Coprophilous discomycetes from the Tuscan archipelago (Italy). Description of two rare species and a new *Trichobolus*

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With this article the author begins a survey of coprophilous Ascomycetes and Basidiomycetes from the Tuscan archipelago, explaining the reasons why this area has so scarcely been explored so far. After collecting samples of wild rabbit dung and amazing at their productiveness, he describes and analyzes two uncommon discomycetes, and introduces a new species of *Trichobolus* with 8-spored asci. Finally he stresses the difficulties in distinguishing the 8-spored species of *Trichobolus* from some *Lasiobolus* and provides a key to them.

Key words – *Chalazion erinaceum* – *Coprotus dextrinoideus* – dextrinoid setae – rabbit dung – *Trichobolus dextrinoideosetosus*.

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Introduction

My survey on coprophilous fungi from Italy has resulted in several articles since 1995 (Cacialli et al.) and culminated in a monograph on Basidiomycetes and Ascomycetes (Doveri 2004) and in its update (Doveri 2011). My studies have covered wide areas of most Italian regions, but some are still unexplored either for fortuitous reasons or especially for restrictions of free admission.

The Tuscan archipelago is one of the less explored areas for fungal diversity. It is formed of seven major islands and some isles and rocks placed in the nothern Tirreno sea between Corsica island and the shore of the Tuscan provinces of Livorno and Grosseto (Fig. 1). It is the largest marine park of the Mediterranean Sea and also of Europe, an area where almost 60,000 sea- and 20,000 land hectares are protected. Some islands (Capraia, Elba, Giglio) are strongly anthropized and live particularly on summer tourism, but to others (Gorgona, Pianosa) the admission is partly or not allowed at all, as places of penal colonies, and for others the environmental protection is absolute and the admission permits hard to obtain. Some animal species are endemic to these islands (e.g. the Montecristo goat and viper) and many live in a wild state. Only recently I have begun studying dung of numerous wild rabbit colonies living in Giglio Island, being amazed at their very high fungal production. According to Richardson (2001) the species richness has a mean number of 9–12 per mammalian dung sample (rabbit included), but I have a slightly lower mean for my Italian samples, so the 18 species (17 ascomycetes, 1 basidiomycete) that I found on a sample of wild rabbit dung are an exception. Three discomycetes particularly drew my attention, *Chalazion erinaceum* as a second collection worldwide, *Coprotus dextrinoideus* as a rare species new to Italy, and *Trichobolus* sp., whose unique morphology allows me to

Fig. 1 – Map of the Tuscan archipelago.

erect a new taxon and call it *Trichobolus dextrinoideosetosus*. The aim of this work is to lay the base of a new survey on coprophilous fungi from the Tuscan archipelago, describing and analysing thoroughly two very rare fungi, and defining a new species and its relationships within *Trichobolus*, and with some 8-spored species of *Lasiobolus*.

Methods

Most isolates were obtained from wild rabbit droppings collected in Giglio Island and placed in a non-sterilised damp chamber, following the methods suggested by Richardson & Watling (1997) and Richardson (2001), slightly modified by Doveri (2004).

Cultured material, incubated at room temperature (18–25 °C) under natural light but not exposed to direct sunlight, was examined every day and for 5 weeks with a stereomicroscope.

Mature ascomata of *Coprotus dextrinoideus* and *Trichobolus dextrinoideosetosus* were noticed after 18–20 days' incubation and of *Chalazion erinaceum* a few days later. Ascomata were picked up from dung by a sterile needle.

Microscopic examinations were carried out on fresh material, mounting specimens in water, Melzer's reagent, Congo red and methyl blue or cotton blue in lactic acid. Spore length and breadth were calculated in water on 20 ascospores at least, discharged from mature asci, excluding ornamentations from measurements. The notation [52, 5, 1] means that 52 ascospores were measured from 5 specimens of 1 collection. Q means the quotient of spore length divided by the breadth in face view.

The collections have been preserved as dried material and slides in the author's personal herbarium (CLSM) or in MCVE. Herbarium abbreviation follows Holmgren & Holmgren (1998).

Taxonomy

Chalazion erinaceum Doveri, Y.Z. Wang, Cacialli & Caroti, Rivista di Micologia 41: 204, 1998. Figs 2–11
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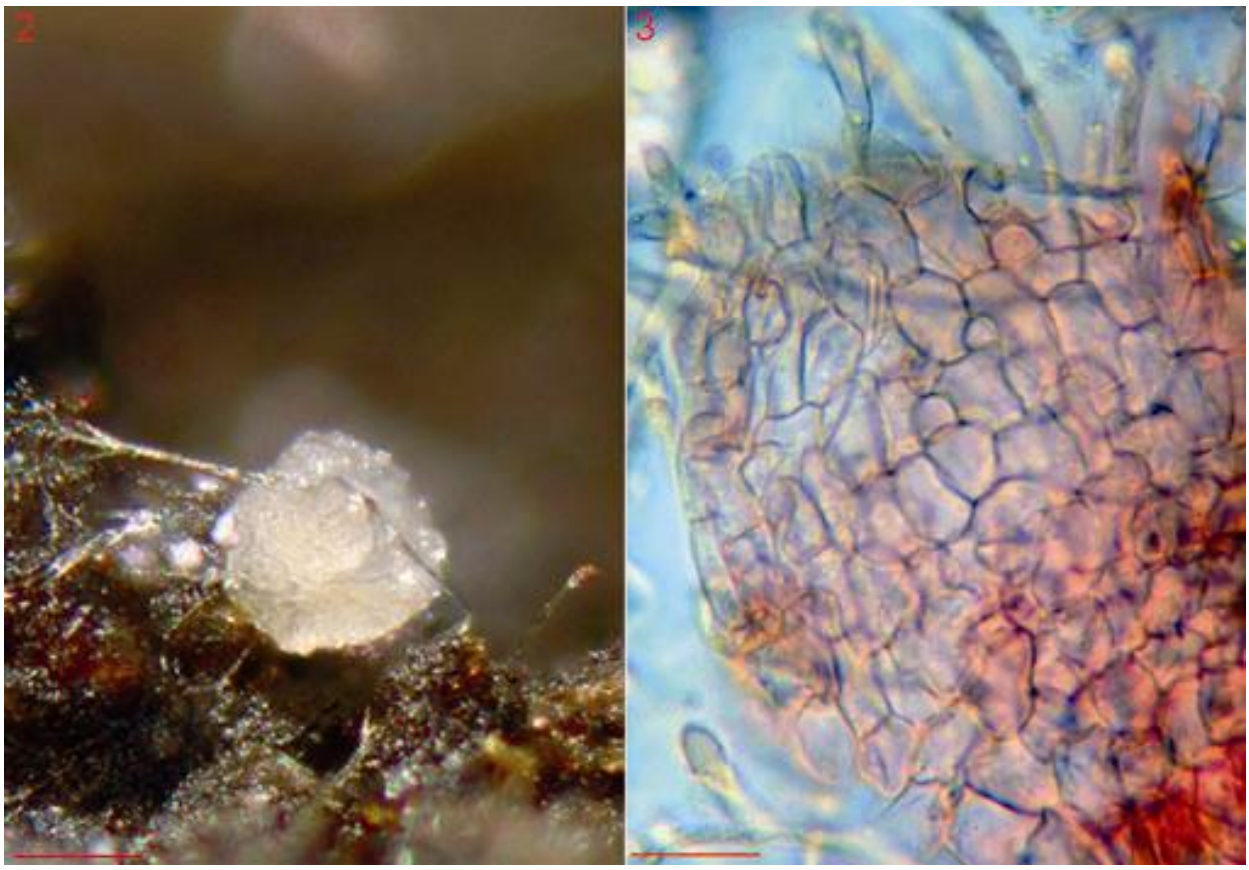
Ascomata 75–150 µm diam., 50–100 µm high, barrel-shaped to subcylindrical and translucent white at first, becoming discoidal or pulvinate and dirty whitish, membranous,



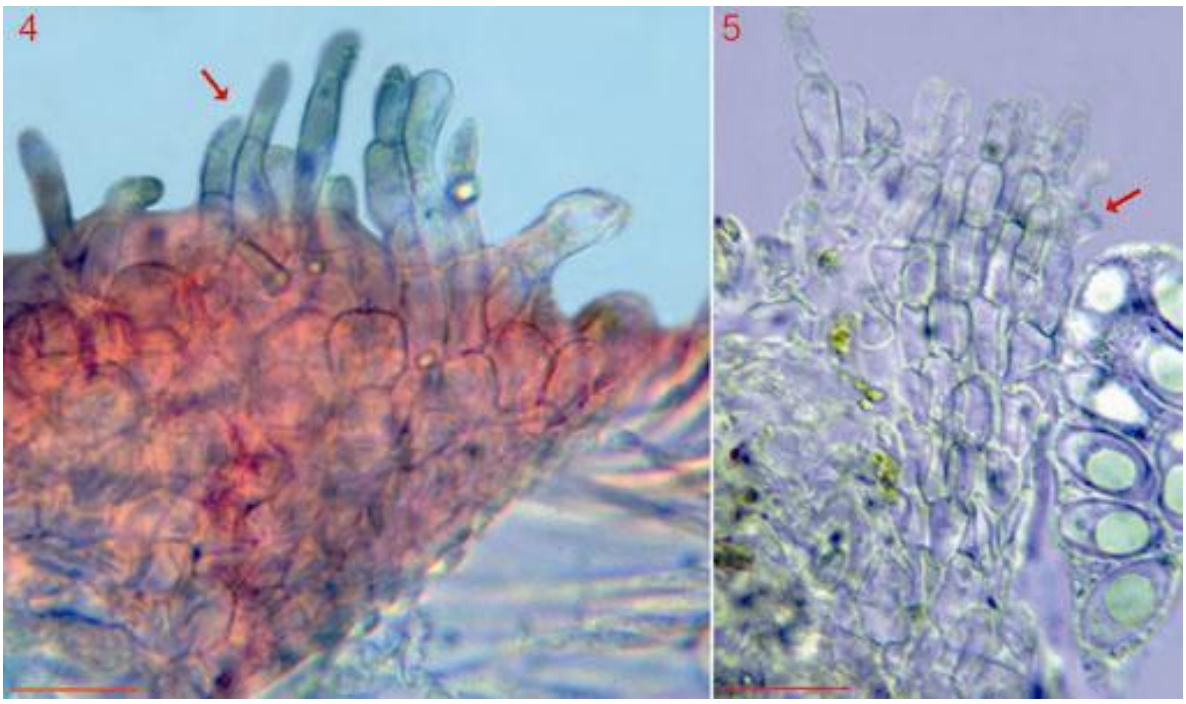
Figs 2–3 – *Chalazion erinaceum*. CLSM 05998 bis. **2** Ascoma on dung **3** Detail of excipulum in Congo red. Bars 2 = 50 µm, 3 = 15 µm.

smooth, with an even, scarcely to well differentiated margin and a hymenial surface of the same colour, dotted at maturity due to the protruding asci. Medullary excipulum not well differentiated from the ectal excipulum, the latter strongly cyanophilic and congophilous, a *textura angularis* of hyaline, thick-walled, polygonal cells, 4–9 µm diam., a *textura prismatica* towards the margin, with cylindrical cells perpendicular to the hymenial surface, often globose or clavate at the ends. Paraphyses 1–2 µm diam., cylindric–filiform, somewhat enlarged at the tips, up to 4 µm diam., simple or sometimes branched at the base, often slightly curved at the apex, septate, containing some hyaline vacuoles, slightly exceeding the asci. Asci 60–70 × 25–35 µm, broadly clavate, non-amyloid, congophilous, unitunicate, operculate, 8-spored, thick-walled, rounded at the apex, abruptly contracted below in a short, lobate stalk. Ascospores bi- or triseriate inside the asci, (13.5–) 14–17.5 (–18) × (9.5–) 10–12 µm (ornamentations excluded), ellipsoidal (Q = 1.33–1.76; average Q = 1.47; 1.57 in the second collection), hyaline, thick-walled, lacking a gelatinous perisporium, smooth and usually with a large oil drop or with a droplet and a larger drop when young, becoming verrucose with roundish, strongly cyanophilic, isolated or sometimes merging warts, 0.5–2.5 µm diam., 0.5–2 µm high.

Material examined – Italy, Grosseto, Punta Ala, 0 m a.s.l., eleven gregarious, superficial specimens on hedgehog dung in culture, F. Doveri and F. Bersan, 2.4.98, 318.3–Punta Ala, MCVE 706; Grosseto, Giglio Island, Castello, 400 m a.s.l., about twenty specimens on wild rabbit dung in culture, S. Rum, 22.3.12, 352.4–Giglio, CLSM 05998 bis.

Notes – The description above concerns my second collection from wild rabbit dung, which has morphological features practically superimposable to the first, except for the somewhat larger spore length/breadth ratio (average Q = 1.57 versus 1.47).

The microscopic features of *C. erinaceum* were drawn freehand in the protologue (Doveri et al. 1998) and in a subsequent work (Doveri 2004), and only a black and white photo of one ascus with



Figs 4–5 – *Chalazion erinaceum*. CLSM 05998 bis. **4** Terminal cells of excipulum in Congo red (arrow) **5** Textura prismatica of the marginal excipulum (water). Bars 4 = 10 µm, 5 = 20 µm.

ascospores was also shown in the protologue. This second finding gives me the opportunity to provide the first detailed colour photos both of macro- and microscopic features.

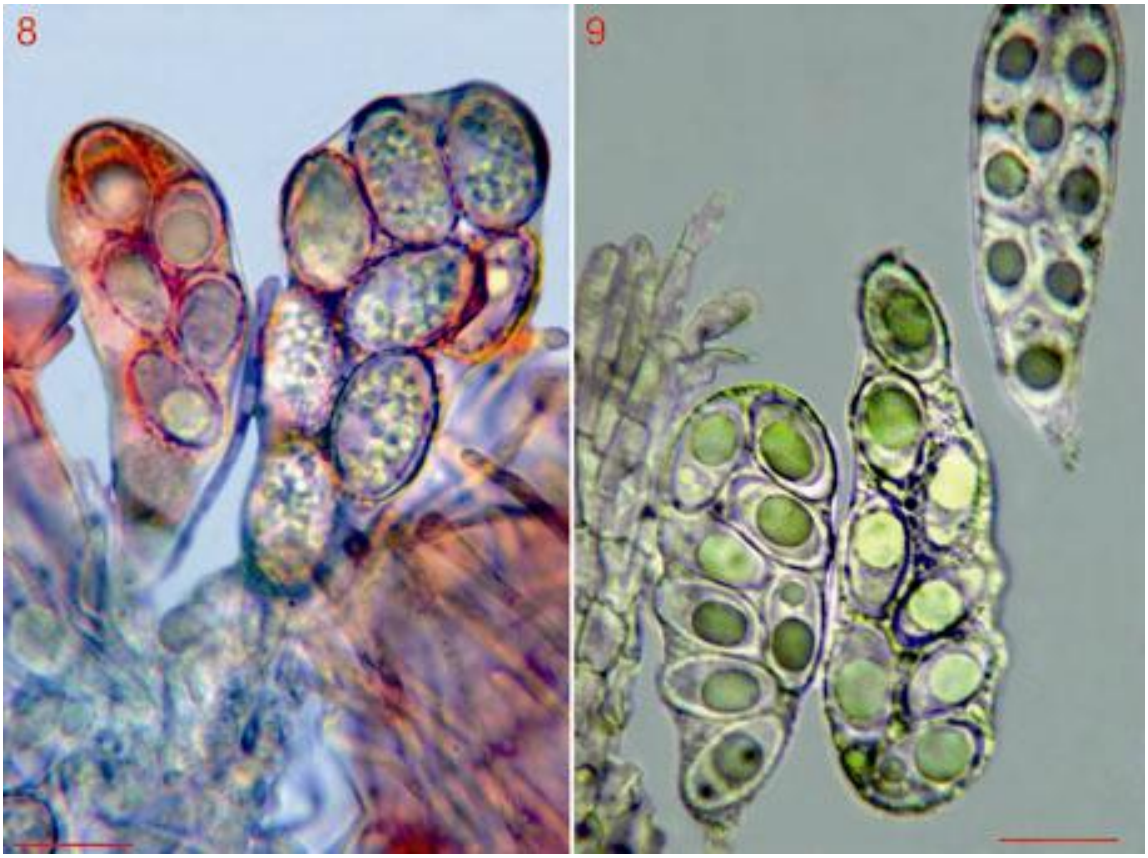
The very rare *C. erinaceum* (only two findings in 15 years), appears to be restricted to a small area of Tuscany (Italy). It is the only coprophilous *Chalazion* and the latest published species after *C. sociabile* Dissing & Sivertsen (1975) and *C. helveticum* Dissing (1980), a key to which is provided in my previous works (Doveri et al. 1998, Doveri 2004). I also refer to these papers and Lumbsch & Huhndorf (2010) for the taxonomic position of *Chalazion* Dissing & Sivertsen in Pyronemataceae Corda (Pezizales J. Schröt.).

Coprotus dextrinoideus Kimbr., Luck-Allen & Cain, Can. J. Bot. 50: 962, 1972. Figs 12–20 MB311762

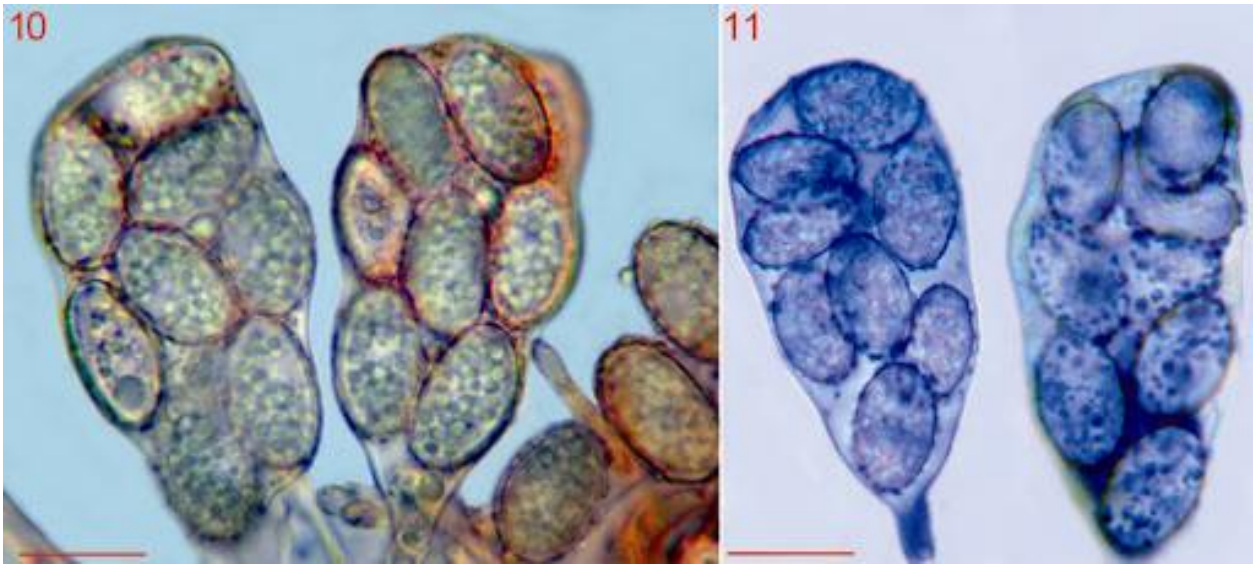
Apothecia sessile, subglobous to subcylindric at first, becoming discoidal, 100–280 µm diam., whitish, soon pale yellow, membranous, smooth, with a darker yellow, slightly prominent margin. Hymenial surface dotted at maturity due to the protruding asci, pale yellow. Subhymenium and medullary excipulum indistinguishable from the ectal excipulum, the latter cyanophilic and strongly dextrinoid, a *textura globulosa* in the lower part of the ascoma, a *textura globulosa-angularis* in the middle, made up of slightly thick-walled, yellowish, polygonal or subglobose cells, 3–10 × 3–8 µm, cylindrical towards the apothecial margin, often somewhat wavy and subcapitate, thick-walled, darker yellow, 7–17 × 3–4 µm. Paraphyses cylindric-filiform, 1–1.5 µm diam., simple or branched (usually at the base), exceeding the asci, septate, containing many pale yellow vacuoles, slightly uncinate, hardly inflated at the tips. Asci slightly congophilous, 8-spored, unitunicate, operculate, non-amyloid, cylindric or broadly cylindric, 80–100 × 16–20 µm, short-stalked, slightly flattened at the apex. Ascopores uniseriate at first, uni– or biseriate later, one–celled, 11–13 (–13.5) × (6.5–) 7–8 (–8.5) µm, ellipsoidal (Q = 1.50–1.76; average Q = 1.62), with subacute ends, thick-walled in the early stages, pale yellow, smooth, containing a large de Bary bubble in aqueous media.

Material examined – Italy, Grosseto, Giglio island, Castello, 400 m a.s.l., about twenty scattered or gregarious, superficial specimens, on wild rabbit dung in a damp chamber culture, S. Rum, 22.3.12, 352.4–Giglio, CLSM 002.12.

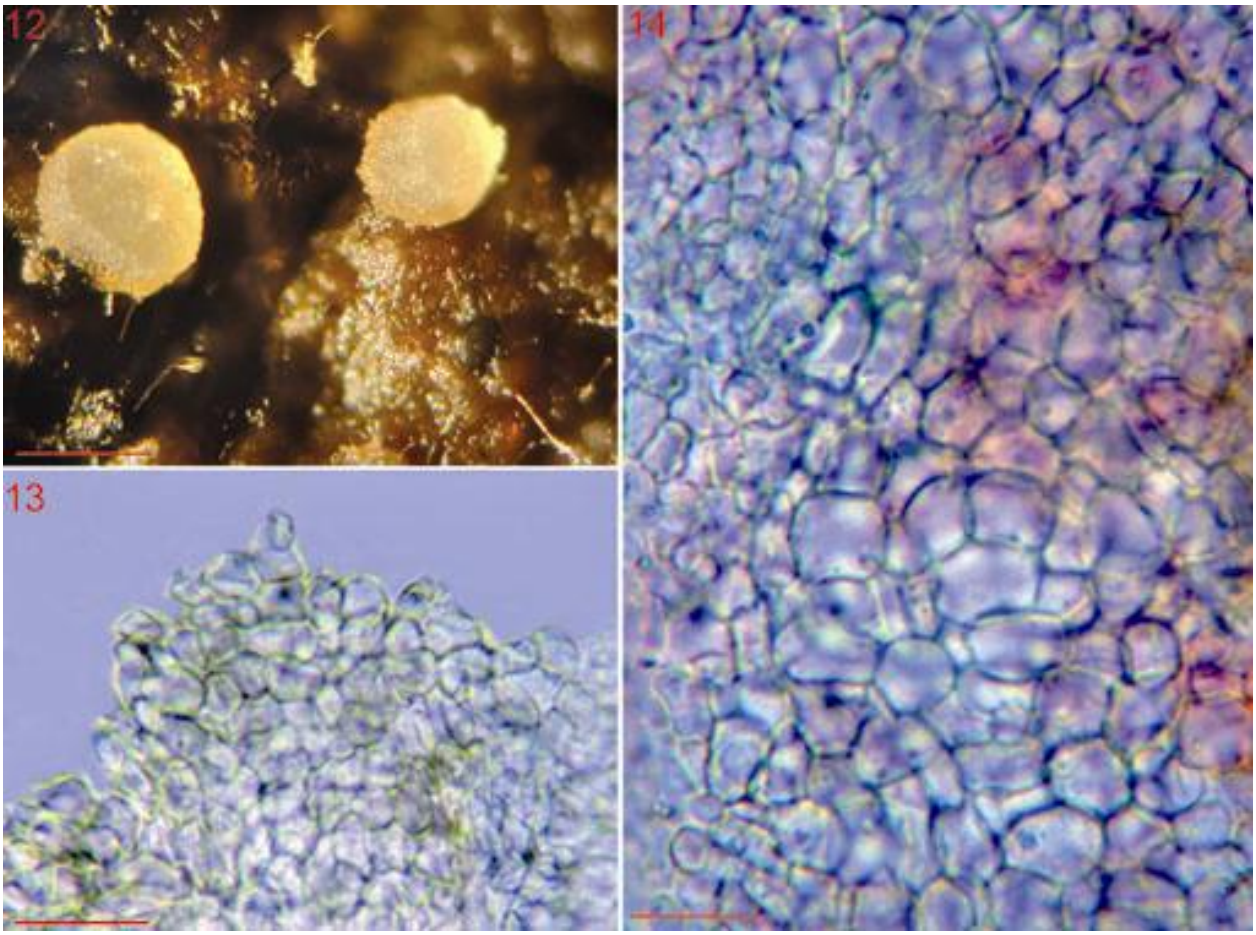
Figs 6–7 – *Chalazion erinaceum*. CLSM 05998 bis. Paraphyses (arrow) mixed with mature and immature asci. Bars = 12 µm.



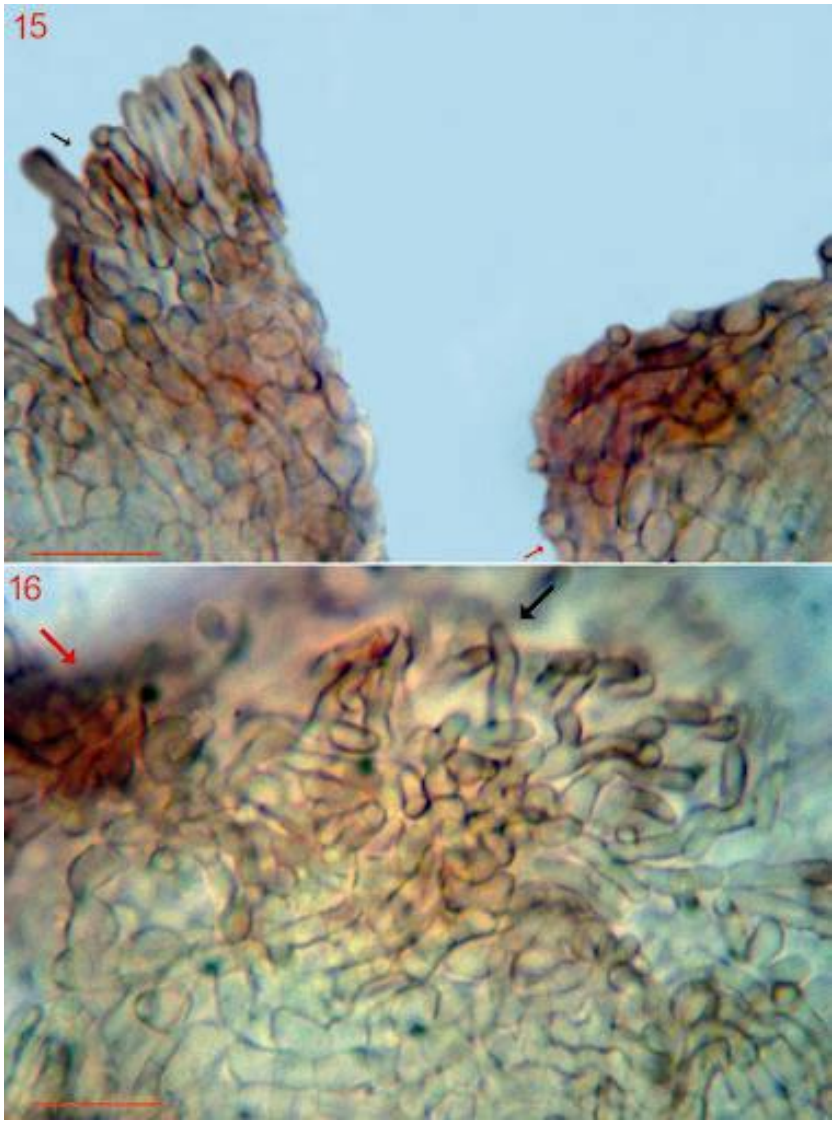
Figs 8–9 – *Chalazion erinaceum*. CLSM 05998 bis. **8** Asci with ascospores in different stages of maturity (Congo red) **9** Immature ascospores inside asci and detail of the marginal excipulum (water). Bars = 12 µm.



Figs 10–11 – *Chalazion erinaceum*. CLSM 05998 bis. **10** Mature ascospores inside asci and some free ascospores (Congo red) **11** Ascospores with strongly cyanophilic warts inside asci (cotton blue in lactic acid). Bars 10 = 12 µm, 11 = 15 µm.



Figs 12–14 – *Coprotus dextrinoideus*. CLSM 00212. **12** Apothecia on dung **13** Yellowish excipular cells (water) **14** Detail of excipulum (Congo red). Bars 12 = 150 µm, 13 = 20 µm, 14 = 15 µm.



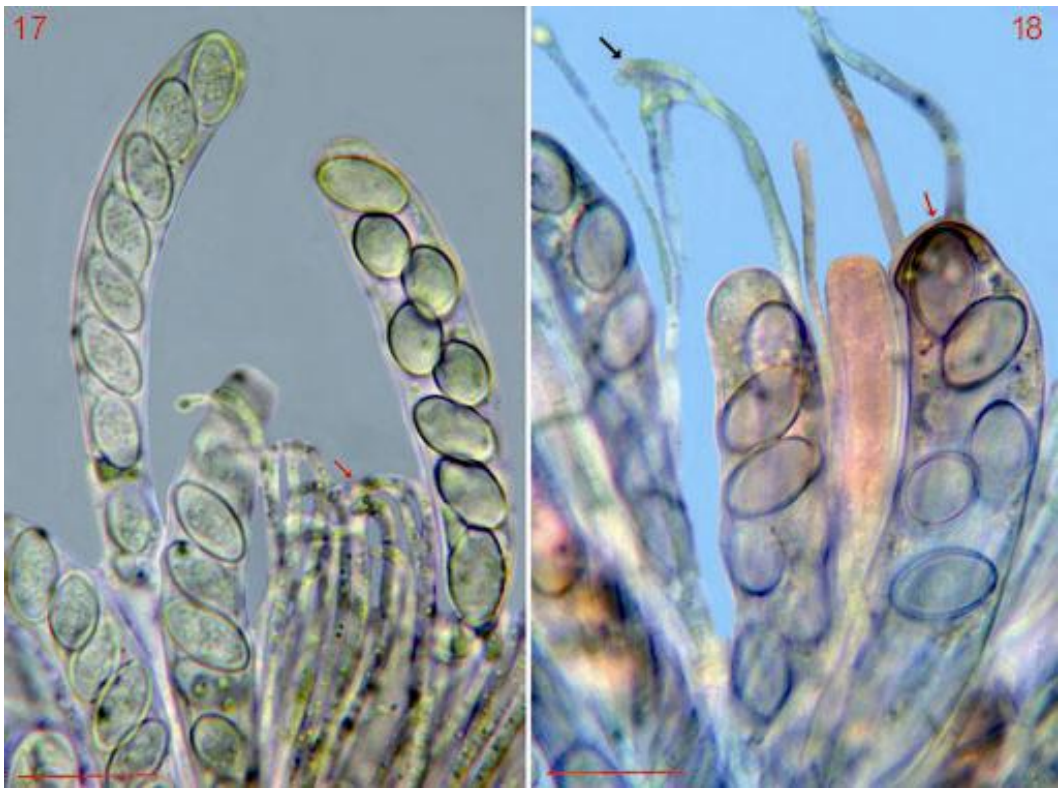
Figs 15–16 – *Coprotus dextrinoideus*. CLSM 00212. **15** Dextrinoid reaction of the middle (red arrow) and marginal (black arrow) excipulum **16** Dextrinoid reaction (red arrow) of the marginal excipulum with wavy terminal cells (black arrow). Bars = 20 µm.

Notes – *Coprotus* [Thelebolales P.F. Cannon, Thelebolaceae (Brumm.) Eckblad] was erected by Korf & Kimbr. (in Kimbrough & Korf 1967) to accommodate coprophilous species with minute, discoidal apothecia, 8 to polyspored, operculate, non-amyloid, congophilous asci protruding at maturity, and hyaline, ellipsoidal ascospores containing a de Bary bubble in aqueous media.

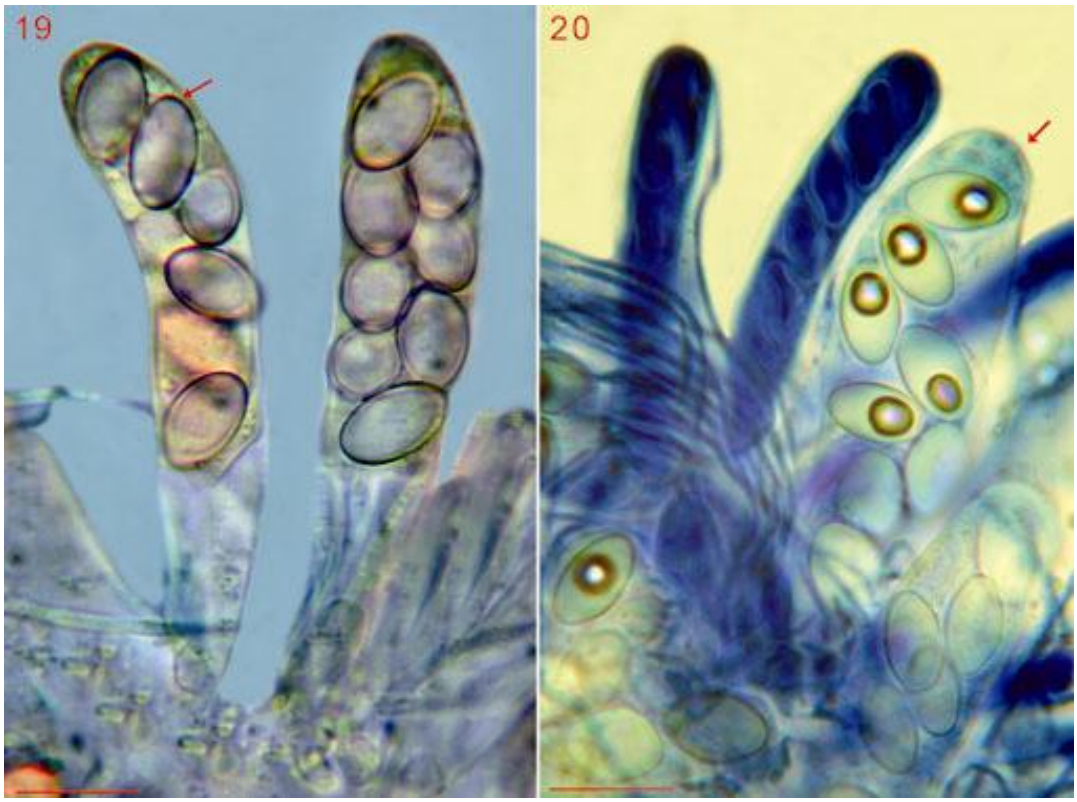
The genus was subsequently monographed by Kimbrough et al. (1972), who accepted and described 18 species, subdivided in two groups, the former with pigmented (yellow to orange) apothecia and paraphyses (containing carotenoids), the latter with whitish apothecia, becoming pale yellow with age or drying, and paraphyses lacking carotenoids. In the latter group a subgroup was recognised with an excipulum (particularly at the margin) of thick-walled, strongly cyanophilic and dextrinoid cells. *C. dextrinoideus* belongs to it.

We described some *Coprotus* spp. from Italy (Cacialli et al. 1996 a, b, Doveri et al. 2000) and I also provided a worldwide dichotomous key to the genus (Doveri 2004), based on Kimbrough et al. (1972) but updated to encompass eight species published after them. Since then no new *Coprotus* sp. has been published.

According to Kimbrough et al. (1972) *C. dextrinoideus* is similar to *C. disculus* Kimbr. et al., but the former has broadly rather than narrowly ellipsoidal ascospores, a more yellow pigmented excipulum with thicker cells

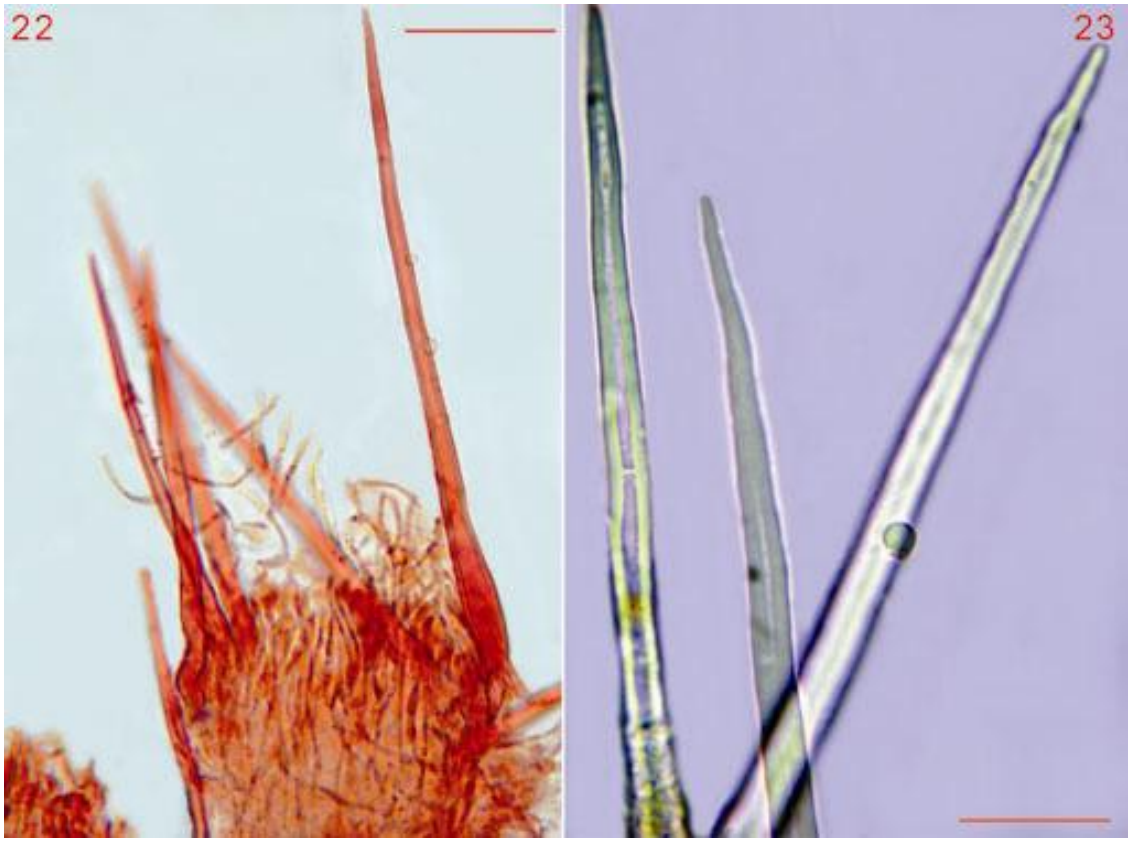


Figs 17–18 – *Coprotus dextrinoideus*. CLSM 00212. **17** Protruding asci in water and apices of paraphyses (arrow) **18** Paraphyses (black arrow) and asci (red arrow) with operculate, slightly flattened apices (Congo red). Bars 17 = 20 µm, 18 = 15 µm.



Figs 19–20 – *Coprotus dextrinoideus*. CLSM 00212. **19** Ascospores with subacute ends (arrow) inside the asci (Congo red) **20** Mature ascus (arrow) with ascospores containing a de Bary bubble in lactic cotton blue. Bars = 15 µm.

Fig 21 – *Trichobolus dextrinoideosetosus*. MCVE 27398. **21** Ascomata on dung. Bar = 200 µm.



Figs 22–23 – *Trichobolus dextrinoideosetosus*. MCVE 27398. **22** Ascoma with straight, pointed setae (Congo red) **23** Apices of setae (water). Bars 22 = 50 µm, 23 = 10 µm.

and longer marginal cells, and paraphyses containing oil drops. We have observed only slightly narrower ascospores in our Italian collections of *C. disculus* (average length/breadth ratio 1.72 versus 1.62), besides we have noticed an additional difference between the two species, i.e. slightly concave, rather than rounded spore ends in *C. dextrinoideus*. This feature was not mentioned in either the protologue or in other publications, but it was drawn by Moyne & Petit (2006–2007) in some ascospores of their collection.

The collection described by Prokhorov & Kutorga (1990) has too narrow asci and small ascospores in comparison with the protologue, whereas the measurements reported by Richardson (2008) for the species he called "cf. *dextrinoideus*" appear to fall in the variability range of the true *C. dextrinoideus*. *C. dextrinoideus* is a rare but widespread species, recorded so far from North- and Central America (Kimbrough et al. 1972), Europe (Prokhorov 1989, 1991, Prokhorov & Kutorga 1990, Kutorga 2000, Moyne 2006, Moyne & Petit 2006) and Middle Asia (Kimbrough et al. 1972, Raitviir & Prokhorov 1988, Abdullah & Alutbi 1994), particularly from cattle dung (Kimbrough et al. 1972, Raitviir & Prokhorov 1988, Prokhorov 1989, Abdullah & Alutbi 1994). Mine is the first record from Italy and from wild rabbit dung.

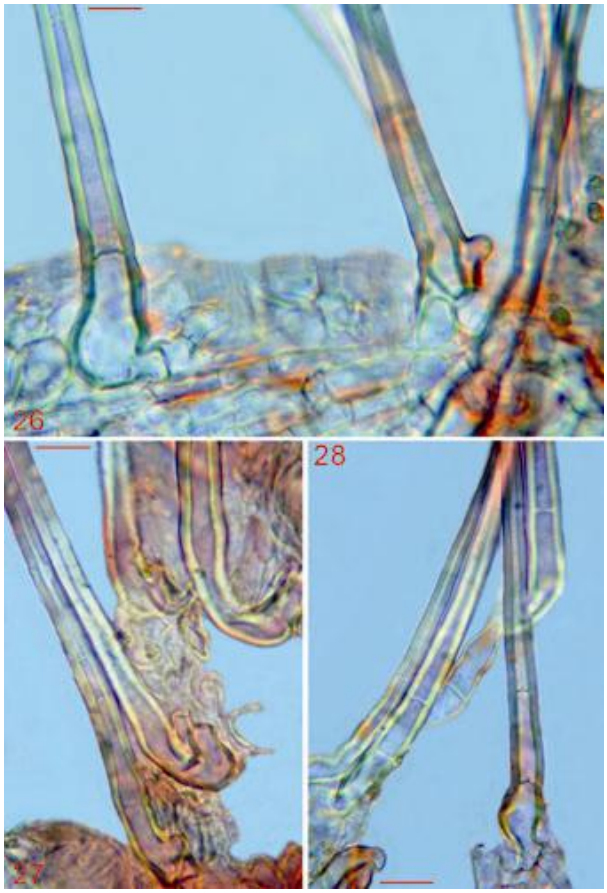
Trichobolus dextrinoideosetosus Doveri, **sp. nov.** Figs 21–39
MB800713

Ascomata cleistohymenial, barrel-shaped to subcylindrical in the early stages, opening in a late stage and becoming shallow-cupulate, membranous, 250–350 µm high, 200–350 µm diam. Outer surface pale yellow, slightly wrinkled, hairy owing to the presence of sparse, pale setae, arising from the middle and upper part of the receptacle, running upwards or sometimes laterally turned. Hymenial surface flat to slightly concave, the same colour, dotted. Margin scarcely differentiated, glabrous. Subhymenium not differentiated from the medullary *excipulum*, the latter very thin, a *textura angularis* of hyaline, thin-walled, polygonal cells, 4–7 × 4–5 µm. Ectal excipulum thin, yellowish, congophilous, not dextrinoid, a *textura angularis* at the lower part of receptacle, formed of comparatively thick–walled, polygonal cells, 8–16 × 5–9 µm, a *textura angularis* to *epidermoidea* in the middle and upper part, sometimes *prismatica* on the flanks of receptacle with cells perpendicular to the hymenial surface. The base is covered with a thick net of hyphoid hairs (rhizoids or anchoring hyphae), hyaline, strongly dextrinoid, very long, flexuous, thin-walled, septate, ramified, sometimes anastomosed, 3–5 µm diam. Hairs 65–175 (–200) × 5–12 µm (at their base), superficial, seta-like, acicular, pointed, usually straight, sometimes slightly curved, pale yellowish, strongly dextrinoid, rarely non-septate, usually with 1–3 (–5) septa, thick-walled (1.5–2.5 µm), with a polymorph, enlarged but rarely slightly bulbous base, sometimes with hints of roots. Paraphyses abundant, exceeding the asci, 1.5–3 µm diam., cylindric-filiform, curved, not or slightly enlarged at the apex, simple or branched at some level, septate, containing pale yellow vacuoles. Asci numerous, non-amyloid, congophilous, 8-spored, 95–120 × (20–) 25–35 µm, claviform, sometimes cylindric-claviform, thick-walled, with a rounded, operculate apex and a short, sometimes lobate stalk. Ascospores [52, 5, 1] 14–18 × 9–11 µm (mean 16 × 10 µm), uniseriate in the early stages, becoming biseriate, one-celled, ellipsoidal (Q = 1.42–177; average Q = 1.57) with roundish poles, smooth, hyaline, thick-walled, with one nucleus and yellowish contents, lacking a gelatinous perisporium, oil drops and de Bary bubbles.

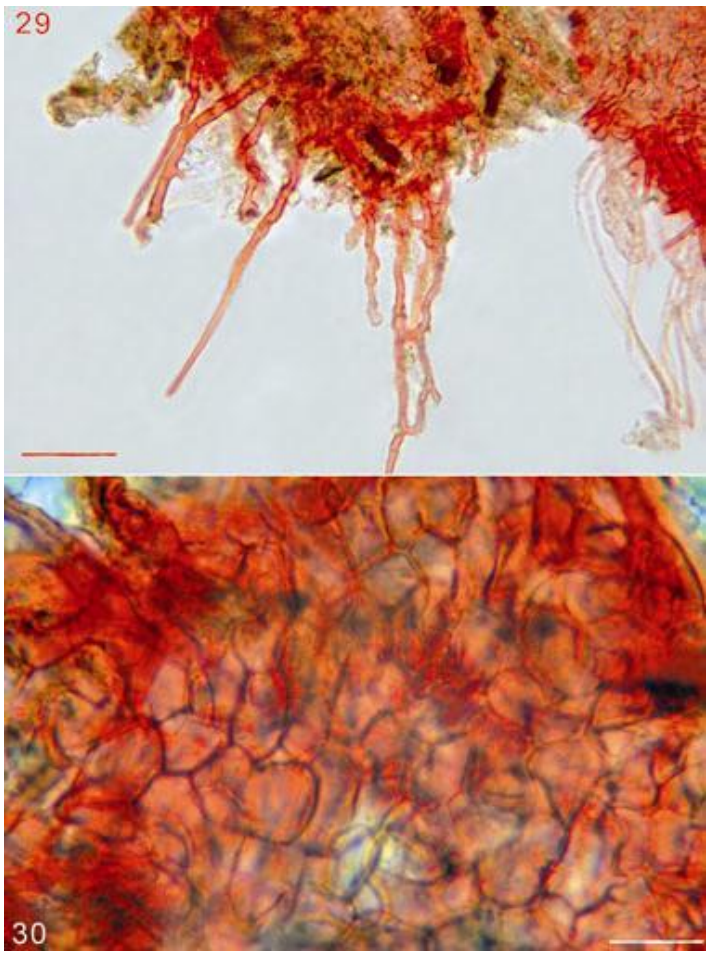
Material examined – Italy, Bolzano, Valle Aurina, 1300 m a.s.l., about forty, superficial, scattered or gregarious specimens on red deer dung in a damp chamber culture, A. Bizzi, 16.7.11, 003.3–Aurina (MCVE 27398, **holotype**); Grosseto, Giglio Island, Castello, 400 m a.s.l., about fifteen scattered specimens on wild rabbit dung in a damp chamber culture, Rum S., 22.3.12, 352.4–Giglio (CLSM 001.12 bis, **paratype**).

Notes – Saccardo (1892) established *Trichobolus* as section (or subgenus) of *Thelebolus* Tode to accommodate species with setulose ascomata, and placed those with glabrous ascomata in section Eu-Thelebolus.

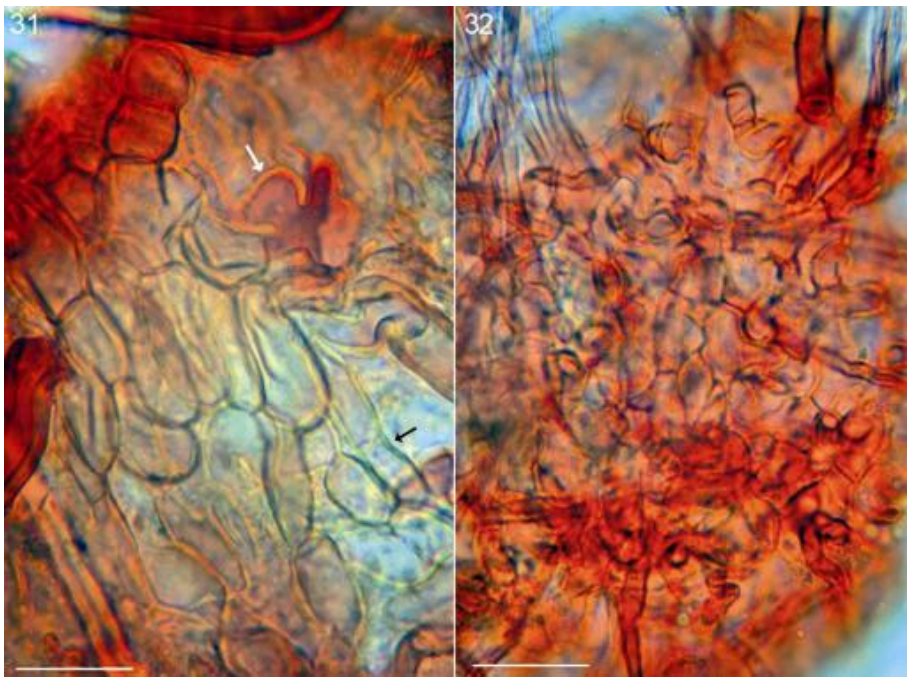
Figs 24–25 – *Trichobolus dextrinoideosetosus*. MCVE 27398. **24** Strongly dextrinoid setae and hyphoid hairs **25** Basal portion of setae (water). Bars = 20 µm.



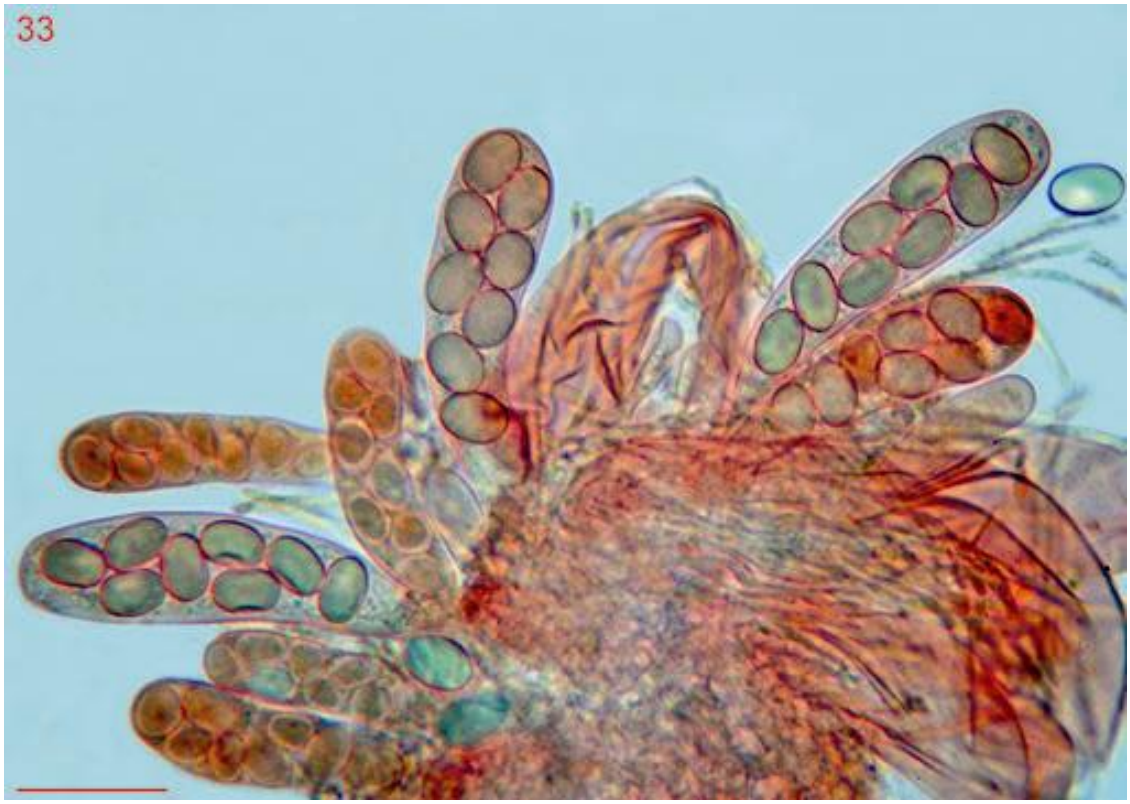
Figs 26–28 – *Trichobolus dextrinoideosetosus*. MCVE 27398. Basal and middle portions of setae (Congo red). Bars 26 = 8 µm, 27–28 = 15 µm.



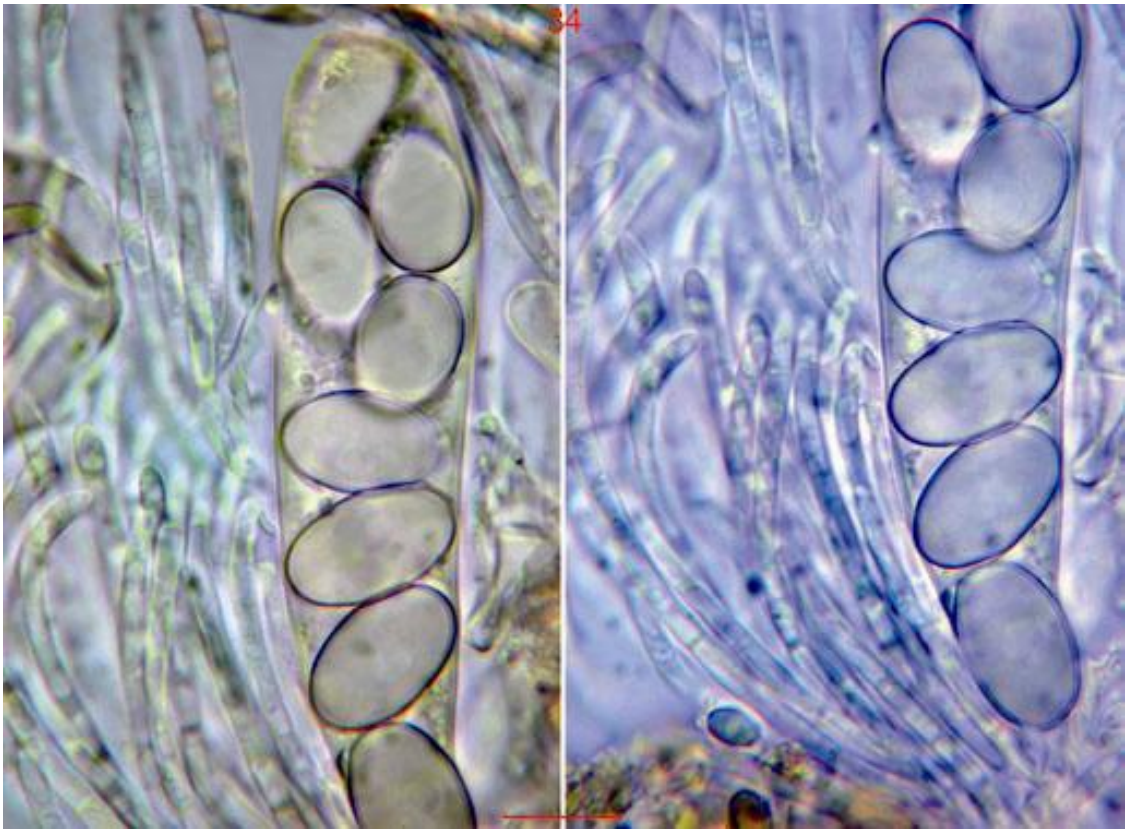
Figs 29–30 – *Trichobolus dextrinoideosetosus* (Congo red). MCVE 27398. **29** Basal hyphoid hairs **30** *Textura angularis* of the basal excipulum. Bars 29 = 40 µm, 30 = 15 µm.



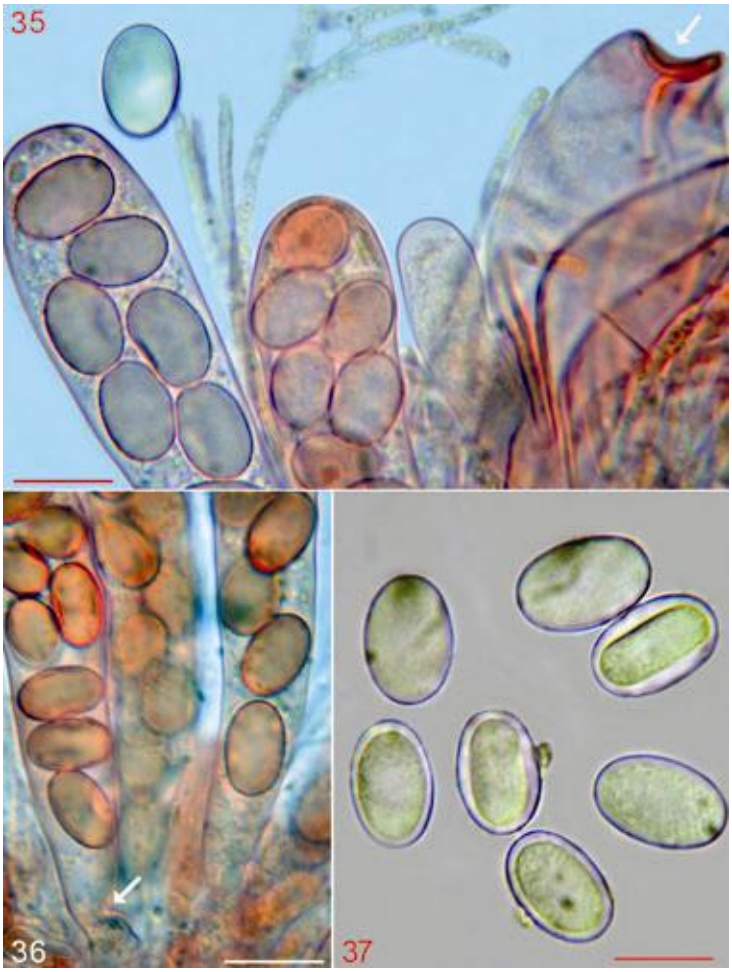
Figs 31–32 – *Trichobolus dextrinoideosetosus* (Congo red). MCVE 27398. **31** *Textura prismatica* of the marginal excipulum (black arrow) with some epidermoid cells (white arrow) **32** Epidermoid stretch of the excipulum. Bars 31 = 15 µm, 32 = 20 µm.



Figs 33 – *Trichobolus dextrinoideosetosus*. MCVE 27398. Overall view of the hymenium (Congo red). Bar = 15 µm.



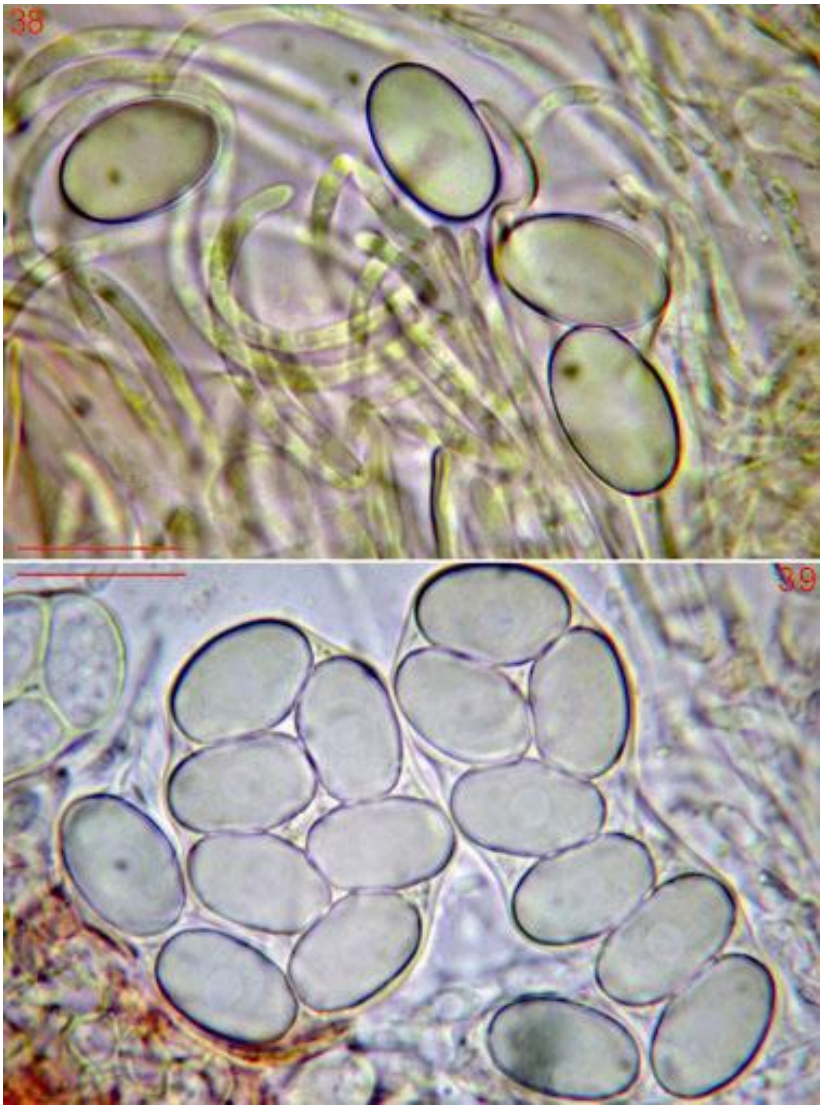
Figs 34 – *Trichobolus dextrinoideosetosus*. CLSM 00112bis. Paraphyses surrounding mature, 8-spored asci with spores biseriate in the upper portion (water). Bar = 12 µm.



Figs 35–37 – *Trichobolus dextrinoideosetosus*. MCVE 27398. (**35**–**36** = Congo red) **35** Paraphyses among operculate asci (arrow) **36** Asci with abruptly contracted bases (arrow) **37** Ascospores with yellowish contents (water). Bars 35–36 = 15 µm, 37 = 10 µm.

Section *Trichobolus* included *Thelebolus zukalii* Heimerl [= *Trichobolus zukalii* (Heimerl) Kimbr.], which shares with Eu–Thelebolus (*Thelebolus stercoreus* Tode : Fr., *T. nanus* Heimerl) growth on dung and minute, subspherical ascomata with a single, ovoidal, poly-spored ascus. Kimbough & Cain (in Kimbrough & Korf 1967) raised *Trichobolus* to genus rank in Theleboleae [= Thelebolaceae (Brumm.) Eckblad] and widened its definition placing *T. pilosus* (J. Schröt.) Kimbr., a species with three poly-spored asci and uniseptate setae, beside *T. zukalii* and *T. sphaerosporus* Kimbr., both uniascal and with polyseptate setae. In their concept *Trichobolus* is very close to *Lasiobolus* Sacc., with which it shares smooth ascospores usually with a de Bary bubble, and non-amyloid, congophilous asci, but *Lasiobolus* differs in having multiascal ascomata with operculate, cylindrical, 8– to poly-spored asci, ellipsoidal rather than spherical to broadly ellipsoidal ascospores, and ventricose, non-septate setae.

The establishment of *Trichobolus octosporus* (Krug 1973) further expanded the boundaries of the genus, which since then also encompasses a species with bowl-shaped ascomata, numerous, operculate, cylindrical, 8-spored asci, scarcely septate (usually 1 septum, rarely 2–3), sometimes non-septate setae, and a dextrinoid excipulum. These morphological features, including a dextrinoid reaction of the excipulum also observed in some *Lasiobolus* spp. (Krug 1973), place *Trichobolus* still closer to *Lasiobolus*, with the result that it is rather complex to separate the 8-spored species of the former from those of the latter. The differences appear to be restricted to the seta shape, which is usually ventricose and non-septate in *Lasiobolus*, simply enlarged and usually polymorphous at the base, and septate in *Trichobolus*.

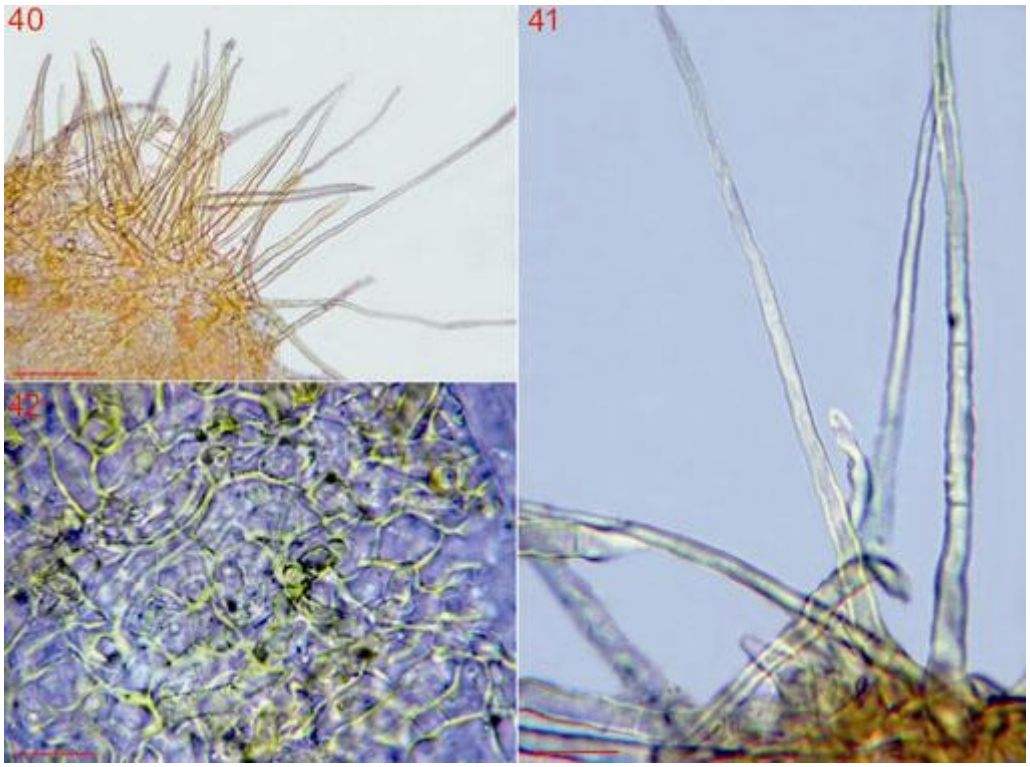


Figs 38–39 – *Trichobolus dextrinoideosetosus*. (water) **38** Free ascospores and paraphyses with yellowish contents (CLSM 00112bis) **39** Mature, uninucleate spores inside the asci (MCVE 27398). Bars = 38 = 18 µm, 39 = 15 µm.

Doveri (2004) described *T. octosporus* from Italy, remarking that his collection from wild rabbit dung shows a spore size matching the protologue (collection from deer dung), but also broadly ellipsoidal, rarely subglobose ascospores (Q = 1.08–1.26; average Q = 1.19) rather than "subspherical or occasionally subellipsoidal" (Q not mentioned in the original diagnosis). I have re-examined the specimens of this collection and taken some photos (Figs 40–46), which clearly prove its ascospores are less ellipsoidal than those drawn freehand in my previous work (Doveri 2004). They also prove that particularly the immature ascospores of my collection and those observed in polar view fully match the ascospores drawn in the protologue.

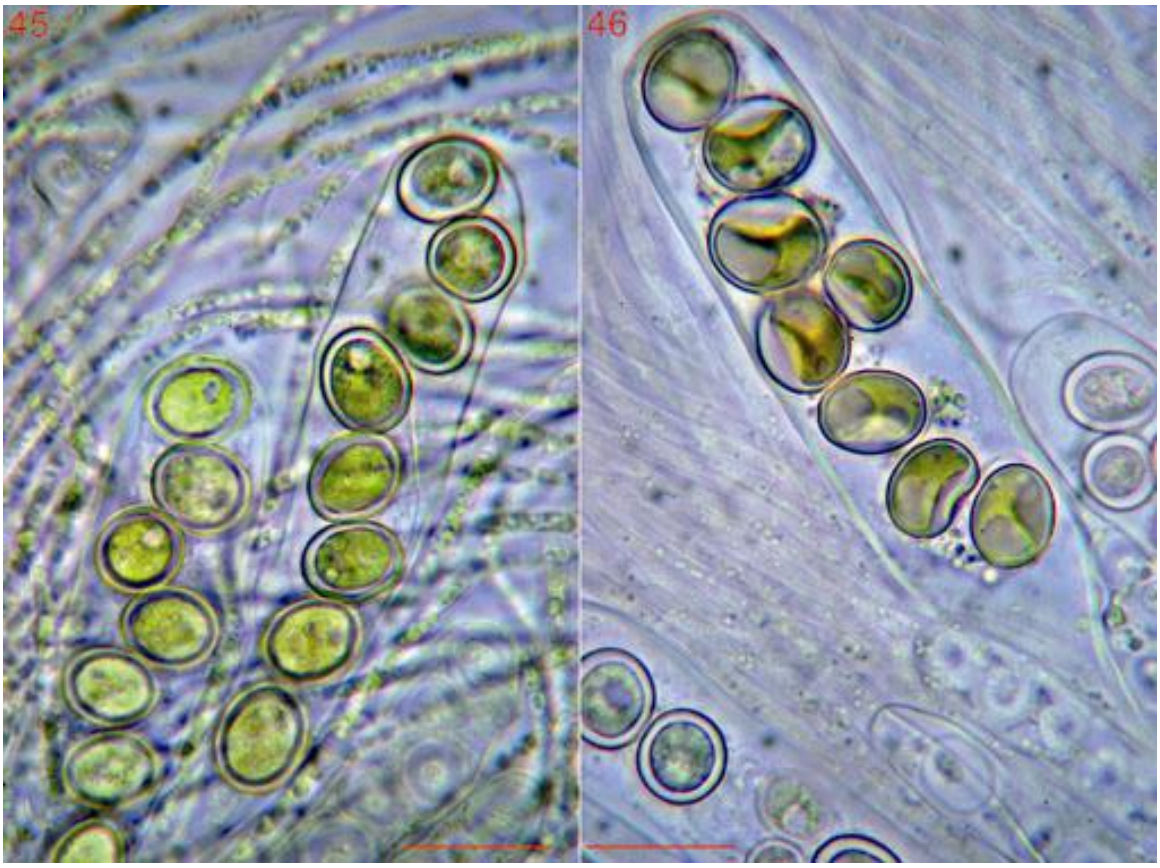
Doveri (2004) also confirmed the difficulty in distinguishing the 8-spored *Trichobolus* spp. from some *Lasiobolus*, particularly from *L. trichoboloides* R.S. Khan & J.L. Bezerra, and provided a key which also included *T. vanbrummelenii*, the latest published 8-spored *Trichobolus* sp. (Valldosera & Guarro 1988) after *T. octosporus*. Since then no new *Trichobolus* species has been erected.

The shallow-cupulate ascomata are the first useful feature to distinguish *T. dextrinoideosetosus* from the uniascal, poly-spored species of *Trichobolus*. Other primary features of the new species are the operculate, 8-spored asci, the ellipsoidal ascospores with a wide range of their size, and the strongly dextrinoid walls of setae and basal hyphoid



Figs 40–42 – *Trichobolus octosporus*. CLSM 06898. **40** Apical part of an ascoma with pointed setae **41** Setae **42** Detail of excipulum. Bars 40 = 40 µm, 41 = 10 µm, 42 = 15 µm.

Figs 43–44 – *Trichobolus octosporus*. CLSM 06898. **43** Overall view of the hymenium **44** Subglobose to broadly ellipsoidal ascospores inside asci. Bars 43 = 40 µm, 44 = 12 µm.



Figs 45–46 – *Trichobolus octosporus*. CLSM 06898. **45** Paraphyses overarching asci **46** Asci with spores in different stages of maturity. Bars = 15 µm.

hairs. The other two recognised *Trichobolus* spp. with 8-spored asci clearly differ from *T. dextrinoideosetosus* in having globose to subglobose ascospores (broadly ellipsoidal at most in *T. octosporus*), *T. vanbrummelenii* also in its ovoidal ascomata and asci (much more similar to those of the oligoascal, poly-spored species), and ascospores with a de Bary bubble (Valldosera & Guarro 1988), *T. octosporus* also in having smaller (12–13 × 10–12 µm) ascospores. Unlike what I previously stated (Doveri 2004), the species described and drawn freehand by Prokhorov (1987) and Raitviir & Prokhorov (1988) under *T. octosporus* is closer to, or even the same as my new species.

The ellipsoidal ascospores of *T. dextrinoideosetosus* place it even nearer to several 8-spored *Lasiobolus* spp. Only two species (*L. monascus* Kimbr., *L. trichoboloides*), however, have both septate (1–2 basal septa) and non-septate setae, like those of some *Trichobolus* spp.: the morphological features of *L. monascus* (Kimbrough 1974) are similar to the uniascal species of *Trichobulus*, whereas *L. trichoboloides* can be compared with *T. dextrinoideosetosus* as having similar minute, shallow–cupulate ascomata, narrow setae, cylindric-claviform asci, and ellipsoidal ascospores. But *L. trichoboloides* differs in having *Lasiobolus*–like setae (non– or uni–septate and with a subventricose base), smaller asci and ascospores (8.5–11.5 × 6–9 µm), and a constant rather than occasional *textura prismatica* at the margin, perpendicular to the hymenial surface (Bezerra & Kimbrough 1975). Instead, I notice a greater likeness between *T. dextrinoideosetosus* and *Lasiobolus cuniculi*, but the latter has larger ascomata on average, longer and wider, subventricose, non–septate setae, and basically larger ascospores (18–24 × 12–14 µm, Bezerra & Kimbrough 1975) with a de Bary bubble. *Lasiobolus lasioboloides* Marchal has a spore size and a seta shape and size similar to *T. dextrinoideosetosus*, but also broadly ellipsoidal or subglobose ascospores and non-septate setae (Marchal 1885, Bezerra & Kimbrough 1975).

The wide range of the spore size in *T. dextrinoideosetosus* has been proven comparing my two Italian collections, the second of which, from wild rabbit dung, shows larger ascospores on average, (17–) 17.5–20.5 (–21) × (10.5–) 11–13 µm, mean 18.8 × 11.7 (Q = 1.48–1.71; Q = 1.61) [34, 3, 1]. The second collection has also asci up to 150 µm, and setae up to 250 µm long, but an identical basic structure. As no gap in spore size between the two collections has been observed and the length/breadth ratio is practically the same, I firmly believe that both are representative of the new species.

The dextrinoid reaction of the excipulum has been observed in all *Lasiobolus* spp. (Bezerra & Kimbrough 1975) and in *Trichobolus octosporus* (Krug 1973), but I have not seen it in *T. dextrinoideosetosus*. I have observed, on the contrary, strongly dextrinoid setae and hyphoid hairs in the new species, a feature that, as far as I know, has not been mentioned in any other *Trichobolus* or *Lasiobolus* sp., and that has influenced my choice of its specific name.

After Krug (1973) and Doveri (2004) I can conclude that *T. dextrinoideosetosus* belongs to a group of species which can be regarded as transitional forms between *Trichobous* and *Lasiobolus*, and I think that their still uncertain taxonomic position (van Brummelen 1998) possibly will be clarified through extensive phylogenetic studies. For the time being I think it useful to provide an updated key based on morphological features.

Key to *Trichobolus* and similar species of *Lasiobolus* with 8-spored asci:

1) Ascomata ovoidal or subglobose. Asci poly-spored, ovate to pyriform, 1–3 in number.....2
1*) Ascomata usually shallow-cupulate or bowl-shaped at maturity. Asci 8-spored, several in number.....4

2) Asci 3 in number. Ascospores subglobose to broadly ellipsoidal. Setae with a basal septum.....*T. pilosus*
2*) Only 1 ascus in each ascoma. Setae usually poly–septate.....3

3) Ascospores globose or subglobose (9–10 × 8.5–9 µm; average Q = 1.07 in my Italian collections) .....*T. sphaerosporus*
3*) Ascospores subglobose to predominantly broadly ellipsoidal (11.5–12.5 × 9.5–10 µm; average Q = 1.19 in my Italian collections.....*T. zukalii*

4) Ascomata and asci ovoidal. Ascospores spherical, 13–19 µm diam. Setae 2–5 septate.....*T. vanbrummelenii*
4*) Ascomata more flattened at maturity. Asci cylindric–claviform. Ascospores different in shape. 5

5) Ascospores ellipsoidal (average Q = > 1.50).....6
5*) Ascospores subglobose to broadly ellipsoidal.....8

6) Ascospores 8.5–11.5 × 6–9 µm with a de Bary bubble. Setae non-septate or with a basal septum. Excipulum of a *textura prismatica* perpendicular to the hymenial surface.....*L. trichoboloides*
6*) Ascospores larger. Excipulum occasionally and only partly of a *textura prismatica*.....7

7) Ascospores 18–24 × 12–14 µm, with a de Bary bubble. Setae subventricose, non-septate.....*L. cuniculi*
7*) Ascospores 14–20.5 × 9–13 µm, without a de Bary bubble. Setae slightly enlarged at their polymorphous base, septate.....*T.* Dextrinoideosetosus

8) Ascospores 12–13 × 10–12 µm, without a de Bary bubble. Setae 0–3-septate.....*T. octosporus*
8*) Ascospores 13–18 × 9–13.5 µm, with a de Bary bubble. Setae non-septate.....*L. lasioboloides*

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