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Notes on taxa of *Coprinus* subsection *Alachuani* from Hungary

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Abstract: 14 taxa of *Coprinus* subsection *Alachuani* are reported from Hungary, most of them as new for the country. Taxonomic notes are added to the species with information on their distribution. *Coprinus gonophyllus*, *C. filamentifer*, *C. tigrinellus*, and *C.* aff. *phaeosporus* are described in detail and illustrated.

Zusammenfassung: 14 Taxa von *Coprinus* Subsektion *Alachuani* werden aus Ungarn aufgelistet, die meisten von ihnen als neu für das Land. Taxonomische Erläuterungen und Angaben zur Verbreitung werden gegeben. *Coprinus gonophyllus*, *C. filamentifer*, *C. tigrinellus* und *C.* aff. *phaeosporus* werden genau beschrieben und illustriert.

In many European countries the genus *Coprinus* is among the worst known groups due to taxonomic and methodological difficulties. In Hungary intensive collecting and recording of *Coprinus* taxa (along with other hard-going genera like *Psathyrella* and *Conocybe*) has been started to improve the very limited knowledge about distribution and taxonomy of these taxa. In the present paper some results of the taxonomically problematic group, *Coprinus* subsect. *Alachuani*, are presented.

Materials and methods

Fruitbodies collected in the field were dried as soon as possible in silicagel. The macroscopical descriptions were made on fresh material. Drawings of microscopic details are based on microphotographs of dried material rehydrated in 10 % NH_4OH; spore measurements are based on at least 20 samples from each collection. The interpretation of microscopic details follows standard conventions (VELLINGA 1988). The abbreviation L. N. refers to the author. All collections are deposited in the private herbarium of the author.

Taxonomic considerations

For practical reasons, in the present paper the classical concept of coprinoid fungi, i.e. treating all traditionally recognised *Coprinus* species in the collective genus *Coprinus*, and all *Psathyrella* taxa in that genus, is followed, despite admitting correctness of the new subdivision proposed by REDHEAD & al. (2001).

The state-of-the-art knowledge about phylogenetic relationships within subsection *Alachuani* is very limited. Phylogenetic analysis of Genbank and own sequences (NAGY, unpubl.) suggests a polyphyly of the group, but at the moment this seems to be

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a result of misidentification of the Genbank specimens and not actual evolutionary patterns. Species with spores <10 µm and small fruitbodies (sect. *Herbicolae*, sensu REDHEAD & TRAQUAIR 1981) seem to form a monophyletic group, but this needs further evidence.

The most outstanding character that holds taxa of subsect. *Alachuani* together is the diverticulate hyphae of the veil. Actually, this type of veil occurs outside of the subsection as well, i.e., in subsect. *Narcotici* (*C. stercoreus*) and subsect. *Lanatuli* (*C. candidolanatus*). Thus it is a plesiomorphic character and gives rise to the idea that this diverticulate, or as SINGER (1986: 521) called it „dichophysoid", type of veil could be an ancestral kind of velar structures in *Coprinopsis*.

Species list

***Coprinus argenteus* P. D. ORTON** 1972, Notes Roy. Bot. Gard. Edinburgh **32**: 139
≡ *Coprinopsis argentea* (P. D. ORTON) REDHEAD, VILGALYS & MONCALVO 2001, Taxon **50**: 226

Collections examined: Hungary: Kecskemét, Nyomási forest, Cynodonti-Festucetum pseudovinae, 29. 8. 2004, leg. L. N.; - - ibid., 24. 5. 2005, leg. L. N.; - - ibid., 16. 5. 2004, leg. L. N.; - - ibid., 28. 4. 2005, leg. L. N.

Remarks: This species repeatedly occurred on a humid site of a sandy pasture together with a number of other interesting taxa: *Conocybe merdaria*, *Coprinus deminutus*, *C. stanglianus*, and *C. urticicola*. According to literature, this taxon has only been found once by ORTON (1972), therefore our collections are the first since its discovery. BENDER (2007) mentioned an additional record, but to my best knowledge this specimen has never been published, so it must be considered as uncertain.

This species is very distinctive within subsect. *Alachuani* due to the characteristic shape of the spores mimicing maize-kernel. The two other taxa with such spores are *C. phaeopunctatus* ESTEVE-RAV. & ORTEGA (ORTEGA & ESTEVE-RAVENTÓS 2003) and *C. maysoidisporus* REDHEAD & TRAQUAIR (REDHEAD & TRAQUAIR 1981). The former differs in having thick-walled velar elements on the pileus and its spores are more globose-rounded triangular and larger (8.5-10.2 × 8-9.4 × 6.5-7.2 µm, measured from the holotype, unpubl.). *Coprinus maysoidisporus* differs – according to the protologue – by larger spores (REDHEAD & TRAQUAIR 1981).

***Coprinus filamentifer* KÜHNER** 1957, Bull. Soc. Nat. Oyonnax **10-11**: 3 (Fig. 1)
≡ *Coprinopsis filamentifer* (KÜHNER) REDHEAD, VILGALYS & MONCALVO 2001, Taxon **50**: 228
≡ *Coprinus filamentifer* var. *dolichocystidiatus* BOGART 1975, Ph.D. dissertation (Seattle): 132, inval.

Pileus: 10-16 mm high, 4-10 mm in diam. when young and still closed, ellipsoid to cylindrical, later conico-campanulate or conico-convex, convex applanate when old, up to 20 mm in diam. Surface covered with thick filamentous-cottony, pale yellowish-cream veil, browning towards centre, margin strongly velate when young, later naked, translucently striate, sulcate up to centre. Colour under veil whitish when young, later greyish-blackish when mature.

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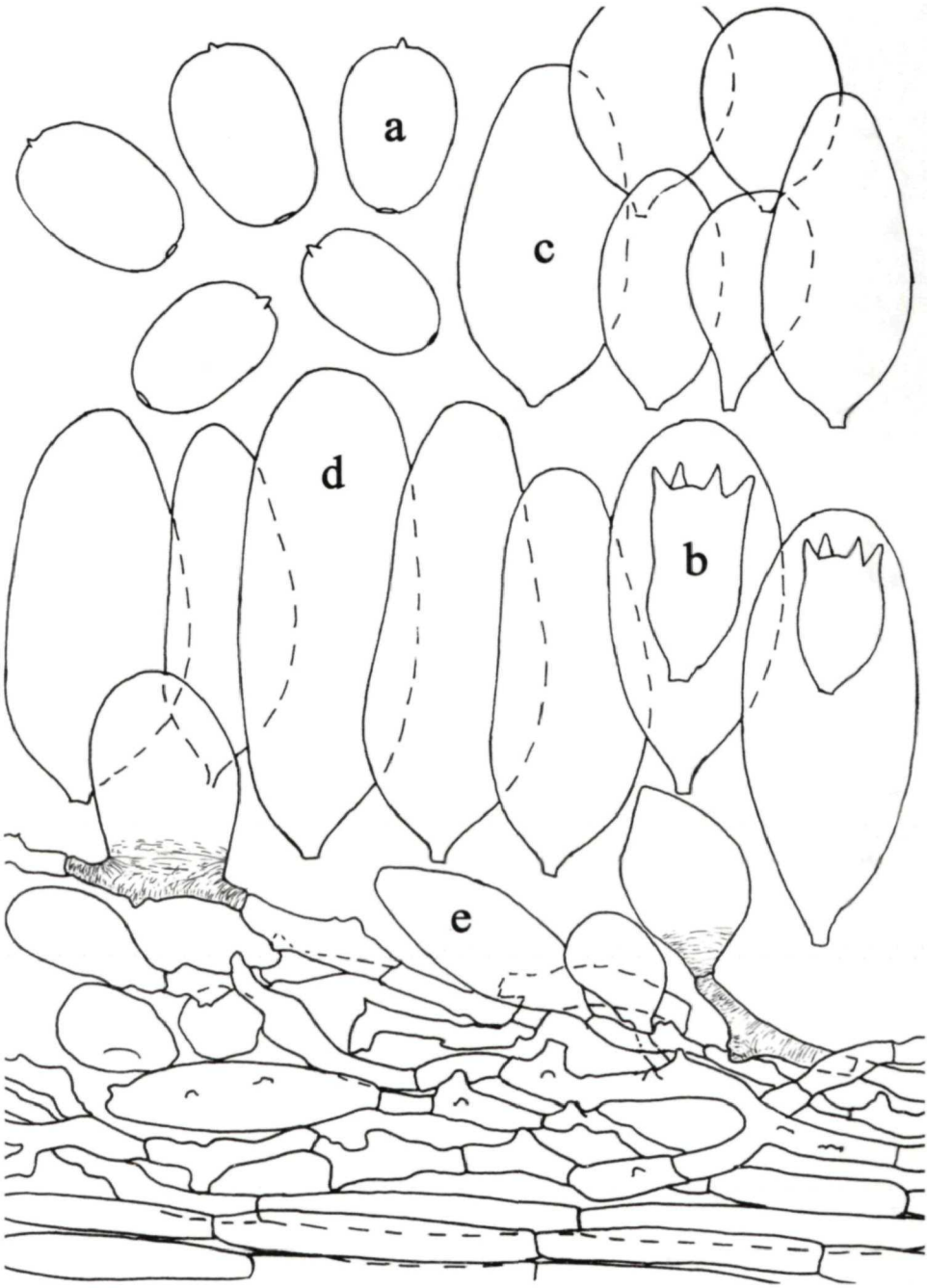

Fig. 1 *a-e. Coprinus filamentifer*. *a* spores (x 1300), *b* basidia, *c* cheilocystidia, *d* pleurocystidia, *e* veil (*b-e* × 520).

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Lamellae: crowded, up to 1.5(-2) mm broad, slightly ventricose, free, lamellar edge whitish, fimbriate, when young whitish, later blackening.

Stipe: 1-2 × 35-50 mm, cylindrical, fragile, fistulose, not bulbous, densely flocculose-veiled in entire length when young, later smooth, whitish. Smell indistinct.

Spores: 6.7-8.4 × 4.3-5.3 µm, on average 7.53 × 4.75 µm, Q = 1.4-1.7, ellipsoid with strongly obtuse ends, some spores also having rounded ends, with central, small (ca. 1.2-1.5 µm wide) germ-pore, very dark, almost completely opaque.

Basidia: very stout, 4-spored, bimorphic, 11.5-20.5 × 6.5-7.5 µm.

Cheilocystidia: abundant mainly balloon-shaped, to ellipsoid, some utriform to clavate cells present as well, 37.5-77.5 × 32-52 µm, on lamellar edge numerous velar hyphae, but these much narrower than that on the pileus.

Pleurocystidia: abundant, ellipsoid to cylindrical or broadly utriform, 57.5-103 × 20.5-48 µm.

Veil: hyphae diverticulate, unusually wide (7-18 µm), strongly to faintly incrusted, terminal elements strongly inflated, often subglobose to fusiform, 52-100 × 23-42 (-100) µm.

Pileipellis: cutis.

Collection examined: Hungary: Ásotthalom (40 km W of Szeged), on cow dung found on a sandy pasture, 9. 6. 2005, leg. L. N.

Remarks: This very rare species has been found only once in Hungary. It has been described from France and it is further known from The Netherlands (ULJÉ 2005), England, Ireland and Scotland (ORTON & WATLING 1979), Germany (BENDER 2007), Italy (CACIALLI & al. 1999, DOVERI 2004, DOVERI & al. 2005), and Spain (CACIALLI & al. 1999).

In my collection the shape of the spores is by far not as constant as suggested by the figure of ULJÉ & NOORDELOOS (1997). Some of the spores are elliptical and do not show the very characteristic obtuse ends.

***Coprinus friesii* QUÉL.** 1872, Mém. Soc. Émul. Montbéliard, Sér. **2, 5**: 129 (Fig. 5 a)
≡ *Coprinopsis friesii* (QUÉL.) P. KARST. 1881, Acta Soc. Fauna Flora Fenn. **2**: 27
= *Coprinus rhombisporus* P. D. ORTON 1972, Notes Roy. Bot. Garden Edinburgh **32**: 145

Collections examined: Hungary: Solt, Kalimajor (along river Danube), on dead grasses buried in clay, 5. 8. 2005, leg. L. N.; - - ibid., 11. 9. 2005, leg. L. N.; - Fülöpháza (15 km W of Kecskemét), under *Populus alba* on leaves and grasses, on sand, 23. 8. 2005, leg. L. N.; - Törökfái (10 km S of Kecskemét), Bromo sterili-Robinietum, 6. 6. 2006, leg. L. N.; - Ásotthalom (40 km W of Szeged): in mown lawn, 12. 5. 2007, leg. L. N.; - - ibid., Bromo sterili-Robinietum, on dead grasses, 30. 5. 2007, leg. L. N.

***Coprinus gonophyllus* Quél.** 1884, Ann. Sci. Nat. 14: pl. 1 (Figs. 2, 5 b)
≡ *Coprinopsis gonophylla* (QUÉL.) REDHEAD, VILGALYS & MONCALVO 2001, Taxon **50**: 228

Pileus: (subglobose-)ovoid to ellipsoid with slightly acute apex, 8-16 × 5-10 mm, conico-campanulate on ageing, flat, when fully expanded up to 30 mm in diam., surface covered with abundant woolly whitish veil breaking up into indistinct patches, and becoming ochraceous when mature, white, darkening to blackish when old.

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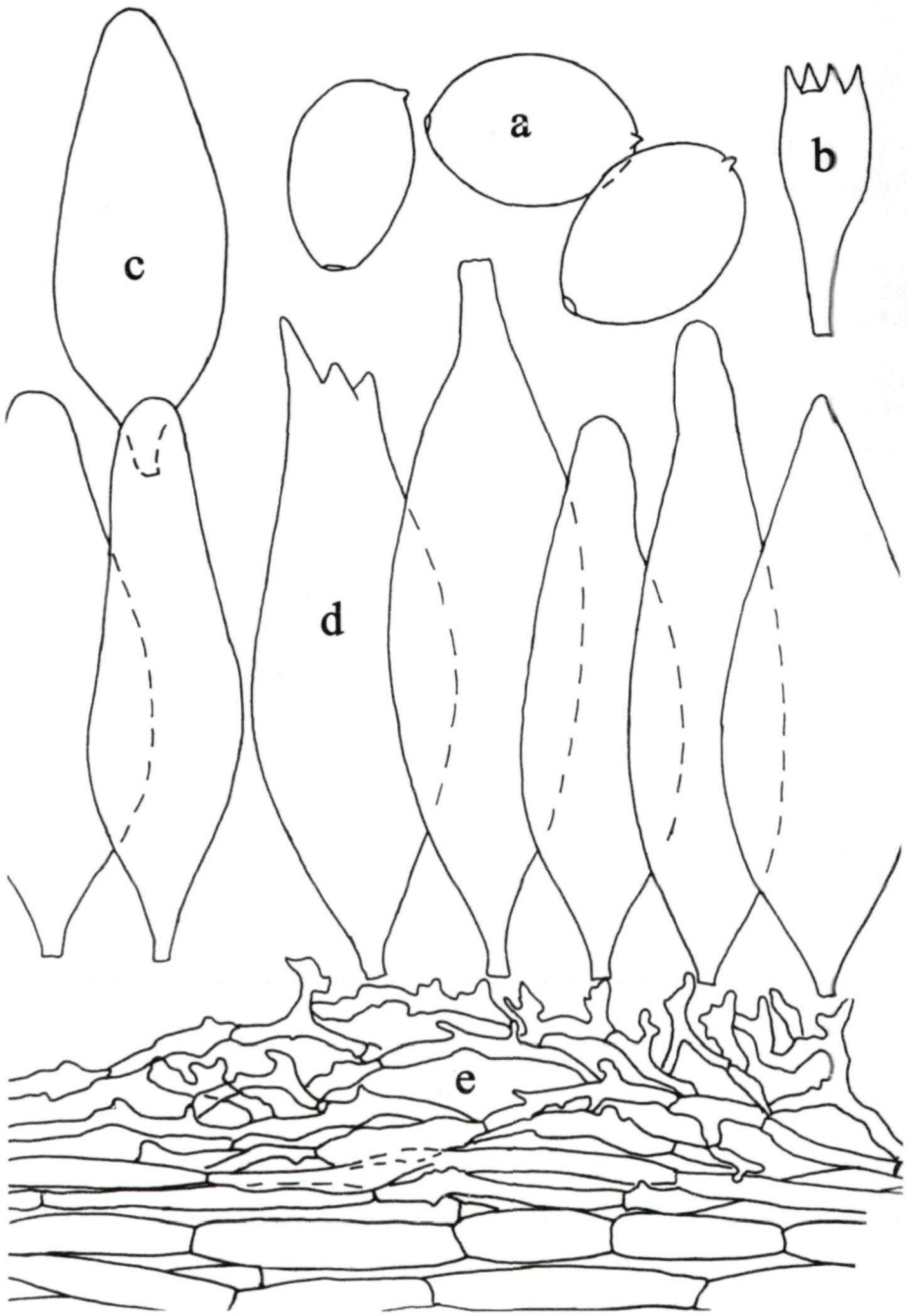

Fig. 2 *a-e*. *Coprinus gonophyllus*. *a* spores (x 1300), *b* basidia, *c* cheilocystidia, *d* pleurocystidia, *e* veil (*b-e* × 520).

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Lamellae: crowded, free, strongly ventricose, up to 3 mm broad, white when young, later blackish, strongly deliquescent, lamellar edge whitish, fimbriate.

Stipe: 1-3.5 × 25-70 mm, fragile, fistulose, cylindrical with small velar disc at base, smooth or covered by a very fine layer of velar hyphae when young, pure white all over. Smell and taste indistinct.

Spores: 7.8-9 × 6-7.3 × 5.5-5.7 µm, on average 8.54 × 6.52 × 5.6 µm, Q = 1.2-1.45, elliptical with obtuse apex, very dark blackish brown, with central ca. 1.3 µm wide germ-pore, slightly flattened, in lateral view elliptical.

Basidia: 4-spored, clavate, bimorphic, ca. 30 × 11 µm.

Cheilocystidia: scarce (ca. 15-25 per lamella), mainly subutriform to fusiform, some cylindrical, 32-41 × 15-17 µm.

Pleurocystidia: fusiform-subutriform or narrowly ellipsoid, often with acute apex bearing finger-like projections in some cases, 42-63 × 15-16 µm.

Veil: composed of 3-5 µm wide, hyaline, thin-walled, diverticulate hyphae with clamp connections.

Pileipellis: cuticular with 7-9 µm wide hyphae.

Collections examined: Hungary: Fülöpszállás (35 km W of Kecskemét), Phragmitetum australis on burnt ground, 26. 4. 2004, leg. L. N.; - Ásotthalom, on old fire place, 8. 8. 2006, leg.: L. N.; - - ibid., on burnt ground, 30. 5. 2007, leg. L. N.

Remarks: This easily recognisable species seems to be rare in Hungary due to the scarcity of suitable habitats.

***Coprinus herinkii* PILÁT & SVRČEK** 1967, Česká Mykol. **21**: 137
≡ *Coprinopsis herinkii* (PILÁT & SVRČEK) REDHEAD, VILGALYS & MONCALVO 2001, Taxon **50**: 228

Collection examined: Hungary: Kecskemét, Nyomási forest, Cynodonti-Festucetum pseudovinae, 29. 8. 2004, leg. L. N.

Remarks: Besides the type collection, this species is only known from Germany (ULJÉ & NOORDELOOS 1997) and now from Hungary. Unfortunately our material is too scanty for making a complete description.

***Coprinus kubickae* PILÁT & SVRČEK** 1967, Česká Mykol. **21**: 142
≡ *Coprinopsis kubickae* (PILÁT & SVRČEK) REDHEAD, VILGALYS & MONCALVO 2001, Taxon **50**: 229
= *Coprinus amphibius* ANASTASIOU 1967, Canad. J. Bot. **45**: 2213 (synonymy adopted from REDHEAD & TRAQUAIR 1981)

Collection examined: Hungary: Csalánosi forest, Phragmitetum communis, on *Typha*, 3. 9. 2004, leg. Z. GORLICZAI.

***Coprinus* aff. *phaeosporus* P. KARST.** 1881, Meddn. Soc. Fauna Flora Fenn. **6**: 9 (Fig. 3)

Pileus: narrowly elliptical to conical when young, 1-2.5 × 0.5-2 mm, conico-campanulate when older, up to 7 mm in diam. when fully expanded, surface covered with whitish sericeous veil, that becomes small whitish to pale ochraceous flocks/patches when old, white when young, greyish-blackish on ageing.

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Lamellae: free, crowded, up to 0.5 mm broad, slightly ventricose, whitish when young, blackish on ageing, lamellar edge fimbriate, whitish.

Stipe: 0.1-0.3 × 7-25 mm, very fragile, cylindrical, seemingly enlarged at base, because of adhering veil, whitish all over, slightly covered with white woolly veil.

Smell and taste: indistinct.

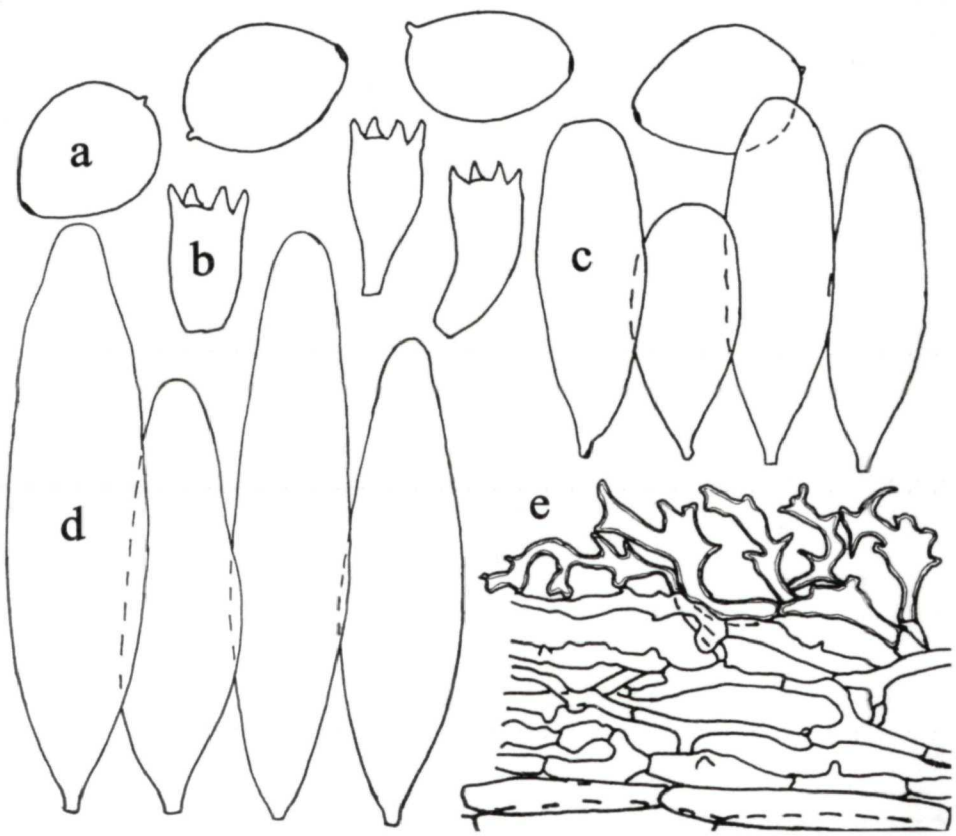

Fig. 3 *a-e. Coprinus* aff. *phaeosporus*. *a* spores (x 1300), *b* basidia, *c* cheilocystidia, *d* pleurocystidia, *e* veil (*b-e* × 520).

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Spores: 6.3-8.3 × 5.5-7 µm, on average 7.5 × 6.39 µm, Q = 1.05-1.35, ovoid in front view, with obtuse or somewhat acute apex, in lateral view broadly fusiform to almost submitriform, not or indistinctly flattened, medium red-brown, with central, 1-1.2 µm wide germ-pore.

Basidia: 4-, exceptionally 2-spored, clavate, bimorphic, 20-25 × 7.5-10 µm, surrounded by pyriform pseudoparaphyses.

Cheilocystidia: scanty, ellipsoid to cylindrical 37-60 × 13-20 µm.

Pleurocystidia: sparse, cylindrical to narrowly elliptical with obtuse apex, 57-100 × 13-18 µm.

Veil: abundant, composed of diverticulate, 2-5 µm wide hyphae with clamp connections, terminal elements more or less coralloid, with slightly thickened wall, up to 0.7 µm, thick-walled regions rather narrow (as compared to other taxa of the group), 2-3.5 µm.

Pileipellis: cuticular.

Collections examined: Hungary: Kecskemét, Dobó str., in regularly mown lawn, 3. 8. 2006, leg. Z. GORLICZAI; - - ibid., 5. 8. 2006, leg. L. N. & Z. GORLICZAI; - Kecskemét, Szivárvány str., in mown lawn, 13. 8. 2006, leg. L. N.; - - ibid., 12. 8. 2007, leg. L. N.; - - ibid., 30. 8. 2007, leg. L. N.

Remarks: This very small species has been found at two localities in 2006 and 2007. Besides the very small fruitbodies (pileus up to 7 mm when fully expanded), it is characterised by slightly thickened wall of the terminal hyphae of the veil (up to 0.7 µm). Its closest relative may be *C. phaeosporus*, which on the other hand, has larger fruitbodies, and brownish velar patches on the pileus, whereas the veil of the Hungarian collections is white. Examination of the holotype of *C. phaeosporus* (NAGY, unpubl.) supports these differences.

Aberrant specimens of *C. urticicola* with thickened walls of the veil could also come close, but this taxon can easily be separated by the more ellipsoid spores.

It is not known however, how constant the difference in fruitbody size and colouration of the veil is. Further collections with such small fruitbodies would support the description of these collections as a new taxon, but at the moment, I refrain from describing it as a new species.

***Coprinus picaceus* (BULL.) GRAY** 1821, Nat. Arr. Brit. Pl. (London) **1**: 634
≡ *Agaricus picaceus* BULL. 1876, Herbier de la France: 407
≡ *Coprinopsis picacea* (BULL.) REDHEAD, VILGALYS & MONCALVO 2001, Taxon **50**: 230

Collection examined: Hungary: Budai mts., János-hegy, Melitti-Fagetum, 15. 10. 2005, leg. L. N., B. DIMA & Z. GORLICZAI.

Remarks: This widespread species is common in hilly regions of Hungary, similar to western European broad-leaved forests. Many other records known were published by BABOS (1989) and RIMÓCZI (1994).

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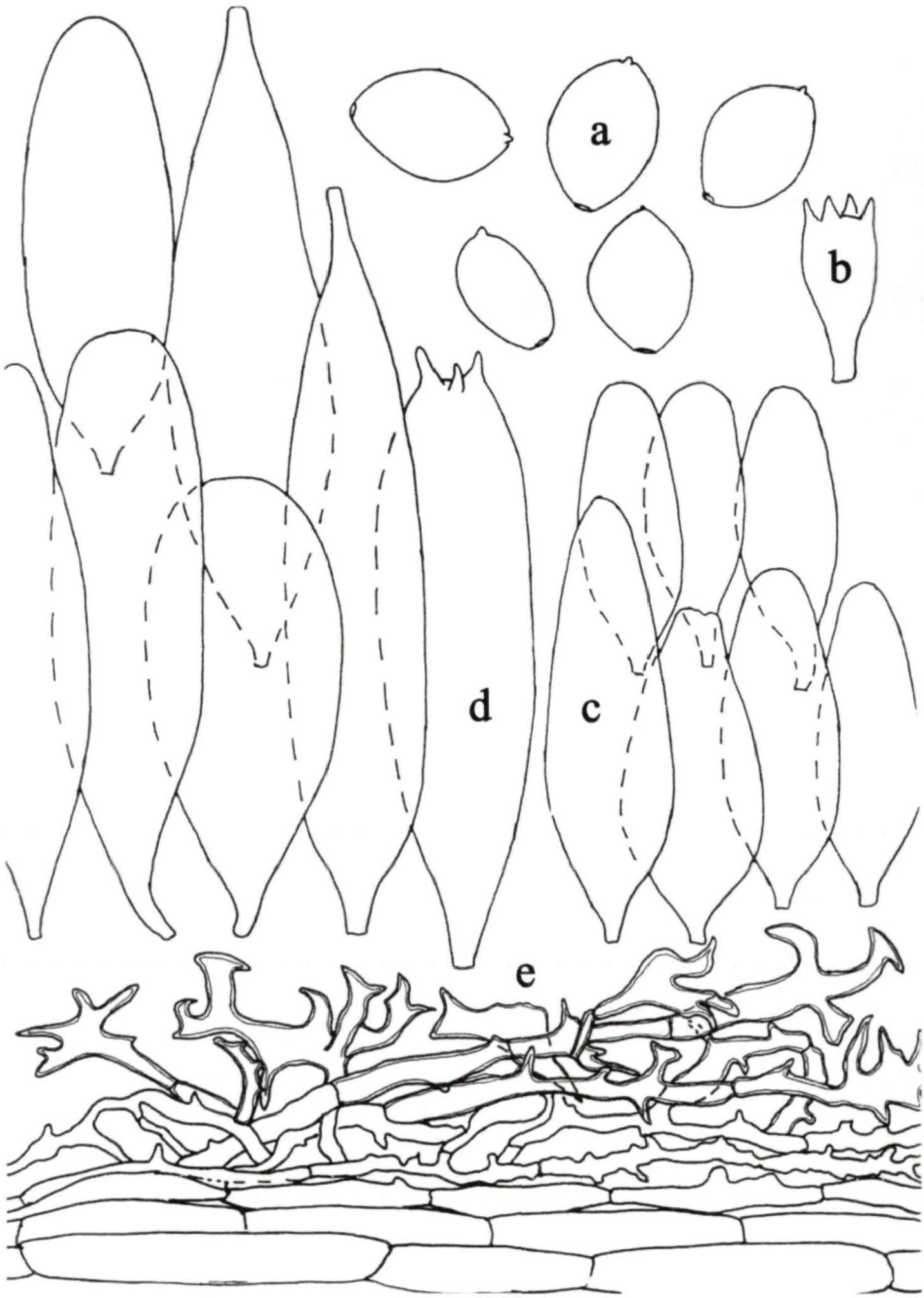

Fig. 4 *a-e. Coprinus tigrinellus*. *a* spores (x 1300), *b* basidia, *c* cheilocystidia, *d* pleurocystidia, *e* veil (*b-e* × 520).

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***Coprinus* aff. *pseudofriesii* PILÁT & SVRČEK** 1967, Česká Mykol. **21**: 140
≡ *Coprinopsis pseudofriesii* (PILÁT & SVRČEK) REDHEAD, VILGALYS & MONCALVO 2001, Taxon **50**: 230

Collections examined: Hungary: Solt, Kalimajor (along river Danube), on dead grasses buried in clay, 5. 8. 2005, leg. L. N.; - - ibid., 11. 9. 2005, leg. L. N.

Remarks: These collections come closest to *C. pseudofriesii* but differ in having much larger spores (up to 12.2 × 11.6 µm). In all other details they fit the concept of *C. pseudofriesii*. Such species pairs with small and large spores, respectively, have been described by REDHEAD & TRAQUAIR (1981), but their actual position is dubious.

***Coprinus sclerotiorum* HORVERS & DE COCK** 1997 in ULJÉ & NOORDELOOS, Persoonia **16**: 283
≡ *Coprinopsis sclerotiorum* (HORVERS & DE COCK) REDHEAD, VILGALYS & MONCALVO 2001, Taxon **50**: 230

Collections examined: Hungary: Kecskemét, Nyomási forest, on cow dung, 20. 4. 2005, leg. L. N.; - Szikra, on old cow dung, 12. 4. 2006, leg. L. N., M. JEPPSON & T. KNUTTSON; - Göbölykút-dűlő, on cow dung, 12. 4. 2006, leg. L. N.; - Fülöpszállás (30 km W of Kecskemét), on old cow dung, 10. 5. 2007, leg.: L. N.

Remarks: This species seems to be not uncommon in Hungarian planar regions, although it has been considered as very rare. It is only known from the type collection (ULJÉ & NOORDELOOS 1997) and from Germany (CLÉMENÇON & KARASCH 2007). The spores are much more variable than presented by ULJÉ & NOORDELOOS (1997). Many of them show only partly the characteristic, rounded angular shape.

***Coprinus spilosporus* ROMAGN.** 1951, Rev. Mycol. **16**: 127
≡ *Coprinopsis spilospora* (ROMAGN.) REDHEAD, VILGALYS & MONCALVO 2001, Taxon **50**: 231

Remarks: Collections from Hungary are reported in BABOS (1989: 46).

***Coprinus stanglianus* BENDER, ENDERLE & GRÖGER** 1988 in BENDER & ENDERLE, Z. Mykol. **54**: 62 (Fig. 5 c)
≡ *Coprinopsis stangliana* (ENDERLE, BENDER & GRÖGER) REDHEAD, VILGALYS & MONCALVO 2001, Taxon **50**: 231

Collections examined: Hungary: Bugac, Cynodonti-Festucetum pseudovinae, 24. 8. 2005, leg. L. N.; - Nyomási forest, Cynodonti-Festucetum pseudovinae, 13. 5. 2004, leg. L. N.; - - ibid., 12. 8. 2005, leg. L. N.; - Méntelek, Cynodonti-Festucetum pseudovinae, 22. 8. 2005, leg. L. N.

Remarks: Records of this species have already been published in NAGY (2005). Here, some further localities are presented. The species has already been found in Italy as well, on partially sandy soil under *Castanea* (LANCONELLI 1997), a fact that I omitted in NAGY (2005).

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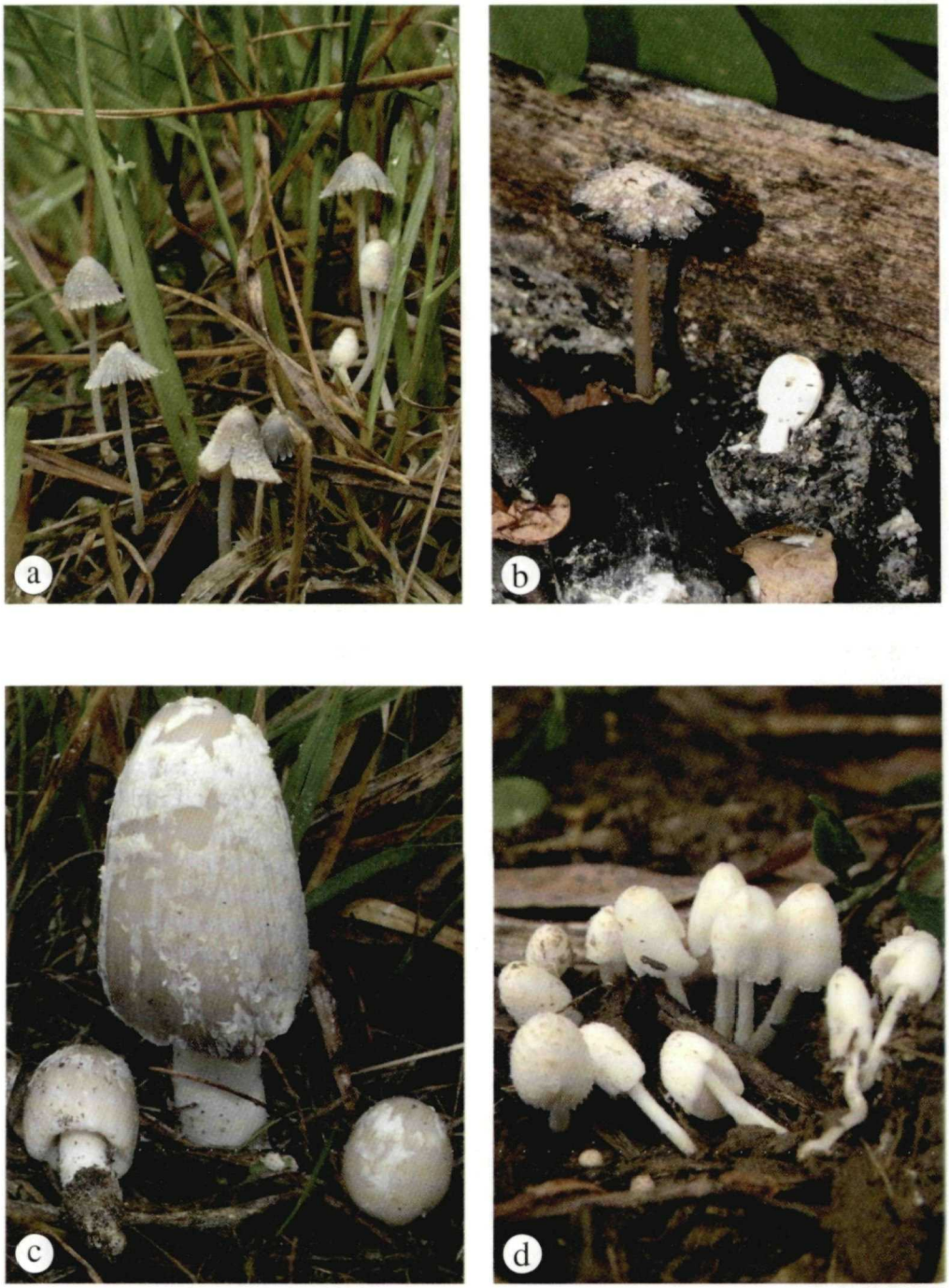

Fig. 5. *a Coprinus friesii. b C. gonophyllus. c C. stanglianus. d C. tigrinellus.* – Phot. L. NAGY.

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***Coprinus tigrinellus* BOUD.** 1885, Bull. Soc. Mycol. France **1**: 283, (Figs. 4, 5 d)
≡ *Coprinopsis tigrinella* REDHEAD, VILGALYS & MONCALVO 2001, Taxon **50**: 231
= *Coprinus subtigrinellus* DENNIS 1961, Kew Bull. **15**: 122-123
= *Coprinopsis subtigrinella* (DENNIS) REDHEAD, VILGALYS & MONCALVO 2001, Taxon **50**: 231

Pileus: conical to ellipsoid when young, 4-10 × 3-7 mm, later conico-campanulate, campanulate, flattening with age, up to 20 mm in diam.; surface covered by sepia to chestnut-brown velar patches vanishing with age, pure white when young, later greyish, then blackish.

Lamellae: free, crowded, up to 2 mm broad, ventricose, white when young, blackening with spore maturation, lamellar edge fimbriate, whitish.

Stipe: 0.5-1.5 × 8-30 mm, fragile, fistulose, cylindrical, covered with woolly veil when young, naked and shiny when old, white. Smell and taste indistinct.

Spores: 6.2-9.1 × 6.1-7 × 5.3-5.8 µm, on average 8.05 × 6.52 × 5.63 µm, Q = 1-1.35, ovoid or ellipsoid, usually with somewhat acute apex, in lateral view ellipsoid, medium red-brown, with central, 1.4-1.7 µm wide germ-pore.

Basidia: 4-spored, clavate, bimorphic, ca. 22-25 × 8-10 µm.

Cheilocystidia: rather scanty, ellipsoid to somewhat utriform, typically ellipsoid with elongate base, e.g., 48 × 25 µm.

Pleurocystidia: abundant, mainly fusiform, some ellipsoid, 51-100 × 16-23 µm.

Veil: hyphae strongly diverticulate, 3-8 µm in diam., with ± coralloid, thick walled terminal elements, walls 0.3-1.7 µm hyaline to very slightly pigmented, hyphae richly covered with rounded to more or less acute excrescences.

Pileipellis: cuticular.

Collections examined: Hungary: Szeged, Boszorkánysziget, Leucojo aestivi-Salicetum albae, on bare clayey soil, 8. 8. 2006, leg. L. N.; - - ibid., on dead grasses in Leucojo aestivi-Salicetum albae, 17. 8. 2005, leg. L. N.; - - ibid., 12. 6. 2007, leg. L. N.

Remarks: In my opinion it is best to define this taxon as having deep chestnut-brown velar patches on the pileus in combination with ovoid, non-lentiform spores and thick-walled velar hyphae with walls less than 2 µm thick. Its closest relative could be *C. pseudofriesii*, but in this species the velar patches are paler. The other difference in the shape of projections of velar hyphae, mentioned by ULJÉ & NOORDELOOS (1997), seems to have only statistical significance, as both pointed and rounded excrescences occur in my collections. *Coprinus xantholepis* P. D. ORTON differs in having much broader hymenial cystidia, while the spores of *C. phaeosporus* P. KARST. are distinctly lentiform and have, as usual, a lower mean of the Q value (ULJÉ & NOORDELOOS 1997).

***Coprinus urticicola* (BK. & BR.) BULLER** 1917, Trans. Brit. Mycol. Soc. **5**: 485
≡ *Agaricus urticicola* BERK. & BROOME 1861, Ann. Mag. Nat. Hist., Ser. **3, 7**: 376
≡ *Psathyra urticicola* (BERK. & BROOME) SACC. 1887, Syll. Fungorum (Abellini) **5**: 1073
≡ *Coprinopsis urticicola* (BERK. & BROOME) REDHEAD, VILGALYS & MONCALVO 2001, Taxon **50**: 232
= *Coprinus urticicola* var. *salicicola* ULJÉ 1997, Persoonia **16**: 296
= *Coprinus melo* J. FAVRE 1948, Assoc. fong. Hauts-Marais: 215

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= *Coprinus suburticicola* PILÁT & SVRČEK 1967, Česka Mykol. **21**: 140
= *Coprinus paleotropicus* REDHEAD & TRAQUAIR 1981, Mycotaxon **13**: 394

Collection examined: Hungary: Kecskemét, Nyomási forest, Cynodonti-Festucetum pseudovinae, at moist site on soil and dead grasses, 5. 8. 2006, leg. L. N. & Z. GORLICZAI.

Remarks: I consider *C. paleotropicus* to be synonymous with *C. urticicola*. The differences (more ovoid spores, habitat on wood) are of very limited importance, therefore no taxonomic value is assigned to them.

Coprinus urticicola var. *salicicola* should differ from var. *urticicola* in more brownish velar patches on pileus and in the habitat on branches of *Salix* (ULJÉ & NOORDELOOS 1997). Upon examination of the holotype (NAGY, unpubl.) it seems to me that the dark colour of the veil is caused by some abnormality in the development of the fruitbody. Habitat preferences in this group are very badly known and hence have very little taxonomic value.

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