

Addition to micromycetes of Lahore, Pakistan

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Abstract

A study of micromycetes of Lahore initiated during 2005 at Fungal Culture Bank of Pakistan (FCBP), Punjab University revealed the presence of 22 species of fungi. They were isolated from soil, air, khoya, stale bread, animal dung and diseased roots, leaves & fruits of various plants on MEA & PDA; a few, however, were recultured on other recommended media for verification of diagnostic characteristics. They include five species of *Fusarium* (*F. equiseti*, *F. oxysporum*, *F. semitectum*, *F. lateritium* & *F. solani*) three species of *Penicillium* (*P. simplicissimum*, *P. citrinum* & *P. capsulatum*) two species each of *Aspergillus* (*A. candidus* & *A. penicilliioides*) and *Mucor* (*M. hiemalis*, *M. subtilissimus*), one species each of *Phytophthora* (*P. cinnamomi*), *Cunninghamella* (*C. elegans*), *Acremonium* (*A. kiliense*), *Absidia* (*A. cylindrospora*), *Rhizopus* (*R. nigricans*), *Doratomyces* (*D. microsporus*), *Choanephora* (*C. cucurbitarum*), *Cladosporium* (*C. cladosporioides*), *Torula* (*T. herbarum*), *Alternaria* (*A. alternata*), *Drechslera* (*D. hawaiiensis*), *Monilia* (*M. sitophila*) and *Sclerotium* (*S. bataticola*). Two species of *Pilobolus* (*P. longipes* & *P. crystallinus*) found growing on dung did not grow in culture on any agar medium used in these studies.

Key words: Micromycetes, Lahore, Fungi, Cultures.

Introduction

Fungi are ubiquitous and important because of their presence in all climates and on all substrates. Most of them can be easily cultured, though some require special media to grow but the biotrophs fail to grow in exenic cultures. For proper growth and sporulation of a fungus specific requirements (nutrients, temperature, moisture, light, relative humidity etc) of a fungus are to be fulfilled. Late Dr. Sultan Ahmad in 1956, 1969, and 1997 (with S. H Iqbal and A. N. Khalid) published lists of fungi from Pakistan. Mirza and Qureshi in 1978 revised the lists of fungi of Pakistan by Ahmad (1956, 1969), by including their own additions and new reports by other authors. They reported 3383 species of fungi belonging to 874 genera from whole of Pakistan.

Materials and Methods

Samples collected from different localities of Lahore in separate sterile cellophane or paper bags were placed in a refrigerator and cultured on agar media as early as possible. Different types of media were prepared (Table 1) for isolation and sporulation. Specimens of diseased plant material if not sporulating were incubated in a moist chamber to induce sporulation before isolation. Diseased pieces

of roots, stems, leaves and rotten fruits were surface sterilized with 10% sodium hypochlorite (NaOCl) for 1-3 minutes, washed in sterile water and placed in petriplates on sterilized agar media. These specimens were incubated at about 25°C. Permanent slides of leaf spots were prepared by Whole Leaf Clearing & Staining Technique (Bruzzese and Hasan.,1983).

Isolations from soil were made by direct soil plating method (Mirza *et al.*, 1979) and incubated in the dark at 25°C, unless otherwise stated, for 48 to 72 hrs. After 24 hour's incubation, fungal colonies start growing. Inoculum from the margin of developing young colonies was transferred to fresh agar plates for purification.

Pieces of dung were examined by preparing moist chambers (Mirza *et al.*, 1979). These chambers were examined almost daily under stereoscope for the growth of fungi.

Phytophthora species was isolated by apple fruit and hemp seed baiting. (Waller *et al.*, 1998). Identification of fungi was done by recording macroscopic and microscopic characters and consulting the pertinent literature. All pure cultures were deposited in Fungal Culture Bank of Pakistan (FCBP).

Table 1: (Composition of media for 1 liter)

Media	Potato cube	Dextrose	Agar	Malt extract	V8-juice	Dung	Sucrose
Potato Dextrose Agar (PDA)	250gm	20gm	20gm	-	-	-	-
Malt Extract Agar (MEA)	-	-	20gm	20gm	-	-	-
V-8 Juice Agar (V8A)	-	-	20gm	-	400ml	-	-
Potato Sucrose Agar (PSA)	250gm	-	20gm	-	-	-	15gm
Dung Decoction Agar (DA)	-	-	20gm	-	-	500gm	-

All media were sterilized at 121°C, temperature 15-psi pressure for 15 minutes, 250mg Chloromycetin was added and pH of media was adjusted between 6.5 and 7.0 after autoclaving.

RESULT & DISCUSSION

The following fungi were found growing on different substrates. They were isolated in pure culture on media mentioned in Table: 2. Species of *Pilobolus* could not be cultured even on dung agar.

1. *Absidia cylindrospora* Hagem, 1908 *Norweg. Mucor. S.* 45.

Colonies after 2-3 days at 25°C, 4.5-5.0 cm in diameter, cottony, white on MEA. *Sporangiophores* branched, hyaline to light brown, smooth-walled, septa present, 79-228x2.36-10.1µm. *Sporangia* pyriform, 19.2-31.2x24-65µm, apophyses distinct. *Columellae* hyaline to grey, ovoid and conical, 6-35 x 5-25, smooth-walled and quickly deliquescent, with 1-3 apical projections. *Sporangiospores* cylindrical, rarely subglobose smooth-walled, hyaline, contents homogenous, 2.3-7.1 x 1.8-4.1µm.

Specimen Examined: Isolated from *Dalbergia sissoo* root, Lahore, 23.11.05(FCBP 554).

This species was reported earlier by Mirza & Qureshi (1978) on dead insect from Faisalabad.

2. *Acremonium kiliense* Grutz, 1925. *Dermatologische Wochenschrift.* **80**:774

Colonies white or pale pink, powdery, raised in the center, 2-3 cm in diameter at 25°C after 10 days on MEA; reverse cream to light brown. *Hyphae* hyaline, typically very fine and narrow, often forming hyphal ropes. *Phialides* long, needle-like, narrow and monoblastic, separated from hyphae by a septum at the base and tapering towards their apices, 20-25x1.5-1.9µm. *Conidia* hyaline, usually in clusters or in balls, ellipsoid, ovoid or cylindrical in shape, few to abundant, 2.5-2.8x1-1.9µm. *Chlamydospores* hyaline, 4-8µm in diameter.

Specimen Examined: Isolated from *Dalbergia sissoo* root, Lahore, 23.11.05(FCBP 565).

In the collection of FCBP it was previously isolated from air (FCBP 229); decaying

wood(FCBP 259); *Pothos* leaves(FCBP 275); mulberry stem(FCBP 162); buffalo dung(FCBP 368) and soil(FCBP 408) from Lahore .

3. *Alternaria alternata* (Fr) Keissler, 1912. *Beith. Bot. Zbl.*, **29**: 434.

Colonies olivaceous black to grey, 5.5-6.0cm diameter after 2 days at 25°C on MEA reverse creamish yellow to black. *Conidiophores* arising singly or in small groups, branched, straight or curved, 1-3 septate, geniculate, pale to mid olivaceous, smooth, up to 50µm long, 3-6µm thick, with 1 or several apical conidial scars (pores). *Conidia* porospores often in branched chains, obclavate, obpyriform, ovoid, with a short conical or cylindrical beak, pale to mid golden brown, up to eight transverse and several longitudinal or oblique septa, 20-63µm long, 9-18µm thick, beak pale, 2-5µm thick.

Specimens Examined: Isolated from *Malus domestica* fruit, Lahore, 12.12.05(FCBP 574), *Lycopersicon esculentum* fruit, Lahore, 12.12.05(FCBP 573), Khoya (Dehydrated milk), Lahore, 12.12.05(FCBP 572).

A. Alternata is reported as *A. tenuis* in older literature. It is the most common and variable species of *Alternaria*. In the collection of FCBP it was previously isolated from *Rumex dentatus* leaves(FCBP 03), air (FCBP 246), *Dalbergia sissoo* root (dieback)(FCBP 158, 189, 194), milk cream(FCBP 216), polluted water(FCBP 265), canned peach(FCBP 328), *Citrullus vulgaris* leaves(FCBP 335), soil(FCBP 345), *Spinacea oleracea* leaves(FCBP 352), *Eucalyptus citriodora* rhizospheric soil(FCBP 369), *Cucurbita* leaf(FCBP 402) and *Gladiolus* bulb(FCBP 404).

4. *Aspergillus penicillioides* Speg. 1896. *Revista Fac. Agron. Univ. Nac. La Plata.* **2**: 246.

Colonies olive grey, dense, velutinous, 5.0-6.0cm after 8 days on MEA at 25°C, reverse hyaline to pale brownish yellow. *Conidial heads* definitely columnar. *Stipes* 150-500µm, hyaline,

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smooth-walled. *Conidiophores* short, smooth, usually hyaline to greenish in terminal areas. *Vesicles* subglobose, (7)9-25µm in diameter; *Sterigmata* uniseriate. *Phialides* (6)7-10(11)µm covering more than half of the vesicle. *Conidia* ellipsoid, rough-walled, 3-5.5(6)x3-4µm.

Specimen Examined: Isolated from *Litchi chinensis* root, Lahore, 23.11.05(FCBP 559).

Previously it was reported by Ahmad (1960) in soil from Lahore.

5. *Aspergillus candidus* Link, 1890. Ges. Naturf. Freunde. Mag. Nevesten. Entdeck. Gesamten. Naturk. **3**:16.

Colonies white to pale yellow, floccose, granular, 1.5-3.0cm in diameters after 4 days on MEA at 25°C, reverse pale yellow to dull brown. *Conidial heads* large, globose becoming radial with age. *Conidiophores* 200-500x4-10µm, smooth-walled, hyaline, slightly yellowed in terminal areas. *Vesicles* 17-35µm wide, globose, predominantly biserial. *Metulae* club-shaped, 7-20x5-8µm, pyriform, 1-septate. *Phialides* 6-9x2-3µm, large, ampulliform, compactly arranged. *Conidia* globose, smooth-walled, 2.5-3.5µm diameter, uniseriate, the chains sometimes sliming down.

Specimen Examined: Isolated from Air, Lahore, 02.11.05(FCBP 546).

Previously it was reported by Ahmad (1956b, 1971a), Qureshi (1966) and J. Ahmad (1967). In the collection of FCBP it was previously isolated from *Dalbergia sissoo* soil (dieback, FCBP 220) from Lahore.

6. *Choanephora cucurbitarum* (Berk. & Rav.) Thaxter. 1903. *Rhodora* **5**: 97

Colonies at 25°C after 3 days on V-8A, 3-4cm in diameter, white to pale yellow, reverse pale olive-buff, sporangial heads seen as dark spots in the colony. *Sporangiophores* bearing sporangia arising from surface hyphae, erect, hyaline, smooth, non-septate, with granular contents, up to 26µm in diameter. *Sporangia*, 1-spored, ovoid, reddish brown, with longitudinal striations, hyaline, with papilla at one end, 17.3-12.6x14.9-9.2µm in size.

Specimen Examined: Isolated from *Calotropis procera* leaves, Lahore, 12-09-2005 (FCBP 541).

7. *Cladosporium cladosporioides* (Fresen.) de Vries, 1952. Contribution to the knowledge of the genus *Cladosporium*. Link ex Fr: 57.

Colonies effuse, olive green or olivaceous brown, velvety, 9 cm in 5 days at 25°C on PDA, reverse greenish black. *Conidiophores* macronematous and micronematous, 350µm long, 2-6µm thick, pale to mid olivaceous brown,

smooth. *Ramo-conidia* 0-1 septate, 30µm long, 2-5µm thick, smooth. *Conidia* uninucleate, formed in long branched chains, mostly 0 septate, ellipsoidal, 3-11x2-5µm, pale to olivaceous brown, smooth.

Specimen Examined: Isolated from *Calotropis procera* leaves, Lahore, 10.11.05(FCBP 550).

This species was earlier reported by Qureshi (1966), J. Ahmad (1967), Ahmad (1968, 1969b) on soil and leaves of the *Zea mays*, from Lahore. In the collection of FCBP it was previously isolated from *Dalbergia sissoo* bark (dieback), (FCBP 190), air(FCBP 215).

8. *Cunninghamella elegans* Lendner, 1908. *Muc. Suisse*. 159.

Colonies after three days at 25°C on MEA, 6.0-6.6cm in diameter, white to dark grey and powdery with sporangial development. *Sporangiophores* erect and collapsing, verticillately branched, hyaline, smooth, punctate, double-walled, septa present with a large apical vesicle and a cluster of lateral smaller one-spored sporangia 2-12 in number. *Vesicles* globose, hyaline, smooth, bearing short sterigmata, *apical vesicles* 30.9-70x30.8-56µm, *lateral vesicles* globose 12-33.6µm in diameter. *Conidia* mostly globose, hyaline to light brown, smooth to minutely echinulate, 4.6-18.7µm in size.

Specimen Examined: Isolated from *Dalbergia sissoo* roots, Lahore, 12-09-2005 (FCBP 504).

This species was earlier reported by Ahmad (1969a) on deer dung from Lahore Zoo and on cow dung from Faisalabad and by Mahmood and Mirza (1972) on dung of different animals and on plant substrates from Lahore. In the collection of FCBP it was previously isolated from *Acacia arabica* rhizospheric soil (dieback, FCBP 112), air mycoflora(FCBP 172), and soil(FCBP 218).

9. *Doratomyces microsporus* (Sacc.) Morton & Smith, 1963. *Mycol. Pap.* **86**:77-80.

Colonies grey to black, having broom-like structures, reaching 2.5-3.0cm in 10 days at 25°C on MEA; reverse dark black. *Synnemata* cylindrical 540µm long, pointed tips when young. *Conidia* ovoid produced at apices of synnemata, smooth-walled, 3-4.5x2µm.

Specimen Examined: Isolated from *Dalbergia sissoo* root, Lahore, 23.11.05 (FCBP 335).

In the collection of FCBP it was previously isolated from water of bleaching tank(FCBP 223), and goat dung(FCBP 355).

10. *Drechslera hawaiiensis* (Bugnicourt) Subram. & Jain ex M. B. Ellis, 1971. *Dematiaceae Hyphomycetes*. 413-414.

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Colonies effuse, grey, dark blackish brown to black, 3.5-4.0cm in diameter in 7 days at 25°C on MEA, reverse black. *Conidiophores* solitary, flexuous, separte, pale to mid brown, up to 120µm long but usually much shorter, 2-7µ thick. *Conidia* straight, ellipsoid, oblong or cylindrical rounded at the ends, pale to mid brown, 2-7(mostly 5) pseudoseptate, 12-37(24.5)x 5-11(8.2)µm.

Specimen Examined: Isolated from *Eriobotrya japonica* fruit, Lahore, 15.11.05 (FCBP 553).

In the collection of FCBP it was previously isolated from Leaf blight of *Marsilea* sp(FCBP 07).

11. *Fusarium solani* (Mart.) 1881. *Sacc.*, *Michelia* **2**: 296.

Colonies floccose, 3.0-3.2 cm diameter in four days on MEA and PSA at 25°C, green to bluish-brown, reverse pale to cream. *Microconidia* develop abundantly in fresh isolates after 2-3 days. *Phialides* are elongated lateral, narrow towards the apex, measured 45-80 x 2.5-3 µm. *Macroconidia* develop after four to seven days, borne on multibranching conidiophores which soon merge into effuse sporodochia, inequilaterally fusoid with many of the spores having widest diameter in the penultimate cell, 3-5 septate, rarely pedicellate, 31-38 x 5.2-6.0µm. *Chlamydoconidia* tend to develop abundantly on weak media after 7-14 days. They are globose, smooth-walled, 9-12x8-10µm and form terminally on short lateral branches.

Specimen Examined: Isolated from *Dalbergia sissoo* root bark, Lahore, 04.10.05(FCBP 538).

F. solani is one of the most common species of *Fusarium* isolated from soil and roots of different plants. It was reported earlier by J. Ahmad (1967), Ahmad (1969a) on *Cyamopsis psoraloides*, *Solanum tuberosum* from Lahore. In the collection of FCBP it was previously isolated from soil(FCBP 16), *Rosa indica* root(FCBP 120), *Solanum tuberosum*, tubers,(FCBP 470), *Acacia arabica*, root (wilt), (FCBP 136), *Litchi chinensis*, rhizospheric soil(FCBP 224), *Lycopersicon esculentum* fruit(FCBP 277), *Lens esculanta* seed(FCBP 438).

12. *Fusarium lateritium* Nees, 1817. *Syst. Pilze Schwamme*. **31**.

Colonies white or light colored, fluffy, with regular margins and zonations, slow growing, reaching 4-5cm in seven days on MEA and PSA at 25°C; reverse white. *Microconidia* absent. *Macroconidia* mostly straight, 3-5 (mostly 3) septate, 24-26x3-3.5µm.; apical cells beaked at the apex; foot cells usually markedly pedicellate. *Phialides* monoblastic.

Specimen Examined: Isolated from *Dalbergia sissoo* soil, Lahore, 04.10.05(FCBP 543),

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Calotropis procera leaves, Lahore, 23.11.05(FCBP 558), *Spinacia oleracea* leaves, Lahore, 16.10.05(FCBP 552),

This species is reported on dung for the first time from Pakistan. Previously it was reported by Ahmad (1969a) from soil, Lahore. In the collection of FCBP it was previously isolated from *Cucumis sativus*(FCBP 237), goat dung(FCBP 284), cow dung,(FCBP 287), *Cucurbita pepo* fruit(FCBP 309), *Solanum melongena* leaves(FCBP 333), *Cicer arietinum* seed(FCBP 348), *Citrullus vulgaris* var. *fistulosus*, fruit(FCBP 452), canned peach(FCBP 327), *Calotropis procera* leaves(FCBP 337), *Acacia* sp. leaves(CBP 569).

13. *Fusarium oxysporum* Schlecht, 1824. *Flora berol.* **2**: 139, emend. Snyder & Hansen pro parte, *Am. J. Bot.* **27**: 64-67, 1940.

Colonies whitish- cream colored, floccose, 4.5- 5.0cm in five days on MEA and PSA at 25°C, reverse pale to bluish-violet. *Phialides* lateral and monoblastic. *Microconidia* borne on urn-shaped monophialides in false heads, oval to reniform, 0-septate 5-12x2.2-3.5µm. *Macroconidia* borne on monophialides, falcate to straight, usually 3-septate, 4.0-12.0x1.08-6.0µm, *apical cell* somewhat pointed; *foot cell* usually markedly pedicellate.

Specimen Examined: Isolated from *Dalbergia sissoo* root bark and soil, Lahore, 04.10-.05(FCBP 540, 539).

In the collection of FCBP it was previously isolated from field soil (FCBP 60), soil buried human nails(FCBP 134), soil, *Dalbergia sissoo*(FCBP 512), *Eucalyptus citriodora* root(FCBP 370).

14. *Fusarium equiseti* Corda. 1886. *Sacc. Sylloge Fung.* **4**: 707-708.

Colonies creamish-yellow, floccose with aerial tufts, 4.5-6.6 cm on MEA and PSA at 25°C, reverse peach yellow. *Phialides* generally obclavate, 12-17x3-4µm, monoblastic. *Microconidia* absent. *Macroconidia* borne on monoblastic phialides, falcate with distinct foot cell, 20.8-26x3-7.5µm, tapering, 3-7 septate; foot cell usually markedly pedicellate, apical cell elongated.

Specimen Examined: Isolated from *Litchi chinensis* roots, Lahore, 04.10.05(FCBP 544).

In the collection of FCBP it was previously isolated from *Litchi chinensis*, root(FCBP 238), *Eucalyptus citreodara* root(FCBP 372), *Vigna radiata* seed(FCBP 459), *Pisum sativum* seed(FCBP 384), *Chenopodium album* leaves(FCBP 436), *Trianthema* sp. leaves(FCBP 490).

15. *Fusarium semitectum* Berk. & Rav. 1875. *Grevillea* 3: 98.

Colonies 6.1 cm in three days on MEA and PSA at 25°C, floccose, white with peach tinge gradually changing to avellaneous and finally becoming buff-brown (14-21 days). *Phialides* polyblastic. *Microconidia* absent. *Macroconidia* 3-5-septate curved wedge-shaped but non pedicellate basal cell and pointed apex, 3-septate spores 17-28x2.5-4µm, 5-septate 22-40x3.7-4µm. *Chlamydospores* globose, intercalary, 5-10µm, formed singly or in chains.

Specimen Examined: Isolated from *Calotropis procera* leaves, Lahore, 23.11.05(FCBP 560).

16. *Monilia sitophila* (Montagne) Sacc, 1882. *Michelia* 2: 379.

Colonies cottony, peach colored, 6.0-6.5 cm in diameter at 20-22°C after 2 days on MEA; reverse yellowish brown. *Conidiophores* highly branched, and septate, flexuous and curved. *Conidia* in chain, easily separating from each other. **Specimen Examined:** Isolated from Moldy bread, Lahore, 05.12.05 (FCBP 582).

In the collection of FCBP it was previously isolated from soil(FCBP 305), wood(FCBP 677) and air(FCBP 593).

17. *Mucor hiemalis* Wehmer, 1903. *Ann. Mycol.* 1: 30.

Colonies on MEA 14.5-15.0mm high at 20°C after 2 days, buff, reverse pale. *Sporangiophores* weakly branched, smooth to punctate, hyaline, septa present at the base, 4.8-19.2µm in diameter. *Sporangia* globose, yellowish brown to black, smooth-walled to punctate, 28-90.8x72.4-89µm in diameter. *Columellae* globose, light yellow, smooth, 8.4-34µm in diameter. *Sporangiospores* mostly ellipsoid, some ovoid, smooth-walled, light grey, with globules, 4.5-11x2.3-8.6µm.

Specimens Examined: Isolated from *Dalbergia sissoo* root, Lahore, 23.11.05(FCBP 542), *Lycopersicon esculentum* fruit, Lahore, 12.12.05(FCBP 571).

It was previously reported by Mirza *et al.*, (1979) in soil and dung, from different parts of Punjab and Baluchistan. In the collection of FCBP it was previously isolated from *Cucumis melo* fruit pulp(FCBP 425).

18. *Mucor subtilissimus* Oudemans, 1898. *Nederl. Kruidkund. Arch.* 3: 435.

Colonies 5cm in diameter after 2-3 days at 35°C on MEA, cottony, white, reverse hyaline. *Sporangiophores* unbranched, hyaline, smooth to punctate, 8.8-11µm in diameter. *Sporangia* globose, brown, smooth-walled and quickly

deliquescent, 57-92µm in diameter. *Columellae* globose or subglobose, hyaline to light brown, smooth-walled, 19-26µm in diameter. *Sporangiospores* mostly cylindrical or ellipsoid, hyaline, grey in mass, smooth, 6-10x2-3µm.

Specimen Examined: Isolated from *Spinacia oleracea* leaves, Lahore, 23.11.05(FCBP 562).

It was reported previously by Mirza & Qureshi (1978) on *Coprinus* basidiocarp growing on cow dung, Faisalabad.

19. *Penicillium capsulatum* Raper & Fennell. 1948. *Mycologia.* 40: 528-530.

Colonies white at the margin yellowish in the center, sulcate, centrally raised, velutinous, 1.4-2.0cm in 5 days on MEA at 20°C, reverse creamish yellow. *Conidiophores* arising from aerial hyphae, short, stout and monoverticillate, but longer, irregularly metulate forms also found. *Stipes* short, smooth, 15-40x2.0-2.5µm. *Phialides* in verticils of 5-8, ampulliform, acerose, commonly 8-10x2.0-2.5µm. *Conidia* ellipsoidal, cylindrical or pyriform, smooth-walled, 3.0-4.0x2.5-3.0µm.

Specimen Examined: Isolated from Moldy bread, Lahore, 05.12.05(FCBP 567).

It was reported earlier by Mirza and Qureshi (1978) on *Lagenaria vulgaris* from Faisalabad.

20. *Penicillium citrinum* Thom, 1910. U.S.Deptt. Agr. *Bur. Anim. Ind. Bull.* 118: 61-63.

Colonies bluish green, floccose in center and velutinous at margins, yellow exudates on surface, margin white, 6.0-6.5 cm after 7 days on MEA at 25°C, reverse yellow to yellowish-cream. *Conidiophores* arise separately from submerged hyphae, usually up to 150µm in length. *Stipe* long, smooth, 300x2.2-3.0µm. *Metulae* often spatulate, 16-30x3µm. *Phialides* ampulliform with short collula, 6-7x2-3µm. *Conidia* spherical, smooth, greenish-yellow, 2-4-3.5µm in diameter.

Specimen Examined: Isolated from Khoya (Dehydrated milk), Lahore, 12.12.05(FCBP 570).

It was earlier reported by Ahmad (1956), Qureshi (1966), J. Ahmad (1967) on rotting citrus fruits and in soil from Lahore.

21. *Penicillium simplicissimum* (Oudem.) Thom, *Penicillia*: 335. 1930.

Colonies powdery dark green with white margin, 5.0-9.0cm in diameter after 3 days on MEA at 25°C, reverse yellow. *Conidiophores* borne from surface aerial hyphae. *Stipe* long and rough-walled, 400-800x2.5-4.0µm. *Metulae* in verticils of 2-5, 12-20x2.5-4.0µm, rough-walled. *Phialides* ampulliform, 8-9x2.2-2.5µm, narrowing abruptly to long collula. *Conidia* subglobose, finely echinulate, 2.5-3.0µm long.

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Specimen Examined: Isolated from *Malus domestica* fruit, Lahore, 20.11.05(FCBP 557).

Previously it was reported by Qureshi (1966), Ahmad (1969a) in soil from Lahore.

22. *Phytophthora cinnamomi* Rands, R. D. 1922. Meded. Inst. Plzjekt., Batavia. **54**: 1-53

Colonies comparatively slow growing, white to yellow, not exceeding 2.0-2.5 cm diameter in four days at 20°C on MEA and PSA. *Mycelium* thin-walled, globose hyphal swelling about 40µm in diameter and abundantly produced in terminal or lateral clusters. *Sporangia* are either produced singly or in a sympodial succession on mostly unbranched hyphae or with terminal proliferations, mostly 57-67x33-39µm, with an inconspicuous apical thickening. *Zoospores* not seen, even with hemp seeds bait.

Specimen Examined: Isolated from *Dalbergia sissoo* root, Lahore, 23.11.05.

It was earlier reported by Gill *et al.* (2001) from *Dalbergia sissoo* root, Faisalabad.

23. *Pilobolus longipes* van Tieghem, 1876. *Ann. Sci. Nat.* **6**(4): 338-340

Trophocysts submerged, light yellow, elongated, 400-600x265-270µm. *Sporangiophores* hyaline, erect, unbranched, nonseptate, smooth-walled, 500-800x50-60µm. *Subsporangial vesicles* orange, ovoid, 525-625x400µm. *Sporangia* subglobose or hemispherical, smooth-walled, 300x180µm. *Sporangiospores* globose to ellipsoid, with one or more globules, thin-walled, variable in size, globose ones 7.2-21µm and ellipsoid 7-11.5x5-8.5µm.

Specimens Examined: Cow dung, Lahore, 08.09.04.

It was earlier reported on llama dung from Lahore Zoo (Mirza *et al.*, 1979).

24. *Pilobolus crystallinus* (Wiggers) Tode, 1784. *Schrift. Naturf Fr. Berlin*, **5**: 96

Trophocysts submerged, light yellow to brown, ovoid, 650-700x300-320µm. *Sporangiophores* hyaline, erect, unbranched, nonseptate, smooth-walled, 400-500x50-60µm. *Subsporangial vesicles* ellipsoid, light brown, 300-370x250-293µm. *Sporangia* hemispherical, smooth-walled, 200-230x150-160µm. *Sporangiospores* ellipsoid, 4-10x9-12µm.

Specimens Examined: Cow dung, Lahore, 08.09.04.

It is a very common species of *Pilobolus* reported earlier from dung of various animals from Punjab and Sindh (Mirza *et al.*, 1979). None of the *Pilobolus* spp grew on media used in this study.

25. *Rhizopus nigricans* (Ehrenb. ex Fr.) Vuillemin, 1902. *Rev. Mycol.* **24**.

Colonies 4.0-4.5cm in diameter at 25°C on MEA in 2 days, cottony, white with black dots, reverse hyaline. *Sporangiophores* arising from stolons opposite the rhizoids, unbranched, dark brown, smooth to punctate, thick walled. *Sporangia* globose, black, erect, apophysate, apophyses broad columellate, wall encrusted and quickly deliquescing, 45.3-227µm in diameter. *Columellae* globose or sub-globose, with broad apophyses, light brown, 2.4-158.5x21.6-120µm. *Sporangiospores* irregularly oval, light yellow, with prominent ridges, contents homogeneous, 9.7-18x5-9µm.

Specimen Examined: Isolated from *Dalbergia sissoo* root, Lahore, 23.11.05(FCBP 555).

It was reported by Mirza *et al.*, (1979) from mole excreta, Lahore zoo.

26. *Sclerotium bataticola* Taubenhau, 1913. *Phytopath.* **3**: 164.

Colonies dotted black with zonation, rounded, 6 cm in diameter at 20°C after 4 days on MEA; reverse black. *Mycelium* usually light, fluffy, branched. *Sclerotia* brown to black, globose or irregular compact; usually it does not produce spores. It is known to be sclerotial state of *Macrophomina phaseolina*.

Specimen Examined: Isolated from *Arachis hypogaea* leaves, Lahore, 12.12.05(FCBP 578).

Previously it was reported by Qazi *et al.*, (1961) on cowpeas, cotton, okra & *Impatiens balsamina*, Faisalabad.

27. *Torula herbarum* (Pers.) Link ex S.F.Gray, 1821, *Nat.Arr. Br. Pl.*, **1**: 557.

Colonies usually effuse, olive to brown or blackish brown, velvety, 9 cm after 7 days on PSA at 20°C, reverse yellow. *Mycelium* superficial and immersed. *Conidiophores* 2-6µm thick except for the conidiogenous cells, which are 7-9µm diameters, semi micronematous, unbranched, subhyaline to mid brown, smooth. *Conidia* straight or slightly curved, cylindrical, rounded at the ends, pale olive to brown, verruculose, 3-10 septate, constricted at the septa, 20-70(29)x5-9(7)µm.

Specimen Examined: Isolated from *Calotropis procera* leaves, Lahore, 02.11.05(FCBP 547).

It was previously reported by Ahmad (1968, 1969a) on dead branches, leaves, and pods of *Albizia lebbek* from Lahore.

Table 2: (list of species isolated from different substrates)*

Substrate/host	Place of Collection	Date of Collection	Medium Cultured on	Fungal species	FCBP Accession No
<i>Litchi chinensi</i> , Wilted roots	Experimental Station of Department MPPL	23 rd November 2005.	PSA	<i>Fusarium equiseti</i>	544
			MEA	<i>Aspergillus penicillioides</i>	559
<i>Eriobotrya japonica</i> , Rotted fruit	Fruit market, Lahore, Cantt	19 th November 2005.	MEA	<i>Drechslera hawaiiensis</i>	553
			MEA	<i>Penicillium capsulatum</i>	567
Moldy Bread slices	Rahat Bakers, Lahore, Cantt	19 th November 2005.	MEA	<i>Monilia sitophila</i>	582
			MEA	<i>Penicillium simplicissimum</i>	557
<i>Malus domestica</i> , Rotted fruit	Fruitmarket, Lahore, Cantt	20 th November 2005.	MEA	<i>Alternaria alternata</i>	574
			MEA & PSA	<i>Alternaria alternata</i>	573
<i>Lycopersicon esculentum</i> , Rotted fruit	Fruitmarket, Lahore, Cantt	12 th December 2005.	MEA	<i>Phytophthora cinnamomi</i>	
			MEA	<i>Cunninghamella elegans</i>	504
			MEA	<i>Mucor hiemalis</i>	542, 571
			MEA	<i>Acremonium kiliense</i>	565
			MEA	<i>Absidia cylindrospora</i>	554
			PSA	<i>Rhizopus nigricans</i>	555
			PSA	<i>Fusarium solani</i>	538
			PSA	<i>Fusarium lateritium</i>	543
				<i>Fusarium oxysporum</i>	539
			MEA		540
			MEA	<i>Doratomyces microsporus</i>	355
				<i>Penicillium citrinum</i>	570
				<i>Alternaria alternata</i>	572
Khoya, (Dehydrated milk) with rotten smell	Milk shop, Lahore, Cantt	12 th December 2005.	MEA		
			V-8		
<i>Calotropis procera</i> , Grayish black spots on leaves	Experimental Station of Department MPPL	10 th November 2005.	PSA	<i>Choanephora cucurbitarum</i>	541
			PSA	<i>Torula herbarum</i>	547
			PDA	<i>Fusarium semitectum</i>	560
			PSA	<i>Cladosporium cladosporioides</i>	550
			MEA	<i>Fusarium lateritium</i>	558
<i>Spinacia oleracea</i> , Brownish black spots on leaves	Punjab University S-hopping Center Lahore	16 th October 2005.	PSA	<i>Mucor subtilissimus</i>	562
			MEA	<i>Fusarium lateritium</i>	552
<i>Arachis hypogaea</i> , Black spots on leaves	Lahore	12 th December 2005.	MEA	<i>Sclerotium bataticola</i>	578
Air	Lahore	2 nd November 2005.	DA	<i>Aspergillus candidus</i>	546
Cow dung	New campus Punjab University	29 th October 2005.		<i>Pilobolus crystallinus</i>	No growth
				<i>Pilobolus longipes</i>	No growth

*All the specimens were collected by Amna Ali & Nosheen Akhtar.

Due to the absence of sporulation the accession number is not given to *Phytophthora cinnamomi*.

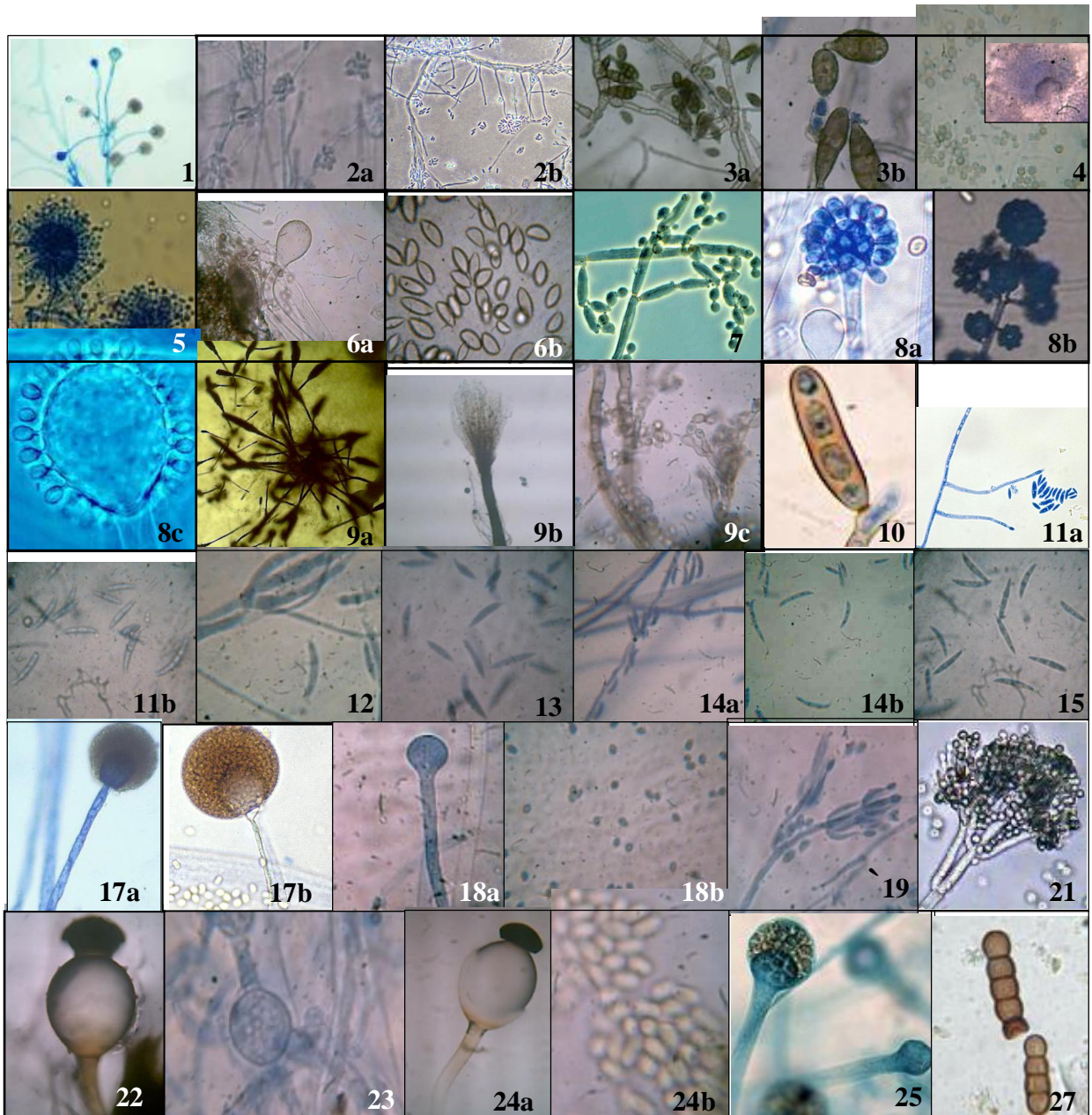


Plate 1: Number of figures corresponds with the number of fungus species.

1: *Absidia cylindrospora*. Branched sporangiophores with sporangia (40x); **2:** *Acremonium kiliense*. a&b Phialides and conidia (100x); **3:** *Alternaria alternata*. a: Hyphae and conidia (40x), b: Conidia (100x); **4:** *Aspergillus penicillioides*. Conidiophore with vesicle (Inset), Conidia (100x); **5:** *Aspergillus candidus*. Conidial head showing vesicle shape, sterigmata and conidia (100x); **6:** *Choanephora cucurbitarum*. a: Sporangiophore with columella (40x), b: sporangiospores (100x); **7:** *Cladosporium cladosporioides*. Conidiophores with conidia (100 x); **8:** *Cunninghamella elegans*. a&b: Conidiophores with vesicle (40x), c: vesicle (100x); **9:** *Doratomyces microsporus*. a: Synnemata in culture (Stereo.), b: A Synnema (40x), c: Detail of synnema with conidiophores and conidia.

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(100x); **10:** *Drechslera haiwiensis*. Typical hyphae and conidia showing pseudoseptation and shape. (100x); **11:** *Fusarium solani*. a: Microconidiophore, phialides and Microconidia (40x), b: Macroconidia (100x); **12:** *Fusarium lateritium*. Macroconidia (100x); **13:** *Fusarium oxysporum*. Macroconidia (100x); **14:** *Fusarium equiseti* a: Macroconidia with phialides, b: Macroconidia (100); **15:** *Fusarium semitectum*. Macroconidia (100x). **17:** *Mucor hiemalis*. a&b: Sporangiophores with columellae and sporangia (40x & 100x); **18:** *Mucor subtilissimus*. a: Sporangiophores with columellae and sporangium(40x), b: Sporangiospores (100x); **19:** *Penicillium capsulatum*. Conidiophores showing ramulae, matulae, phialides and conidia (100x); **21:** *Penicillium simplicissimum*. Conidiophore, Phialides and conidia (100x); **22:** *Phytophthora cinnamomi*. Sporangium filled with spores (100x); **23:** *Pilobolus longipes*. Sporangium with subsporangial vesicle (40x); **24:** *P. crystallinus*. a: Sporangium with subsporangial vesicle (40x), b: Sporangiospores (100x); **25:** *Rhizopus nigricans*. Sporangiohophores with sporangia & columellae (100 x); **27:** *Torula herbarum*. Conidia (100 x).

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