

Some New Records of Coprophilous Fungi from Libya

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Summary. Seventeen species of coprophilous fungi, isolated by moist chamber technique, from dung samples collected from Tripoli vicinity (November, 1978 to January, 1979) have been described and illustrated. Out of these, sixteen are new records for Libya while one, *Zopfiella* sp., appears to be new but no name has been given as yet. Recent generic delimitations have been followed and affinities of some species have been discussed.

Introduction

The coprophilous fungi play an important role in the biodegradation of organic materials especially in heavily manured soils and mushroom compost beds. The ease with which these fungi can be grown and maintained in culture, has proved exceedingly useful in the study of substrate degradation, morphogenesis and genetics. Moreover, they are an excellent example to demonstrate the variety of fungi and their succession on a natural substrate. Because of the close link of their lifecycle with the alimentary canal of herbivores especially cows, buffaloes or sheep, they have remained the focus of attention of mycologists since early times.

In spite of their importance and suitability for cultural study, coprophilous fungi have received little attention in this country. In fact, the fungus flora of Libya is largely unknown (KRANZ, 1965). This is particularly true for most of the arid tropical parts of North Africa and the Middle East. In view of the recent interest in tropical mycology (SIMMONS, 1978), this investigation was undertaken to study the occurrence and abundance of fungi in Libya. In this publication, seventeen species of coprophilous fungi have been described and illustrated. Out of these, 16 are new records for Libya while the affinities of *Zopfiella* sp. are not clear. Perhaps it represents an undescribed taxon.

The method of study followed are the same as discussed by BRUMMELEN (1967) and LUNDQVIST (1972). Fresh dung samples were collected from Tripoli vicinity from November, 1978 to January, 1979. These were incubated in moist chambers at room temperature and were scanned daily under a stereo-microscope for any developing fungal fruit-bodies. Sections or crushed mounts for microscopic study

were prepared in water, lactophenol (with and without cotton blue), Melzer's reagent, 25% glycerine and 3% KOH sol. (subsequently staining with 1% aqueous phloxine).

The material of all collections cited in the text has been deposited at the Mycology Herbarium, Botany Department, Faculty of Science, Al-Faateh University, Tripoli.

Enumeration of species

1. *Ascobolus immersus* PERS., Mycol. Eur. 1: 341. 1822.

Figs. 1—4

Apothecia gregarious, immersed when young but may project one-half of their length at maturity and appear columnar or warty, sessile, 600—800 μm long and 400—500 μm broad, globular to pear-shaped, smooth, dirty yellow to yellow brown; disc closed at first but opens irregularly at maturity, convex to flat with ill-defined margin, marked with violet-brown tips of projecting asci. Flesh poorly developed and composed of globular to subangular cells. Paraphyses 2—2.5 μm wide, filiform, septate, simple or sparsely branched, subhyaline, occurring in bundles, apically enclosing greenish yellow mucus, often projecting beyond and covering young asci. Asci 290—450 \times 75—100 μm , clavate, diffusely amyloid, 4—8 spored. Ascospores uniseriate to biseriate or irregularly disposed, 42—55 \times 30—40 μm , broadly ellipsoid to ovoid, thick-walled, smooth, subhyaline when young but turn violet to violet-brown with age, covered with thick, hyaline, mucilaginous sheath.

Collections examined. — Tripoli, on sheep droppings, Dec. 12, 1978, AMB 118; Tripoli, on cowdung, Dec. 25, 1978, AMB 137.

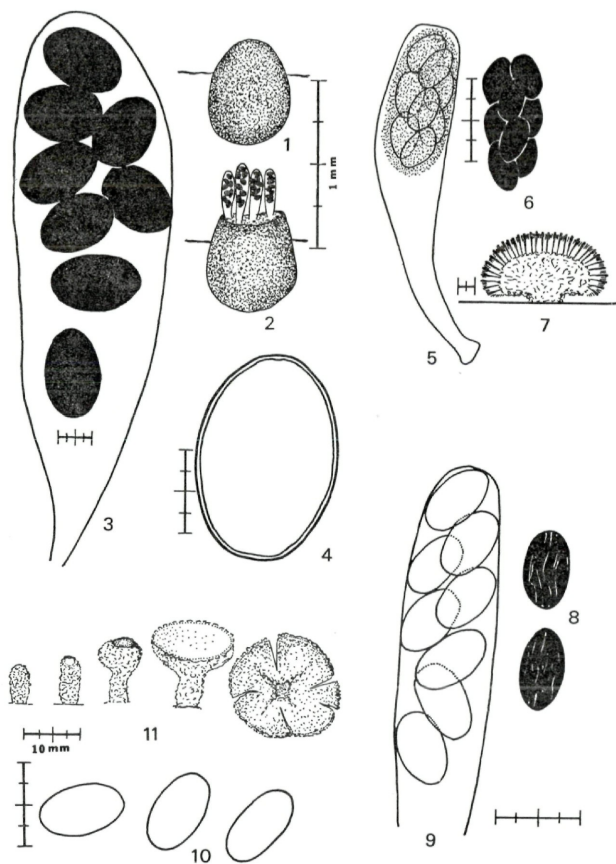
This species is easily recognised by the semiimmersed apothecia and large, smooth, violet-brown ascospores. The mature asci project appreciably out of the apothecial disc and the enclosed ascospores can be seen by a hand lens. The number of ascospores per ascus is variable. Evidently, in 4-spored asci, the ascospores are larger and more deeply pigmented. BRUMMELN (1967) has recorded the existence of fine lines (sometimes forming a reticulum) on ascospore wall but the ascospores in Libyan collections are consistently smooth.

This species is world-wide in distribution and also appears to be common in Libya. We have often noticed their apothecia in incubation chambers.

2. *Ascobolus furfuraceus* PERS. per HOOK. Fl. Scot. 2: 33. 1821

Figs. 8—9

Apothecia solitary, sessile, superficial, 800—1000 μm across and up to 450 μm high, globose at first becoming discoid to saucer-shaped at maturity; externally yellow to yellowish brown, smooth, powdery;



Figs. 1–11. *Ascobolus immersus* (1–4): 1, semi-immersed, immature ascocarp; 2, mature ascocarp showing projecting asci; 3, ascus showing arrangement of ascospores; 4, ascospore. — *Saccobolus depauperatus* (5–7): 5, mature ascus; 6, spore cluster showing two rows of three and one row of two longitudinally disposed spores; 7, diagrammatic section of mature apothecium. — *Ascobolus furfuraceus* (8–9): 8, ascospores; 9, ascus showing arrangement of ascospores. — *Peziza vesiculosa* (10–11): 10, ascospores; 11, apothecia in different stages of development. — Scale of magnification, 20 μ m

disc plane to concave, yellowish green, dotted with violet-brown tips of projecting asci; margin well defined, raised, smooth to dentate. Flesh well developed, composed of globose or subangular cells (20—50 μm across). Paraphyses 2—3.5 μm wide, filiform, simple or sparsely branched, septate, subhyaline, apically enclosing greenish yellow mucus. Asci 150—185 \times 20—25 μm , clavate-cylindrical, diffusely amyloid, 8-spored. Ascospores uniseriate at first but become biseriate or irregular at maturity, 16.5—20 \times 10—11.5 μm , ellipsoid, purple to purple-brown at maturity, wall thick, deeply pigmented and marked with longitudinal striae which may be reticulated.

Collections examined. — Tripoli, on sheep droppings, Nov. 22, 1978, AMB 103; Tripoli, on sheep droppings, Dec. 12, 1978, AMB 127.

The chief features of this species are sessile, dry, powdery apothecia with concave disc and welldefined, raised margin. The nature of striae and their arrangement on ascospore wall is also a noticeable character.

According to BRUMMELEN (1967), it is a cosmopolitan and variable species. The Libyan collections are quite typical of the species. The raised margin, in apothecia of collection no. AMB 127, is quite pronounced and projects up to 100 μm beyond the disc. We have noticed only few scattered apothecia and the species appears to be uncommon.

3. *Saccobolus depauperatus* (BERK. & BR.) HANSEN, Vid. Meddr. Dansk. Natur. Foren. 1876: 87. 1876

Figs. 5—7

Apothecia gregarious, superficial, sessile, 100—350 μm across and 55—275 μm high, globose at first but tend to flatten with age and appear pulvinate, white to cream; disc convex, dotted with violaceous brown tips of projecting asci; margin ill-defined. Flesh composed of globose to subangular cells, not well-differentiated into ectal or medullary regions. Paraphyses 1.5—2.5 μm wide, filiform, simple, septate, subhyaline, collapsing in mature apothecia. Asci 70—90 (140) \times 14—18 μm , clavate, with a bulbous base, diffusely amyloid, 8-spored. Ascospores 9.5—11.5 \times 5—6 μm , ellipsoid to subfusiform, violaceous brown, wall deeply pigmented, smooth, united in a cluster and difficult to separate. Spore cluster 30—35 \times 12.5—15 μm , composed of two rows of three and one row of two longitudinally disposed spores, spore cluster not shortening at maturity, enveloped in a gelatinous sheath.

Collection examined. — Tripoli, on cowdung, Nov. 22, 1978, AMB 102.

The chief features of this species are small, white to cream apothecia, nature of spore cluster and ascospores. The spore cluster does not shorten at maturity and consists of two rows of three and one

row of two longitudinally disposed ascospores. *S. versicolor* (KARST.) KARST. is very similar but possesses definitely longer and broader ascospores ($13-21.5 \times 6.5-9.5 \mu\text{m}$ fide BRUMMELEN, 1967). The Libyan collection seems quite typical of the species.

4. *Saccobolus truncatus* VEL., Monogr. Discom. Boh. 1: 370. 1934

Figs. 12—15

Apothecia gregarious, superficial, sessile, 200—460 μm across and 100—200 μm high, subglobose at first but tend to flatten at maturity, pale yellow to yellow; disc convex, dotted with purple-black tips of projecting asci; margin ill-defined. Flesh composed of globular to subangular cells (7—9 μm across). Hymenium up to 120 μm thick. Paraphyses 1.5—3 μm wide, filiform with broadened tips (2.5—4 μm), septate, simple or sparsely branched, subhyaline but tinted yellow in the apical part. Asci 85—110 \times 21—25 μm , clavate, diffusely amyloid, 8-spored. Ascospores 14.5—18 \times 6.7—9 μm , ellipsoid to subfusiform, ends rounded at first but may become truncate especially on one side (not all spores), violet to violet-brown, opaque, wall deeply pigmented, smooth to somewhat granular, spores uniting in a cluster and difficult to separate. Spore cluster 38—48 \times 14.5—16.2 μm , composed of four rows of two longitudinally disposed spores, spore cluster shortens at maturity and spores become irregularly disposed, enveloped in a hyaline, gelatinous sheath.

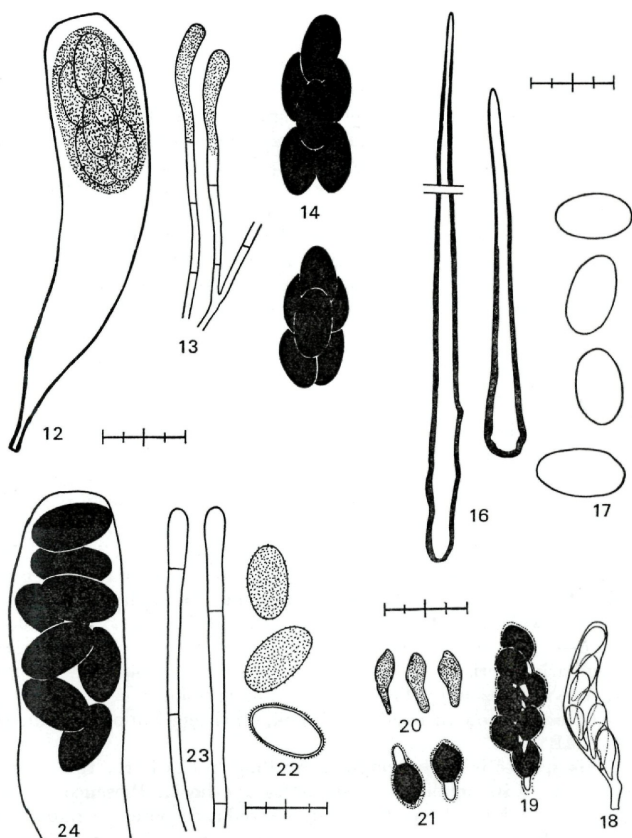
Collection examined. — Tripoli, on cowdung, Nov. 22, 1978, AMB 112.

The chief features of this species are small, yellow, sessile apothecia, presence of pigmented paraphyses and the nature of spore cluster and ascospores. The spore cluster in this species shortens at maturity and also results in rearrangement of ascospores. The Libyan collection is quite typical of the species but we have not observed the fissure in the episporium of ascospores mentioned by BRUMMELEN (1967).

5. *Iodophanus carneus* (PERS.) KORF in KIMBROUGH & KORF, Amer. Journ. Bot. 54: 19. 1967.

Figs. 22—24.

Apothecia gregarious to crowded, discoid, 0.5—1.5 mm across and 0.3—0.5 mm high, sessile, pinkish yellow to pale orange at first but turn light pink to flesh-coloured at maturity; disc convex, dotted with tips of projecting asci. Flesh well developed, composed of globose cells. Hymenium up to 220 μm thick. Paraphyses 2.5—5 μm wide, filiform, septate, occasionally branched. Asci 190—250 \times 26—31 (35) μm , cylindrical with a narrow base, diffusely amyloid, 8-spored.



Figs. 12–24. *Saccobolus truncatus* (12–15): 12, mature ascus; 13, paraphyses; 14, young spore cluster; 15, mature spore cluster shortened lengthwise. — *Lasiobolus ciliatus* (16–17): 16, hairs; 17, ascospores. — *Zopfiella* sp. (18–21): 18, immature ascus; 19, mature ascus; 20, young ascospores; 21, mature ascospores. — *Iodophanus carneus* (22–24): 22, ascospores; 23, paraphyses; 24, ascus showing the arrangement of ascospores. — Scale of magnification, 20 μ m

Ascospores uniseriate to irregularly biseriate, $18-22 \times 10.5-11.5 \mu\text{m}$, ellipsoid with rounded ends, subhyaline, wall smooth when young but echinulate at maturity, spines small ($0.3-0.5 \mu\text{m}$ long), blunt, profuse, non-amyloid.

Collections examined. — Tripoli, on sheep droppings, Dec. 25, 1978, AMB 141; AMB 142; Tripoli, on camel droppings, Dec. 25, 1978, AMB 143.

This species is marked by the small, fleshcoloured apothecia, cylindrical, amyloid asci and medium-sized, ellipsoid, finely echinulate ascospores. The Libyan collections are quite typical of the species and resemble in most respects. Young apothecia are definitely pinkish yellow to pale orange but become pink or flesh-coloured at maturity. The amyloid reaction of the ascus wall does not appear to be consistent. It is diffusely amyloid in collection nos. AMB 141 and AMB 142 but intense in AMB 143. This species appears to be rather common as we have noticed its apothecia in several incubation chambers.

6. *Lasiobolus ciliatus* (SCHMIDT ex Pers.) Boud., Ann. Spi. Nat. Bot. 10: 354. 1869.

Figs. 16—17

Apothecia gregarious, sessile, $200-375 \mu\text{m}$ across and up to $300 \mu\text{m}$ high, globose when young becoming discoid at maturity, white to cream, hairy; disc convex, dotted with tips of projecting asci. Hairs arising from the lower part of apothecium, $80-160$ (200) μm long and $7-10.5 \mu\text{m}$ broad at the base, subulate, base bulbous, apex pointed, thick-walled, walls subhyaline to pale yellow, up to 1.5μ thick. Flesh well-developed, composed of angular cells and differentiated into ectal and medullary excipulum. Paraphyses filiform, $1.5-2 \mu\text{m}$ wide, septate, collapsing in mature hymenia. Asci $100-145 \times 25-35 \mu\text{m}$, clavate-cylindrical, 8-spored. Ascospores uniseriate to irregularly biseriate, $18.5-20.5 \times 11-12 \mu\text{m}$, ellipsoid with rounded ends, thin-walled, subhyaline, smooth, nonamyloid.

Collection examined. — Tripoli, on sheep droppings, Jan. 14, 1979, AMB 140.

This species is fairly common on dung but is likely to be overlooked due to its small-sized, colourless apothecia. Presence of subhyaline, stiff hairs and smooth, medium-sized ascospores are important diagnostic features. The hairs in the Libyan collection are definitely smaller and slender as compared with Australasian collections ($450 \times 10-40 \mu\text{m}$, fide RIFAI, 1968) and British collections ($400 \times 30 \mu\text{m}$, fide DENNIS, 1968). Moreover, the size of asci also seems smaller. These are reported to be $140-260 \times 17-25 \mu\text{m}$ by RIFAI (l. c.) and $300 \times 35 \mu\text{m}$ by DENNIS (l. c.). In view of the variability recorded for the size of hairs, ascospores and asci in this species, it is preferred to file the Libyan collection under *L. ciliatus*.

7. *Peziza vesiculosa* BULL. ex ST.-AMANS, Fl. agen. p. 534. 1821.

Figs. 10—11

Apothecia somewhat gregarious, sessile to sessile, cupulate or may become repand and irregularly contorted at maturity, up to 2.5 cm across and 1.5 cm high; externally whitish turning deep cream to pale yellow, rough, marked with minute wart-like pustules; disc cream turning violaceous brown at maturity, smooth. Stalk absent or 'short stubby' to sometimes 1 cm long and 3—5 mm broad, cylindrical to irregular. Flesh up to 1.5 mm thick, composed of globose to subangular cells, bounded on the outside by a cuticle (15—20 μm thick) of compactly packed cells. Subhymenium up to 60 μm thick, composed of compactly arranged small cells. Hymenium up to 350 μm thick. Paraphyses filiform to subclavate, 3—4 μm wide below and 5—7.5 μm wide at the apex, septate, unbranched, thin-walled. Asci 260—275 \times 15—17.5 μm , subcylindrical with a narrow base and subtruncate apex, 8-spored. Ascospores obliquely uniseriate 20—23 \times 10.5—12.5 μm , ellipsoid with rounded ends, smooth, subhyaline, nonamyloid.

Collections examined. — Tripoli, University Agricultural Farm, on manure pile, Dec. 12, 1978, AMB 109; Tripoli, on sheep droppings, Jan. 11, 1979, AMB 138; Tripoli, on cow dung, Jan. 11, 1979, AMB 139.

This species is marked by the large apothecia occurring on dung and ellipsoid, subhyaline, smooth ascospores. It is a widely distributed species and usually occurs on richly manured soil. The Libyan collections are quite typical of the species, however, the maximum size of apothecia, we have recorded, is 2.5 cm although these are reported to be 8 cm for the species (DENNIS, 1968). The apothecia collected from the field are usually sessile or with a short stubby base but those appearing in incubation chambers are shortly stipitate. The stipe is, however, irregular and variable in shape.

8. *Zopfiella* sp.

Figs. 18—21

Cleistothecia superficial, scattered, globose to subglobose, 150—300 μm across, non-ostiolate, olivaceous brown to brownish black, sparsely hairy. Hairs up to 1 mm long and 4.5—6 μm wide, cylindrical with acute tips, thick-walled (up to 1 μm thick), yellow-brown to fuscus-brown with subhyaline tips, smooth, septate. Paraphyses not observed. Asci 35—45 \times 12—15 μm , subcylindrical, wall collapsing at maturity, 8-spored. Ascospores biseriata, 9.5—11.5 \times 6—6.5 μm , lemon-shaped, base subtruncate, apex papillate with germ pore, smooth, ochre-brown to pale fuscus; primary appendage 5—6 \times 2.2—2.6 μm , cylindrical to subconical, thin-walled, subhyaline,

fungacious; secondary appendages absent; enveloped in a hyaline, gelatinous sheath.

Collection examined: Tripoli, on cow dung, Dec. 12, 1978, AMB 121.

This species is marked by the hairy, non-ostiolate ascocarps and pedicellate ascospores. Young asci are much smaller and usually different stages of development can be seen in the same ascocarp. The ascospores are subhyaline and narrowly clavate when young but the upper part develops into a large brown cell while the lower part remains subhyaline, and constitutes the primary appendage.

This species comes within the circumscription of the genus *Zopfella* (= *Tripterospora*) but does not resemble known species. Perhaps it represents some unknown taxa but we prefer to examine more collections before describing it as new. Our collection differs from *Podospora* by the absence of an ostiole in the ascocarp. According to von ARX (1974) *Zopfella* WINT. is the correct generic name for some species previously included under *Strattonia* CIF. and *Tripterospora* CAIN (1956).

9. *Podospora communis* (SPERG.) NIESSL, Hedwigia 22: 156. 1883

Fig. 25

Perithecia superficial to semi-immersed, olivaceous brown to brownish black, base globose to ovoid, $400-550 \times 350-475 \mu\text{m}$, narrowing above into a conical neck ($230-275 \times 120-140 \mu\text{m}$). Hairs confined to the basal part, $1.5-2 \mu\text{m}$ wide, flexuous, sparsely branched, septate, thin-walled, light brown to brown. Paraphyses evanescent. Asci $100-190 \times 30-35 \mu\text{m}$, clavate with subtruncate apex, 8-spored. Ascospores biseriata, $28-34(37) \times 18-20 \mu\text{m}$, ellipsoid to ovoid, smooth, deeply pigmented, olivaceous brown; primary appendage $22-28 \times 4-5 \mu\text{m}$, cylindrical, thin-walled, subhyaline; upper secondary appendages 4, crown-like, each $28-38 \times 2.8-4 \mu\text{m}$, whip-like, hyaline; lower secondary appendages 4, crown-like, present on distal end of primary appendage, each $25-42 \times 1.8-3.5 \mu\text{m}$, whip-like, hyaline.

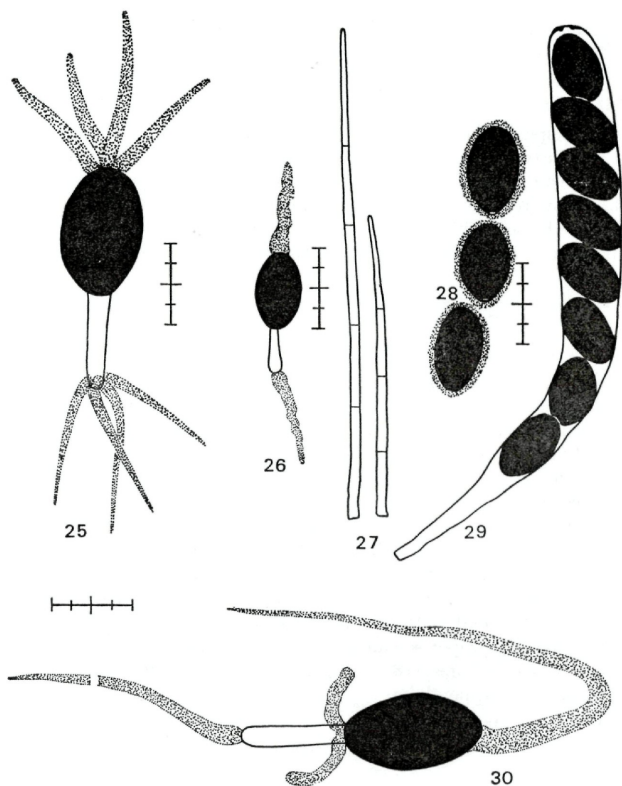
Collection examined. — Tripoli, on cow dung, Dec. 12, 1978, AMB 124.

This species is marked by the nature of ascospores and their biseriata arrangement in the ascus. The four secondary appendages are "crown-like" and are present on the distal end of the ascospore as well as at the tip of the primary appendage. The Libyan collection is quite typical of the species, although the primary appendage appears more slender as in Iraqi collections ($5-6 \mu\text{m}$ wide fide ABDULLAH & RATTAN, 1978).

10. *Podospora setosa* (WINTER) NISSL, Hedwigia 22: 156. 1883

Figs. 26—27

Perithecia superficial to semi-immersed, light brown to brownish black; base ovoid to pyriform, 500—600 × 400—450 μm, translucent, narrowing above into a papilliform or short cylindrical neck which may be up to 350 μm long and 175—225 μm broad, opaque, black, smooth. Hairs sparse or abundant, solitary (non-fascicled), confined



Figs. 25—30. *Podospora communis*: 25, ascospore. — *P. setosa* (26—27): 26, ascospore; 27, hairs. — *Sordaria micola* (28—29): 28, ascospores; 29, ascus. — *P. anserina*: 30, ascospore. — Scale of magnification, 20 μm

to the base of the perithecium, 60—175 μm long and 2—3 μm broad at the base, subulate, tinted brown, tips subhyaline and 1—1.5 μm broad. Paraphyses evanescent. Asci 300—325 \times 45—55 μm , subfusiform, 128-spored. Ascospores multiseriate, 17—20 \times 10—11.5 μm , ovoid, deeply pigmented, dark brown to olivaceous brown, smooth, germ pore apical; primary appendage 10—13 \times 2—2.5(3.5) μm , clavate with broad distal end, thin-walled, subhyaline; secondary appendages whip-like, 15—25 μm long and 4—5 μm broad at the base, attached at the upper and of ascospore and distal and of primary appendage. Spore mass in ascus fusiform, 230—285 \times 40—50 μm , loose, individual spores separating easily on tapping.

Collections examined. — Tripoli, on sheep droppings, Nov. 22 1978; AMB 113; AMB 125

This species is marked by setose (hairy) perithecia, multispored asci and nature of ascospores. MOREAU (1953) has recognized different races on the basis of number of ascospores in each ascus (32-, 64-, 128- and 512-spored asci) but in Libyan collections we have seen only 128-spored asci. This species is very common and we have noticed their perithecia in the majority of the incubation chambers.

11. *Podospora anserina* (CES.) NIESSL, Hedwigia 22: 156. 1883.

Fig. 30

Perithecia semi-immersed, dark brown to almost black, base ovoid to subglobose, 325—450 \times 300—375 μm , narrowing above into a cylindrical neck, 400—450 \times 120—140 μm , smooth or with few scattered hairs in the basal part, occasionally tufted especially near the neck. Hairs up to 150 \times 3 μm , subulate, stiff, light brown, nonseptate. Asci 175—225 \times 18—20 μm , subcylindrical with a long stalk and narrowed apex, 4-spored. Ascospores obliquely uniseriate, 33—38 \times 16—19 μm , ellipsoid, pigmented brown, smooth; primary appendage 22—26 \times 3.5—4.5 μm , cylindrical, subhyaline; upper secondary appendage lash-like, attached eccentrically to the distal end of spore, 150—400 μm long and 3—6 μm broad at the base; lower secondary appendage attached at the distal end of primary appendage, lash-like, shorter than the upper secondary appendage; two or more evanescent secondary appendages (18 \times 3.5 μm) also present near the proximal end of primary appendage.

Collections examined. — Tripoli, on sheep droppings, Nov. 12, 1978, AMB 111; AMB 114; Tripoli, on camel droppings, Dec. 25, 1978, AMB 126.

This species is easily identified, thanks to the 4-spored asci and characteristic appendages on the ascospores. The Libyan collections are quite typical of the species. Presence of hairs on the perithecium seems to be a variable feature. These were totally lacking in coll. no.

AMB 111, few basal hairs were apparent in coll. no. AMB 114 while tufted hairs in the neck region were observed in coll. no. AMB 126. Such a variation has also been noticed by ABDULLAH & RATTAN (1978) in Iraqi collections and BINYAMINI (1972) in Israeli collections. This species appears to be very common as we have noticed the perithecia in most of the incubation chambers.

12. *Sordaria fimicola* (ROB.) CES. & NOT., Comm. Soc. Crit. Ital. 1: 226. 1863

Figs. 28—29

Perithecia semi-immersed, brownish black to black, base globose to subglobose, 225—325 μm across, smooth, narrowed upwards into a conical neck, 150—230 \times 75—100 μm , smooth, black. Paraphyses evanescent. Asci 140—200 \times 15—20 μm , cylindrical, 8-spored, with a thickened apical ring. Ascospores obliquely uniseriate, 19—22 \times 11.5—12.5 μ , ellipsoid, deeply pigmented, dark brown, smooth, with a basal germ pore, appendages absent, enveloped in a thin, hyaline, mucilaginous covering.

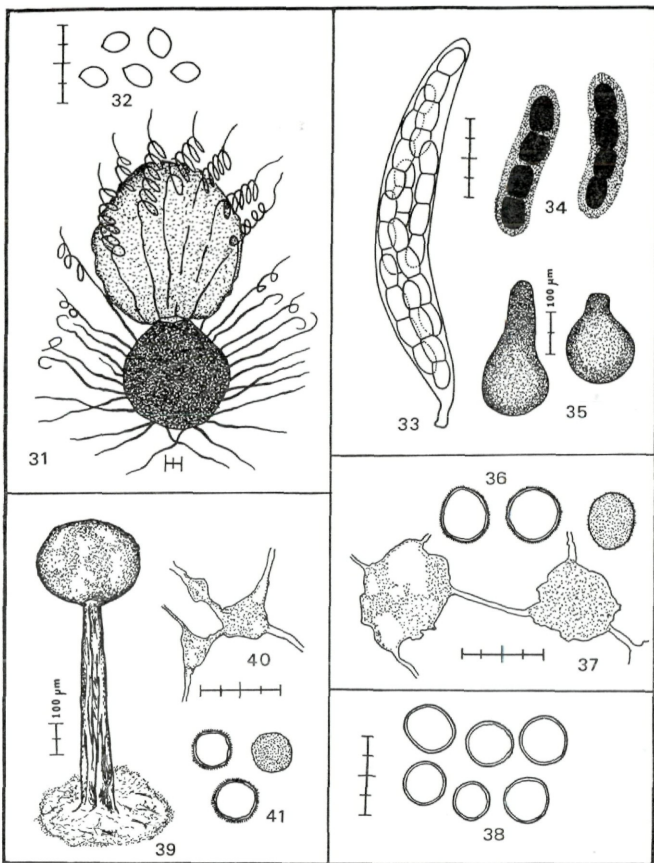
Collections examined. — Tripoli, on cow dung, Nov. 22, 1978, AMB 101.

This species is marked by the smooth perithecia, 8-spored asci and medium-sized ascospores. It is very close to *S. humana* (FUCKEL) WINTER but differs only in the shape of ascospores. These are comparatively broader (20—25 \times 13—17 μm , fide Dennis, 1968) and appear ovoid in *S. humana*. In other features these species are indistinguishable. *Sordaria fimicola* is a common and widely distributed species but we have noticed it less commonly in Libya.

13. *Chaetomium bostrychodes* ZOFF, Abh. Bot. Ver. Prov. Brandenburg 19: 173. 1877

Figs. 31—32

Perithecia superficial, brownish black, globose to subglobose, 120—150 μm across, hairy all over, ostiolate, after dehiscence spore mass (200 \times 175 μm) may accumulate among terminal hairs near the ostiole and gives the perithecia a 'dumple-shaped' appearance. Hairs flexuous to stiff, septate, moderately thickwalled, brown with subhyaline tips; basal hairs straight, 90—120 μm long and 4—4.5 (5) μm broad at the base, subulate; lateral hairs similar to the basal ones but tips become curved or once coiled; terminal hairs straight below (up to a distance of 200 μm), 3.8—4.2 μm broad at the base, tips coiled, coils 7 or less. Asci evanescent. Ascospores 6.5—7.5 \times 4.8—5.5 (6.2) μm , ovoid to subglobose, smooth, pale olive in mass but subhyaline individually, with a minute apiculus at one or both ends.



Figs. 31–41. *Chaetomium bostrychodes* (31–32): 31, dehisced perithecium; 32, ascospores. — *Sporormia minima* (33–35): 33, ascus showing arrangement of ascospores; 34, mature ascospores; 35, perithecia. — *Fuligo cinerea* (36–37): 36, spores; 37, capillitium. — *Pilobolus oedipus*: 38, spores. — *Physarum pusillum* (39–41): 39, fructification; 40, capillitium; 41, spores. — Scale of magnification, 20 µm

Collection examined. — Tripoli, on sheep droppings, Dec. 12, 1978, AMB 135.

This species is marked by the typical hairs and small, minutely apiculate, smooth ascospores. The Libyan collection resembles the species in most respects but differs in having slightly narrower spores (SETH, 1968).

14. *Sporormia minima* AUERSW., Hedwigia 7: 66. 1868

Figs. 33—35

Pseudothecia immersed to semi-immersed, olivaceous brown to brownish black; base subglobose to ovoid, 160—175 × 125—140 μm , narrowing upwards into a conical or subcylindrical neck, 50—110 × 48—60 μm . Peridium membranous, translucent, composed of angular cells (5—15 μm across). Hairs flexuous, 2—2.5 μm wide, branched, septate, thin-walled, subhyaline, rather sparse and confined to the basal part of pseudothecium. Paraphyses absent. Asci 100—110 × 13—14.5 μm , subfusiform, 8-spored. Ascospores biseriata to triseriate, 31—33.5 × 5.5—6.7 μm , smooth, brown, enclosed in a gelatinous sheath, 3-septate forming 4 segments or cells which separate at maturity; middle segments 7.5—8.5 × 5.7—6.7 μm , ovoid with truncate ends; end cells 9—9.5 × 4.8—5.7 μm , conical with truncate proximal ends and obtuse distal ends (free ends).

Collection examined. — Tripoli, on sheep droppings, Dec. 12, 1978, AMB 134

Small pseudothecia and medium sized, 3-septate ascospores are the chief distinguishing features of this species. *S. intermedia* AUERSW. is very similar but possesses larger ascospores (40—60 × 8—12 μm , fide DENNIS, 1968). *S. australis* SPERG. is also close but possesses definitely large asci (120—150 × 17—21 μm , fide CAIN, 1934) and ascospores (38—45 × 7.5—8.5 μm , fide CAIN, l. c.). The pseudothecia are also larger in both *S. australis* (230—280 × 180—220 μm , fide CAIN, 1934) and *S. intermedia* (1/4 mm across, fide DENNIS, 1968), while these are smaller, hardly visible to unaided eye, in *S. minima*. The Libyan collection seems typical of the species. This species appears rather rare but perhaps it is overlooked due to its small size.

15. *Fuligo cinerea* (SCHW.) MORGAN, Journ. Cinc. Soc. Nat. Hist. 19: 33. 1896

Figs. 36—37

Fructifications subplasmiodiocarpous, sessile, fragile, spreading up to 2.5 × 1 cm, usually thin, rarely exceeding 3 mm in thickness. Peridium crustose, white or may turn pale brownish in patches, irregularly thickened, thickness may vary from 15 μm to 75 μm , often flakes away in small chips exposing the black spore mass. Capillitium

composed of large, irregular white flakes of lime connected by narrow tubules; flakes variable in size, 50—300 μm across or even more; tubules 2—2.5 μm in diameter, hyaline. Spore mass black mixed with whitish specks of capillitium. Spores 13.5—14.5 \times 11.5—12.5 μm , broadly ellipsoid to globose, violet brown to brown, minutely but abundantly asperulate, spines 0.5—0.7 μm long.

Collections examined. — Tripoli, University Agricultural Farm, on manure pile of sheep droppings, Dec. 12, 1978, AMB 104; Tripoli, on cow dung, Dec. 12, 1978, AMB 123.

This species is very common on manure piles and fruits abundantly. MARTIN & ALEXOPOULOS (1969) have pointed out the variation in spores. In Libyan collections also we have noticed that ellipsoid spores are more deeply pigmented and stronger spinulose than globose spores which are relatively paler and less strongly spinulose.

16. *Physarum pusillum* (BERK. & CURT.) LISTER, Mycetozoa ed. 2: 64. 1911

Figs. 39—41

Fructifications gregarious, stipitate. Sporangia 300—450 μm across, globose to vertically compressed, umbilicate below, white to greyish white. Peridium thin, lime encrusted, fragile in the upper part and flakes away easily but relatively thicker in the basal part and may persist as a shallow cup after dehiscence. Stalk 800—1100 μm long, subulate, up to 150 μm broad at the base but gradually narrows to 50 (60) μm near the top, longitudinally sulcate or rugulose, brown to umber coloured. Hypothallus conspicuous, effused on the substratum and up to 400 μm across, pale brown to umber. Columella not seen. Capillitium composed of angular nodes of crystalline matter connected by narrow hyaline tubules, subhyaline. Spore mass black, containing whitish specks of capillitium. Spores 9—10.5 μm across, globose to subglobose, brown, minutely warted.

Collection examined. — Tripoli, on sheep droppings, Dec. 25, 1978, AMB 136

This is one of the commonest species of Myxomycetes fruiting on dung. It appears to be common in Libya as its neat whitish sporangia on brown stalks are a frequent visitor in dung incubation chambers. The Libyan collection is quite typical of the species although the spores tend to be little smaller in size as compared with the species (9—, 10—12 μm in diam., fide MARTIN & ALEXOPOULOS, 1969).

17. *Pilobolus oedipus* MONT., Mem. Soc. Linn. Lyon, 1—6. 1826

Fig. 38

Sporangiophores gregarious, superficial, 1.5—2 mm long, subhyaline with black sporangium. Trophocyst 275—420 \times 200—

230 μm , ovoid to bulbous, firm-walled, with a septum at the base which separates rhizoidal hyphae but continues upwards into the stalk; rhizoidal hyphae up to 1 mm long, branched, progressively becoming narrow and thin-walled towards the tips. Stalk 650—1300 \times 70—110 μm , erect, stiff and firm-walled, narrow below but broadens apically and merges into the subsporangial vesicle. Subsporangial vesicle 370—415 \times 275—330 μm , ovoid, thick-walled especially on the sides, merges into columella above. Columella 140—185 μm long and 140—185 μm broad at the base, conical. Sporangium 275—325 \times 230—257 μm , discoid, upper wall black and cutinized (violet-fuscous through transmitted light), lower side bounded by wall of columella. Spores (8.5) 9.5—13.5 (15) μm , globose to subglobose, pale yellow individually but brown in mass. thick-walled, wall up to 0.7 μm thick, smooth.

Collections examined: Tripoli, on cow dung, Nov. 22, 1978; AMB 110; Tripoli, on cow dung, Dec. 12, 1978, AMB 115.

This species is marked by the relatively small sporangiophores and pale yellow, globose to subglobose spores. The size of spores is variable within the same sporangium. Some spores are smaller (9—10 μm across) while others appear large (13—14 μm across) although intermediate forms are common. In shape also the spores fluctuate between globose and subglobose. *P. kleinii* TIEGH. seems very similar but the spores in that species are narrower and appear ellipsoid. *Pilobolus oedipus* appears to be very common in Libya and fruits during the first week of incubation especially on cow dung. The Libyan collections are very typical of the species but there seems some variation in the colour of spores. According to NAUMOV (1939) and TANDON (1968) the spores are reddish orange, but SACCARDO (1888) has recorded the colour as "pallidae". In the Libyan collections the spores are definitely pale yellow to yellow (pale golden) with a more or less subhyaline wall.

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