having very short-stalked asci, with a thickened apical ring, and much larger spores ($24\text{--}26 \times 15\text{--}16 \mu\text{m}$, KRUG, 1995), whereas *F. apotoma* J.C. Krug, which also shares with *F. microsperma* asci with an indistinct apical ring, is distinguishable by its even larger spores ($31\text{--}34 \times 17\text{--}19 \mu\text{m}$, KRUG, 1995) and asci with a shorter stalk.

In the Italian collection of *F. microsperma*, kindly sent us by M.J. Richardson, we have observed almost all differences mentioned by KRUG (1995) in comparing the European with the American findings, i.e. spores with narrower ends and more evident germ pores, and constantly long-stalked asci in the former, but, unlike Krug, we have not observed wider spores in the Sicilian collection.

The European findings of *F. microsperma*, particularly occurring in the Mediterranean area (Richardson's, and Lundqvist's in KRUG, 1995), and a LUNDQVIST's (1997) collection from Canary Islands, come from domestic animals, whereas the North American collections (KRUG, 1995) particularly come from American moose dung.

***Hypocopra lojkaeana* (Rehm) J.C. Krug & N. Lundq. ex Doveri, comb.nov. – Fig.4**

Basionym: *Sordaria lojkaeana* Rehm, *Ascomyc.*, fasc. 19, n° 946 (1888)

≡ *Hypocopra lojkaeana* (Rehm) J.C. Krug & N. Lundq., in Hansen & Knudsen, *Nordic Macromycetes*, 1, p. 241 (2000), not validly published.

= *Hypocopra merdaria* (Fr. : Fr.) J. Kickx f., *Fl. Crypt. Flandres*, p. 362 (1867), s. auct. (misapplied name).

Original diagnosis – REHM, *Hedwigia*, 27, p. 163 (1888).

N.B.: REHM gathered his 1-2175 numbers of dried “Ascomyceten” in 57 fasc. during the period 1870-1918. The new species of fasc. 19 (numbers 901-950) are described in *Hedwigia*, 27, pp. 163-175, published in 1888).

946. *Sordaria Lojkaeana* Rehm nov. spec.

Perithecia solitaria, primitus subimmersa, dein plus minusve emergentia, globosa, apice applanata, interdum subconca-va, fusca, papilla rotunda, nigrescente, poro minimo pertusa instructa, 1 mm diam. Asci cylindraceo-clavati, crassi, 250 μ long., 18-21 μ lat., 8 spori. Sporidia elliptica, 1 cellularia, haut nucleata nec appendiculata, gelatina 2-3 μ lat., obte-gente, 27-30 μ long., 12-14 μ lat., plerumque 1 sticha. Paraphyses longissimae, filiformes, nucleatae, 4-5 μ cr. Porus J+ ope valde coerulescens.

Ad sterces Capreae. Hungariae, leg. Lojka (beatus).

Systematic position: Sordariomycetes s. O.E. Erikss. & Winka; Xylariomycetidae s. O.E. Erikss. & Winka; Xylariales Nannf.; Xylariaceae Tul. & C. Tul.; *Hypocopra* (Fr.) J. Kickx f.

Description of the Italian collection

Stromata thick, broadly annulate to clypeate, dark-coloured, containing a single or rarely two perithecia, made up of brown, thick-walled, polygonal cells, 4–7 µm diam. Perithecia globose, 950–1100 µm diam., membranous, smooth, whitish to pale yellow, with a papillate, scarcely differentiated, coriaceous, somewhat rough, blackish neck, supporting sparse pointed, septate hairs. **Peridium** layered, with an exostratum typically formed of pale pigmented, septate, elongated, thick-walled cells, 3–5 µm diam., arranged in compressed rows. **Paraphyses** simplex or branched, exceeding the asci, cylindric, septate, 4–7 µm diam., slightly constricted at the septa, tapering upwards, containing many hyaline vacuoles. **Asci** strongly amyloid (apical apparatus unchangeably blue staining), 8-spored, 235–260 × 25–27 µm, cylindric, roundish or slightly pointed at the apex, quite short-stalked. **Spores** surrounded by a broad, ephemeral, gelatinous sheath, obliquely to vertically uniseriate, 26–30 (–31) × 14–16 µm, slightly asymmetrical to symmetrical, ellipsoidal or narrowly ovoidal to broadly fusiform, thick-walled, smooth, dark brown (hyaline at first), one-celled. Each spore with a longitudinal, eccentric, narrow germ slit, extending the full length.

Examined material: Italy, L'Aquila, Piani del Sirente, 1050 m, about twenty gregarious, almost fully immersed (except for the neck, which protrudes above the stroma) specimens, on hare dung, *leg.* F. Doveri, 9.6.2006, 368.1–Ovindoli, CLSM 006.06.

Observations

H. lojkaeana can be recognised by its preferable growth on leporid dung (CAIN, 1934; MUNK, 1948; LUNDQVIST, 1972, 2000), large stromata, usually containing a single perithecium, strongly amyloid asci, one-celled, almost equilateral, medium size spores, with a germ slit extending their full length. It has often been mistaken for and wrongly described (CAIN, 1934; MUNK, 1957; CHMIEL, 1977; DENNIS, 1981) under *H. merdaria* which, on the contrary, grows on dung of sheep (SPEGAZZINI, 1878; BRETON, 1965; TÓTH, 1965; ERIKSSON, 1992; WELT & HEINE, 2006), other domestic herbivores (GRIFFITHS, 1901; ANGEL & WICKLOW, 1975) and marmot (DOVERI, 2004), and has two-celled, larger spores (32–41 × 17–20 µm, KRUG & CAIN, 1974; 39–44 × 21–26 µm, DOVERI, 2004), with a germ slit shorter than their full length.

Although *H. lojkaeana* is widespread, particularly in Europe (see the references above), ours is the first record from Italy.

All *Hypocopra* spp. are fimicolous. Since KRUG & CAIN (1974) described 14 new species, inserting them in a synoptic key to *Hypocopra*, and DOVERI (2004) provided a key to the accepted species, no other new taxon has been erected.

Recombination

We take the opportunity to establish the recombination *Hypocopra leporina*, previously, but invalidly made by KRUG & LUNDQVIST:

Hypocopra leporina (Niessl ex Rehm) J.C. Krug & N. Lundq. ex Doveri, comb. nov.

Basionym: *Hypocopra equorum* (Fuckel) G. Winter f. *leporina* Niessl ex Rehm, *Ascomyc.*, fasc. 20, no. 992 (1889).

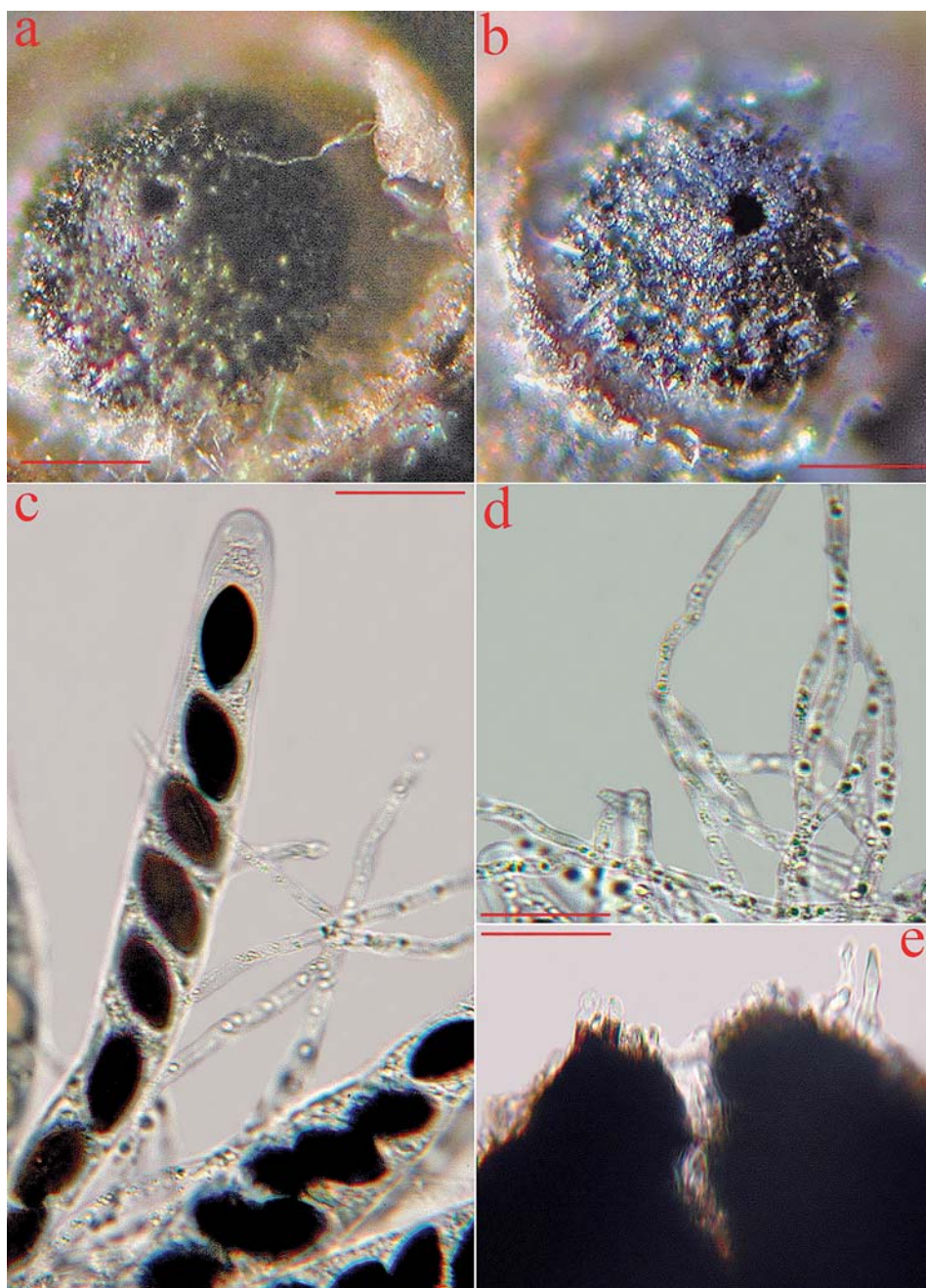


Fig. 4 – *Hypocopra lojkaeana*

Photos – F. DOVERI

a-b: emerging perithecial neck; c: asci containing mature, uniseriate spores, interspaced with paraphyses; d: paraphyses; e: perithecial apex with some hairs.

Scale bars: a-b = 200 μm ; c-d = 30 μm ; e = 150 μm .

≡ *Hypocopra leporina* (Niessl ex Rehm) J.C. Krug & N. Lundq., in Hansen & Knudsen, *Nordic Macromycetes*, 1, p. 241 (2000), not validly published.

Key to coprophilous species of *Hypocopra* from Italy

- 1) Stromata dark tomentose. Asci with a dextrinoid apical apparatus. Spores two-celled, strongly inequilateral, $17\text{--}19 \times 7.5\text{--}8.5 \mu\text{m}$ *H. leporina*
- 1*) Stromata non-tomentose. Asci with an amyloid apical apparatus. 2
- 2) Stromata small, annulate, pale, with a single perithecium. Spores two-celled, inequilateral. 3
- 2*) Stromata larger and darker, usually clypeate, with one to several perithecia. Spores equilateral or slightly inequilateral, one- or two-celled. 4
- 3) Spores amygdaliform, $26\text{--}33.5 \times 11.5\text{--}12.5 \mu\text{m}$ ($23\text{--}27 \times 11\text{--}13$, KRUG & CAIN, 1974). Germ slit $13\text{--}25 \mu\text{m}$ long.
..... *H. antarctica* (Speg.) Furuya & Udagawa
- 3*) Spores slightly inequilateral to amygdaliform, rarely equilateral and ellipsoidal, variable in size, $27.5\text{--}39.5 \times 13.5\text{--}21 \mu\text{m}$. Germ slit $18\text{--}23 \mu\text{m}$ long.
..... *H. aff. festucea* J.C. Krug & Cain
- 4) Spores one-celled, $26\text{--}30 \times 14\text{--}16 \mu\text{m}$. Germ slit extending the full spore length.
..... *H. lojkaeana*
- 4*) Spore two-celled. Germ slit shorter than the spore length. 5
- 5) Stromata with one or occasionally a few perithecia. Spores usually equilateral, $24\text{--}30.5 \times 13.5\text{--}15 \mu\text{m}$ ($23\text{--}27 \times 13\text{--}14$, KRUG & CAIN, 1974), with germ slit $14\text{--}17 \mu\text{m}$ long.
..... *H. brefeldii* (Zopf) Chenant.
- 5*) Stromata with a single perithecium. Spores often slightly inequilateral, $39\text{--}44 \times 21\text{--}26 \mu\text{m}$ ($32\text{--}41 \times 17\text{--}20$, KRUG & CAIN, 1974). Germ slit $26\text{--}29 \mu\text{m}$ long.
..... *H. merdaria*

Melanospora zamiae Corda, *Icones fung.*, 1, p. 24 (1837). — Fig. 5

- ≡ *Sphaeronema zamiae* (Corda) Catt., *Arch. Lab. Bot. Critt. Univ. Pavia*, 2, p. 118 (1877).
 = *Melanospora leucotricha* Corda, *Icones fung.*, 1, p. 25 (1837).
 = *Melanospora cirrhata* Berk., in Cooke, *Grevillea*, 16 (80), p. 102 (1888).
 = *Melanospora rollandi* Costantin, *Bull. Soc. mycol. Fr.*, 6, p. 64 (1890).
 = *Melanospora globosa* Berl., *Malpighia*, 5, p. 387 (1891).
 = *Melanospora pampeana* Speg., *An. Mus. nac. Hist. nat. B. Aires*, 6, p. 287 (1899).
 = *Melanospora townei* Griffiths, *Bull. Tor. Bot. Club*, 26, p. 434 (1899).
 = *Ampullaria aurea* A.L. Sm., *J. Bot. Brit. For.*, 41, p. 258 (1903).
 = *Melanospora acremonioides* (Harz) Vuill., *Bull. Soc. mycol. Fr.*, 27, p. 149 (1911).
 = *Melanospora rhizophila* Peglion & Sacc., in Sacc., *Ann. Mycol.*, 11, p. 16 (1913).
 = *Melanospora mattiroliana* Mirande, *Bull. Soc. mycol. Fr.*, 32, p. 72 (1916).
 = *Ampullaria succinea* Petch, *Ann. R. Bot. Gard. Peradeniya*, 6, p. 238 (1917).

Original diagnosis

1. M. ZAMIAE: Tab. VII. fig. 297. *A. gregaria*, minuta; perithecio aureo, hyalino, lageniformi; collo elongato supra penicillato, floccis laxis sparsis, ramosis, luteis tecto; nucleo atterimo; sporis magnis ovatis, utrinque apiculatis, olivaceo-

*atris, apacis. Hab. in foliis putridis Zamiae pungentis, Rei.chenberg. † Magnit. nat. †† fungilli auct. *sporae max. auct.*

Systematic position: Sordariomycetes s. O.E. Erikss. & Winka; Hypocreomycetidae O.E. Erikss. & Winka; Melanosporales N. Zhang & M. Blackw.; Ceratostomataceae G. Winter; *Melanospora* Corda.

Description of the Italian collection

Ascomata perithecioid, (sub)globose, 140–250 μm diam., membranous, golden yellow, covered (particularly in the lower portion) with hyphoid hairs, with a cylindrical to sub-conical neck, 80–120 $\times$ 40–60 μm , crowned with dense, diverging setae. **Peridium** very thin, pseudoparenchymatous: endostratum a textura globulosa or globulosa-angularis of roundish, pale-yellowish, thin-walled cells, up to 42 μm diam.; exostratum a textura angularis of comparatively thick-walled, quite deep yellow-orange cells, 12–17 $\times$ 10–17 μm . Cells at the neck elongated-cylindrical, darker yellow, septate, parallel, sometimes somewhat wavy, thick-walled (about 1 μm). **Setae** pale yellow to hyaline, non-septate, somewhat pointed at their tips, 110–200 $\times$ 4–6 μm , gathering, at the apex, the mature spores in a dark globule. **Hyphoid hairs** septate, yellowish, thin-walled, 2.5–4 μm diam., somewhat enlarged at the base. **Paraphyses** ephemeral, vesiculate. **Asci** ephemeral, 8-spored, non-amyloid, unitunicate, lacking an apical apparatus, subglobose to saccate, with a short stalk, 40–50 $\times$ 30–40 μm . **Spores** conglobate, 16–19 (–20) $\times$ (11–) 12–13 (–14) μm , ellipsoid-citriform ($Q = 1.28\text{--}1.72$; $Q = 1.43$), symmetrical, occasionally flattened at one side, dark olive-brown, smooth, with two apical, depressed germ pores, up to 2 μm diam.

Examined material: Italy, Vicenza, Recoaro Terme– Monte Rasta, 950 m, about fifty gregarious or isolated, superficial specimens on sheep dung in a moist chamber culture, leg. F. Doveri, 8.6.2007, 102.1–Recoaro Terme, CLSM 011.07.

Observations

M. zamiae is widespread, particularly in the tropics and warm temperate regions (CANNON & HAWKSORTH, 1982), where it grows on soil (DOGUET, 1955; PETERSEN, 1960; ELÍADES *et al.*, 2006) and rotting vegetables (SPEGAZZINI, 1899; CALVIELLO, 1973, 1976; MATSUSHIMA, 1975; CANNON & HAWKSWORTH, 1982; HANLIN & GOH, 1993), sometimes on dung (SETH, 1968; LORENZO, 1992; VALLDOSERA & GUARRO, 1992) or associated with other fungi (CALVIELLO, 1973; HANLIN & GOH, 1993) or even mycoparasitic (CANNON & HAWKSWORTH, 1982). Its morphological features are strongly variable in size, depending on substratum (DOGUET, 1955).

M. zamiae is similar to *M. brevirostris* (Fuckel) Höhn., from which it differs in having a much longer perithecial neck and symmetrical spores, smaller on average (15–23 $\times$ 10–16 versus 21–34 $\times$ 11–17 μm , CANNON & HAWKSWORTH, 1982), with less marked germ pores. Only these two *Melanospora* spp. have been found in Italy so far.

Preussia isomera Cain, *Can. J. Bot.*, 39, p. 1643 (1961). — **Fig. 6**

= *Honoratia pisana* Cif., Vegni & Montemart., in Vegni & Montemartini, *Atti Ist. bot. Univ. Lab. crittog. Pavia*, ser. 5, 20, p. 176 (1963).

N.B.: some authors consider *Sporormiella* Ellis & Everh. a synonym of *Preussia* Fuckel, but *Preussia isomera* is a different taxon from *Sporormiella isomera* S.I. Ahmed & Cain.

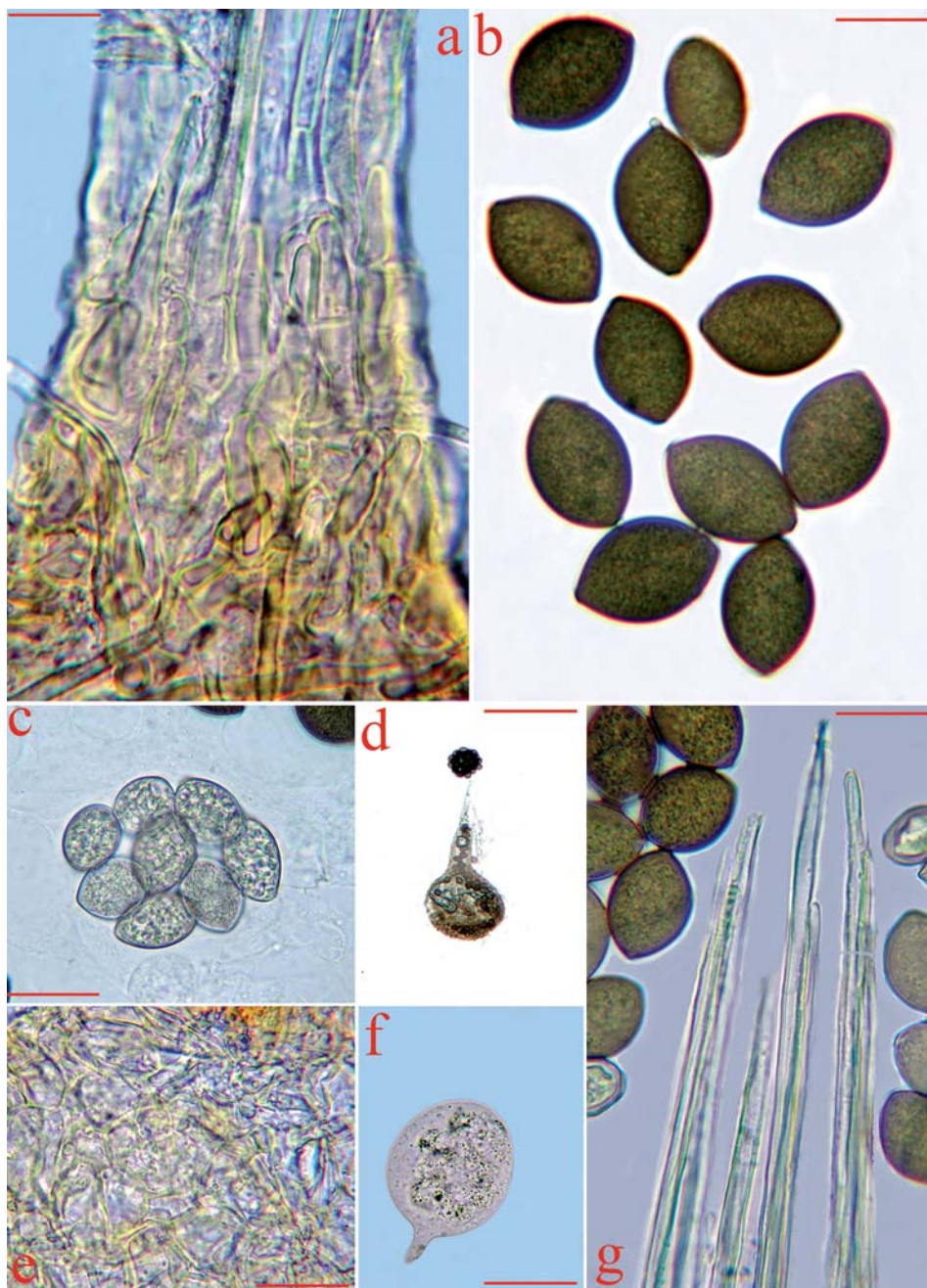


Fig. 5 – *Melanospora zamiae*

Photos – F. DOVERI

a: perithecial neck; b: mature spores; c: conglobate, immature spores inside the ascus; d: perithecium with an apical spore cluster; e: exoperidium; f: ascus; g: apices of setae.
Scale bars: a, g = 15 µm; b = 12 µm; c, e = 20 µm; d = 200 µm; f = 30 µm.

Original diagnosis

Ascocarpis dense congregatis, saepe constipatis et in stratis compluribus coacervatis, plerumque superficialibus sed nonnullis in agaro omnino immersis, vel globosis vel aliquantulum prolatis vel leviter depressis, 100–350 μ diam., nigris, nitentibus, levibus, glabris non ostiolatis. Peridio ascocarpi tenui, membranaceo. Cellulis peridii in stratis externis brunneis, angulatis, constantibus, in strato uno, 5–9 μ diam.; cellulis peridii in stratis interioribus hyalinis, turgidis. Ascis octosporis, late clavatis vel subellipsoideis, 43–55 $\times$ 15–18 μ , plerumque latissimis prope medium, superne subtruncatis, ad apicem neque perforatis, neque incrassatis, basin versus in stipitem 5–10 μ longum abrupte attenuatis, in fasciculis irregulariter dispositis, novellis pariete crasso, firmo pertinaci, maturis evanescentibus. Sine paraphysibus. Ascosporis primum hyalinis, tribus septis celeriter praeditis, et profunde constrictis, postremo pallido-brunneis, 30–33 $\times$ 4.0–4.5 μ diam., in fasciculis parallelis cumasco dispositis. Segmentis ascosporarum maturis facile sejunctis, raro extra ascos in perpetuum alligatis, cylindraceo-ovalibus, a utroque termino late rotundatis, 7.0–9.0 $\times$ 4.0–4.5 μ m, pari amplitudine et forma ferme praeditis, vel aliquando cellulis terminalibus et mediis paulo longioribus, cellulis terminalibus aliquando paulo angustioribus. Hilo germinali pari longitudine cellulis ascosporarum, in longitudinem disposito, leviter curvato, vix spectabili.

Systematic position: Dothideomycetes s. O.E. Erikss & Winka; Pleosporomycetidae Schoch, Spatafora, Crous & Shoemaker; Pleosporales Luttrell ex M.E. Barr; Sporormiaceae Munk; *Preussia* Fuckel.

Description of the Italian collection

Pseudothecia cleistothecoid, subglobose, 100–300 μ m diam., smooth, membranous, brightly blackish, somewhat deformed at maturity. **Peridium** two-layered, pseudoparenchymatous, with an endostratum of pale, thin-walled, polygonal cells, and an exostratum of dark brown, thick-walled, polygonal cells, 5–7 $\times$ 4–5 μ m. **Pseudoparaphyses** filiform, 1.5–2 μ m diam., septate, sometimes branched, reduced to short fragments, with several hyaline vacuoles. **Asci** bitunicate, 8-spored, occasionally 4-spored, clavate, 38–45 $\times$ 15–18 μ m, very thick-walled at first, rounded at the apex, abruptly contracted at the base in a short stalk, less than 10 μ m long. **Spores** 30–35 $\times$ 4–5 μ m, hyaline at first, pale brown at maturity, cylindrical, arranged in rows parallel to the ascus longitudinal axis, thick-walled, 4-celled, deeply constricted at the transverse septa. Cells more or less equal in size, 7–9 $\times$ 4–5 μ m, easily separable from each other and soon free inside the ascus. Gelatinous perisporium not observed. End cells subconical, with a roundish apex, middle cells narrowly cylindrical, each with an obscure, wavy, subparallel germ slit.

Examined material: Italy, Vicenza, Monte di Malo, 200 m, several gregarious, superficial specimens on horse dung, leg. A. Bizzi, 1.9.2007, 103.3-Malo, CLSM 002.08.

Observations

According to CAIN (1961), *P. isomera* resembles *P. nigra* (Routien) Cain, from which it differs in having larger spores and asci. In our opinion it is also similar to *P. fleischhakkii*, but the latter has more than 5 μ m broad spores, usually with isodiametric middle cells.

After protologue (CAIN, 1961), *P. isomera* has been also described from India (MUKERJI, 1970), but with much longer asci, resembling those of a *Sporormiella* Ellis & Everh. sp., and from U.S.A. (ANGEL & WICKLOW, 1975). Its morphology and cytology were studied in depth by KOWALSKI (1968), who proved it to be homothallic.

The majority of collections come from rabbit pellets, but occasionally recorded from cattle dung. In Italy it has been also isolated from grains of *Avena* (VEGNI & MONTEMARTINI, 1963) and described under *Honoratia pisana* Cif., Vegni & Montemart., which VON ARX & STORM (1967) stated to be a synonym of *Preussia isomera* after studying the type material.

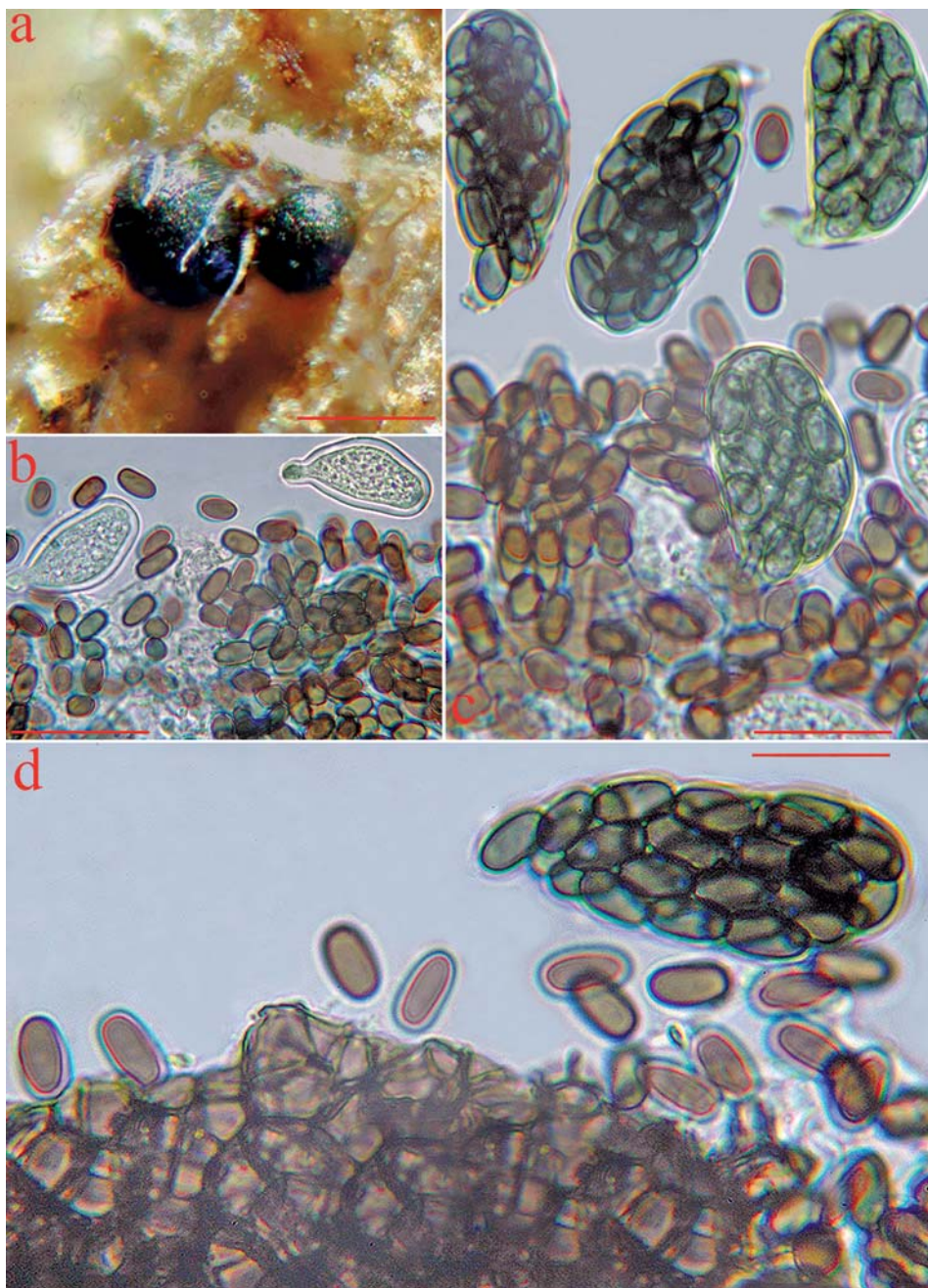


Fig. 6 – *Preussia isomera*

Photos – F. DOVERI

a: pseudothecia; b: mature asci with spores and free spore cells; c: empty asci above free spore cells; d: ascus with mature spores and free spore cells above peridial cells.

Scale bars: a = 250 μm; b = 25 μm; c = 18 μm; d = 15 μm.

Key to coprophilous species of *Preussia* from Italy

- 1) Asci short stalked, < 15 μm long. Spores cylindrical, transversely septate. 2
- 1*) Asci very long stalked, (broadly) clavate. Spores cylindrical or subfusiform, transversely or obliquely septate. 3
- 2) Asci 48–62 $\times$ 20–22 μm , clavate-sacciform, usually with a non-abruptly contracted stalk. Spores 22–28 $\times$ 5.7–6.2 (26–35 $\times$ 6–7, CAIN, 1961).
..... *P. fleischhakii* (Auersw.) Cain
- 2*) Asci 38–45 $\times$ 15–18 μm , clavate, with an abruptly contracted stalk. Spores 30–35 $\times$ 4–5 μm (30–33 $\times$ 4–4.5 μm , CAIN, 1961). *P. isomera*
- 3) Spores 30.5–34.5 $\times$ 5–6.5 μm (24–38 $\times$ 5–7.5, CAIN, 1961), cylindrical, obliquely septate. *P. funiculata* (Preuss) Fuckel
- 3*) Spores transversely septate. 4
- 4) Spores 30.5–33.5 $\times$ 8–9 μm (26–35 $\times$ 7–8, CAIN, 1961), subfusiform, with middle cells broader than long. *P. typharum* (Sacc.) Cain
- 4*) Spores 27–30.5 $\times$ 5–5.5 μm (26–32 $\times$ 5–5.5, CAIN, 1961), cylindric, with middle cells longer than broad. *P. terricola* Cain

Sporormiella minipascua S.I. Ahmed & Cain, *Can. J. Bot.*, 50, p. 451 (1972). — **Fig. 7**
 $\equiv$ *Sporormia pascua* Niessl, *Oesterr. Bot. Z.*, 28, p. 165 (1878), s. Cain 1934, non s. Niessl.

Original diagnosis

Peritheciis sparsis vel aggregatis, immersis, subglobosis, 180–220 μ diam, atro-brunneis usque nigris, denudatis; collo breve cylindraceo, nigro, denudato. Peridio tenui membranaceo. Ascis octosporis, cylindraceo-clavatis, 120–140 $\times$ 14–16 (–17) μ , latissimi prope apicem, inferne attenuatis, breve stipitatis. Paraphysibus filiformibus, septatis, ramosis, 2–3 μ crassis, ascos superantibus. Ascosporis supra 2- aut 3-seriatis, infra 1-seriatis, 8-cellularibus, fusiformi-cylindraceis, 32–36 $\times$ 5.5–6.5 μ , utrinque late rotundatis, demum atro-brunneis opacisque, septatis, septis non obliquis, leniter constrictis, cohaerentibus, articulo quarto majore. Stria germinationis obliqua usque diagonali. Strato mucoso angusto.

Holotypus : in fimo cervino, Ontario, Nipissing Dist., Pickerel Lake Portage from Lake Timagami, 10 Aug. 1933, Cain, TRTC 5390.

Systematic position: Dothideomycetes s. O.E. Erikss & Winka; Pleosporomycetidae Schoch, Spatafora, Crous & Shoemaker; Pleosporales Luttrell ex M.E. Barr; Sporormiaceae Munk; *Sporormiella* Ellis & Everh.

Description

Pseudothecia ostiolate, subglobose, 170–230 μm diam., membranous, smooth, blackish, with a papillate, scarcely differentiated neck. **Peridium** two-layered, pseudoparenchymatous: 1) endostratum of pale brown, comparatively thin-walled, polygonal cells, 14–18 $\times$ 10–12 μm ; 2) exostratum of dark brown, thick-walled, polygonal cells, 7–13 $\times$ 5–10 μm . **Pseudoparaphyses** plentiful, cylindric-filiform, exceeding the asci, 1.5–3 μm diam., narrowing at the septa, branched and anastomosed, containing several hyaline vacuoles, not inflated at their tips. **Asci** bitunicate, non-amyloid, 8-spored, 116–140 $\times$ 15–19 μm , cylindrical to cylindric-claviform, rounded at the apex, short-stalked. **Spores** biseriate above, uniseriate in the lower part of the ascus, surrounded by a broad gelatinous sheath, 34–42 $\times$ (6.5–) 7 (–7.5) μm , cylindric-claviform, straight or slightly curved, hyaline at first, becoming yellow and reddish to dark brown at maturity, smooth, thick-walled, 8-celled, shallowly constricted at the transverse septa, with cells not readily separating, each with a diagonal germ slit. End cells subconical, with a rounded or slightly pointed apex,

somewhat longer than the middle ones. Middle cells cylindric, wider than long, the fourth from the upper end the widest.

Examined material: Italy, Trento, Brentonico-Monte Baldo, 1 400 m, six semi-immersed specimens on cattle dung, *leg.* A. Bizzi, 25.5.2006, 101.4-Malcesine, CLSM 008.07.

Observations

S. minipascua belongs to a group of species characterised by 8-celled spores, with the fourth cell from the upper end the broadest. It is close to *S. pascua* (Niessl) S.I. Ahmed & Cain, which can be distinguished by its larger spores ($40\text{--}49 \times 8\text{--}9$ versus $32\text{--}36 \times 5.5\text{--}6.5$ μm , AHMED & CAIN, 1972). Our collection of *S. minipascua* fully matches the protologue (AHMED & CAIN, 1972) except for its slightly larger spores which, however, are smaller, on average, than those of *S. pascua*, including our Italian finding of the latter (DOVERI, 2004).

S. minipascua is rare, known so far in North America (CAIN, 1934) and Japan (FURUYA & UDAGAWA, 1972), on deer dung only. Ours is possibly the first European finding, on cattle dung.

Key to coprophilous species of *Sporormiella* with 8-celled spores from Italy

N.B.: a worldwide key to *Sporormiella* spp. with 8-celled spores has recently been suggested by WELT & HEINE (2007).

- 1) Spores with the fourth cell from the upper end broader than the others. 2
- 1*) Spores with third cell from the upper end the broadest. 3
- 2) Spores $40\text{--}51.5 \times 7.5\text{--}8.5$ μm ($40\text{--}49 \times 8\text{--}9$, AHMED & CAIN, 1972).
..... *S. pascua* (Niessl) S.I. Ahmed & Cain
- 2) Spores $34\text{--}42 \times 7$ μm ($32\text{--}36 \times 5.5\text{--}6.5$, AHMED & CAIN, 1972). *S. minipascua*
- 3) Spores $38\text{--}43.5 \times 8\text{--}9$ μm ($40\text{--}48 \times 7\text{--}8$, AHMED & CAIN, 1972). End cells conic-ovoid. *S. octomera* (Auersw.) S.I. Ahmed & Cain
- 3*) Spores larger. End cells hemispheric or conic-ovoid. 4
- 4) Spores $52.5\text{--}60 \times 9.5\text{--}10.5$ μm ($50\text{--}59 \times 10\text{--}11.5$, AHMED & CAIN, 1972). End cells subconical. Asci gently narrowing towards the base.
..... *S. corynespora* (Niessl) S.I. Ahmed & Cain
- 4*) Spores $48.5\text{--}63 \times 12.5\text{--}14.5$ μm ($48\text{--}58 \times 12\text{--}14$, AHMED & CAIN, 1972). End cells hemispheric. Asci abruptly contracted towards the base.
..... *S. octonalis* S.I. Ahmed & Cain

Trichodelitschia munkii N. Lundq., *Svensk Bot. Tidskr.*, 58 (1), p. 267 (1964). — **Fig. 8**

Original diagnosis

Ex affinitate Trichodelitschiae bisporulae (Cr.) Lundq. a qua distat: ascis angustioribus $6\text{--}9$ μ crassis, sporibus minoribus $18\text{--}20.5 \times 6$ μ strato mucoso transversaliter bipartito cinctis.

Suecia: Vestrogöthia, Österplana, in fimo alcino, Lundqvist 2442^o, holotypus (UPS).

Systematic position: Dothideomycetes s. O.E. Erikss & Winka; Pleosporomycetidae Schoch, Spatafora, Crous & Shoemaker; Pleosporales Luttrell ex M.E. Barr; Phaeotrichaceae Cain; *Trichodelitschia* Munk.

Description

Pseudothecia subglobose to pyriform, dark brown, membranous, ostiolate, hairy, $200\text{--}250 \times 180\text{--}200\text{ }\mu\text{m}$, with a hardly differentiated, papillate neck, which is almost hidden owing to the presence of many dark setae. **Peridium** pseudoparenchymatous, two-layered: 1) endostratum of pale, polygonal cells; 2) exostratum of dark brown, thick-walled, polygonal cells, $7\text{--}17\text{ }\mu\text{m}$ diam., of slightly darker, papillate cells around the ostiole. **Basal hairs** hyphoid, numerous, brown, densely septate, often branched, thick-walled, knotted, apically roundish, $2\text{--}5\text{ }\mu\text{m}$ diam., arising from the outermost cells and covering the whole immersed surface of the pseudothecium. **Lateral hairs** up to $250 \times 2\text{--}3\text{ }\mu\text{m}$ ($5\text{--}6\text{ }\mu\text{m}$ at the base), intermediate between the basal hairs and the neck setae, fairly pointed, dark brown, very thick-walled (more than $1\text{ }\mu\text{m}$), septate, somewhat less rigid and less acuminate than the apical hairs. **Apical setae** placed on the neck and upper portion of pseudothecium, sharp, acicular, stiff, dark brown to almost black (paler at the apex), non-septate, thick-walled (more than $2\text{ }\mu\text{m}$), with a polymorphous base, $30\text{--}130 \times 4\text{--}6\text{ }\mu\text{m}$ ($6\text{--}12$ at the base). **Pseudoparaphyses** abundant, exceeding the asci, often anastomosed and branched, cylindric-filiform, septate, slightly narrowing at the septa, containing hyaline vacuoles, tapering upwards, with a non- or hardly enlarged tip. **Asci** bitunicate, non-amyloid, 8-spored, cylindric, $135\text{--}150 \times 9\text{--}12\text{ }\mu\text{m}$, with an indistinct apical apparatus, roundish at the apex, narrowing towards the base, which ends in a lobate stalk. **Spores** (16.5--) $17\text{--}19$ ($\text{--}19.5$) $\times 6\text{--}7\text{ }\mu\text{m}$, obliquely uniseriate, individually surrounded by a broad, gelatinous sheath, which contracts at the septum, hyaline to olive at first, dark brown at maturity, subdivided by a transverse septum into two conical, separable cells, each narrowing near its base, thick-walled, with an apical, broad ($1.5\text{--}2\text{ }\mu\text{m}$ diam.), hyaline, non prominent germ pore collar.

Examined material: Italy, Palermo, Portala di Colla (Parco delle Madonie), 1 230 m, several semi-immersed, gregarious specimens on sheep dung in culture, *leg.* M.J. Richardson, 8.4.2005, Richardson's sample no. MJR 9/05, and also in E (Edinburgh herbarium), 609.1-Collesano.

Observations

Since LUNDQVIST (1964) stated *T. munkii* is a circumboreal or north temperate species, growing on dung of herbivorous forest animals, particularly on elk (*Alces*), sometimes on roe deer, hare, capercaillie, and horse, it has been recorded several times from this area, usually on elk dung (MORAVEC, 1968; BOOTH, 1982; ERIKSSON, 1992). We have also found one record from New Zealand on dung of an unspecified animal (BELL, 1983). Ours is probably the first report of this species from a temperate region.

As also stated in the key below, *T. munkii* differs from *T. minuta* (Fuckel) N. Lundq. in having narrower asci and smaller spores, with non-prominent germ pores and a gelatinous sheath constricted at the septum rather than constricted at the sides of the latter, whereas it is distinguishable from *T. lundqvistii* N. Heine & P. Welt, a recently erected species collected from elk (*Alces*) dung (WELT & HEINE, 2007), by the larger spores ($15\text{--}18 \times 4.5\text{--}5.5\text{ }\mu\text{m}$ in *T. lundqvistii*). It also differs from *T. bisporula* (H. Crouan & P. Crouan) Munk in having smaller spores with cells easily separable from each other at maturity. A worldwide key to *Trichodelitschia* spp. has been suggested by WELT & HEINE (2007).

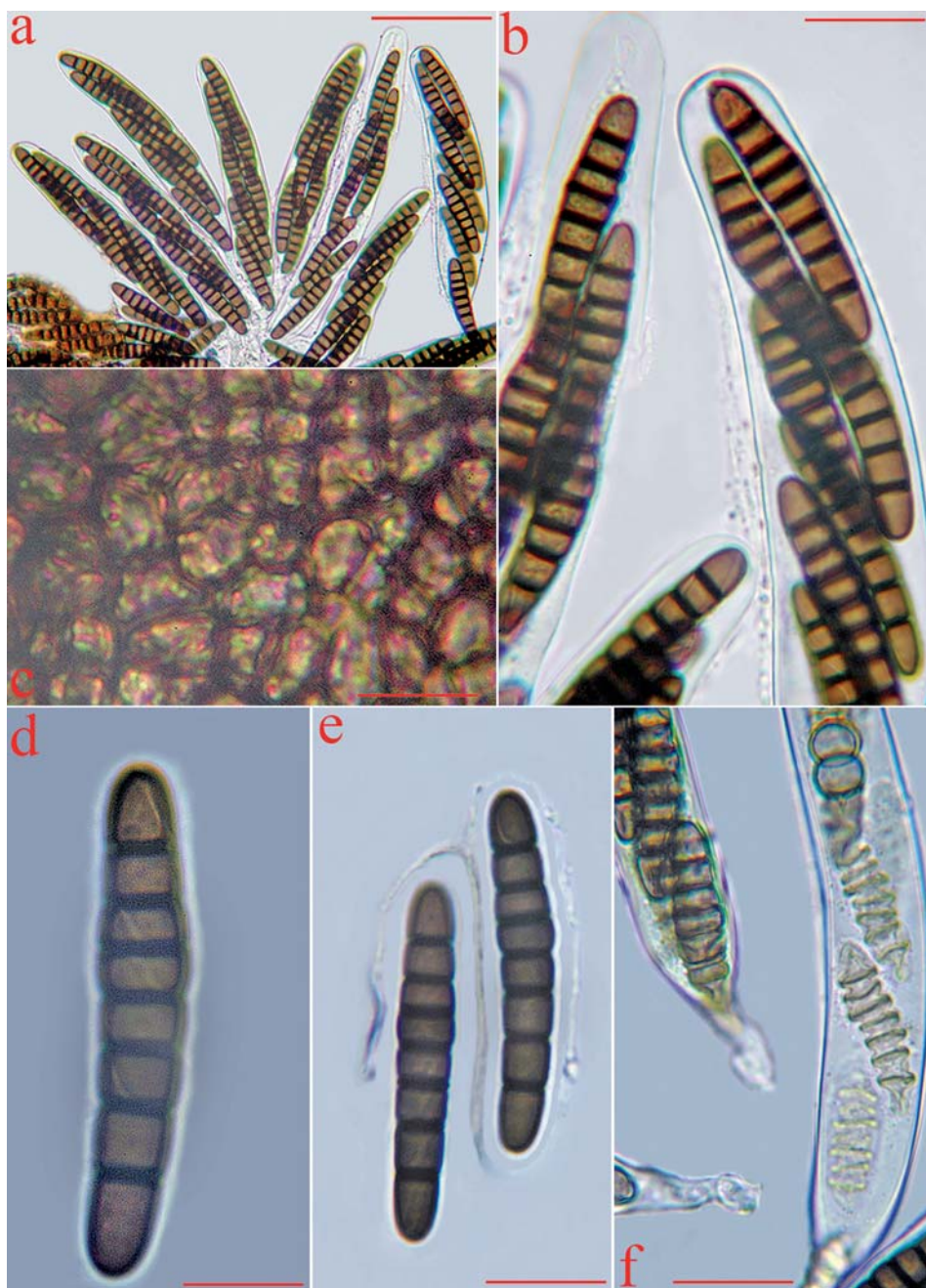


Fig. 7 – *Sporormiella minipascua*

Photos – F. DOVERI

a: asci with mature spores; b: apices of asci with spores; c: exoperidial cells; d-e: mature spores; f: bases of asci with immature spores.

Scale bars: a = 50 μ m; b-c = 15 μ m; d = 10 μ m; e = 13 μ m; f = 25 μ m.

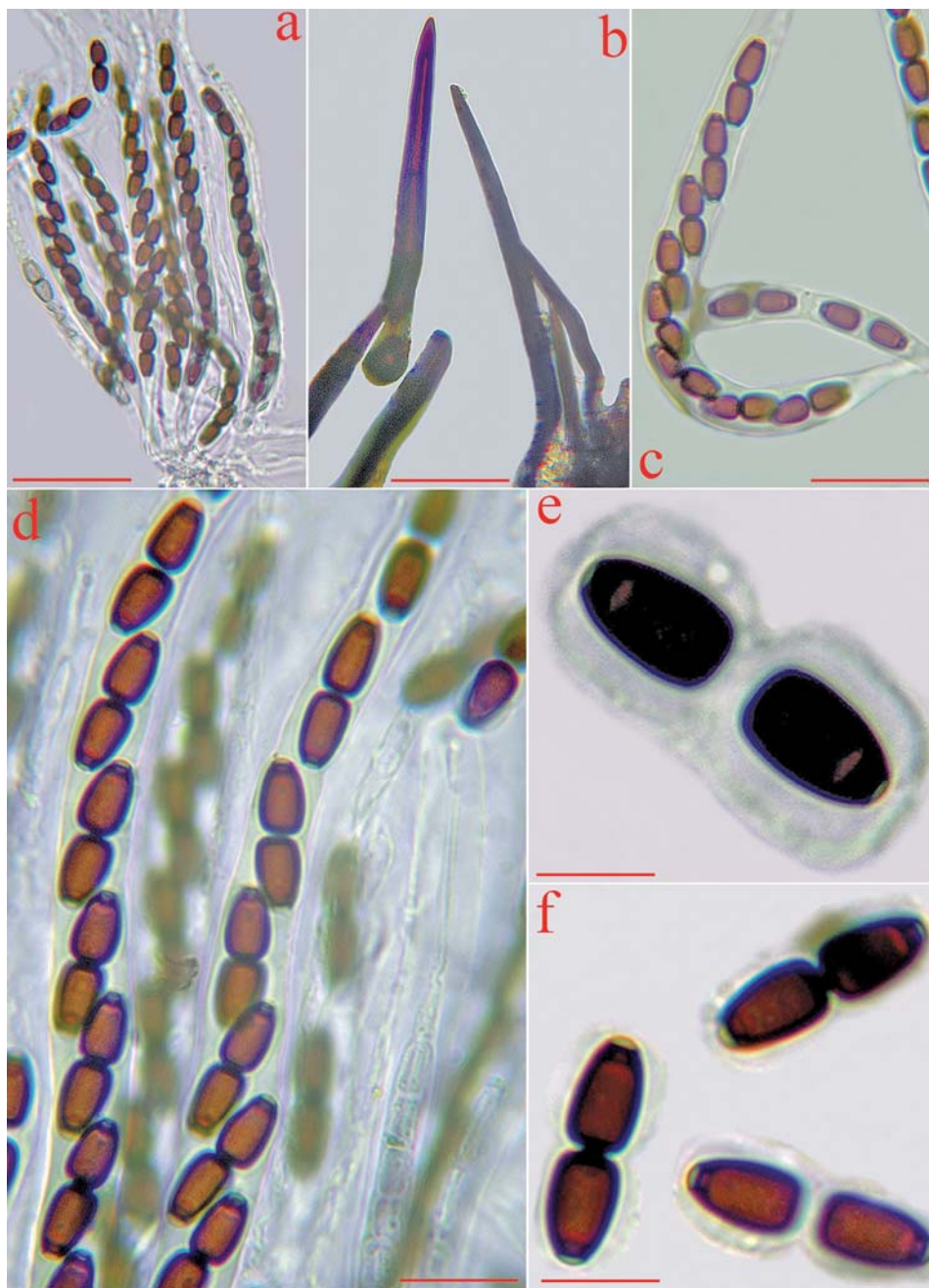


Fig. 8 – *Trichodelitschia munkii*

Photos – F. DOVERI

a, c-d: 8-spored asci with mature spores; b: apical setae; e-f: free mature spores.

Scale bars: a = 40 μ m; b = 25 μ m; c = 20 μ m; d = 15 μ m; e = 7 μ m; f = 10 μ m.

Key to the Italian species of *Trichodelitschia*.

- 1) Spores $21.5\text{--}24.5 \times 8\text{--}9.5 \mu\text{m}$, with a prominent germ pore at each end and a gelatinous sheath constricted at the sides of septum. *T. minuta* (Fuckel) N. Lundq.
1*) Spores $17\text{--}19 \times 6\text{--}7 \mu\text{m}$, with slightly flattened germ pores and a gelatinous sheath constricted at the septum. *T. munkii*

Acknowledgements

The author is grateful to Mike Richardson for his suggestions and correction of the English text. He also thanks A. Bizzi and D. Garofoli for providing him with a share of the material described in this article.

Bibliographic references

- AHMED, S. I., & ASAD, F. 1969. — Coprophilous fungi of west Pakistan. Part III. *Journal of Scientific and Industrial Research*, 12, p. 239-243.
- AHMED, S. I., & CAIN, R. F. 1972. — Revision of the genera *Sporormia* and *Sporormiella*. *Canadian Journal of Botany*, 50, p. 419-477.
- ANGEL, K., & WICKLOW, D. T. 1975. — Relationships between coprophilous fungi and fecal substrates in a Colorado grassland. *Mycologia*, 67, p. 63-74.
- ARX, J. A. (von), & STORM, P. K. 1967. — Über einige aus dem erdboden isolierte, zu *Sporormia*, *Preussia* und *Westerdykella* gehörende Ascomyceten. *Persoonia*, 4 (4), p. 407-415.
- BELL, A. 1983. — *Dung Fungi. An illustrated guide to coprophilous fungi in New Zealand*. Wellington, Victoria University Press, 88 p.
- BELL, A. 2005. — *An illustrated guide to the coprophilous Ascomycetes of Australia*. CBS Biodiversity Series 3, x + 172 p.
- BOOTH, T. 1982. — Taxonomic notes on coprophilous fungi of the Arctic: Churchill, Resolute Bay, and Devon Island. *Canadian Journal of Botany*, 60, p. 1115-1125.
- BRETON, A. 1965. — Champignons coprophiles des départements du Lot, du Puy-de-Dôme et du Finistère. *Bulletin de la Société mycologique de France*, 81, p. 607-622.
- CAILLEUX, R. 1971. — Recherches sur la mycoflore coprophile centrafricaine. Les genres *Sordaria*, *Gelasinospora*, *Bombardia* (Biologie-Morphologie-Systématique) Écologie. *Bulletin de la Société mycologique de France*, 87 (3), p. 461-567.
- CAIN, R. F. 1934. — Studies of coprophilous Sphaeriales in Ontario. *University of Toronto Studies, Mycol. Ser.*, 38, p. 1-126.
- CAIN, R. F. 1961. — Studies of coprophilous Ascomycetes - VII. *Preussia*. *Canadian Journal of Botany*, 39, p. 1633-1666.
- CALVIELLO, B. O. 1973. — Contribución al estudio de Ascomycetes Argentinos. I. *Comunicaciones del Museo Argentino de ciencias naturales "Bernardino Rivadavia", Botánica*, 2 (7), p. 31-39.
- CALVIELLO, B. O. 1976. — Las especies argentinas de "*Melanospora*" Cda. *Revista del Museo Argentino de ciencias naturales "Bernardino Rivadavia"*, 5 (4), p. 93-103.
- CANNON, P. F., & HAWKSWORTH, D. L. 1982. — A re-evaluation of *Melanospora* Corda and similar Pyrenomyces, with a revision of the British species. *Botanical Journal of the Linnean Society*, 84, p. 115-160.
- CHANG, J.-H., & WANG, Y.-Z. 2005. — The genus *Cercophora* (Lasiosphaeriaceae) in Taiwan. *Fungal Science*, 20 (1-2), p. 19-25.
- CHMIEL, M. A. 1977. — Nowe stanowiska koprofilnych workowców w południowo-wschodniej Polsce. *Annales Universitatis Mariae Curie-Skłodowska, sect. C*, 32 (5), p. 87-95.
- CRIBB, A. B. 1994. — New records of fungi on dung from Cape York Peninsula, Queensland. *Proceedings of the Royal Society of Queensland*, 104, p. 19-24.
- DENNIS, R. W. G. 1981. — *British Ascomycetes*. 2nd ed. Vaduz, J. Cramer, 585 p.
- DOGUET, G. 1955. — Le genre *Melanospora*. *Le Botaniste*, 9, p. 1-313.
- DOVERI, F. 2004a. — *Fungi Fimicoli Italici*. Trento, A.M.B., Fondazione Studi Micologici, 1104 p.

- DOVERI, F. 2004b. — *Podospora alexandri*, una nuova specie fimicola dall'Italia. *Rivista di Micologia*, 47 (3), p. 211-221.
- DOVERI, F. 2005. — *Sporormiella hololasia*, a new hairy species from Italy. *Sporormiella hololasia*, una nuova specie pelosa dall'Italia. *Rivista di Micologia*, 48 (1), p. 31-41.
- DOVERI, F. 2006. — Nuove segnalazioni di Onygenales coprofile dall'Italia. New records of coprophilous Onygenales from Italy. *Rivista di Micologia*, 49 (3), p. 245-266.
- DOVERI, F. 2007b. — *Sporormiella gigantea* comb. nov., una nuova definizione di *Sporormiella ovina* s. S.I. Ahmed & Cain, nom. amb. *Sporormiella gigantea* comb. nov., a redefinition of *Sporormiella ovina* s. S.I. Ahmed & Cain, nom. amb. *Rivista di Micologia*, 50 (1), p. 43-55.
- DOVERI, F. 2008a. — Aggiornamento sul genere *Chaetomium* con descrizione di alcune specie coprofile, nuove per l'Italia. An update on the genus *Chaetomium* with descriptions of some coprophilous species, new to Italy. *Pagine di Micologia*, 29, p. 1-60.
- DOVERI, F. 2008b. — A bibliography of *Podospora* and *Schizothecium*, a key to the species, and a description of *Podospora dasypogon* newly recorded from Italy. *Pagine di Micologia*, 29, p. 61-159.
- DOVERI, F. 2008c [2007]. — An updated key to coprophilous Pezizales and Thelebolales in Italy. *Mycologia Montenegrina*, X, p. 55-82.
- DOVERI, F., & COUÉ, B. 2008a. — A new variety of coprophilous *Schizothecium* from France. *Documents mycologiques*, XXXIV (135-136), p. 1-14.
- DOVERI, F., & COUÉ, B. 2008b. — On two new taxa of *Thecotheus*. *Documents mycologiques*, XXXIV (135-136), p. 15-40.
- DOVERI, F., GRANITO, V. M., & LUNGHINI, D. 2005. — Nuovi ritrovamenti di *Coprinus* s.l. fimicoli in Italia. New findings of fimicolous *Coprinus* s.l. in Italy. *Rivista di Micologia*, 48 (4), p. 319-340.
- ELIADES, L. A., CABELLO, M. N., & VOGET, C. E. 2006. — Contribution to the study of alkalophilic and alkali-tolerant ascomycota from Argentina. *Darwiniana*, 44 (1), p. 64-73.
- ERIKSSON, O. E. 1992. — *The non-lichenized pyrenomycetes of Sweden*. Lund, SBT, 208 p.
- FRIES, E. M. 1823. — *Systema Mycologicum*. Vol. 2. Gryphiswaldiae, p. 620.
- FURUYA, K., & UDAGAWA, S.-I. 1972. — Coprophilous Pyrenomycetes from Japan – II. *The Journal of general and applied microbiology*, 18, p. 455-467.
- FURUYA, K., & UDAGAWA, S.-I. 1973. — Coprophilous Pyrenomycetes from Japan III. *Transactions of the Mycological Society of Japan*, 14, p. 7-30.
- GRIFFITHS, D. 1899. — Contributions to a better knowledge of the Pyrenomycetes - I: a study of miscellaneous species. *Bulletin of the Torrey Botanical Club*, 26, p. 432-444.
- GRIFFITHS, D. 1901. — The North American Sordariaceae. *Memoirs of the Torrey Botanical Club*, 11, p. 1-134.
- HANLIN, R. T., & GOH, T.-K. 1993. — Icones Ascomycetum Venezuelae: *Melanospora zamiae*. *Mycotaxon*, 49, p. 167-174.
- JENG, R. S., LUCK-ALLEN, E. R., & CAIN, R. F. 1977. — New species and new records of *Delitschia* from Venezuela. *Canadian Journal of Botany*, 55, p. 383-392.
- KOWALSKI, D. T. 1968. — Morphology and cytology of *Preussia isomera*. *Botanical Gazette*, 129 (2), p. 121-125.
- KRUG, J. C. 1989. — *Periamphispورا*, a new genus of the Sordariaceae. *Mycologia*, 81 (3), p. 475-479.
- KRUG, J. C. 1995. — The genus *Fimetariella*. *Canadian Journal of Botany*, 73, p. 1905-1916.
- KRUG, J. C., & CAIN, R. F. 1974. — New species of *Hypocpra* (Xylariaceae). *Canadian Journal of Botany*, 52, p. 809-843.
- LORENZO, L. E. 1992. Contribución al estudio de Pyrenomycetes “sensu lato” (Ascomycotina) coprófilos del Parque Nacional Nahuel Huapi (Argentina) III. *Boletín de la Sociedad Argentina de Botánica*, 28 (1-4), p. 183-193.
- LUCK-ALLEN, E. R., & CAIN, R. F. 1975. — Additions to the genus *Delitschia*. *Canadian Journal of Botany*, 53, p. 1827-1887.
- LUMBSCH, H. T., & HUHNDORF, S. M. 2007. — Outline of Ascomycota – 2007. *Myconet*, 13, p. 1-58.
- LUNDQVIST, N. 1964. — The Genus *Trichodelitschia* in Sweden. *Svensk Botanisk Tidskrift*, 58 (1), p. 267-272.
- LUNDQVIST, N. 1972. — Nordic Sordariaceae s. lat. *Symbolae Botanicae Upsalienses*, 20 (1), p. 1-374.
- LUNDQVIST, N. 1997. — Fungi fimicolae exsiccati. *Thunbergia*, 25 (4-5), p. 1-25.
- LUNDQVIST, N. 2000. — *Hypocpra*. In : HANSEN, L., & KNUDSEN, H. (ed.). *Nordic Macromycetes*. Vol. 1. Ascomycetes. Copenhagen, Nordsvamp, 309 p.

- MATSUSHIMA, T. 1975. — *Icones microfungorum a Matsushima lectorum*. Kobe, Matsushima, 209 p. + 415 tav.
- MORAVEC, Z. 1968. — Remarks on some coprophilous fungi in Norway. *Česká Mykologie*, 22 (4), p. 301-309.
- MUKERJI, K. G. 1970. — Fungi of Delhi: III. Some interesting Ascomycetes. *Mycopathologia et Mycologia Applicata*, 42 (3-4), p. 277-280.
- MUNK, A. 1948. — Pyrenomycetes collected in the peninsula Mols, Jutland. *Dansk Botanik Arkiv*, 12 (11), p. 1-19.
- MUNK, A., 1957. — Danish Pyrenomycetes. *Dansk Botanik Arkiv*, 17, p. 1-491.
- NAGY, L. 2006. — *Coprinus doverii* sp. nov., a unique new species of subsection *Setulosi* from central and southern Europe. *Mycotaxon*, 98, p. 147-151.
- PETERSEN, R. H. 1960. — Some soil and coprophilous fungi from the South Pacific area. *Mycologia*, 52, p. 552-556.
- RICHARDSON, M. J. 2001. — Diversity and occurrence of coprophilous fungi. *Mycological Research*, 105 (4), p. 387-402.
- RICHARDSON, M. J. 2004. — Coprophilous fungi from Iceland. *Acta Botanica Islandica*, 14, p. 77-102.
- RICHARDSON, M. J., & WATLING, R. 1997. — *Keys to fungi on dung*. London, British Mycological Society, 68 p.
- SETH, H. K. 1968. — Coprophilic Ascomycota from Germany. *Nova Hedwigia*, 16, p. 495-499.
- SPGAZZINI, C. 1878. — Fungi coprophili veneti. *Pugillus I. Michelia*, 1 (2), p. 222-238.
- SPGAZZINI, C. 1899. — Fungi Argentini Novi v. critici. *Anales del Museo Nacional de Buenos Aires*, ser. 2, 3, p. 81-365.
- TÓTH, S. 1965. — Data to the knowledge on the coprophilous microscopic fungi in Hungary II. *Annales Historico-Naturales Musei Nationalis Hungarici, pars bot.*, 57, p. 149-157.
- VALLDOSERA, M., & GUARRO, J. 1992. — Estudios sobre hongos coprófilos aislados en España. XVII. Ascomycotina. *Boletín de la Sociedad micológica de Madrid*, 17, p. 19-37.
- VEGNI, G., & MONTEMARTINI CORTE, A. 1963. — *Honoratia* n. gen. di Dothideales ad aschi polisporici. *Atti dell'Istituto Botanico e del Laboratorio Crittogamico dell'Università di Pavia*, ser. 5, 20, p. 170-182.
- WELT, P., & HEINE, N. 2006. — Beiträge zur Kenntnis coprophiler Pilze (2) - Nungbewohnende Pilze Thüringens: Teil 1. Hoher Artenreichtum coprophiler Pilze in einem Schutzgebiet - Indikator für eine intakte Natur? *Boletus*, 29 (2), p. 81-92.
- WELT, P., & HEINE, N. 2007. — Beiträge zur Kenntnis coprophiler Pilze (1). Teil 2: Coprophile Pilzfunde im Chemnitzer NSG „Um den Eibsee“ auf verschiedenen Substraten sowie Ergänzungen zu den Pilzfunden auf Angusrind-Dung. *Zeitschrift für Mykologie*, 73 (2), p. 213-244.



Important note

This text is the English version of an article published in French language. This version is distributed only by an electronic matter. Due to the changes of page composition between the two versions, only the original French version is the reference for the real pagination, by example for the new combinations proposed by the author.