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COPROPHILOUS FUNGI OF WEST PAKISTAN

Part III. Karachi

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In continuation of the studies of coprophilous fungi from West Pakistan, eleven more species have been reported. Ten of them belong to Ascomycota and one to Myxomycota. These consist of *Ascobolus leveillei* Boud., *A. stercorarius* (Bull.) Schrot., *Ascophanus ochraceus* (Crouan) Boud., *Chaetomium caprinum* Bainier, *C. funicolum* Cooke, *Delitschia vulgaris* Griff., *Podospora inflatula* Cain, *Sporormiella minima* (Auersw.) Ahmed and Cain, *Sp. pseudominima* Ahmed and Cain, *Sp. tetramera* Ahmed and Cain, and *Licea tenera* Jahn.

All these species have been recorded for the first time from Karachi. *Ascobolus levellei*, *Chaetomium caprinum*, *Delitschia vulgaris*, *Podospora inflatula*, *Sporormiella pseudominima*, *Sp., tetramera* and *Licea tenera* have never been reported from West Pakistan.

Brief descriptions which could help laboratory identifications have been provided.

Introduction

In our first paper[7] of this series, the genera *Delitschia* and *Trichodelitschia* were reported for the first time from West Pakistan. The species reported for the first time were: *Ascobolus subglobosus* Seaver, *Ascophanus argenteus* (Curr.) Boud., *Saccobolus violascens* Boud., *Delitschia marchelii* Berl. and Vogl., *Sporormia fimetaria* De not., *Trichodelitschia bisporula* (Cr.) Lundqvist, and *Zygopleurage zygospora* Boedijn. In the second paper[8] of this series, the genus *Lophiotrichus* was reported for the first time from West Pakistan. The species new for this region were: *Ascophanus aurora* (Crouan) Boud., *A. lacteus* (Cooke and Phill.) Sacc., *Chaetomium aterrimum* Ell. and Ev., *Lophiotrichus brevirostratus* Ames, and *Thielavia variospora* Cain. All of the eleven species included in the present paper have never been recorded from Karachi. The species recorded for the first time from West Pakistan are: *Ascobolus leveillei* Boud., *Chaetomium caprinum* Bainier, *C. funicolum* Cooke, *Delitschia vulgaris* Griff., *Podospora inflatula* Cain, *Sporormiella pseudominima* Ahmed and Cain, *Sp., tetramera* Ahmed and Cain, and *Licea tenera* Jahn.

Materials and Methods

During the examination of the specimens quoted in this paper, camera lucida drawings were made and short notes taken. These were used respectively for illustrations and descriptions of the individual species.

The collections examined during the present studies are deposited in the Mycological Herbarium of the P.C.S.I.R. Laboratories, Karachi. The numbers of these specimens are quoted at the end of each of the species described. For any additional information about the materials and methods, our previous papers[7,8] of this series may be consulted.

1. *Ascobolus leveillei* Boud., Ann. Sci. Nat. V **10**,225, (1862).

Ascobolus Boudieri Quel., Ench. Fung. 293, 1886.

Apothecia thickly crowded, sessile, subglobose, externally brownish, slightly roughened, up to 0.3 mm in dia; hymenium finally convex, greenish in the beginning, becoming gradually darker and finally black. Asci clavate, tapering below into a small base, 175–190×25–28μ, 8-spored; spores biseriate to irregularly disposed, hyaline at first ranging through purple to dark brown, ellipsoid, 11.5–12.5 (–14)×20–25μ, finally sculptured in the form of minute granules. Paraphyses slightly thickened at the tip, embedded in the mucilaginous substance.

Specimens examined: P.C.S.I.R. Herb. No: 90, Country Club Road, Karachi, West Pakistan.

The size range of some of the structures, like the ascocarps and the spores of our specimen has been found slightly smaller. Since the measurements fall within the prescribed limits of *A. leveillei*, it is considered to be the same (Plate I, A-A[1]).

2. *Ascobolus stercorarius* (Bull.) Schrot., Krypt.-Fl. Schles, **32**, 56, (1893).

Peziza stercoraria Bull. Herb. Fr. Pl. 376, f.I. 1787.

Ascobolus pezizoides Pers.; J.F. Gmel. Syst. Nat. 1461. 1791.

Ascobolus furfuraceous Pers. Obs. Myc. 1:33. 1796.

Ascobolus stercorarious retisporus Clements, Bot. Surv. Nebr. **5,** 9. (1901.)

Apothecia scattered to thickly crowded, sessile, finally becoming superficial, globose or subglobose in the beginning, opening by an aperture and expanding, scutellate to discoid, 3 mm in dia externally pale-yellow or greenish, furfuraceous; hymenium concave to plane, at first yellowish or greenish due to protruding asci, finally black; asci clavate, tapering gradually into a small base, 190–220×25–30μ, 8-spored; spores partially 2-seriate to irregularly disposed, ellipsoid, hyaline at first, becoming violet, later brown, sculpturing in the form of ridges and crevices, occasionally connected to each other and thus giving a reticulate appearance, 20–25×10–14μ., Paraphyses enlarged above, embedded in golden-yellow mucilaginous substance.

Specimens examined: P.C.S.I.R. Herb. Nos: 177, 178, 179 and 180, from P.C.S.I.R. Laboratories Campus, Karachi, (Plate I, B-B[1]).

The asci and spores are found to be slightly lesser in size range than usual for this species. Since no other difference has been observed our specimen belongs to *A. stercorarious.*

3. *Ascophanus ochraceus* (Crouan) Boud. Ann. Sci. Nat. V. **10,** 247 (1869).

Ascobolus ochraceus Crouan, Fl. Finist. 57. 1867.

Ascophanus subgranuliformis Rehm; Verh. Zool. Bot. Ges. Wien., **37,** 224 (1887).

Ascophanus flavus Karst. Medd. Soc. Fauna Fl. Fenn., **16,** 105 (1889).

Apothecia thickly crowded, sessile, at first globose or subglobose, finally subdiscoid, pale yellow, externally smooth, 3–1 mm in dia, hymenium a little brighter than the outside of the apothecium, roughened by the protruding asci; asci cylindric, 110–130×12.5–15μ, 8-spored, spores 1-seriate, ellipsoid, smooth, subhyaline or faintly yellowish, 15–20×8–10.5μ. Paraphyses enlarged above, 5–6μ in dia.

Specimens examined: P.C.S.I.R. Herb. No: 94, Hub River Dam, Karachi, (Plate I, C-C[1]).

4. *Chaetomium caprinum* Bainier, Bull. Soc. Myc. France, **25,** 223 (1909).

Perithecia steel gray, large, tall, the greatest width just above the base, then narrowing with the cylindrical upper portion to the ostiolar collar, 400–600×200–240μ, embedded in a subiculum of dark, olive-brown to black rhizoids; peridium composed of pallisade-like cells. Terminal hairs smooth or minutely roughened with spines, irregularly and remotely septate, dark olive brown, straight or flexed, coiling above irregularly or in the form of a spiral, producing occasionally along their convolutions short, septate, tapering and irregularly coiled branches. Asci club-shaped, 8-spored, about 50x10μ. Ascospores more or less lemon-shaped, greenish when young, finally olive-brown, about 7.5×6.25μ.

Specimens examined: P.C.S.I.R. Herb. No: 181, P.C.S.I.R. Laboratories Campus, Karachi (Plate II, D-D_2).

5. *Chaetomium funicolum* Cooke. Grevillea 1:176, 1873.

Chaetomella cavallii Mattirolo: Savoia, 11 Ruwenzori **1,** (3) (1909) Pl. 3, f. 1-3.

Chaetomium bartholomaei Saccardo and Sydow; Saccardo, syll. Fung., **14,** 490 (1899).

Chaetomium setosum Ellis and Everhart, Am. Nat., **31,** 340 (1897).

Perithecia black, ovate to globose, 130–160μ in dia, firmly attached to the substratum by dark olive to black rhizoids, frequently producing long straight or curved cirrhi. Terminal hairs forming a dense, compact head, dichotomously branched with acute angles, frequently alternately constricted and inflated throughout, near the base about 5–6μ in dia, fading to light coloured tips, bearing on the branches clusters of refractive needles. Lateral hairs stiff, spine-like, dark olive-brown to black, hyaline and crumpled at tip, rarely and obscurely septate, smooth or irregularly roughened by short, blunt projections, about 4μ in dia. Asci club-shaped, 8-spored, 34×8μ. Ascospores when mature olive-brown, egg-shaped to lemon-shaped, slightly more pointed at one end, apiculate at both ends, 5.80-7×4–5μ.

Specimens examined: P.C.S.I.R. Herb. No: 218, P.C.S.I.R. Laboratories Campus, Karachi, (Plate II, E-E_2).

6. *Delitschia vulgaris* Griff., Mem. Torrey Bot. Club **II,** 104, (1901).

Phorcys vulgaris V. Hochnel, Sitzungsb. Akad. Wiss. Wien (Math. nat. Kl.) **129,** 159 (1920).

Perithecia about 1300×480μ, neck and the upper part of the perithecium covered with long,

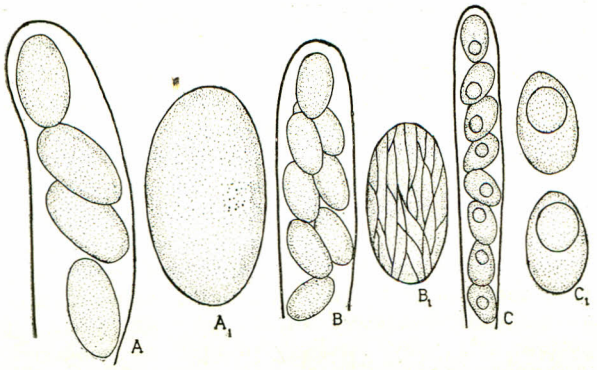

Plate I.—Ascobolus leveillei Boud. A. Ascus; A_1. Ascospore, *Ascobolus stercorarius* (Bull.) Schrot. B. Ascus; B_1. Ascospore. *Ascophanus ochraceus* (Crouan) Boud. C. Ascus; C_1. Ascospores.

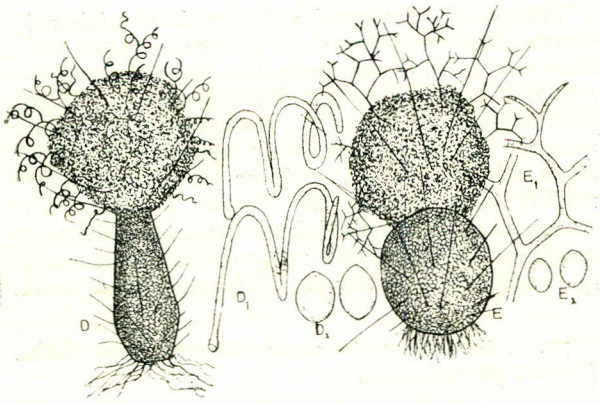

Plate II.—Chaetomium caprinum Bainier. D. Perithecium; D_1. Terminal hairs; D_2 . Ascospores. *Chaetomium funicolum* Cooke. E. Perithecium; E_1. Terminal hair; E_2. Ascospores.

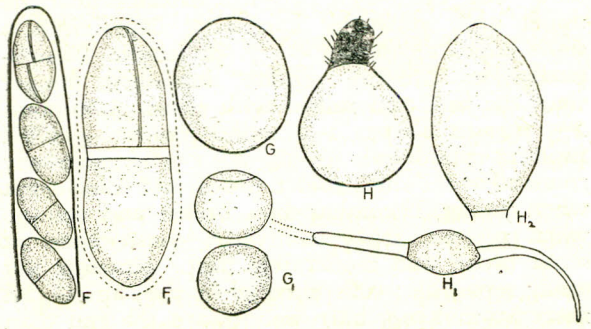

Plate III.—Delitschia vulgaris Griff. F. Ascus; F_1. Ascospore. *Licea tenera* Jahan. G. Perithecium; G_1. Spores. *Podospora inflatula* Cain. H. Perithecium; H_1-H_2. Ascospore.

brown, septate, flexuous hairs, measuring about 200×2μ. Asci cylindrical 200–240×24–27μ. Para physes filiform, abundant. Spores obliquely uniseriate, ellipsoid, 29–33×14–15μ, constriction broad and shallow, surrounded by a broad gelatinous sheath; germ slit lateral, extending entire length of cell (Plate III, F-F1).

Specimens examined: P.C.S.I.R. Herb. No: 240, P.C.S.I.R. Laboratories Campus, Karachi.

7. *Licea tenera* Jahan. Ber. Deutsch. Bot. Ges., **36,** 665, 4(1919) pl. 18, fig. 4-6.

Sporangia subglobose to ovoid, sessile or with a constricted base. bright yellow-brown, 3–4 mm. in dia, sporangium wall transparent, yellow-brown, dehiscent irregularly; spores sub-globose, pale olive-yellow, minutely spinulose, with a thin area on one side, 10–12μ in dia.

Specimens examined: Herb. No. 48, P.C.S.I.R. Laboratories Campus, Karachi, 78, Hub River Dam, Karachi, West Pakistan (Plate III, G-G_1).

8. *Podospora inflatula* Cain. Can. Journ. Bot., **40,** 454–455 (1962).

Perithecia 500–600×240–350μ, pyriform, with short, straight, 1–4 septate, light brown hairs, inflated at the tips. Asci 8-spored, clavate, 200–230×30–35μ, with a small thickened apical ring. Ascospores biseriate, ellipsoid, 25–37·5×17–20μ, exospore thin; primary appendage basal, cylindrical, about 24·5×5·5μ, secondary appendage lash-like, upper one excentric, 37·5×5μ, lower one similar to the upper, attached to the distal end of the primary appendage; germ pore apical

Specimens examined: Herb. Nos: 45 and 49, P.C.S.I.R. Laboratories Campus, Karachi, (Plate III, H-H_2).

9. *Sporormiella minima* (Auersw.) Ahmed and Cain. (Under Publication).

Sporormia minima Auersw., Hedwigia, **7,** 66 (1868).

Sporormia evallata Pers., Nuovo Gior. Bot. Ital., **7,** 190 (1875).

Sphaeria multifera Berk. and Rav., Grevillea, **4,** 143 (1878).

Philocopra multifera Sacc; Syll. Fung., **1,** 251 (1882).

Pseudothecia scattered or loosely aggregated, immersed when young, becoming nearly superficial when old, subglobose to nearly pyriform, 100–200 × 90–120μ, thin, membranaceous, smooth, bare, dark brown to nearly black; neck small, papilliform, smooth, bare, black. Asci 8-spored, short and broad, more or less cylindrical, (80–) 90–100 × 13–18μ, broadly rounded above, broadest part below the middle, abruptly contracted below into a very short stipe. Pseudoparaphyses scantly, filiform, septate, equalling the asci and mixed with them. Ascopores obliquely 2–3 seriate, 4-called, cylindrical, 28–32(–34) × 5–6μ, broadly rounded at the ends, straight or curved, ranging from hyaline when young through yellowish brown to dark brown and opaque, septa transverse, constrictions at septa broad and deep, segments readily separable at the central septum, easily separable at the other septa; cells nearly equal in size, terminal cells very slightly narrower towards the ends; germ slit nearly parallel with a crink near the middle, gelatinous sheath hyaline, narrow (Plate IV, I-I_1).

Specimens examined: P.C.S.I.R. Herb. Nos: 17, 24, Karachi University Campus, Karachi.

10. *Sporormiella pseudominima* Ahmed and Cain. (under publication).

Pseudothecia scattered or loosely aggregated, semi-immersed, becoming nearly superficial when old, subglobose to nearly pyriform, 180–240 × 100–150μ, thin, membranaceous, smooth, bare, dark brown to nearly black; neck small papilliform, measuring 50–80 × 40–50μ smooth, bare, black. Asci-8-spored, subcylindrical 90–105 (–110) × 16–19(–20)μ, broadly rounded above, broadest near the middle, abruptly contracted below into a very short stipe, measuring about 4–6μ in length. Pseudoparaphyses filiform, septate, longer than the asci and mixed with them, measuring 2–2.5μ in dia. Ascospores obliquely 2–3 seriate, 4-celled, cylindrical, 28–36 × 6–7μ, broadly rounded at the ends, straight or curved, olivaceous-brown when young, becoming dark brown and opaque when mature, septa transverse, constrictions at septa narrow and deep, segments easily separable; cells more or less equal in length, terminal cells very slightly narrower toward the ends; germ slit prominent, very strongly oblique to diagonal, gelatinous sheath hyaline, narrow (Plate IV, J-J_1).

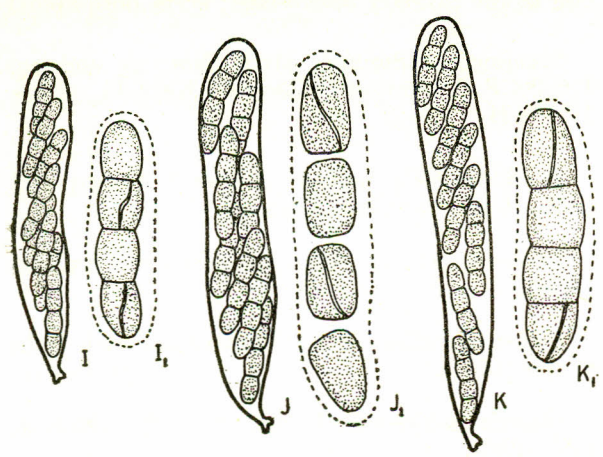

Plate IV.—*Sporormiella minima* (auersw.) Ahmed & Cain. I. Ascus; I_1. Ascospore. *Sporormiella pseudominima* Ahmed & Cain. J. Ascus; J_1. Ascospore. *Sporomiella tetramera* Ahmed & Cain. K. Ascus; K_1. Ascospore.

Specimens examined: P.C.S.I.R. Herb. Nos: 4,6,10,24, Karachi University Campus, Karachi; 34, Makli, West Pakistan; 58, 59, 62, Malir Cantt. (North), Karachi.

This species resembles *Sporormiella minima* in several characters but may be differentiated from it by the width of the spore, the separability of the segments and the nature of the germ slit. In *Sp. pseudominima* the spores are comparatively broader and the segments are equally separable at all the septa whereas in *Sp. minima* the segments are readily separable at the central septum. The germ slit in *Sp. pseudominima* is strongly oblique to diagonal, without a crink near the middle while in *Sp. minima* it is nearly parallel and with a crink.

11. *Sporormiella tetramera* Ahmed and Cain. (Under publication).

Pseudothecia scattered, immersed to semi-immersed, becoming nearly superficial when old, subglobose to pyriform, 200–300 × 180–200μ, thin, membranaceous, smooth, bare, dark brown to nearly black; neck small papilliform, smooth, bare, black. Asci 8-spored, cylindrical-clavate, (110–) 120–140 (–150) × 13–16μ, broadest near the upper end, gradually narrowing below into a short stipe, measuring 8–15μ in length. Pseudoparaphyses filiform, septate, branched, longer than the asci and mixed with them. Ascospores 2–3 seriate above, 1–2 seriate below, 4-called fusiform-cylindrical, 32–38(–40) × 6–8μ, narrowly rounded at the ends, golden brown and translucent when young, becoming dark brown and opaque when mature, septa transverse, constrictions at septa broad and moderately deep, segments not easily separable; cells unequal in size, apical cell more prominently narrower toward the end than the basal cell, measuring, 8–10.5 × 6.5–7μ, upper mid-cell measuring 5.5–7 × 7–8μ, lower mid-cell 7–9 × 7–7.5μ, basal cell longer than the remaining,

9–15×6–7.5μ; germ slit oblique to diagonal, gelatinous sheath hyaline, moderately broad.

Specimens examined: P.C.S.I.R. Herb. Nos: 21, Karachi University Campus, Karachi; 60, Malir Cantt. (North), Karachi, (Plate IV, K-K_1).

This species seems to be related to *Sporormiella capybarae*, to which it resembles in several respects; however, it possesses distinctly smaller asci and spores.

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