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A KEY FOR THE IDENTIFICATION OF *AMANITA* SPECIES,
SECT. *VAGINATAE*, SUBSECT. *OVIGERAE*
(*Basidiomycota Amanitaceae*) FROM SICILY

SUMMARY

Four species of the genus *Amanita* Pers. (*A. dryophila*, *A. mairei*, *A. pseudolactea* and *A. separata*) belonging to section *Vaginatae*, subsection *Ovigerae* and bearing ellipsoidal basidiospores are reported from Sicily. Ecological, taxonomical and distributional features of each species and a key for their identification are also included.

RIASSUNTO

Chiave d'identificazione delle specie del gen. Amanita, sect. Vaginatae, subsect. Ovigerae (Basidiomycota Amanitaceae) della Sicilia. In questo lavoro è segnalata la presenza in Sicilia di quattro specie del genere *Amanita* Pers. (*A. dryophila*, *A. mairei*, *A. pseudolactea* e *A. separata*) afferenti alla sezione *Vaginatae*, sottosezione *Ovigerae* e caratterizzate da basidiospore di forma ellissoidale. Gli autori riportano i caratteri macroscopici, microscopici, ecologici, tassonomici e distributivi di ciascuna specie e propongono una chiave di identificazione.

INTRODUCTION

The increase of mycological investigations in Sicily during the last fifteen years permitted to widen the knowledge on ecology and distribution of a huge number of macromycetes and to clarify the perplexed taxonomy of some interesting taxonomic groups. The genus *Amanita* Pers. is one of the most investigated in mycology and the sense of curiosity on such macromycetes is not only based on their fundamental role in forest ecosystems, but also on the

importance of some *Amanita* species as food and consequently as source of income for people harvesting mushrooms. Besides, since ancient times, the problems related to poisoning and possible cure were debated by the scientific communities. The identification of *Amanita* species complex is still a controversial topic, particularly in south Mediterranean regions, where mycological investigation needs to fill the gap of knowledge versus central and northern European countries. Besides, monographs and identification keys for *Amanita* species are mainly based on collections carried out in environments with different ecological features as compared with the Mediterranean one. Owing to the increase of mycological investigations, some *Amanita* taxa, previously unrecorded from Sicily, were collected. This work deals with descriptions and taxonomic remarks on four *Amanita* species belonging to section *Vaginatae* (Fr.) Quél., subsection *Ovigerae* (Sing.) Contu, bearing ellipsoidal basidiospores.

MATERIALS AND METHODS

Periodical observations on the occurrence of *Amanita* species in the Sicilian territory were carried out in the last years. For each taxon the scientific binomial, the habitat, the localities and the cartographic references were recorded. The distributive data are referred to the grid map 1 : 50000 (Official Map of the Italian State). According to the methodology adopted by the Working Group for Mycology of the Italian Botanical Society (PADOVAN, 1994), each cartographic sheet was divided into 64 subunits (3.5 x 2.5 km) in order to obtain a more detailed distribution of each taxon. The herbarium specimens are kept in the *Herbarium Mediterraneum* (PAL) and in the private *Herbarium of Marco Contu*.

RESULTS AND DISCUSSION

Amanita dryophila Consiglio & Contu in *Persoonia* 17 (2): 287 (1999). Figs. 1a, 2a, 3.

Cap 3-8 cm, brown-bronze or light brown-orange, convex, then convexo-plane. The centre of the cap is slightly umbonate, glabrous, without or with few white remains of universal veil. The margin of the cap is striate-pectinate. Gills wide and thick, ventricose, close, free, white. The gills margin is white and slightly crenulated. Stipe, 5-12 x 1-2 cm, slender, cylindrical or slightly clavate, not bulbous, white, streaked by orange creamy bands. Annu-

lus absent in the unripe and ripe basidiomata. Volva fragile and crisped, rarely intact also in the unripe basidiomata, reduced in patches at the base of the stipe, white, immutable. Flesh tender, white, immutable, smell and taste not well distinct. The spore print is white. Basidiospores, $10.5-12 \times 9-10 \mu\text{m}$, hyaline, not amyloid, broadly ellipsoidal or subglobose, with a big drop of oil in the centre. Basidia tetrasporic, $45-70 \times 12-16 \mu\text{m}$, clavate, without clamp-connections at the base. Hymenial tree composed by a chain of stretched cylindrical hyphae. The trama of hymenophore is bilateral and banal. The marginal cells are frequent, clavate to sphero-pedicellate, often also catenate, $15-30 \mu\text{m}$ wide, abundant also in exsiccata samples. The surface of pellis is composed by a jelly suprapellis. The pileipellis is composed by a cutis of cylindrical hyphae, intertwined, $3-8 \mu\text{m}$ wide. Universal veil with subcellular texture and composed by cylindrical hyphae, intertwined, $3-8 \mu\text{m}$ wide and many hyaline sphaerocysts, up to $50 \mu\text{m}$ of width. Vascular hyphae frequent. Clamp-connections absent.

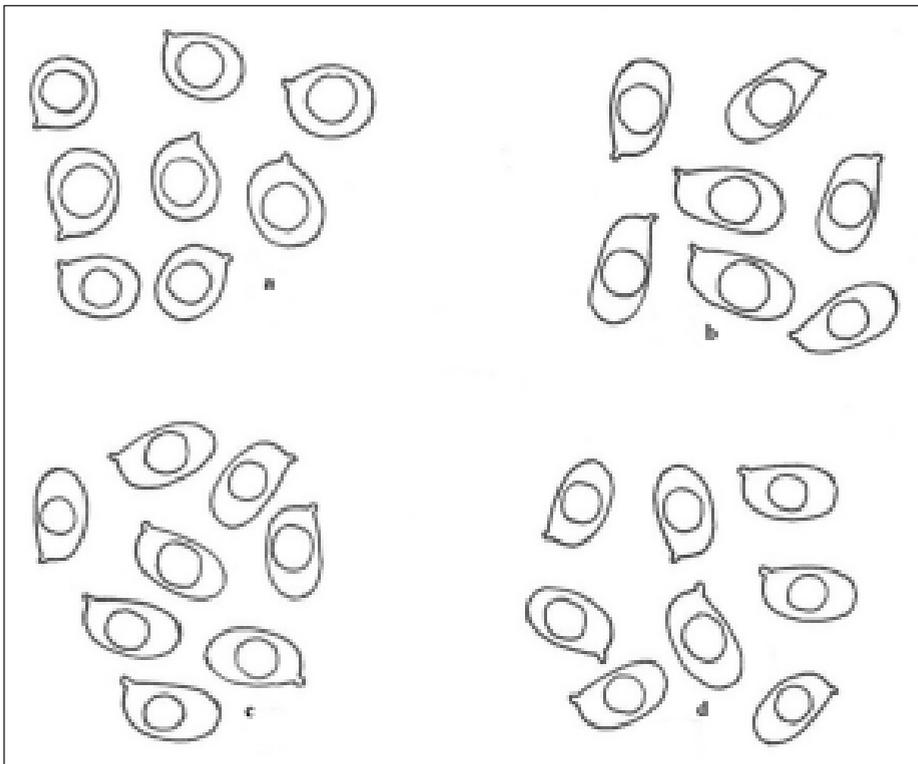


Fig. 1 — Basidiospores: **a)** *Amanita dryophila*, **b)** *Amanita mairei*, **c)** *Amanita pseudolactea*, **d)** *Amanita separata*.

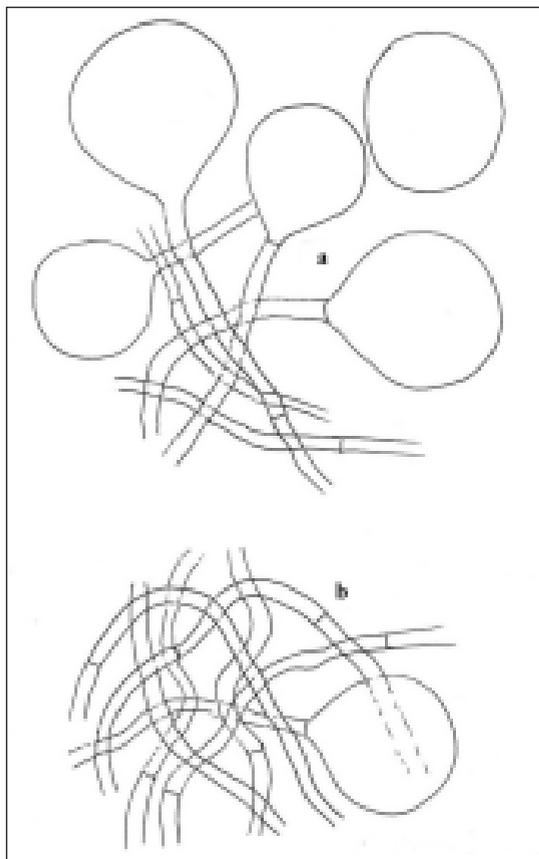


Fig. 2 — Universal veil: **a**) *Amanita dryophila*, **b**) *Amanita mairei*, *A. pseudolactea*, *A. separata*.

ing to section *Vaginatae*, *A. dryophila* is an edible species only after cooking. *A. beckeri* Huijsman is a different taxon which is characterized by a more evident light brown colour of the cap, the universal veil white then brownish and the spherical spores (cfr., ex plur., MESPLEDE, 1980; FRAITURE, 1993; ROMAGNESI, 1992; TULLOSS, 1994). *A. malleata* (Bon) Contu, as recently reported by TULLOSS (1994), could be distinguished from *A. dryophila* by the greyish or grey-brownish color of the cap, the more stretched basidiospores and the different habitat represented by meadows. *Amanita fulva* (Schaeff.) Fr. show a more tawny pileus, and sometimes an entirely tawny volva and globose basidiospores (FRAITURE, 1993) whilst *A. spadicea* Pers. is characterized by a darker, chestnut-brown pileus. The volva is saccate and membranose and the basidiospores are globose (CONTU, 1999a, b). Moreover the general veil of *A. fulva* and *A. spadicea* is characterized by few inflated cells.

Habitat: in broad-leaved woods (*Quercus ilex* L., *Q. suber* L., etc.), on calcareous and (sometimes) acid soils.

Specimens examined: Serre della Pizzuta (Piana degli Albanesi, Palermo), 12 May 2002, 01 June 2002, *Venturella & Saitta* (PAL), cartographic references: 607114.

Notes: *A. dryophila* is a common, autumnal species, reported from Italy, France and Spain but probably present also in many other countries. It could be easily identified by the brown-bronze or light brown-orange colour of the cap, the stipe streaked by orange creamy bands, the white and crisped universal veil and the broadly ellipsoidal or subglobose basidiospores. As the other species belong-



Fig. 3 — The typical saccate and membranose volva of *Amanita dryophila*.

Amanita mairei Foley in Mém. Hors-sér. Soc. Hist. Nat. Afrique du Nord 2: 117 (1949). Figs. 1b, 2b, 4.

= *Amanita crassipes* Coccia & Migl. in Micol. Ital. 29 (1): 77-78, 2000

= *Amanita griseocastanea* Coccia & Migl. in Micol. Ital. 29 (1): 78-79, 2000

= *Amanita luteovergens* Coccia & Migl. in Micol. Ital. 29 (1): 80, 2000

Cap rather fleshy, 3-9 cm, convex then convex-applanate, white greyish or grey bistre, without umbo, glabrous, smooth, with scattered or abundant white remnants of veil. The margin of the cap is striate-pectinate. Gills wide and thick, ventricose, close, free, white or greyish. The gills margin is white or greyish and slightly crenulated. Stipe, 5-8 x 1-2 cm, cylindrical or slightly clavate, not bulbous, white, streaked by creamy bands. Annulus absent in the unripe and ripe basidiomata. Volva thick, membranous and sheating, persistent, not crisped, white, immutable. Flesh fragile, white, immutable, smell and taste not well distinct. The spore print is white. Basidiospores, 10.5-14 x 8-10 μ m, hyaline, not amyloid, broadly ellipsoidal or ellipsoidal stretched, with a big drop of oil in the centre. Basidia tetrasporic, 45-60 x 12-15 μ m, clavate, without clamp-connections at the base. Hymenial tree composed by a chain of stretched cylindrical hyphae. The trama of hymenophore is bilateral and banal. The marginal cells are frequent in the fresh basidiomata but rare in the



Fig. 4 — Basidioma of *Amanita mairei*.

exsiccata, clavate to spheropedicellate, often also catenate, 12-20 μm wide. The surface of pellis is composed by a jelly suprapellis. The pileipellis is composed by a cutis of cylindrical hyphae, intertwined, 3-6 μm wide. Universal veil with textura almost entirely filamentous and composed by cylindrical hyphae, intertwined, 3-10 μm wide. The spherocysts, are hyaline or greyish, up to 30 μm of width, not frequent. Vascular hyphae not rare in the pileus, subhymenial and veil trama. Clamp-connections not observed.

Habitat: in conifer woods and mixed woods with *Q. ilex*, on acid sandy soils along the coast.

Specimens examined: Monte Petroso (Monreale, Palermo), 07 Oct 2003, *Venturella & Saitta* (PAL), cartographic references: 594123, 594214; Bosco di Scorace (Buseto Palizzolo, Trapani), 05 Oct 2003, *Venturella & Saitta* (PAL), cartographic references: 606414.

Notes: *A. mairei* is an autumnal species, frequently collected in all the Mediterranean area including the coasts of North Africa (Morocco, Tunisia and Algeria), and it is widely distributed in the coastal conifer woods and strictly related to *Pinus* trees (MALENÇON & BERTAULT, 1970; BREITENBACH & KRANZLIN, 1995) Its presence in Europe was previously excluded by COCCIA & MIGLIOZZI (2000a). As the other species belonging to section *Vaginatae*, *A.*

mairei is an edible species only after cooking. Our observations in the Sicilian territory and comparisons with fresh and dried materials coming from Sardinia and Latium (Italy) and Tunisia (exsiccata kept in *herb. pers. M. Contu*) demonstrated that there are no significant morphological and anatomical differences between *A. mairei* and *A. crassipes* Coccia & Migliozi and *A. griseo-castanea* Coccia & Migliozi. For the reasons given above the two taxa proposed by COCCIA & MIGLIOZZI (2000b) should be considered as synonyms of *A. mairei*. Besides the basidiomata of *A. mairei* showed a high variability in pileus, gills and flesh colours. In particular the flesh can occasionally turn to greyish or to yellowish as usually happens in other *Amanita* species (especially those belonging to section *Lepidella*). For these reasons *A. luteovergens*, only recorded in a locality of Latium and described by COCCIA & MIGLIOZZI (2000b) on few ephemeral characters such as the change of flesh colour after cutting, should be considered as a phenotype of *A. mairei*.

Amanita pseudolactea Contu in Boll. Acc. Gioenia Sci. Nat. Catania 32 (356): 24 (1999, 2001). Figs. 1c, 2b, 5.

Cap, 3-6 cm, not very fleshy, conic-convex, rarely convex-applanate in the ripe basidiomata and in such case with a prominent central umbo. The cap is glabrous, without or with few scattered remnants of universal veil, snow-white, sometimes greyish at the disc. The margin of the cap is striate-pectinate. Gills wide and thick, ventricose, close, free, white. The gills margin is white and slightly crenulated. Stipe, 5-8 x 0.5-1.5 cm, cylindrical or slightly clavate, not bulbous, white, streaked by creamy bands. Annulus absent in the unripe and ripe basidiomata. Volva thick, membranous and sheating, persistent, not crisped, white, immutable. Flesh firm, white, immutable, smell and taste not well distinct. The spore print is white. Basidiospores, 10.5-13.5 x 8.5-10.5 μm , hyaline, not amyloid, ellipsoidal or ellipsoidal stretched, with a big drop of oil in the centre. Basidia tetrasporic, 45-70 x 12-15 μm , clavate, often with clamp-connections at the base. Hymenial tree composed by a chain of cylindrical hyphae. The trama of hymenophore is bilateral and banal. The marginal cells are frequent, clavate to spheropedicellate, often also catenate, 15-30 μm wide. The surface of the pileipellis is composed by a jelly suprapellis. The pileipellis is composed by a cutis of cylindrical hyphae, intertwined, 3-9 μm wide. Universal veil with textura almost entirely filamentous and composed by cylindrical hyphae, intertwined, 3-8 μm wide. The sphaerocysts are very rare or absent. Vascular hyphae not rare in the pileus, subhymenial and veil trama. Clamp-connections often at the base of the basidia.

Habitat: in broad-leaved and conifer woods, on acid soils.



Fig. 5 — *Amanita pseudolactea*: a particular of the margin striate-pectinate and the volva thick, membranose and sheathing.

Specimens examined: Monte Petroso (Monreale, Palermo), 07 Oct 2003, *Venturella & Saitta* (PAL), cartographic references: 594123, 594214.

Notes: *A. pseudolactea* is an infrequent autumnal species, reported from Trentino Alto Adige and Sardinia (Italy), but surely growing also in many other countries. The main characters for the identification of such species are the cap conic-convex and umbonate, entirely white (the gills and the volva are also white), the stretched basidiospores and the universal veil with textura almost entirely filamentous. The clamp-connections are frequently present at the base of basidia. As many other species belonging to section

Vaginatae, *A. pseudolactea* could be also identified by the fragile consistence of the basidiomata and the easy perishability. Like the other species belonging to section *Vaginatae*, *A. pseudolactea* is an edible species only after cooking. Initially collected and described from Sardinia (CONTU, 1999a), *A. pseudolactea* was subsequently reported from Trentino Alto Adige (province of Trento, leg. M. Contu & M. Floriani, exsiccata kept in TR and in *herb. pers.* M. Contu). *A. vaginata* fo. *alba* (De Seynes) Vesely (GILBERT, 1918, 1940-1941; PARROT, 1960; BAS, 1977; GARCIN, 1984; FRAITURE, 1993; TRAVERSO, 1999, etc.) and *A. nivalis* Greville (WATLING, 1985) are also characterized by white colour of basidiomata, but they could be separated by the spherical spores. *A. alba* Bull. *sensu* CETTO (1976, table no. 860) and MOSER (1986) seems to be identical. On the other hand the basidiomata of *A. albogrisescens* Contu (CONTU, 1999a) are basically white but tend to become greyish at the apex of the cap and could be separated for the typically subglobose basidiospores. The binomial *A. pseudolactea* was chosen by authors to underline the possibility that such species could be misidentified as *A. lactea* (MALENÇON *et al.*, 1967; cfr. also TULLOSS & GMINDER, 2000). The discrimi-

nant characters of *A. lactea* are represented by the cap not conic-campanulate and without umbo, the stipe with an evident annulus although sometimes disrupted and the bigger and more stretched basidiospores. Besides, *A. lactea* belongs to the section *Caesareae* Sing. while *A. pseudolactea* is included in the section *Vaginatae*.

Amanita separata Contu in Micol. Veget. Medit. 13: 162 (1998). Figs. 1d, 2b, 6.

Cap, 5-12 cm, rather fleshy, convex then applanate and clearly umbonate, glabrous, smooth, without or with few and scattered remnants of universal veil, bistre-dark brownish in the unripe basidiomata then light cinereous or pearl grey, margin striate-pectinate. The gills are distant, thick, ventricose, close, free, white. The gills margin is white and crenulated. Stipe, 8-15 x 1-2 cm, cylindrical, not bulbous, white, streaked by white bands. Annulus absent in the unripe and ripe basidiomata. Volva tenacious, membranous and sheathing, persistent, not crisped, white, immutable. Flesh firm, white, immutable, smell and taste not well distinct. The spore print is white. Basidiospores, 10.5-13.5 x 8-10.5 μm , hyaline, not amyloid, widely ellipsoidal or ellipsoidal stretched, with a big drop of oil in the centre. Basidia tetrasporic, 45-70 x 12-18 μm , clavate, without clamp-connections. Hymenial tree composed by a chain of cylindrical hyphae. The trama of hymenophore is bilateral and banal. The marginal cells are frequent, clavate to spheropedicellate, often also catenate, 15-30 μm wide. The surface of the pileipellis is composed by a jelly suprapellis. The pileipellis is composed by a cutis of cylindrical hyphae, intertwined, 3-8 μm wide. Universal veil with textura almost entirely filamentous and composed by cylindrical hyphae, intertwined, 2-12 μm wide. Spherocysts are very rare or absent. Vascular hyphae not rare in the pileus, subhymenial and veil trama. Clamp-connections not observed.

Habitat: in broad-leaved woods, rarely in mixed woods, on acid soils.

Specimens examined: Serre della Pizzuta (Piana degli Albanesi, Palermo), 18 May 2002, *Venturella & Saitta* (PAL), cartographic references: 607114.

Notes: *Amanita separata* is currently considered as an infrequent autumnal species from Italy and Spain, but it is probably widely distributed in the Mediterranean area since it could be easily confused with other species belonging to section *Vaginatae*. Initially collected and described from Sardinia (CONTU, 1998), it was reported from different localities of Spain (MAHIQUES & TEJEDOR, 2001) and subsequently recorded in the years 2001, 2002 and 2003 by M. Contu in different localities of northern Sardinia in *Q. suber* woods, on acid soils. *A. separata* could be easily identified by the dark colours of the cap



Fig. 6 — Basidioma of *Amanita separata* collected in a broad-leaved wood of Sicily.

in the unripe basidiomata. The dark colour tend to become pale in the ripe basidiomata (a typical character of *A. lividopallescens* (Gillet) Seyot species-complex). The stout and slender basidioma, the ellipsoidal-stretched basidiospores and the textura almost entirely filamentous of the universal veil are additional characters for the identification of the species. As the other species belonging to section *Vaginatae*, *A. separata* is an edible species only after cooking. *A. subfraudulenta* Contu (CONTU, 1999b, 2004) (= *A. lividopallescens* var. *tigrina* Romagnesi ex Bon = *A. lividopallescens* var. *malleata* Piane ex Romagnesi) is a very close taxon which differs from *A. separata* for the margin of the gills typically brown-bistre, the stipe streaked by brown-bistre bands, versicoloured, and the absence of marginal cells on the margin of the gills.

KEY FOR THE IDENTIFICATION OF *AMANITA* SPECIES SECT. *VAGINATAE*,
SUBSECT. *OVIGERAE*

- 1* Tetrasporic basidia, basidiospores rarely bigger than 14 μm 2
- 2 Cap brown-bronze or light brown-orange, stipe streaked by orange creamy bands, basidiospores widely ellipsoidal, $Q = 1.15-1.2$
..... ***A. dryophila* Consiglio & Contu**
- 2* Cap with different colours, basidiospores ellipsoidal-stretched 3
- 3 Cap white-greyish or grey bistre, without umbo, gills often turning to grey, in sandy soils on the coasts ***A. mairei* Foley**
- 3* Cap with umbo and different colours, in woods of the inland 4
- 4 Cap snow-white, conic-convex, clamp-connections often at the base of the basidia ***A. pseudolactea* Contu**

- 4* Cap initially convex then appanate and clearly umbonate, bistre-dark brownish then light cinereous or pearl grey, clamp-connections absent at the base of basidia ***A. separata* Contu**

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