

Taxonomic studies on the fungi of Kuwait. III. Ascomycotina (Plectomycetes and Discomycetes)

A. F. MOUSTAFA*

Department of Science, Teachers' Institute of Education, Al-Shamia, Kuwait

ABSTRACT

In this paper, descriptions and keys for the identification of 23 species belonging to the classes Plectomycetes and Discomycetes are given along with illustrations and photographs. Also, remarks on the species frequency of occurrence are included.

INTRODUCTION

Ascomycotina is represented in Kuwait by a relatively wide spectrum of genera and species. This paper reports on 23 taxa belonging to 12 genera of the classes Plectomycetes and Discomycetes. Other species belonging to Pyrenomycetes and Loculoascomycetes will be dealt with in a future paper. Living cultures of most fungi mentioned in this article have been kept at the Centraalbureau voor Schimmelcultures, Baarn, Holland.

Key to classes of Ascomycotina in Kuwait

- Asci unitunicate:
 Asci evanescent, scattered within a cleistothecium Plectomycetes
 Asci persistent, regularly arranged within the ascocarp:
 Ascocarp an epigeous perithecium Pyrenomycetes
 Ascocarp an epigeous or hypogeous apothecium. Discomycetes
Asci bitunicate Loculoascomycetes

* Present address: Department of Botany, Faculty of Science, Suez Canal University, Ismailia, Egypt.

Plectomycetes

Eurotiales

Key to families and genera in Kuwait (after Ainsworth *et al.* 1973)

- Peridium of loosely interwoven hyphae Gymnoascaceae
 - Peridial hyphae thick-walled, differentiated from vegetative hyphae, most with dark branched appendages . . . *Myxotrichum*
 - Peridial hyphae thin-walled, very similar to vegetative hyphae:
 - Ascomata orange–yellow, ascospores pigmented . . *Arachniotus*
 - Ascomata yellowish–green, ascospores hyaline. . . *Narasimhella*
- Peridium typically prosenchymatous or pseudoparenchymatous:
 - Ascomcarps soft, granular to tuberculate in surface view, with long coiled appendages, conidial state lacking. . . Euterfeziaceae (*Lasiobolidium*)
 - Ascomcarps sclerotoid, smooth in surface view, without appendages, conidial state always present. Eurotiaceae
 - Conidial state is *Acremonium*, ascospores winged . *Emericellopsis*
 - Conidial state is *Aspergillus* or *Penicillium*, ascospores not winged:
 - Cleistothecia surrounded by thick-walled hülle cells, ascospores purple-red, conidial state *Aspergillus* from the *A. nidulans* group. *Emericella*
 - Cleistothecia not surrounded by hülle cells, ascospores hyaline or yellowish:
 - Conidial state an *Aspergillus*:
 - From *A. glaucus* group. *Eurotium*
 - From *A. fischeri* group. *Neosartorya*
 - Conidial state a *Penicillium* *Talaromyces*

Discomycetes

Pezizales

Key to families and genera in Kuwait (*sensu* Trappe 1979)

- Asci turn blue in iodine Pezizaceae (*Tirmania*)
- Asci do not turn blue in iodine:
 - Ascomcarps hypogeous, large tuber-like, asci broadly clavate, non operculate, ascospores scattered Terfeziaceae (*Terfezia*)
 - Ascomcarps hypogeous or epigeous, small crust-like or spherical, asci cylindrical to subclavate, operculate, ascospores uniseriate Pyronemataceae (*Pyronema*)

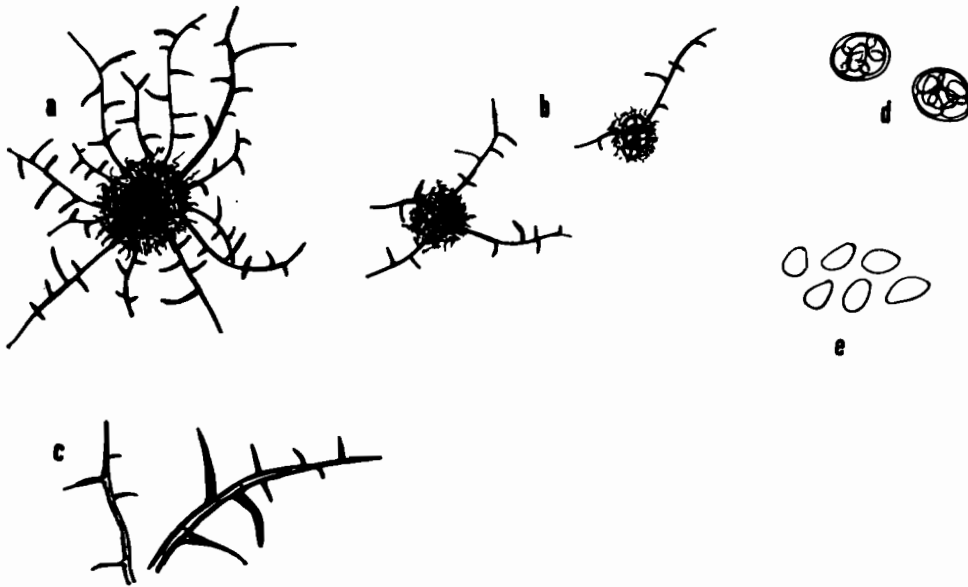


Fig. 1. *Myxotrichum deflexum*: (a) whole amount, (b) reduced-size ascocarps, (c) branched, septate appendages, (d) asci, (e) ascospores.

Key to species and descriptions

Myxotrichum Kunze

Myxotrichum deflexum Berkeley in Ann. Nat. Hist. 1: 260 (1838). (Fig. 1).

Ascocarps spherical to confluent or discrete, brownish-black, surrounded by dark, septate, thick-walled, smooth peridial hyphae from which originate long, branched appendages with straight, pointed tips; asci evanescent, obovate to elliptical, $14\text{--}22 \times 5\text{--}10 \mu\text{m}$, 8-spored; ascospores pale-yellow, oval to elliptical, $2.5\text{--}3.0 \times 3.5\text{--}5.0 \mu\text{m}$, with faint longitudinal striations; conidial state unknown.

Arachniotus Schroet (Fig. 2)

Common in the soil (Moustafa 1975a), some species thermotolerant (Moustafa *et al.* 1976), others osmophilic (Kamel 1979).

Ascocarps spherical to confluent, in shades of orange-yellow to cinnamon, sometimes turning by age into dark brown; colony reverse ranges from pale-yellow to orange-yellow to orange-brown; gametangial initials consist of two similar gametangia coiled about each other; asci borne either singly or in short chains, globose to subglobose to ovoid, 8-spored with persistent walls. Ascospores lenticular to oblate, may show typical rims and/or furrows and/or thickenings in the equatorial region, others may not show any of the foregoing characters. The conidial state, when present, may be represented by either arthrospores or aleuriospores.

The genus *Arachniotus* is represented in Kuwait by three species which can be identified with the following key:

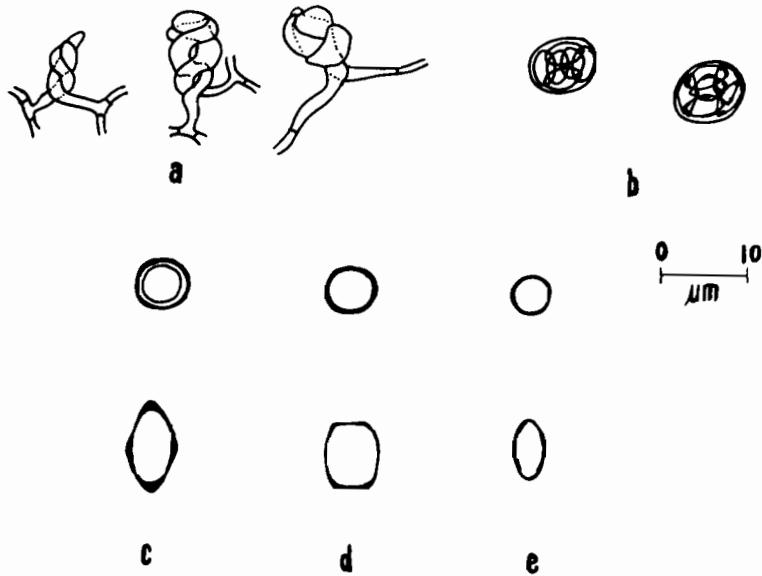


Fig. 2. *Arachniotus*: (a) gametangial initials, (b) asci, (c) ascospores of *A. dankaliensis*, (d) ascospores of *A. desertorum*, (e) ascospores of *A. citrinus*.

Ascomata yellowish-green, ascospores rhomboidal to elliptical. . . . *A. citrinus*

Ascomata orange-yellow, ascospores lenticular to oblate:

Ascospores showing an equatorial rim and polar

thickenings. *A. dankaliensis*

Ascospores showing a shallow furrow but no polar

thickenings. *A. desertorum*

Arachniotus citrinus Masee & Salmon in Ann. Bot. **15**: 313 (1902).

Ascocarps bright-yellow; ascospores lenticular to rhomboidal, $6-7 \times 4.5-5.5 \mu\text{m}$, with slight thickening in the equatorial region, no rims or furrows (Fig. 2e).

Arachniotus dankaliensis (Castellani) van Beyma in Antonie van Leeuwenhoek **8**: 107 (1942) (Plate I, c & d).

Ascocarps deep-orange to cinnamon; ascospores reddish-brown, with prominent equatorial rims and polar thickenings, $6-7.5 \times 4.5-5.5 \mu\text{m}$ (Fig. 2c).

Arachniotus desertorum Moustafa in Trans. Br. Mycol. Soc. **61**: 392 (1973) (Plate I e).

Ascocarps orange-yellow becoming orange-brown to cinnamon in age; ascospore dimension and colour very similar to *A. dankaliensis* especially in colour, but they are typically lenticular with very faint rims bordering a very shallow furrow; no polar or equatorial thickenings. (Fig. 2d).

Narasimhella Thirum. & Mathur (Fig. 3)

The genus is very rare. It is represented by only one species, *N. hyalinospora*.



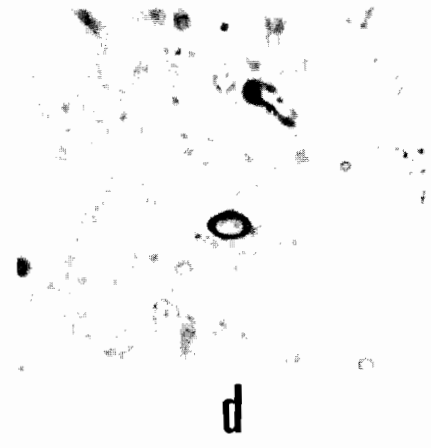
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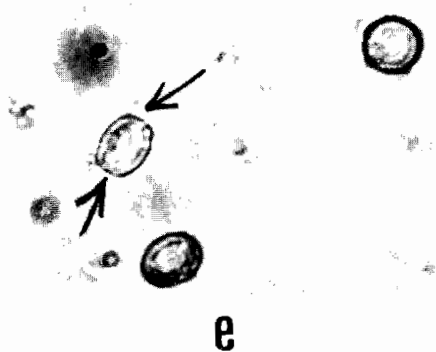
b



c



d



e

Plate I. *Arachniotus*: (a & b) gametangial initials, (c & d) asci and ascospores of *A. dankaliensis*, (e) ascospores of *A. desertorum*.

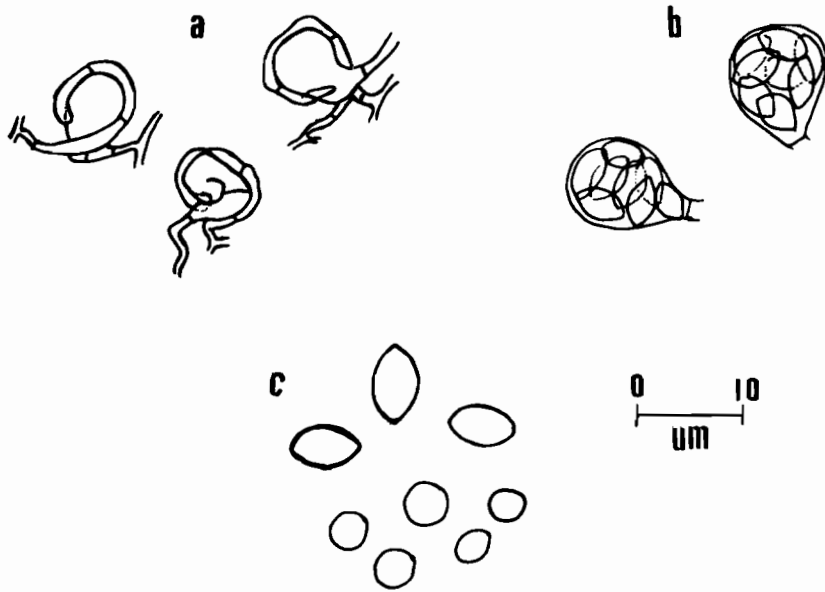


Fig. 3. *Narasimhella hyalinospora*: (a) gametangial initials, (b) asci, (c) ascospores.

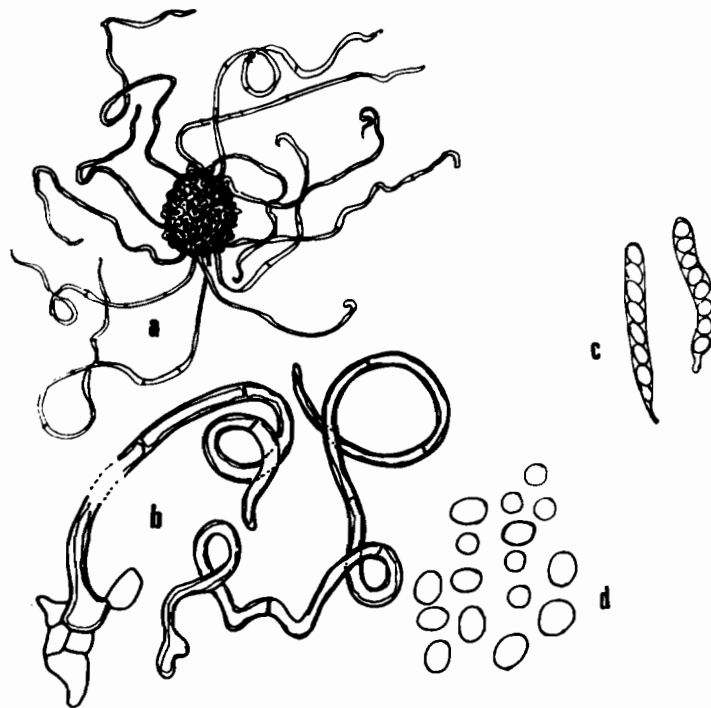


Fig. 4. *Lasiobolidium orbiculoides*: (a) whole amount of ascocarp, (b) septate, loosely coiled appendages, (c) cylindrical asci, (d) ascospores.

Narasimhella hyalinospora (Kuehn *et al.*) von Arx in *Persoonia* **6**: 371 (1971).

Very rare in the soil, recorded only once from the tidal flats of Kuwait (1980). Colonies slow-growing; ascocarps yellowish-green; gametangial initials ring-like; asci obovate to clavate, 8-spored; ascospores hyaline, oblate $4.0-5.0 \times 3.0-4.0 \mu\text{m}$, with a low equatorial frill.

Lasiobolidium Malloch & Cain (Fig. 4)

Less common in the soil (Moustafa 1975b). It is represented by one species *L. orbiculoides*.

Lasiobolidium orbiculoides Malloch & Benny in *Mycologia* **65**: 648 (1973).

Colonies fast-growing; ascocarps globose to subglobose, yellowish to buff at first, becoming reddish in age, ascocarp surface granular, covered with very long, hyaline, unbranched, septate, wavy-coiled appendages; asci cylindrical on short stipes, 8-spored; ascospores uniseriate, smooth, hyaline, broadly elliptical to oblate, $8-14 \times 9-12 \mu\text{m}$, without any characteristic surface structure.

Emericellopsis van Beyma (Fig. 5)

Less common in the soil (Moustafa & Al-Musallam 1975), osmotolerant (Moustafa 1975b).

Ascomata astomatous, globose, with translucent walls 3 to 5 layers thick; asci 8-spored, sub-globose with hyaline persistent walls; ascospores oval to ellipsoidal, dark coloured, with 2 to 5 longitudinal, hyaline to pigmented broad wings; conidial state is *Acremonium* (= *Cephalosporium*).

The genus *Emericellopsis* is represented in Kuwait by two species easily differentiated as follows:

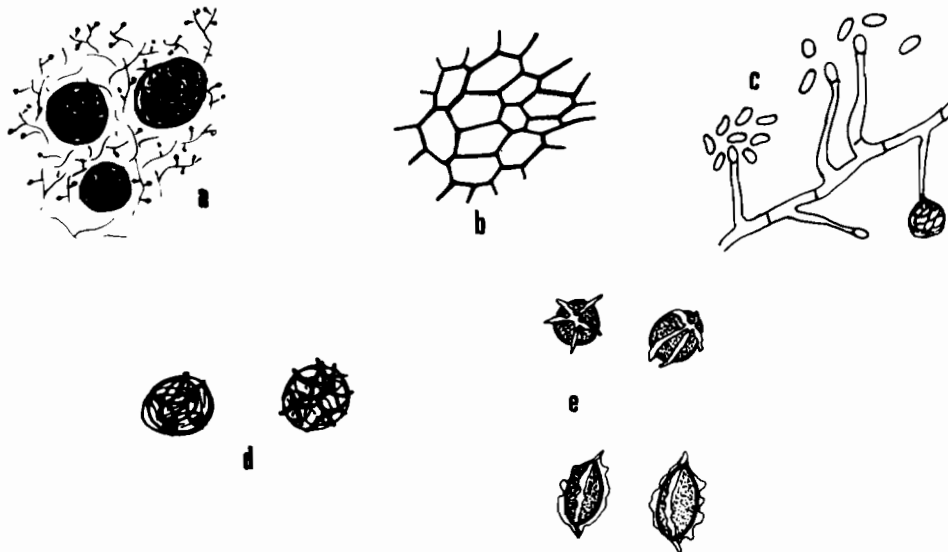


Fig. 5. *Emericellopsis*: (a) whole amount, (b) ascocarp wall, (c) conidial state, (d) asci, (e) ascospores.

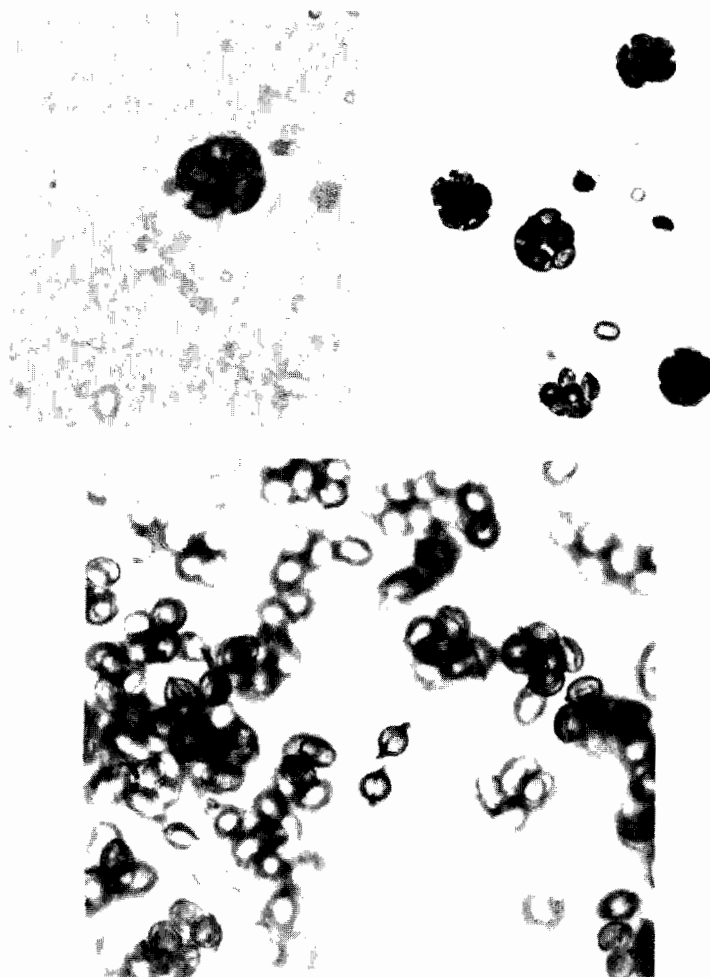


Plate II. *Emericellopsis*: asci and winged ascospores of *E. glabra*.

Ascospores 9–10 μm long	<i>E. glabra</i>
Ascospores 5–6 μm long	<i>E. minima</i>

Emericellopsis glabra (van Beyma) Backus & Orpurt in *Mycologia* **53**: 64 (1961) (Plate II).

Ascospores 8.5–10.5 \times 5.0–6.0 μm , wings dark pigmented, uniform in width, not attenuated at the tip.

Emericellopsis minima Stolk in *Trans. Br. mycol. Soc.* **38**: 419 (1955).

Ascospores 5.0–6.0 \times 3.0–4.0 μm , wing hyaline, triangular with attenuation at the tip.

Emericella Berk. & Br. (Fig. 6)

Very common in the soil of Kuwait (Moustafa 1975a), osmotolerant (Moustafa &

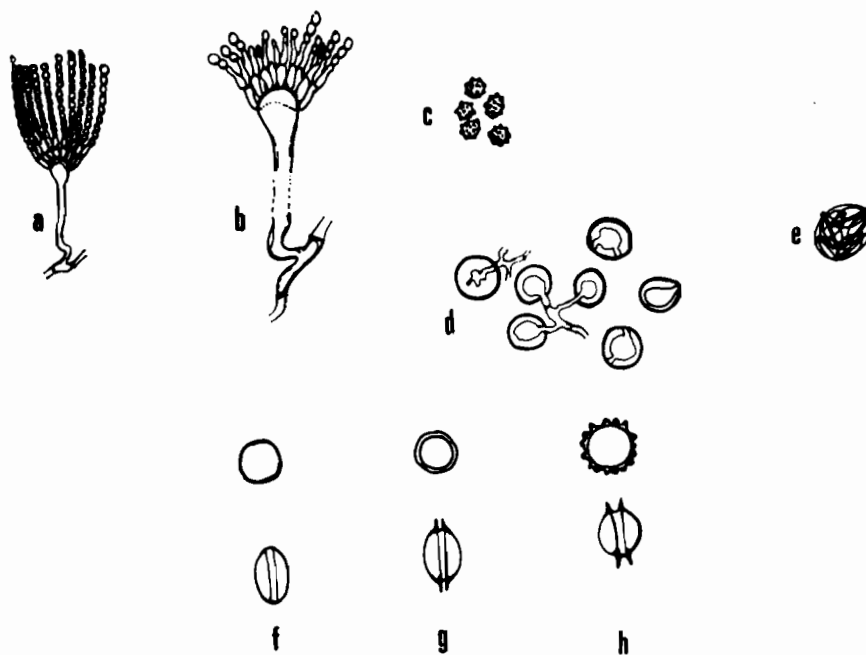


Fig. 6. *Emericella*: (a) whole mount of conidial state, (b) detailed structure of conidial apparatus, (c) rough conidia, (d) globose hülle cells, (e) asci, (f) ascospores of *E. nidulans* var. *acristatus*, (g) ascospores of *E. nidulans*, (h) ascospores of *E. nidulans* var. *dentatus*.

Al-Musallam 1975; Kamel 1979), thermotolerant (Moustafa *et al.* 1976). Ascomata globose, pale yellow, surrounded by thick-walled, globose hülle cells; asci globose to subglobose, 8-spored; ascospores orange to purple-red, lenticular, with hyaline rim bounded by two equatorial crests. The conidial state is *Aspergillus nidulans*, with conidial heads typically short columnar; conidiophores sinuate; vesicles flask-shaped to hemispherical; sterigmata biserial, fertility limited to the upper half of the vesicle; conidia globose, finely verrucose to rough.

The genus *Emericella* is represented in Kuwait by three species best identifiable according to their ascospore morphology as follows:

Ascospores with a hyaline rim not bounded by crests	<i>E. nidulans</i> var. <i>acristatus</i>
Ascospores with a hyaline rim bounded by prominent crests:	
Crests entire in surface view	<i>E. nidulans</i>
Crests dentate in surface view	<i>E. nidulans</i> var. <i>dentatus</i>

Emericella nidulans (Eidam) Vuillemin in Compt. Rend. Acad. Sci. **184**: 137 (1927).
Con. St. *Aspergillus nidulans* (Eidam) Wint.

Ascospores purple, lenticular, smooth, with two equatorial crests bounding a hyaline rim, $4.0-4.5 \times 3.5-4.0 \mu\text{m}$ (Fig. 6g).

Emericella nidulans (Eidam) Wint. var. *acristatus* Fennell & Raper in Mycologia **47**: 79 (1955).

Ascospores orange-red, lenticular, smooth, with a prominent hyaline rim, but no crests in the equatorial area, $4.0-5.0 \times 3.0-4.0 \mu\text{m}$ (Fig. 6f).

Emericella nidulans (Eidam) Wint. var. *dentatus* Sandhu & Sandhu in *Mycologia* **55**: 297 (1963).

Ascospores orange-red, lenticular, smooth, with a hyaline rim bounded by two equatorial crests which are typically dentate in surface view, $3.5-4.0 \times 2.5-3.0 \mu\text{m}$, (Fig. 6h).

Eurotium Link ex Fr. (Fig. 7)

Very common in the soil (Moustafa 1975a), osmophilic (Moustafa & Al-Musallam 1975; Kamel 1979).

Ascomata globose to subglobose, yellow, surrounded by yellowish-red hyphae, hülle cells absent; asci spherical, 8-spored; ascospores pale to hyaline, lenticular, smooth or rough, some may show two ridges bordering a definite furrow in the equatorial area, others may not show these structures.

The conidial state is in the *Aspergillus glaucus* group which is characterized by radiate to very loosely columnar heads; smooth conidiophores; flask-shaped to globose vesicles; uniseriate sterigmata; fertility over the vesicular area incomplete, i.e. reduced to the upper half or upper two-thirds; conidia globose to subglobose.

The genus *Eurotium* is represented in Kuwait by three species easily differentiated as follows:

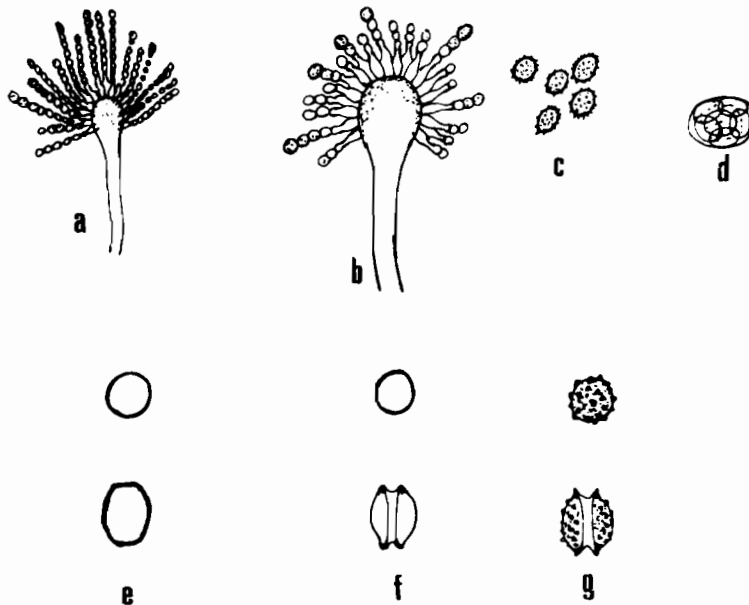


Fig. 7. *Eurotium*: (a) whole mount of conidial state, (b) detailed structure of conidial apparatus, (c) rough conidia, (d) ascus, (e) ascospores of *E. repens*, (f) ascospores *E. ruber*, (g) ascospores of *E. amstelodami*.

- Ascospores surface rough *E. amstelodami*
 Ascospores surface smooth:
 Equatorial ridges and furrow prominent *E. rubrum*.
 Equatorial ridges and furrow lacking *E. repens*

Eurotium repens de Bary in Abhandl. Senckenberg. Naturforsch. Ges. 7: 361 (1870).
 Con. St. *Aspergillus repens* (Corda) Saccardo.

Ascospores smooth, $4.5-5.5 \times 3.5-4.5 \mu\text{m}$ with very faint furrow or flat area in the equatorial region; ridges completely absent (Fig. 7e).

Eurotium rubrum (König, Spieckermann & Bremer) Thom & Church in The Aspergilli: 112 (1926).

Con. St. *Aspergillus sejunctus* Bainier & Sartory.

Ascospores smooth, $5.6 \times 4-5 \mu\text{m}$, with a prominent broad but shallow furrow bounded by two equatorial ridges (Fig. 7f).

Eurotium amstelodami Mangin in Ann. Sci. Nat. Botan. 10: 360 (1909).

Con. St. *Aspergillus amstelodami* (Mangin) Thom & Church.

Ascospores rough, $4.5-5.0 \times 3.0-4.0 \mu\text{m}$, with a definite broad, deep furrow bounded by two equatorial ridges (Fig. 7g).

Neosartorya Malloch & Cain (Figs 8 & 9)

Less common in the soil (Moustafa 1975a), osmophilic (Kamel 1979), thermotolerant (Moustafa *et al.* 1976). It is represented in Kuwait by one species, *N. fischeri*, and two varieties.

Neosartorya fischeri (Wehmer) Malloch & Cain

Con. St. *Aspergillus fischeri* Wehmer.

Ascomata white to cream, globose, enveloped by loose hyphae; asci globose to subglobose, 8-spored; ascospores globose, hyaline with two long equatorial crests bounding a relatively broad furrow.

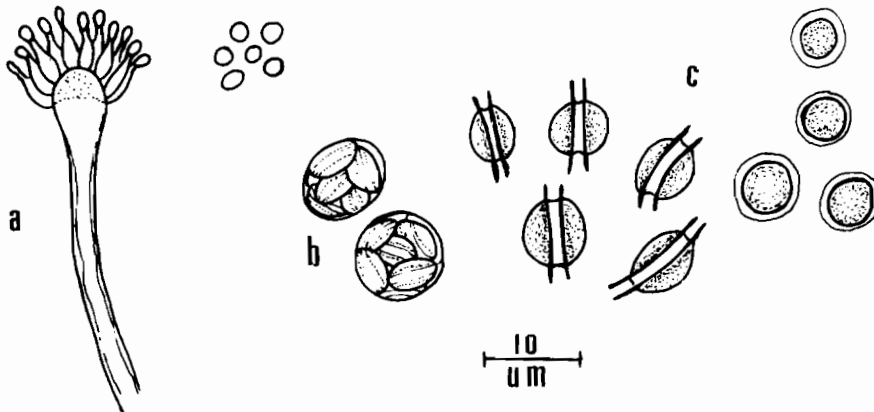


Fig. 8. *Neosartorya fischeri* var. *glaber*: (a) conidial state, (b) asci, (c) ascospores.

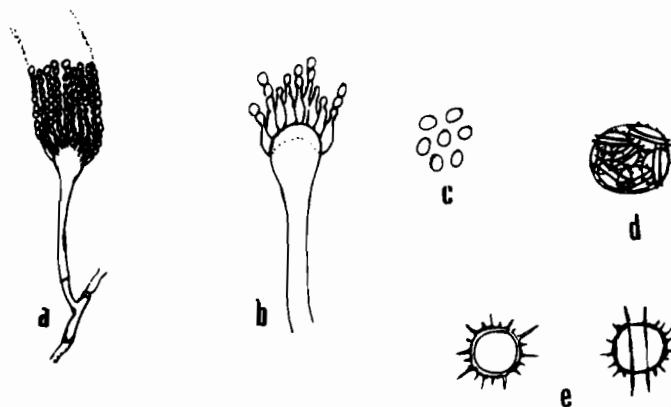


Fig. 9. *Neosartorya fischeri* var. *spinosus*: (a) whole mount of conidial state, (b) detailed structure of conidial apparatus, (c) smooth, subglobose conidia, (d) ascus, (e) ascospores.

The conidial state is *Aspergillus fischeri* Wehmer which is characterized by long, columnar, compact conidial heads, smooth conidiophores and flask-shaped vesicles; sterigmata uniseriate; fertility over the vesicular area restricted to the upper half; conidia globose to subglobose, smooth to delicately roughened.

Distinction between the two varieties depends upon the ascospore morphology as follows:

Ascospores lenticular, with smooth surface *N. fischeri* var. *glaber*
 Ascospores globose with spiny surface *N. fischeri* var. *spinosus*

Neosartorya fischeri (Wehmer) Malloch & Cain var. *glaber* Fennell & Raper in *Mycologia* **47**: 75 (1955) (Fig. 8).

Ascospores smooth, lenticular, $6.5-7.5 \times 4.5-5.0 \mu\text{m}$, equatorial crests $1-1.5 \mu\text{m}$ wide.

Neosartorya fischeri (Wehmer) Malloch & Cain var. *spinosus* Raper & Fennell in *The Genus Aspergillus*: **246** (1965) (Fig. 9).

Ascospores with long spines, globose, $4-5 \mu\text{m}$ in diameter, equatorial crests $1-2 \mu\text{m}$ wide.

Talaromyces Benjamin (Fig. 10)

Less common in the soil, osmotolerant and thermotolerant (Kamel 1979).

Colonies cream-buff to orange-yellow, reverse yellow to orange-yellow; ascospores globose to confluent or discrete, orange-yellow; asci globose to elliptical, 8-spored; ascospores typically spinulose, broadly ellipsoidal; conidia subglobose to elliptical, smooth.

The conidial state in *Penicillium*, Section *Biverticillata-Symmetrica* (Raper & Thom 1949), in which the conidiophores carry a verticil of 2-3 metulae and another verticil of 5-7 lanceolate phialides in symmetrical structure.

The genus *Talaromyces* is represented in Kuwait by two species easily distin-

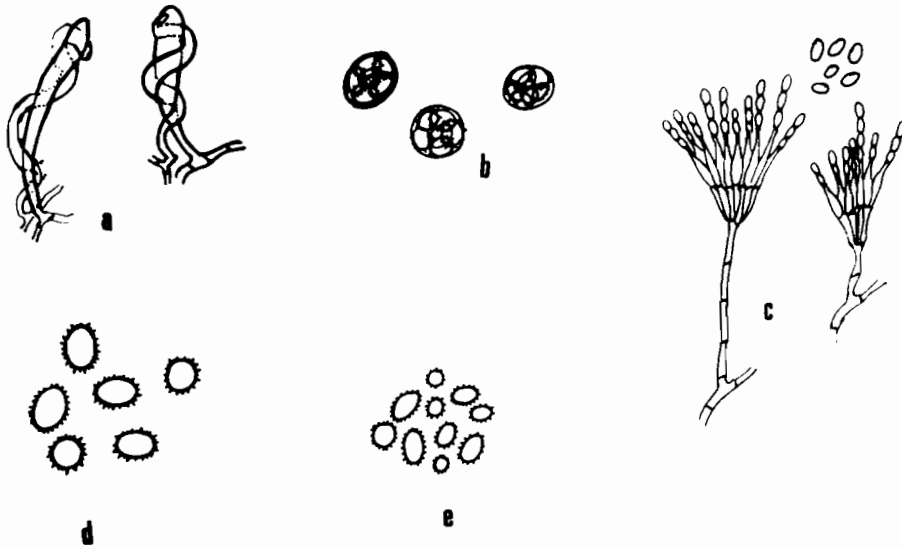


Fig. 10. *Talaromyces*: (a) gametangial initials, (b) asci, (c) conidial state, (d) ascospores of *T. flavus*, (e) ascospores of *T. trachyspermus*.

guished as follows:

Ascomata orange, ascospores 4–6 μm long *T. flavus*
 Ascomata cream to buff, ascospores 3–4 long *T. trachyspermus*

Talaromyces flavus (Klöcker) Stolk & Samson in Stud. Mycol. 2: 64 (1972).

Con. St. *Penicillium vermiculatum* Dangeard.

Colonies orange–yellow, reverse in culture ranges from orange–red to intense red to brown; asci elliptical, 12–15 \times 10–12 μm ; ascospores spinulose, ellipsoidal, 4–6 \times 3.0–4.5 μm (Fig. 10d); conidia smooth, brownish–green, oval to elliptical, 2.5–3.5 \times 2.0–2.5 μm .

Talaromyces trachyspermus (Shear) Stolk & Samson in Stud. Mycol. 2: 64 (1972).

Con. St. *Penicillium spiculispodium* Lehman.

Colonies white as first then cream to buff, reverse in culture pale–yellow; asci elliptical, 6–8 \times 5–6 μm ; ascospores spinulose, ellipsoidal, 3–4 \times 2.5–3.5 μm (Fig. 10e); conidia similar to those of *T. flavus*.

Pezizales (= Tuberales) (truffles)

Truffles are very common in the deserts of Kuwait and most of the neighbouring countries of the Arabian Peninsula. They occur almost every year, and good harvests are expected in seasons of heavy and early rainfall. The harvest occurs in March through April. Truffles are highly accepted as an important food item in Kuwait. They grow in association with two annual members of the Cistaceae: *Helianthemum ledifolium* and *H. salicifolium*. The nature of this association has not been fully studied.

Truffles are represented in Kuwait by two genera: *Tirmania* and *Terfezia* which are easily differentiated by the following characters:

1. Colour of the peridium: pale in *Tirmania*, dark in *Terfezia*.
2. Colour of the gleba: yellowish–white in *Tirmania*, yellowish to pinkish–orange in *Terfezia*.
3. Reaction of asci to Melzer's iodine reagent: in *Tirmania* the asci turn blue while in *Terfezia* the reaction is negative.
4. Asci in *Tirmania* are attenuated at the base to form very long necks, while in *Terfezia* the necks are short.
5. Ascospores in *Tirmania* are smooth and subhyaline while in *Terfezia* they are typically sculptured, and golden-brown when mature.

Key to the genera and species in Kuwait

Ascocarps pale, gleba yellowish, ascospores smooth	<i>Tirmania</i>
Ascospores globose, 16–24 μm	<i>T. pinoyi</i>
Ascospores elliptical 14–20 \times 12–15 μm	<i>T. nivea</i>
Ascocarps dark, gleba pinkish, ascospores definitely rough	<i>Terfezia</i>
Ascospores 16–24 μm in diameter; reticulate	<i>T. claveryi</i>
Ascospores 24–32 μm in diameter, verrucose	<i>T. boudieri</i>

Tirmania Chatin (White Kamé) (Figs 11–13)

The genus *Tirmania* is locally known as 'Zubaidi'. Ascocarps variable in shape and size, subglobose, oval, pyriform to turbinate, lobed to irregular with a prominent basal scar; peridium pale, scabrous, with many cracks and furrows, prosenchymatic; gleba yellowish–white, fleshy, solid, consisting of labyrinthiform fertile pockets separated by sterile veins; asci randomly arranged, thin-walled, 8-spored, broadly clavate to obovoid, rounded at the top, definitely attenuated at the base to form very long necks, amyloid (turning blue in Melzer's iodine reagent); ascospores globose to elliptical, loosely arranged, double-walled, with a smooth outer and reticulate inner wall (Plates III & IV).

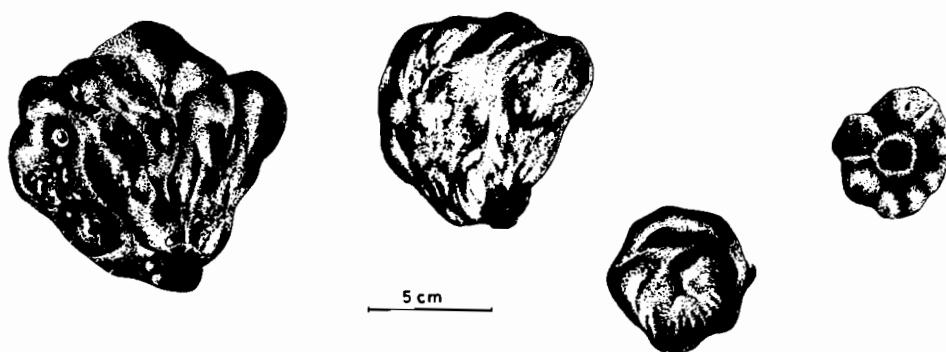


Fig. 11. *Tirmania*: whole mount of entire ascocarps.

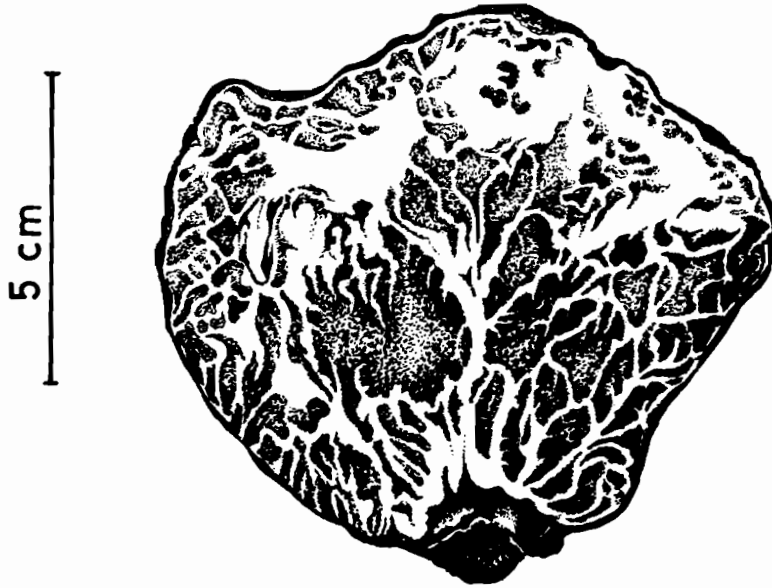


Fig. 12. *Tirmania*: whole mount of vertically sliced ascocarp.

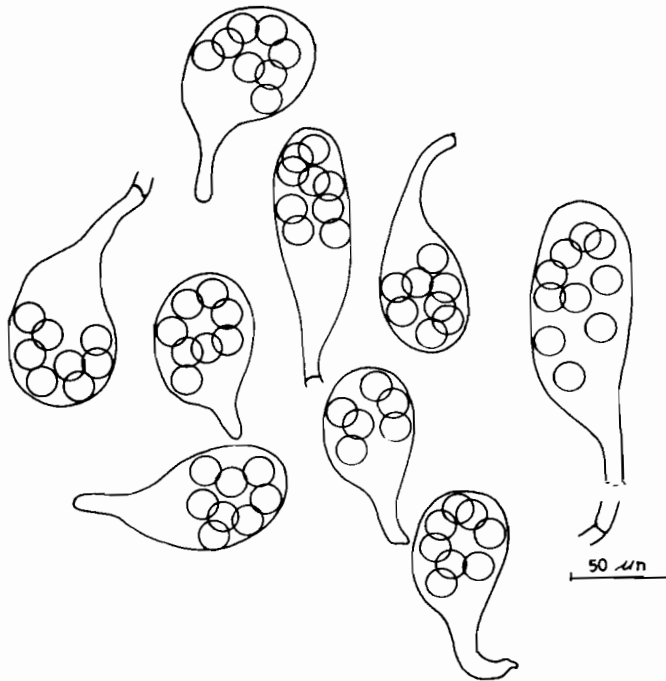


Fig. 13. *Tirmania*: asci and ascospores.

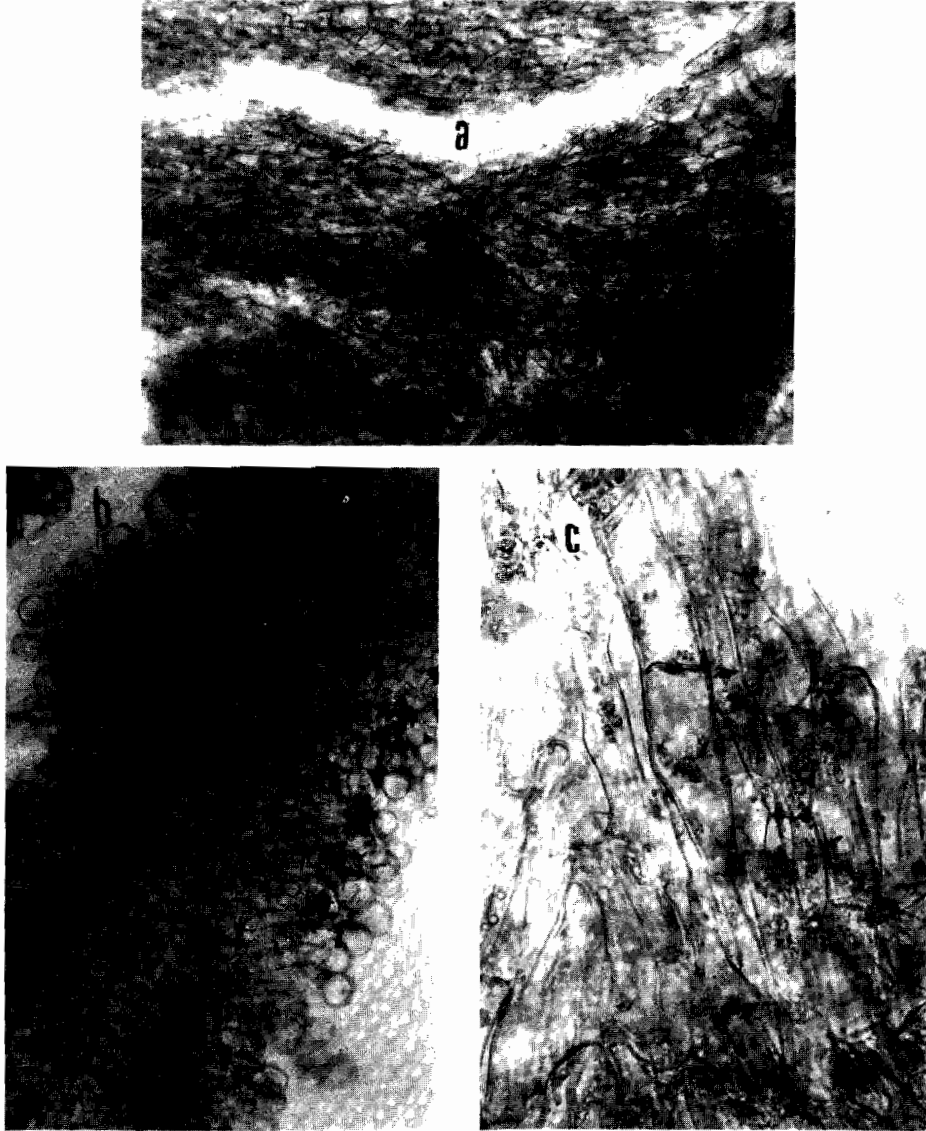


Plate III. *Tirmania*: (a) prosenchymatous peridium, (b) sterile vein separating two fertile pockets, (c) magnified peridial cells.

Tirmania pinoyi (Maire) Malençon in *Persoonia* **7**: 277 (1973).

Ascocarps 0.5–(3.0–5.0)–8.5 cm in diameter; asci 70–100 × 40–55 μm ; ascospores globose, 16–24 μm with a smooth outer wall and a reticulate inner wall.

Tirmania nivea (Desf. ex Fr.) Trappe in *Trans Br. Mycol. Soc.* **51**: 88 (1971).

Ascocarps 3–(8–12)–18 cm in diameter; asci 60–80 × 30–50 μm ; ascospores elliptical, 16–20 × 12–15, with a smooth outer wall and a reticulate inner wall.

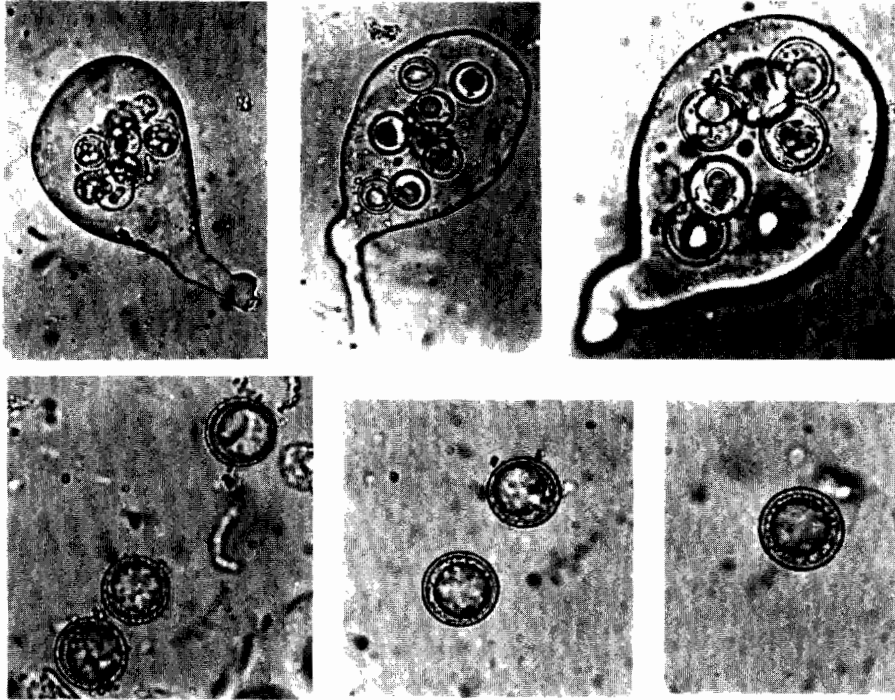


Plate IV. *Tirmania*: asci and ascospores.

Terfezia Tul. (Black or Brown Kamé) (Figs 14–16)

The genus *Terfezia* is locally known as 'Khlas'. Ascocarps variable in shape and size, globose to subglobose, oval to obpyriform, sometimes lobed, with a prominent basal attachment; peridium dark-brown to black, pseudoparenchymatous; gleba yellowish–orange to pinkish–orange, fleshy, solid, consisting of subspherical fertile pockets separated by sterile veins; asci randomly arranged, thin-walled, 8-spored, sometimes with a fewer number of spores, subglobose to obvoid, $80\text{--}100 \times 55\text{--}85 \mu\text{m}$, hyaline, thin-walled, rounded at the top, slightly attenuated at the base to



Fig. 14. *Terfezia*: whole mount of entire ascocarps.

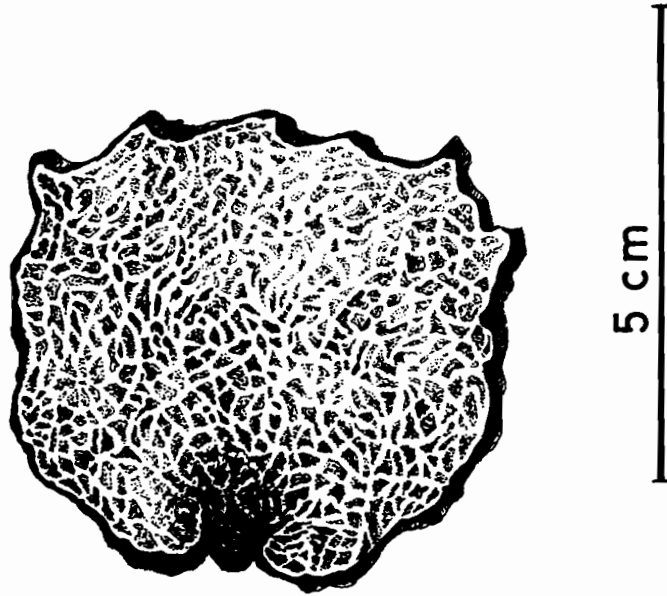


Fig. 15. *Terfezia*: whole mount of vertically sliced ascocarp.

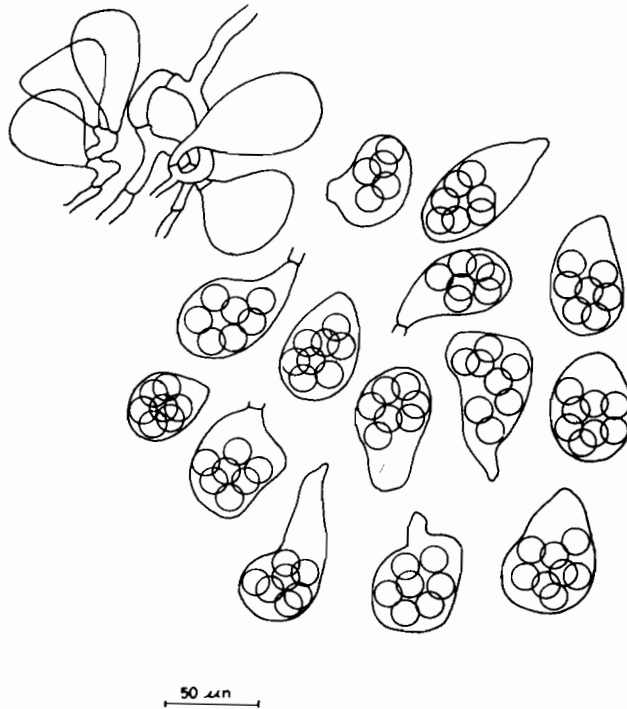


Fig. 16. *Terfezia*: asci and ascospores.

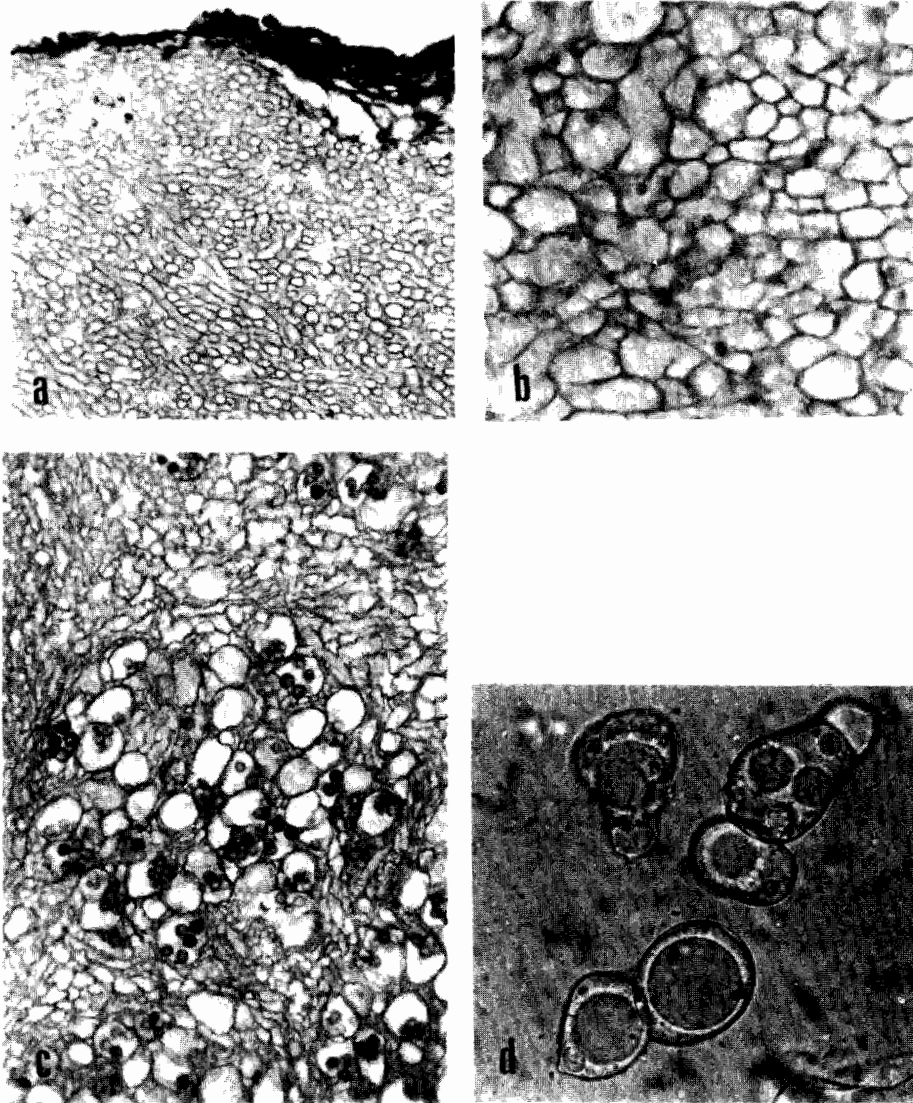


Plate V. *Terfezia*: (a) pseudoparenchymatous peridium, (b) magnified peridial cells, (c) fertile pocket with asci and ascospores, (d) young asci with immature ascospores.

form relatively short necks, non-amyloid (negative reaction with Melzer's iodine); ascospores subglobose, loosely arranged, at first hyaline, turning to pale-yellow and finally golden-brown at maturity, with typically warty-reticulate surface (Plates V & VI).

Terfezia boudieri Chatin in Compt. Rend. Acad. Sci. **111**: 947 (1890).

Ascocarps 1.5–(5.0–8.0)–12 cm in diameter; asci 80–100 × 55–85 μm; ascospores golden-brown, warty, globose, 24–32 μm.

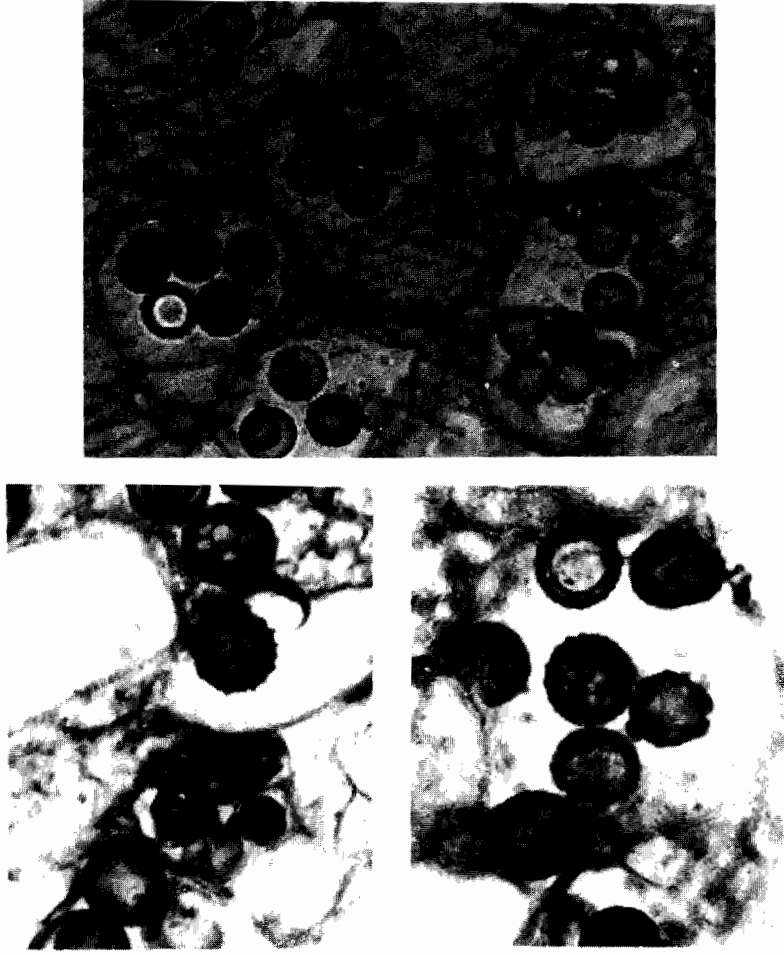


Plate VI. *Terfezia*: asci with typically warty ascospores.

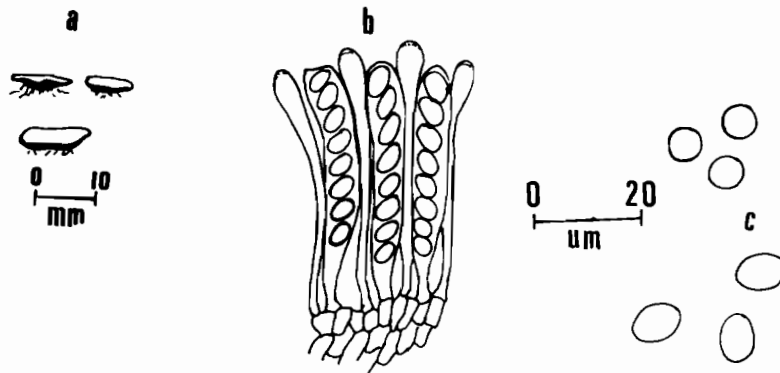


Fig. 17. *Pyronema* sp.: (a) whole mount of apothecia, (b) V.S. in ascocarp showing asci and paraphyses, (c) ascospores.

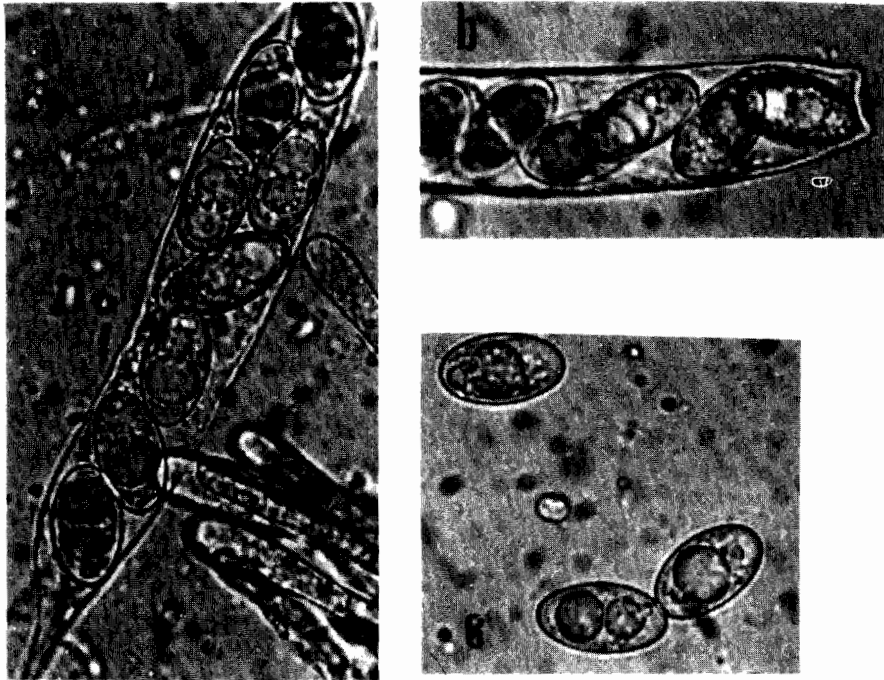


Plate VII. *Pyronema* sp.: (a) asci and paraphyses, (b) ascus tip showing dehiscent operculum, (c) large elliptical ascospores.

Terfezia claveryi Chatin in Compt. Rend. Acad. Sci. **111**: 947 (1890).

Ascocarps (1.0) 4.5–6.5 (9.5 cm) in diameter; asci 50–70 × 60–85 μm; ascospores golden-yellow, reticulate, globose, 16–24 μm.

Pyronema Carus (Fig. 17, Plate VII)

Very common under grass especially after manuring in the period March–April. It is represented in Kuwait by one species.

Apothecia discrete, pink, 2–5 μm in diameter; asci 8-spored, operculate, cylindrical, 70–90 × 5–10 μm, intermingled with paraphyses of almost similar length; ascospores hyaline, smooth, broadly ellipsoidal, 5–10 × 3–14 μm.

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دراسات تصنيفية على فطريات الكويت
الجزء الثالث : الفطريات الزقية

عبد الواحد فهيم مصطفى*
قسم العلوم ، معهد التربية للمعلمين ، الشامية ، الكويت

خلاصة

في هذا البحث ، تم وصف ٢٣ نوعا من الفطريات الزقية الموجودة في الكويت ، كما ذكرت درجة ترددها ، وتم عمل المفاتيح اللازمة للتعرف على هذه الانواع . وقد زود البحث بالرسوم التوضيحية والصور الضوئية لهذه الفطريات للمساعدة في التعرف عليها .

* العنوان الحالي : قسم النبات بكلية العلوم ، جامعة قناة السويس ، الاسماعيلية ، مصر .

