

Crinipellis pedemontana sp. nov. (Agaricomycetes), a new basidiomycete from Italy

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Abstract: *Crinipellis pedemontana*, a new agaric growing on stems of dead grasses in an Italian urban park, is described and illustrated. It fits in sect. *Grisentinae* on account of the green reaction with KOH and ammonia and its bright colored pileus. The unique combination of purple-violaceous tinges in the pileus and the presence of chlamydospores in the pileipellis characterize this species as new. Its taxonomic position within *Crinipellis* and the related genus *Moniliophthora* is discussed.

Key words: Agaricales, chlamydospores, Marasmiaceae, taxonomy

INTRODUCTION

During a survey of macrofungi in the Parco del Valentino, a green area in Turin (Piedmont, western Italy), a remarkable new species of *Crinipellis* was recorded on dead culms of Poaceae. It is well characterized by having a brown-pinkish pileus with purple hues, encrusting pigments turning green in alkali (KOH and ammonia) and the presence of chlamydospores.

An exhaustive search including monographic treatments and papers by Singer (1942, 1976), Pegler (1968, 1977, 1986), Dennis (1970), Singer and Cléménçon (1972), Redhead and Liu (1982), Paechnatz (1984), Candusso (1986, 1991), Redhead (1986, 1989), Doyle (1987), Halling (1993), Corner (1996), Antonín and Noordeloos (1997), Bon (1999), Takahashi (2000, 2002), Aime and Phillips-Mora (2005) and Arruda et al (2005), confirmed the unique nature of this species: Its characteristics do not match any

published species. Therefore an extensive diagnosis, description and illustrations of this previously undescribed *Crinipellis* are provided.

MATERIALS AND METHODS

Color codes are from Séguy (1936). Macroscopic characters were examined from fresh material. Studies are based on dried material with a Leica DM 4500 B and an Olympus BX50 light microscope with magnification up to 1000×. Observations were made on mounts in these reagents: Congo red in 10% ammonia, 3% KOH, cresyl-blue in water and Melzer's reagent. Measurements are based on observation of 30 basidiospores and do not include the apiculus.

These abbreviations were used: E = the quotient of length and width of the spores; Q = the mean value of E values in all collections studied; L = number of entire lamellae; l = number of lamellulae between each pair of entire lamellae.

All examined material has been deposited and preserved in: MUT (Mycotheca Universitatis Taurinensis, Dipartimento di Biologia Vegetale, Università di Torino, Italy), BRNM (Moravian Museum, Brno, Czech Republic), and LIP-Herbarium M. Bon (Laboratoire de Botanique, Faculté des Sciences Pharmaceutiques et Biologiques, Université Lille II, France).

TAXONOMY

Crinipellis pedemontana A.Vizzini, Antonín & Noordel., sp. nov. FIGS. 1–3

(= *Crinipellis alcalivirens* Singer fo. ? *sensu* Bon 1999, Les collybio-marasmioides et ressemblants. Doc. mycol. Mém. hors Sér. 5, p. 74; misapplied name).

Pileus (5)10–18(24) mm latus, primo hemisphaericus dein plano-convexus, explanatus et obtuse umbonatus, denique aetate depressus, siccus, squamuloso-velutinus, villosus, subzonatus, brunneo-incarnatus, brunneolo-purpureus, disco obscuriori; margo primo incurvus, mox explanatus, villosulus, fimbriatus, non striatus. KOH ope cuticola reactionem virescentem praebet. Lamellae crassiusculae, valde fere distantes, 2–3 mm latae, subadnatae vel prope liberae, sinuato-ventricosae, albo-cremeae, acie concolore, plus minusve intervenatae; lamellulae saepe cum lamellis concrecentes. Stipes 15–32(40) × (1.5) 2–3.5(4) mm, teres, subaequalis, non bulbosus, interdum plano-compressus, superne perspicue dilatatus usque ad 5 mm, fibrosus, solidus dein medulosus, subfistoloso-farctus; siccus, squamuloso-villosus, culmini albidus-cremeus, basi fusco-brunneus, pilis brunneo-fuscis inductus, maxime inferna parte. Sporata alba. Sporae ellipsoideae-amygdaliformes 7. 5–9(10) × (4)4. 5–6(6.5) μm, hyalinae, laeves, mono-biguttulatae, non pseudoamyloideae. Basidia clavifor-

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FIG. 1. *Crinipellis pedemontana*. Basidiomes (after MUT HS122, holotype).

mia, tetraspora $25\text{--}41 \times 7\text{--}9 \mu\text{m}$. Cheilocystidia versiformia, subfusioidea vel lageniformia, $25\text{--}42 \times 7\text{--}11 \times 2\text{--}4 \mu\text{m}$, apice rotundato, interdum bifido vel moniliformi; pleurocystidia absunt. Pili pilei longissimi, $60\text{--}400 \times 6\text{--}9(12) \mu\text{m}$, pseudoamyloidei, KOH ope virescentes, flexuosi, crassetunicati, tunica fere $2.5 \mu\text{m}$ crassa, et apice rotundato. Pili stipiti $50\text{--}280(360) \times 4\text{--}9 \mu\text{m}$. Hypotrachium (subpileipellis) ex hyphis $25\text{--}40 \times 6\text{--}12 \mu\text{m}$ latis, pigmento extracellularem incrustato KOH ope virescente praeditis. Pileipellis plurimis chlamydosporis $10\text{--}24 \mu\text{m}$, tunica fere $4.5 \mu\text{m}$ crassa, large pediculatis. Fibulae copiosae.

Holotypus (hic designatus) in loco dicto Parco del Valentino, ad radices vegetalium et culmos graminearum (*Phleum pratense*) apud Augustam Taurinorum, Piemonte, Italia, a A. Vizzini lectus, 04-X-1992, in herbario Mycothecae Universitatis Taurinensis asservatur, MUT HS122. Isotypi in herbariis BRNM 705399 et LIP-Herb. M. Bon 930316 asservantur.

Etymology. *pedemontanus* = referring to the collection site, in Piedmont, a region in NW Italy (from πομός, ποδός, pous, podos [Greek] meaning foot + mons, montis [Latin] meaning mountain, and thus "at the foot of the mountain").

Pileus (FIG. 1) (5)10–18(24) mm broad, campanulate-convex, expanding to nearly applanate, depressed at center when old, often with an obtuse and distinct umbo, with involute, then straight margin, finally with irregularly undulate marginal zone, sometimes fimbriate, membranaceous to thin-fleshed, not translucently striate; dry, subzonate, not hygrophanous, radially subtomentose-fibrillose to fibrillose, with small adpressed-fibrillose squamules at center, often glabrescent with age, turning dark

green with a drop of KOH or NH_4OH ; ochraceous (Se 174, 201, 202, 248) to pinkish malvaceous lilac (Se 69, 70), with purplish hues (Se 14–15, 165), darker at center (brown, Se 692, 702), and cream-ochraceous (Se 199) under hairy covering. *Lamellae* (FIG. 1) moderately distant, L = (16)20–26(30), l = (0)1–2–(3), thickish, slightly intervenose, sometimes partially fused with the lamellulae and then forked, emarginate-adnate to adnate, almost free, subventricose, up to 2–3 mm broad, white to cream-pink (Se 200), with entire, concolorous edge. *Stipe* (FIG. 1) 15–32(40) \times (1.5)2–3.5(4) mm, cylindrical, often broadened up to 5 mm at apex, sometimes narrowed toward the base, not bulbous, sometimes compressed, stiff, solid to fistulose, dry, whitish-cream at apex (Se 200), gradually becoming darker toward the base (brown, Se 692), entirely subtomentose-fibrillose (apex) to squamulose-strigose (base). *Context* thin, tough, elastic, especially in stipe, whitish in stipe, cream ocher (Se 199) in cortex. *Odor* indistinct, *flavor* mild. *Spore print* whitish. *Type of development of the basidiome* pileostipitocarpic (ss. Reijnders 1963).

Basidiospores (FIG. 2b) $7.5\text{--}9.0(10) \times (4.0)4.5\text{--}6.0(6.5) \mu\text{m}$, E = 1.5–2.0, Q = 1.7, (broadly) ellipsoid, ellipsoid-amygdaliform, hyaline, smooth, thin-walled, mono- or biguttulate, nondextrinoid. *Basidia* $25\text{--}41 \times 7.0\text{--}11 \mu\text{m}$, 4-spored, clavate. *Basidioles* up to $38 \times 5.0\text{--}10 \mu\text{m}$, clavate or cylindrical. *Cheilocystidia* (FIG. 2a) $25\text{--}42 \times 7.0\text{--}11 \times 2\text{--}4 \mu\text{m}$, lageniform, subfusoid, with obtuse, irregularly curved or branched apex, sometimes moniliform, hyaline, thin- to slightly thick-walled. *Pleurocystidia* absent. *Hymeno-*

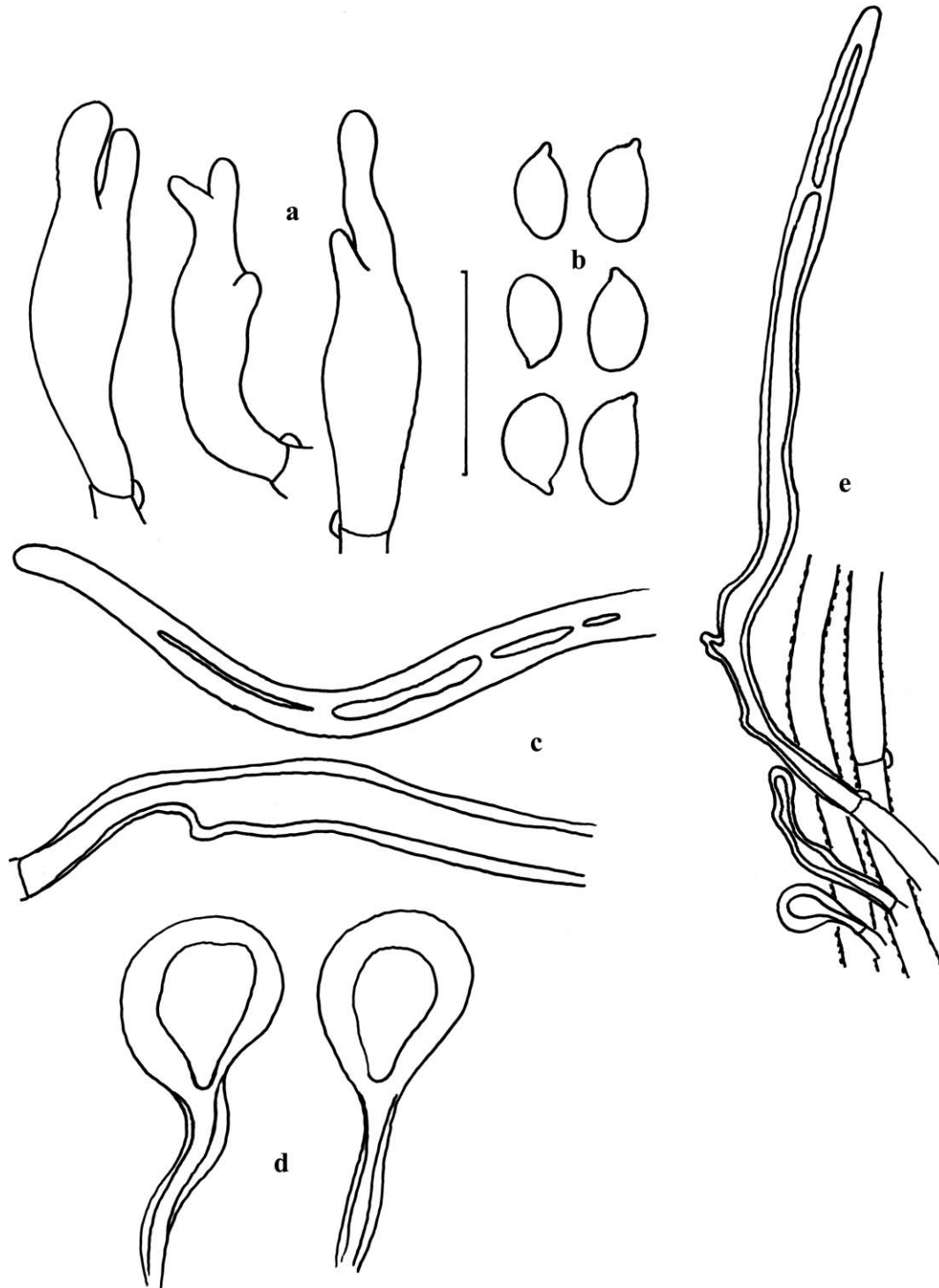


FIG. 2. *Crinipellis pedemontana*. Microscopic characters (after MUT HS122, holotype, and BRNM 705399, isotype). a. Cheilocystidia. b. Basidiospores. c. Stipe setae. d. Chlamydospores. e. Pileipellis. Bars: a–d = 20 μ m, e = 50 μ m.

phoral trama subregular, made up of cylindrical, sometimes slightly inflated, thin-walled, 5.0–12(15) μ m wide hyphae with nondextrinoid and in KOH hyaline or yellowish walls. *Pileipellis* (FIG. 2e) bilayered, *suprapellis* a transition between a cutis and a trichoderm, made up of (semi)erect, thick-walled

(0.5–2.5 μ m), setiform terminal elements (FIGS. 2e, 3b; hairs, setae), 60–400 \times 6.0–9.0(12) μ m, gradually tapering toward the apex, with a narrow lumen and several secondary septa (pseudosepta); with brown to yellow walls that gradually become hyaline and colorless toward the apex, turning green in alkali

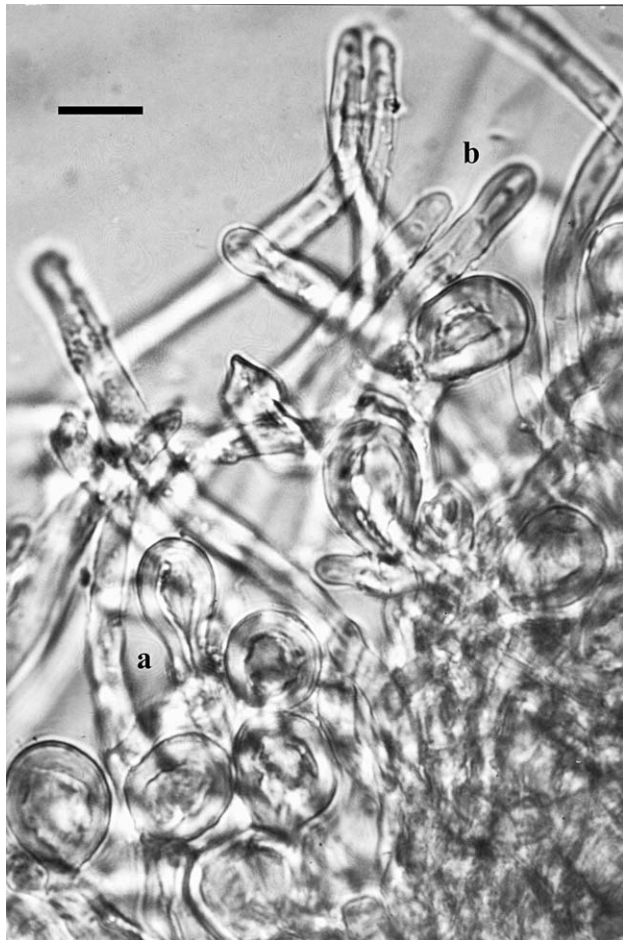


FIG. 3. *Crinipellis pedemontana*. Elements of pileipellis. a. Cluster of chlamydospores. b. Setiform hairs with rounded tips and numerous secondary septa (after MUT HS122, holotype). Bar = 20 μ m.

and dextrinoid in Melzer's reagent. *Chlamydospores* (FIGS. 2d, 3a) present in suprapellis, often in clusters, sphaeropedunculate, about 10–24 μ m diam, with long, 5.5–7.0 μ m wide pedicel, with 3–4.5(5) μ m thick, yellow-brown, dextrinoid wall. *Subpellis* regular, made up of radially arranged, cylindrical elements, 25–40 \times 6.0–12 μ m, with brown-incrusted walls that turn green in KOH or ammonia. *Stipitipellis* similar to pileipellis, consisting of a trichoderm of setiform elements (FIG. 2c), 50–280(360) \times 4.0–9.0 μ m, with thick, dextrinoid walls. *Stipititrama* regular, made up of cylindrical, thin-walled, slightly dextrinoid, 4.0–12 μ m wide hyphae with hyaline or slightly brownish walls. *Clamp connections* present in all tissues.

Ecology. Solitary or gregarious, saprotrophic on herbaceous debris, on basal part of dead grasses (*Phleum pratense* L., Poaceae).

Material examined. ITALY, Piedmont, Turin: Parco del Valentino, 4-X-1992, in meadow, near *Cedrus atlantica* (Endl.) Manetti, leg. A. Vizzini (HOLOTYPE, MUT HS122;

Isotypes, BRNM 705399 and LIP-Herb. M. Bon 930316); ibidem 12-X-1994, leg. A. Vizzini, (Paratypus, Topotypus, MUT HS214).

DISCUSSION

The genus *Crinipellis* Pat., originally described by Patouillard in 1889, is characterized by marasmioid or collybioid basidiomes with long, dextrinoid, setiform hairs on pileus and sometimes also on stipe. This genus currently accommodates more than 70 species (Kirk et al 2001, Takahashi 2002), the majority having a pantropical distribution (Singer 1976, 1986).

Most *Crinipellis* species are saprotrophic on herbaceous or woody plants, except section *Iopodinae* (Singer) Singer (Singer 1986), whose members are parasitic on various woody plants. This section is characterized morphologically by the presence of purple, violaceous or red pigments, which do not stain green in KOH or ammonia. Recent molecular studies (Aime and Phillips-Mora 2005) have shown that *Crinipellis pernicioso* (Stahel) Singer, together with some anamorphic fungi parasitic on *Cocoa*, *Theobroma cacao* L., form a distinct monophyletic clade, separate from *Crinipellis*. They accordingly proposed to accommodate these fungi in genus *Moniliophthora* H.C. Evans, Stalpers, Samson & Benny. Although few data are known from other species of sect. *Iopodinae* the suggestion was made that all species described from that section eventually should be transferred to genus *Moniliophthora*. *Crinipellis* and *Moniliophthora* form together with *Marasmius* and *Chaetocalathus* a monophyletic group that may be considered a separate family Marasmiaceae (clade/marasmioid) within the large assemblage Tricholomataceae *sensu lato* (Moncalvo et al 2002, Bodensteiner et al 2004, Aime and Phillips-Mora 2005, Wilson and Desjardin 2005).

Crinipellis pedemontana is characterized by rather robust basidiomes, pileus with a pink-purple tinge, nondextrinoid basidiospores, brownish incrusted walls of subpileipellis hyphae turning green in KOH and especially by the presence of chlamydospores in the pileipellis, which may be scattered to common. These chlamydospores may be considered modified setiform hairs that are swollen apically. Therefore *C. pedemontana* fits well in sect. *Grisentinae* (Singer) Singer, which contains species with brown, lilac, red or purple tinges and whose pigments turn gray to green in alkaline solutions (KOH or ammonia) (Singer 1976, 1986).

The presence of chlamydospores (chlamydocnidia) is a unique character within *Crinipellis*. These structures more correctly should be called chlamydocytes, a more general term without functional

attribute. Similar chlamydospores have been observed morphologically in the pileipellis and pileitrama (as apical and/or intercalary elements) of some species of *Lentinellus* (Hericiales, Lentinellaceae; Segedin 1996, Moreau et al 1999, Petersen and Hughes 2004), *Panellus* (Agaricales, Mycenaceae, called sclerocysts by Pöder 1985), *Hemimycena* (Agaricales, Mycenaceae, Moreau et al 2005), in basidiomes and/or mycelia of some species of polypores (Stalpers 2000) and on the cleistothecial wall of species of the genus *Emericella* (the so-called hülle cells, Carvalho et al 2002), a teleomorph of many *Aspergillus* species (Ascomycota, Eurotiales, Trichocomaceae), where they function as diaspores (Ellis et al 1973). However it is unlikely that these structures are homologous.

Bon (1999), who examined a specimen of the yet undescribed *Crinipellis pedemontana*, included it in his keys as a form (with a question mark) of *Crinipellis alcalivirens* Singer. However that species originally described from Colombia does not have pink-purple tinges in the pileus, has a slender stipe, smaller spores ($7.8\text{--}8.5 \times 4.5\text{--}5.7 \mu\text{m}$), narrower and less pigmented setae, not incrustated subpellis (hypotrachium), abundant pleurocystidia and is found on culms of Bambuseae (Poaceae).

However the only species in Europe that sometimes has a lilac tinge in the pileus (viz. *C. tomentosa* [Qué.] Singer) differs not only by the lack of chlamydospores but also by having a much deeper brown, brownish gray, grayish-brown to ochraceous-gray pileus, up to 1–1.5(2) mm wide stipe, slightly larger basidiospores, $(7.5)8.1\text{--}10.8(12.5) \times (3.9)4.1\text{--}6.5 \mu\text{m}$ and distinctly shorter setae, only 150–200 μm long; furthermore the pigments of this species of *Crinipellis* do not stain in alkaline solutions (Antonín and Noordeloos 1997).

C. dusenii (Henn.) Singer, from Africa and South America on fallen leaves of dicotyledonous trees has a purple or bright red pileus, an amber or brown, sometimes also purple or chestnut-colored, slender (0.5–1.5 mm) stipe, narrower spores ($3.3\text{--}5 \mu\text{m}$), smaller basidia ($18\text{--}27.5 \times 6\text{--}8 \mu\text{m}$), well developed pleurocystidia, and not incrustated hyphae in the supra- and subpileipellis (Pegler 1968, Singer 1976); *C. rubida* Pat. & R. Heim, found in Venezuela on fallen twigs and branches, has a bright pink pileus drying out to vinaceous, a longer and thinner $(5)40\text{--}60 \times (0.7)1 \text{ mm}$ stipe concolorous with pileus, smaller $(7.3\text{--}8 \times 4\text{--}4.8 \mu\text{m})$ basidiospores, which may become thick-walled and septate with age, smaller $(20\text{--}28 \times 6\text{--}6.7 \mu\text{m})$ cheilocystidia with numerous apical projections, setae that remain hyaline or turn pale vinaceous in NH_4OH , and nonincrustated hyphae in the pileipellis (Singer 1942, 1976).

As indicated above all species from sect. *Iopodinae* (Singer) Singer (the genus *Moniliophthora*), although

their pileus color may be somewhat similar, differ by the absence of a green reaction in alkaline solutions and obviously by lacking chlamydospores.

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