# COPROPHILOUS FUNGI OF WEST PAKISTAN. PART 1. - KARACHI

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During the study of coprophilous fungi from Karachi, a total of eleven species belonging to Ascomycetes have been reported. The two genera reported from West Pakistan for the first time are: *Delitschia* and *Trichodelitschia*. The species new to this part of the world are : *Ascobolus subglobosus*, *Ascophanus argenteus*, *Saccobolus violascens*, *Delitschia marchalii*, *Spororomia fimetaria*, *Trichodelitschia bisporula* and *Zygopleurage zygospora*.

## Introduction

Coprophilous mycoflora of West Pakistan is very poorly known. Mahju[10] was the first to report 29 species belonging to 21 genera of coprophilous fungi. Later on Ginai[7] recorded 48 species belonging to 26 genera. These included those fungi too which were already reported by Mahju. Chand[8] in his study of the fungus flora of Lahore soils disclosed that among the undoubted species which Mahju and Ginai obtained from dung included: *Mucor mucedo*, *M. griseosporus*, *Syncephalis sphaeriea*, *Aspergillus flavus*, *Sordaria macrospora*, *S. coprophila*, *S. winteri*, *S. decipiens*, *Chaetomium spirale*, *C. globosum*, *Sporormia minima*, *Stysanus stemmonites*, *Coremium* sp., *Isaria brachiata*, *Torula convoluta* and *Oedocephalum glomerulosum*. Ahmed[1,2] in his *Pezizales of West Pakistan*,[1] as well as Fungi of West Pakistan[2] also included some of the Coprophilous fungi.

Mirza and Nasir[11] published their findings of coprophilous species of West Pakistan which consisted of 37 species and 18 genera. The species reported, belonged to Ascomycetes, Basidiomycetes, Phycomycetes and Fungi Imperfecti. Ahmed *et al.*[3] during their studies of coprophilous fungi from Karachi reported 26 species, all belonging to Ascomycetes. In spite of these reports in recent years, the information about this group from such a vast area as West Pakistan is still very meagre.

In this paper, eleven species belonging to eight genera of Ascomycetes are described and illustrated. Of the eleven species reported from Karachi, only one, namely *Podospora prethopodalis*, has been previously recorded from Karachi.[11] On the basis of West Pakistan, the existence of the genus *Delitschia* and *Trichodelitschia* has been determined for the first time. The species reported from West Pakistan for the first time are: *Ascobolus subglobosus*, *Ascophanus argenteus*, *Saccobolus violascens*, *Delitschia marchalii*, *Sporormia fimetaria*, *Trichodelitschia bisporula*, and *Zygopleurage zygospora*.

## Materials and Methods

All the collections examined during this study are deposited in the Mycological Herbarium of P.C.S.I.R. These specimens are quoted at the end of each of the species described.

Samples of collections were placed in moist chambers. A layer of moist wood scrapings was placed at the bottom of ordinary glass troughs and covered with a double layer of filter paper of the right size. A few pieces of sufficiently moistened specimens were placed on the filter paper. These chambers were covered with glass plates and kept undisturbed. After a few days, the chambers were examined periodically under a dissecting microscope. This continued for about two months. The fruiting bodies were picked up by the help of a dissecting needle and placed on ordinary glass slides in a drop of water. After examinations for the fruiting bodies, internal microstructures were studied by teasing the material and placing a coverslip. For staining the gelatinous sheaths as well as the gelatinous appendages the material was stained in a drop of aqueous cotton blue and then placed in a drop of lactophenol.

Short notes and Camera lucida drawings were made during the examination of the specimens.

1. *Ascobolus americanus* (Cooke & Ellis) Seaver, *The North American Cup-Fungi*, p. 85 (1961) (Plate I; Fig. A-$A_1$). = *Ascobolus leveillei americanus* cooke & Ellis, Grevillea, **5**,52(1876).—Apothecia entirely superficial, scattered to gregarious, subdiscoid, never more than 1 mm in diameter, externally yellowish; hymenium plane to convex, greenish yellow in the beginning, becoming almost black when old, strongly roughened by the protruding asci. Asci broad clavate, gradually tapering below into a stem-like base, 200-250 × 35-40 μ; 8-spored, spores two seriate to irregularly disposed, ellipsoid, thick-walled, finally violet to brown, smooth when young, finally sculptured by minute granules,

usually 30-37 × 16-18μ, paraphyses embedded in greenish-yellow mucilaginous substance.

Specimens examined: P.C.S.I.R. Herb. Nos. 14, 36, 50, 53, 85.

2. *Ascobolus immersus* Pers., Obs., Mycol., 1,35 (1796). (Plate I; Fig. C-$C_1$). =*Ascobolus macrosporus* Crouan, Ann. Sci. Nat. IV, **7**,173 (1857). =*Ascobolus gigasporus* de Not. Comm. Critt. Ital., 1, 360 (1863).—Apothecia up to 2 mm in diameter, scattered or thickly crowded, externally greenish-yellow, becoming brownish, pilose, hymenium similar to the outside of the apothecium. Asci few, very large, clavate, projecting prominently, 500–600 × 90–100 μ; 8-spored, spores large, two seriate to irregularly disposed, broad elliptical and each surrounded by a hyaline mucilaginous envelope, hyaline in the beginning violet and finally brown, reticulations consisting one to a few anastomosing bands which are usually difficult to observe 23–35 × 50–66.5 μ, paraphyses slender, embedded in a greenish-yellow mucilaginous substance.

Specimen examined: P.C.S.I.R. Herb. No. 88.

3. *Ascobolus subglobosus* Seaver, Mycologia, **8**, 96 (1916). (Plate I; Fig. B-$B_1$).—Apothecia gregarious, more or less discoid; externally smooth, greenish-yellow, hymenium finally becomes black due to the protruding asci; asci subcylindric to clavate, gradually narrowing to a small base, 8-spored; spores more or less globose, uniseriate in the beginning, finally crowded to partly biseriate, becoming violet with age and finally dark brown to black, provided with reticulations, usually 18–20 μ in diameter, paraphyses rarely enlarged above, embedded in yellowish mucilaginous substance.

Specimens examined: P.C.S.I.R. Herb. No. 47.

4. *Ascophanus argenteus* (Curr.) Boud. Ann. Sci. Nat. V, **10**, 245 (1869). (Plate I; Fig. D-$D_1$). =*Ascobolus argenteus* Currey, Trans. Linn. Soc., **24**, 496 (1864).—Apothecia small, discoid, up to 0.3 mm in diameter, crowded, hymenium white, roughened by the protruding asci; asci broadly calvate to subovoid and abruptly tapering into a blunt base, 50–60 × 20μ, 8-spored, spores more or less 2-seriate, ellipsoid, hyaline, smooth, with a de Barry globule, 10–12.5 × 6.7 μ; paraphyses enlarged at their apices, slender, septate, hyaline.

Specimens examined: P.C.S.I.R. Herb. Nos. 11, 22, 23, 51.

5. *Delitschia marchalii* Berl. & Vogl.; in Sacc. Syll. Fung. Addit., **127**, (1886). (Plate II; Fig. E-$E_1$). =*Delitschia* sp., Marchal. Bull. Soc. Belgique, **23**,[2] 16 (1884).—Asci cylindrical, narrowing below into a stipe, spores obliquely uniseriate, two-celled, 9.5–11 × 4.5–6μ, oblong-ellipsoid, hyaline at first, finally becoming dark brown and opaque; surrounded by narrow, hyaline gelatinous sheath; germ slit lateral, extending the entire length of each cell.

Specimens examined: P.C.S.I.R. Herb. Nos. 13, 15.

6. *Saccobolus violascens* Boud., Ann. Sci. Nat. V, **10**, 230 (1869). (Plate II; Fig. G–G ).

PLATE I

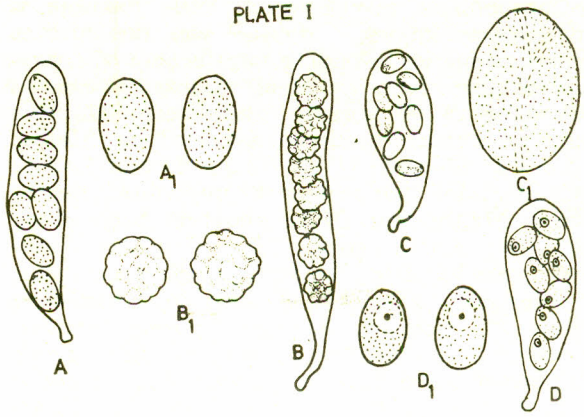


Plate I: A-$A_1$—*Ascobolus americanus* (Cook & Ellis) Seaver; B-$B_1$—*Ascobolus subglobosus* Seaver; C-$C_1$—*Ascobolus immersus* Pers; D-$D_1$—*Ascophanus argenteus* (Curr.) Boud.

PLATE II

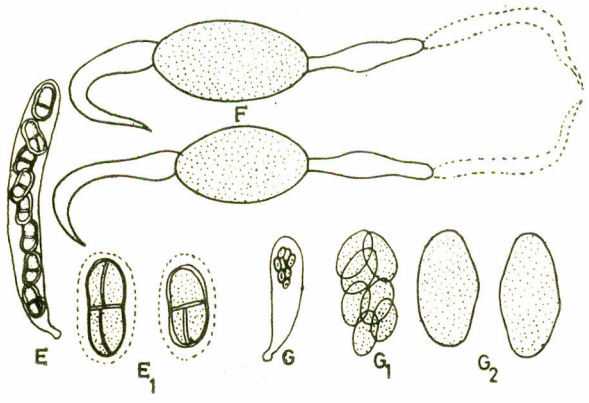


Plate II: E-$E_1$—*Delitschia marchalii* Berl & Vogl; F—*Podospora prethopodalis* cain G, $G_1$, $G_2$—*Scaccobolus violascens* Boud.

= *Saccobolus neglectus* Boud., Ann. Sci. Nat. V, **10,** 231 (1869).—Apothecia small, up to 1 mm in diameter, scattered, superficial, pale violaceous; hymenium strongly convex, in the begining similar in colour to the outside of the apothecium, finally almost black; asci broad-clavate, gradually narrowing into a small base 175 × 30–35 μ, 8-spored; spore-mass compact, elongate, 40–60 × 24 μ, spores more or less almond shaped, slightly unequal sided, finally becoming violaceous.

Specimens examined: P.C.S.I.R. Herb. Nos. 30, 40, 46, 64, 74.

7. *Sordaria fimicola* (Rob. in Desm.) Ces. & de Not., comment. Soc. Crit. Ital., **1,** 226 (1863). (Plate III, Fig. H-$H_1$). = *Sphaeria fimicola* Rob. in Desm., Ann. Sci. Nat., **3** (11), 353 (1849). = *Spahaeria equina* Fuckel, Fung. rhenan. No. 1802 (1866). = *Hypocopra fimeti* Fuckel (non *H. fimeti* (Pers.) Fr., Jahrb. Nass. ver. Nat., 23–24: 240 (1869). = *Hypocopra fimicola* (Rob. in Desm.) Sacc. Syll. Fung., **1,** 240 (1882).—Perithecia scattered or gregarious, superficial to semi-immersed, globose to pyriform, 400-500 × 200-300 μ. Asci 8-spored, cylindrical, 150–200 × 14–16 μ, rounded at the apex, narrowed below into a short stipe. Ascospores obliquely uniseriate, ellipsoid, broadly rounded above, slightly pointed below, finally dark brown and opaque; hyaline gelatinous sheath present, a single basal germ pore observed.

Specimens examined: P.C.S.I.R. Herb. No. 3.

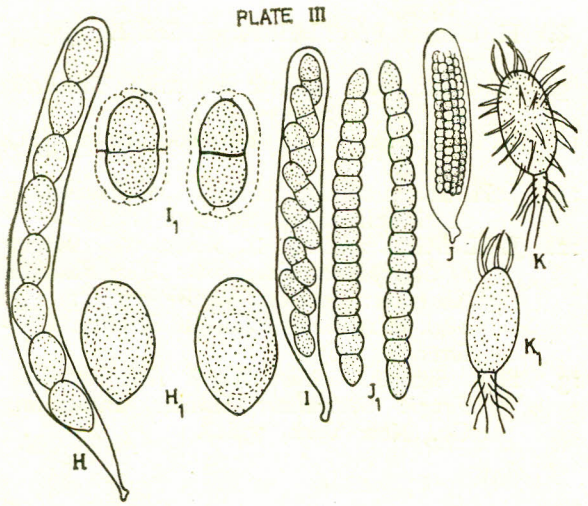


Plate III: H-$H_1$—*Sordaria fimicila* (Rob. in Desm.) Ces & de Not.; I-$I_1$—*Trichodelitschia bisporula.* (Cr.) Lundqvist; J-$J_1$—*Sporormia fimetaria* de Not. ; K-$K_1$—*Zygopleurage zygospora* Boedijn.

8. *Sporormia fimetaria* de Not., *Memorie* R. Accad. Sci. Torino, 2, **10,** 342 (1849). (Plate III. Fig. J-$J_1$). = *Sphaeria fimetaria* Rab., Herb. Mycol. (ed. 1 No. 1733). = *Brochospora fimetaria* Kirsch., Hedwigia **81,** 204 (1944).—Pseudothecia scattered, immersed beneath the substratum through which the upper wall of the peridium opens to the surface, globose, 91–125 μ, in diameter. Asci 8-spored, cylindrical, 70–80 × 12–16 μ, broadly rounded above, contracted below into a small base. Ascospores parallel, firmly united into a cylindrical, truncate mass in the centre of the ascus, 16–20 celled, cylindrical 50–57 × 3.5–4.5 μ, broadly rounded at the ends; light brown when young, finally dark brown and opaque; septa transverse, segments easily separable; terminal cells much longer than the remaining cells; germ-slit absent, a very narrow hyaline gelatinous sheath surrounds the spore-bundle.

Specimens examined: P.C.S.I.R. Herb. Nos. 2, 5, 6, 18.

In the type description of this species, the number of cells ranges from 16–20. In our specimens, the spores were mostly 16-celled and a few 17-celled. 14 and 15-celled spores were rarely recorded. In the 14 and 15-celled spores the occurence of enlarged cells was frequent. The enlarged cells are attributed to the failure of division in certain cells.

Our collections agreed more or less with the type description in all other characters assigned to this species.

9. *Podospora prethopodalis* Cain, Can. J. Bot., **40,** 458–459 (1962). (Plate II, Fig. F).—Perithecia brownish black, nearly superficial to partly immersed, scattered, subglobose to pyriform with long flexuous brown hairs, 420–550 × 250–400 μ. Neck short papilliform to long cylindrical, black, with a few tufts of straight, brown, septate hairs. Asci 8-spored, broadly clavate, 200–250 × 40-55 μ, Ascospores biseriate, ellipsoid, 30–45 × 14–22 μ, rounded at the apex, truncate at the base, finally dark brown and opaque; primary appendage at the distal end swollen in the middle, 17–35 × 6–8 μ. Secondary appendage lash-like, upper one excentrically attached to the apex of the spore, lower one similar to the upper but narrower, attached to the distal end of the primary appendage, very fragile; germ pore excentric.

Specimens examined: P.C.S.I.R. Herb. Nos. 45, 52, 57, 72.

10. *Trichodelitschia bisporula* (Cr.) Lundqvist, Svensk Botanisk Tidskrift BD 58, H. **1,** 267–272 (1964). (Plate III. Fig. I-$I_1$) = *Hormospora*

*bisporula* Cr., Flor. Finistere. 21 (1867).= *Delitschia bisporula* (Cr.) Hans. Vidensk. Meddel. V, 1876, 313 (1877).= *Trichodelitschia bisporula* (Cr.) Munk, Dansk. Bot. Arkiv, **15,** 109 (1953).= *Delitschia moravica* Niessl. verh. Nat. Ver. Brün, **14,** 207 (1876).—Perithecia scattered or aggregated in small clusters, semi-immersed to free, pyriform, 250–300 × 180–225 μ, dark brown to black, with a stout papilliform to short cylindrical neck, the upper part of the perithecium and the neck covered with straight, black, spiny hairs, lower part of the perithecium usually covered with long, fleuxuous, septate hairs. Asci 8-spored, more or less cylindrical, dark brown and opaque, 110–140 × 10–14 μ, narrowed below into a long stipe. Spores obliquely uniseriate, ellipsoid to oblong, 22–24 × 7.5–8 μ, transversely uniseptate, deeply constricted at the septum, surrounded by a narrow, hyaline gelatinous sheath and an umbo with a germ pore at each end of the spore.

Specimens examined; P.C.S.I.R. Herb. No. 56.

11. *Zygopleurage zygospora* Boedijn, Persoonia, **2** (3), 316 (1962). (Plate III; Fig. K-$K_1$). = *Sordaria zygospora* speg., Michelia, **1,** 227 (1878). = *Philocopra zygospora* Sacc., Syll. Fung., **1,** 251 (1882). = *Podospora zygospora* Niessl, Hedwigia, **22,** 156 (1883). = *Pleurage zygospora* Kuntze, Rev. Gen. Plant., **3**(3), 505 (1898).—Perithecia scattered, immersed to semi-immersed, 700–1000 × 450–650 μ:, pyriform, dark in colour, covered with olivaceous brown, long, flexuous hairs up to the neck or occasionally nearly bare; neck bears dark papillae. Asci 8-spored, cylindrical clavate, 275–340 × 40–45 μ, fragile. The terminal dark cells of the ascospores biseriate, 30–35× 14–18 μ, narrowly rounded at the apices, truncate at the bases, with apical germ-pore. The two dark terminal cells of a spore are jointed by a connecting filament; usually four short 77–100 ×7.5 μ, diverging secondary appendages attached near the distal end of each fertile cell, numerous slender secondary appendages attached to the base of interconnecting filament.

Specimens examined: P.C.S.I.R. Herb. Nos. 35, 38, 39, 41, 42, 43, 44, 75.

In some of the collections of this species the secondary appendages at the distal end (Plate III; Fig. $K_1$) of each fertile cell were distinctly four whereas in others there were secondary appendages all over the fertile cells (Plate III; Fig. K).

Because of the perfect similarity in the rest of the characters there is no doubt that the spores having different types of appendages belong to the same species. It is considered that perhaps this character depends on the humidity available at the time of appendage formation.

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