

Some New Records of Coprophilous Fungi from Lybia. II. *)

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Summary. Nine species of coprophilous fungi isolated by moist chamber technique, from dung samples collected from various localities in Libya, have been described and illustrated. All are new records for the area.

Introduction

In this second paper on Libyan coprophilous fungi 9 species are added to those previously recorded (RATTAN & EL-BUNI, 1979). All are new records for Libya.

The method of study followed is the same as discussed previously (RATTAN & EL-BUNI, 1979). The serial number of the species represents the serial number of coprophilous fungi being described in these series. The material of all collections cited in the text has been deposited at the Mycology Herbarium, Botany Department, Al-Faateh University, Tripoli (ULT).

18. *Saccobolus minimus* VELENOVSKY 1934. — Pl. 1, fig. 2.

Monogr. Discom. Boh. 1: 370.

Apothecia scattered, sessile, 150—200 μm in diam., up to 120 μm high, initially globose but become pulvinate at maturity, ochre-yellow to yellowish brown; disc convex, dotted with violet-black tips of mature asci; margin illdefined. Flesh poorly differentiated, mostly textura globosa. Paraphyses filiform, 2—3 μm wide, unbranched, septate, subhyaline but faintly tinted yellow in the apical part. Asci 70—90 \times 15—16 μm , subcylindrical, 8-spored. Spore cluster 27—30 \times 11.5—12.5 μm , composed of 4 rows of 2 longitudinally arranged spores. Ascospores 11.5—13 \times 5.5—6.5 μm , ellipsoid to subfusiform, violet brown, smooth to finely granular, somewhat asymmetrical.

Collection examined: On sheep droppings, Kufra, Jan. 27, 1979, AMB 163.

This species comes close to *S. truncatus* VELENOVSKY (BRUMMELEN, 1967; RATTAN & EL-BUNI, 1979) but differs in having smaller

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ascospores and spore clusters. The spore cluster in *S. truncatus* shortens appreciably at maturity and spores also become irregularly arranged. In *S. minimus*, however, there is no shortening of spore cluster and there is no marked rearrangement of spores.

19. *Saccobolus saccoboloides* (SEAVER in DODGE & SEAVER) BRUMMELEN 1967. — Pl. 1, figs. 5, 6.
Persoonia Suppl. 1: 168.

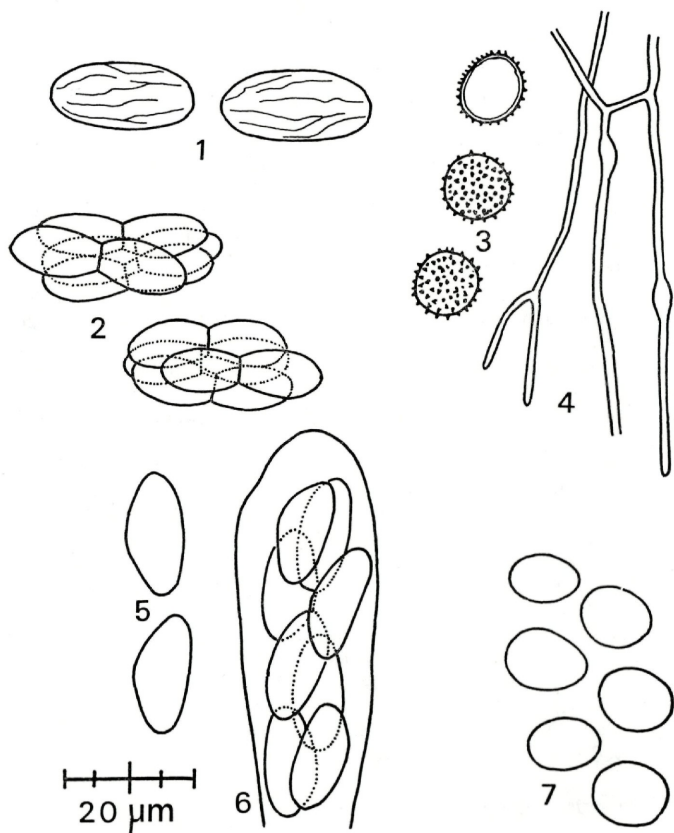
Apothecia gregarious, sessile, 0.5—1.0 mm in diam., and 0.4—0.5 mm high, initially subglobose but become pulvinate at maturity, dark brown to almost brownish black; disc convex; margin ill-defined. Flesh poorly differentiated, mostly textura globosa, cells c. 20 μ m in diam. Paraphyses filiform, 2—3 μ m wide, unbranched, septate, subhyaline. Asci 100—125 \times 14.5—19 μ m, clavate with truncate apex, 8-spored. Spore cluster loose, spores at first free, uniseriate to biseriate but move to the upper part of the ascus during maturation and become arranged according to pattern I (*sensu* BRUMMELEN, 1967, in 4 rows of 2 longitudinally arranged spores in each). At maturity spores again become free or do so if lightly tapped under the coverglass. Ascospores 17—18.5 \times 7.5—9 μ m, ellipsoidfusiform, violet-brown, smooth to finely granular.

Collection examined: On cow dung, Wadi-el-Kuf, April 16, 1979, SSR 178.

This species is marked by the almost black apothecia and nature of spore cluster. SEAVER (in DODGE & SEAVER, 1946) described this species under *Ascobolus* due to the occurrence of free ascospores and considered it as a link between *Ascobolus* and *Saccobolus*. BRUMMELEN (1967), however, transferred this species under *Saccobolus* on the basis of comparative morphology and pointed out that occurrence of free ascospores cannot be maintained as the sole conclusive character in separating *Saccobolus* from *Ascobolus*.

20. *Ascobolus michaudii* BOUDIER 1907. — Pl. 1, fig. 1.
Hist. Class. Discom. Eur. p. 71.

Apothecia scattered, substipitate, 0.8—1.5 mm in diam., up to 750 μ m high, bright yellow to lemon-yellow when young but turn yellow-brown at maturity; disc closed initially but opens during development and becomes plane to concave, concolorous but dotted with violet-brown tips of mature asci; margin acute, well defined, smooth; external surface smooth but not furfuraceous. Flesh well developed, mostly textura globosa to textura angularis. Paraphyses filiform, 2.5—4 μ m wide, unbranched, septate. Asci 150—175 \times 20—22 μ m, clavate with truncate apex, 8-spored. Ascospores uniseriate initially but become biseriate at maturity, 20—22 \times 9.5—



Figs. 1–7. 1. *Ascobolus michaudii*: ascospores. — 2. *Saccobolus minimus*: ascospore clusters. — 3, 4. *Didymium iridis*: 3, spores; 4, capillitium. — 5, 6. *S. saccoboloides*: 5, ascospores; 6, ascus. — 7. *Pilobolus pullus*: spores

11 μm , ellipsoid, violet-brown, ornamented with 2—4 (5) irregular, longitudinal crevices or ridges which rarely anastomose.

Collection examined: On cow dung, Wadi el-Kuf, April 16, 1979, SSR 168.

This species is marked by substipitate, lemon yellow apothecia and ascospore ornamentation. It can be easily separated from *A. furfuraceus* PERSEON per HOOKER, recorded from Libya (RATTAN & EL-BUNI, 1979) by the lack of powdery or furfuraceous apothecia. Moreover, there are always more than 6 anastomosing ridges on the spore wall in *A. furfuraceus* while in *A. michaudii* these are always less than 5 and these rarely anastomose.

21. *Podospora curvula* (DE BARY) NIESSL 1883. — Pl. 2, fig. 8.

Hedwigia 22: 156.

Perithecia semi-immersed, brown to brownish black, 900—1000 \times 400—450 μm , subconical with ovoid base which merges gradually into the neck, shaggy due to the presence of agglutinating hairs or papillae. Neck ill-defined, black, shaggy. Papillae up to 75 μm long and 25 μm broad at the base, composed of one or more agglutinated, septate hairs with inflated cells, light brown. Asci ca. 160 \times 20 μm , subfusiform, 8-spored. Paraphyses evanescent. Ascospores biseriata, 24—26 \times 12.5—13.5 μm , ellipsoid, smooth, brown; primary appendage hyaline, cylindrical to tapering distally, 7.5—10 μm long and 2—2.5 μm broad at the base; secondary appendages lash-like, up to 40 μm long and 2.5 μm broad at the base, present on the proximal end of spore and distal end of the primary appendage.

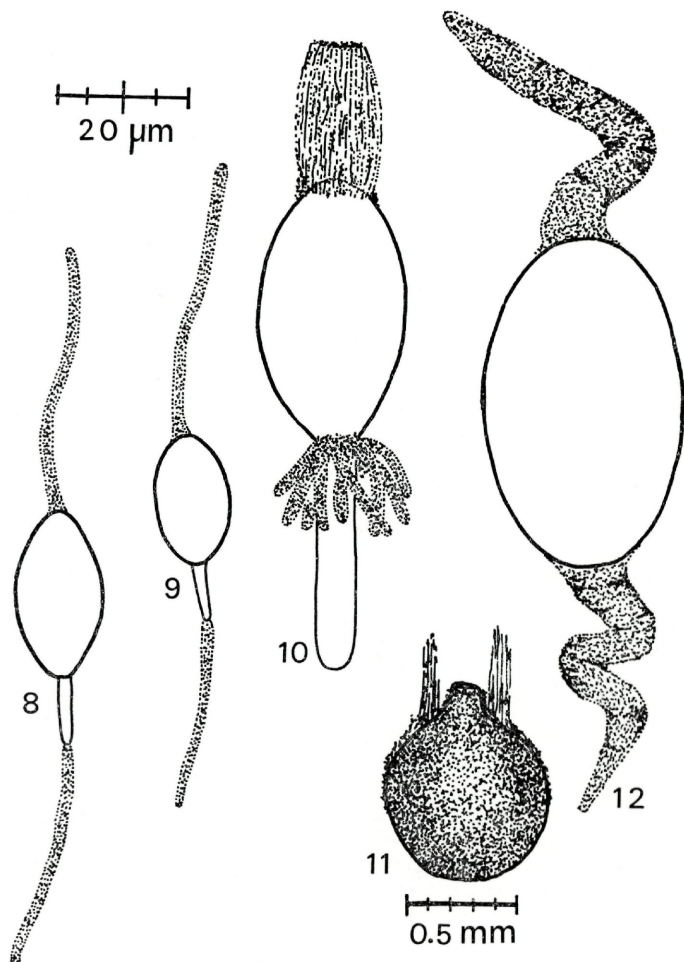
Collection examined: On goat droppings, Derna, April 15, 1979, SSR 179.

This Libyan collection resembles the species closely but differs in having comparatively narrower ascospores. MIRZA & CAIN (1969) have given the following measurements: 23—28 (32) \times 13—16 (18) μm . Moreover, they have also mentioned the occurrence of a small secondary appendage at the base of the primary appendage but we have not observed it in the Libyan material.

22. *Podospora decipiens* (WINTER) NIESSL 1883. — Pl. 2, fig. 10.

Hedwigia 22: 156.

Perithecia semi-immersed, brownish black, base ovoid to pyriform, 600—700 \times 400—475 μm , smooth, narrows gradually into short, conical neck. Neck, 225—275 \times 135—150 μm , often marked with small black papillae. Hairs absent. Asci 200—240 \times 40—45 μm , clavate to subfusiform, 8-spored. Paraphyses evanescent. Ascospores biseriata, 35—40 \times 18—22 μm , ellipsoid, brown, smooth; primary appendage cylindrical, subhyaline, 35—42 \times 5—6 μm ; upper



Figs. 8—12. 8. *Podospora curvula*: ascospore. — 9. *P. vesticola*: ascospore. — 10. *P. decipiens*: ascospore. 11, 12. *Arnium arizonense*: 11, perithecium; 12, ascospore

secondary appendage occurring as lyreshaped tuft up to 18—22 μm long and 10—12 μm broad; lower secondary appendage fugacious, occurring in clusters at the junction of primary appendage and spore body, each up to 15 μm long and 2.5 μm broad, cylindrical, hyaline.

Collection examined: On sheep droppings, Tripoli, Feb. 13, 1979, AMB 151.

This species is quite distinctive because of the size of ascospores and nature of the primary and secondary appendages. The Libyan collection resembles closely with the species but differs in having relatively slender and shorter primary appendages. These have been recorded up to, 40—60 \times 7—8 μm (CAIN, 1934; MIRZA & CAIN, 1969; ABDULLAH & al., 1978) for the species.

23. *Podospora vesticola* (BERKELEY & BROOME) MIRZA & CAIN 1969. — Pl. 2, fig. 9.

Can. J. Bot. 47: 2044.

Perithecia semi-immersed, brownish black to greyish black, 800—1100 \times 375—575 μm , conical with a broad base which gradually narrows above and merges into the neck, shaggy due to the presence of papillae or agglutinating hairs. Neck not well-differentiated from the basal part, up to 250 μm long and 225 μm broad, black, devoid of hairs but may be shaggy or papillate. Papillae up to 100 μm long, composed of one or more agglutinated septate hairs with inflated cells, light brown to dark brown. Asci 150—175 \times 15—18 μm , subcylindrical, 8-spored. Paraphyses evanescent. Ascospores uniseriate initially but may become biseriate at maturity, 19—21 \times 11.5—12.5 μm , ellipsoid, brown, smooth; primary appendage cylindrical, hyaline, c. 9 \times 1.5 μm ; secondary appendages lash-like, up to 45 μm long and 2.5 μm broad at the base, upper one placed eccentrically at the proximal end of the spore while the lower one at the distal end of the primary appendage.

Collection examined: On cow dung, Tripoli, Feb. 13, 1979, AMB 158.

This species is marked by large shaggy perithecia with agglutinated hairs or papillae. The ascospores are rather small and serve to distinguish this species from the related *P. curvula* (DE BARY) NIESSL and *P. miniglutinans* MIRZA & CAIN. According to MIRZA & CAIN (1969) the ascospores are uniseriate but they appear biseriate due to displacement under the pressure of coverslip.

24. *Arnium arizonense* (GRIFFON) LUNDQVIST & KRUG 1972. — Pl. 2, figs. 11, 12.

in LUNDQVIST, Symb. Bot. Upsal. 20: 232.

Perithecia immersed to semi-immersed, brownish black to almost black, hard and shell-like, brittle, base globose, 550—700 μm , smooth, covered with white downy hyphae when young but these disappear towards maturity, with a fascicle of stiff hairs near the neck area; neck papilliform, short, 90—110 μm long and 135—140 μm broad, hairs up to 400 μm long and 2—2.5 μm broad unbranched, sparsely septate, light brown, often occurring in a loose fascicle or cluster which arises near the neck area but projects far beyond the neck. Asci 240—275 \times 22—28 μm , clavate with a long drawn out stalk (80—150 \times 5—7.5 μm), 4-spored. Paraphyses filiform, 2—2.5 μm broad, evanescent. Ascospores 45—50 \times 24—30 μm , ellipsoid, brownish black, smooth, with germ pore at one end only; primary appendage absent; secondary appendage lash-like, c. 60 \times 7.5 μm , occurring one at each end of the ascospore.

Collection examined: On cow dung, Shahat, April 14, 1979, SSR 166.

This Libyan collection comes close to *Arnium arizonense* and resembles it in most respects. It is marked by 4-spored asci and nature of ascospores. These are large, elliptical, brownish black, lacking primary appendage but are provided with secondary appendages at both ends. The perithecia are covered with white downy mycelium when young but become almost smooth and bald at maturity except for the fascicle of brown hairs in the neck area. The presence of hair fascicles seem to be variable as these are reported to be well developed in the American specimens and almost absent in the European specimens (LUNDQVIST, 1972).

25. *Pilobolus pullus* MASSEE 1901. — Pl. 1, fig. 7.

Kew Bull. p. 160.

Sporangiophores somewhat scattered, erect, 0.9—1.0 mm tall, subhyaline with black sporangia. Trophocyst bulbous, immersed, 275—325 \times 150—200 μm , with a septum at the base which separates rhizoidal hyphae. Stalk 375—450 \times 75—80 μm , erect, stiff, cylindrical, arising from proximal end of trophocyst and continues above into the subsporangial vesicle. Subsporangial vesicle 400—450 \times 325—400 μm , ovoid, firm-walled especially on the sides, continues above into conical columella. Sporangium globose (300—325 μm) in surface view, vertically compressed (125—175 μm) and appear ovoid in side view, upper wall brownish black (violet brown through transmitted light), lower side subhyaline being bounded by the columella. Spores 9—12 \times 8—10 μm , broadly ellipsoid to ovoid, bright golden yellow, moderately thick-walled, smooth.

Collection examined: On goat droppings, Ras el-Hilal, April 15, 1979, SSR 167.

This species appears common in Jabal Akhdar area and appeared on most of the dung samples. It is marked by small sporangiophores (less than 1.0 mm tall), golden-yellow and ovoid to broadly ellipsoid spores. This Libyan collection resembles closely with *P. pullus* (GROVES in BULLER, 1934; NAUMOV, 1939), and is accordingly filed under it. There seems some confusion in literature over the exact specific limits of this species. MASSEE's (1901) original diagnosis is quite scanty. PETCH's (quoted from GROVES in BULLER, 1934) description of this species from Ceylon does not match with ours. The spore measurements given by him are smaller (8—10 × 5—6 μm). Moreover, the stalk in Libyan collection is cylindrical and does not expand almost from the base as mentioned by PETCH (l. c.).

Pilobolus kleinii v. TIEGHEM is very similar but differs in having definitely longer sporangiophores (2—5 mm fide GROVES in BULLER, 1934) and relatively longer but narrower spores (11—20 × 6—10 μm, ellipsoid, fide GROVES in BULLER, 1934).

26. *Didymium iridis* (DITMAR) FRIES 1829. — Pl. 1, fig. 3, 4.

Syst. Mycol. 3: 210.

Fructifications gregarious, stipitate, 0.7—1.0 mm tall. Sporangia 350—550 μm across, globose to subglobose in surface view, vertically compressed (275—325 μm) and appear ovoid in side view, umbilicate below, white. Peridium thin, colourless, densely coated with white lime crystals. Stalk erect, cylindrical to attenuated upwards, up to 400 μm long, 120 μm broad at the base and narrows to 45 μm at the top, longitudinally rugulose, yellowish brown, somewhat darker at the base but translucent in the apical half. Hypothallus somewhat conspicuous, effused, 350—450 μm across, dark brown. Columella globose to subglobose, c. 100 × 75 μm, colourless. Capillitium composed of narrow, slender threads, 1—2 μm wide, with occasional swellings, (4—6 μ broad), sparsely branched, anastomosing, light brown with subhyaline endings. Spores 8.5—9.5 μm in diam., brown in mass but light violet in transmitted light, echinulate.

Collections examined: On sheep droppings, Derna, April 15, 1979, SSR 169; on cow dung, Kufra, January 24, 1979, AMB 174.

This species appears to be very common in Jabal Akhdar and Kufra areas because fructifications were observed on most of the dung samples collected from these areas. It is very close to *D. nigripes* (LINK) FRIES and perhaps they are synonyms but we have followed MARTIN & ALEXOPOULOS (1969) and prefer to segregate them on the basis of colour of stalk, capillitium and columella.

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