

FUNGAL FLORA OF PAKISTAN COTTON

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Many fungi are known to be associated with cotton plant from seed to the crop maturity. Ahmad (1956, 69) reported 11 species of fungi belonging to 10 genera, Khan & Kamal (1968) recorded 14 species of fungi belonging to 9 genera, Saleem *et al* (1974, 75) isolated 7 species of fungi belonging to 6 genera and Hussain *et al* (1975) isolated 23 species associated with cotton bolls.

During our studies on different cotton diseases a number of fungi were isolated and identified; out of which 27 species (*marked with asterisks*) belonging to 16 genera were new to cotton and 15 species (*in bold letters*), belonging to 12 genera were new to cotton as well as first record for Pakistan. In this paper, an attempt was made to collect the scattered information on fungal flora of cotton. This includes 80 species belonging to 40 genera. The fungi are arranged alphabetically in accordance with the system mentioned by Ainsworth *et al* (1971). It is hoped that this list will prove to be very useful medium of information to the workers associated with cotton pathology. Living cultures of the fungi have been deposited at the Cotton Mycological Herbarium (CMH) of Cotton Research Institute, Multan, Pakistan and Herbarium, Commonwealth Mycological Institute, Kew, Surrey, England (IMI) from where these can be had on request.

PHYCOMYCETES

Mucorales

Absidia corymbifera* (Cohn) Sacc. and Trotter. Syll. Fung. **21 : 825 (1912)

Gossypium hirsutum seed, Multan.

CMH. 97, 118 IMI. 184671, 184675

CHAETOCLADIUM HASSELTINEI Mehrotra and Sarbhoy, Mycologia **52**:
797 (1960)

Gossypium hirsutum seed, Multan.

CMH. 147 IMI. 188827.

Cunninghamella echinulata* (Matruchot) Thaxter, Rhodora, **5: 98-268 (1903)

Gossypium hirsutum seed, Multan.

CMH. 30, 146 IMI. 170809, 188826.

Mucor hiemalis* Linn. ex. Fres; Beitr. Z. Mycol. **7 (1850).

Gossypium hirsutum seed, Multan.

CMH. 25 IMI. 170807.

Rhizopus oryzae Went. Geerling, Kon. Ak. Wetensk. Amsterdam, **4** (1895).

Gossypium hirsutum stem, Multan.

CMH. 1, 121 IMI. 170788, 184857.

Gossypium hirsutum seed and bolls (Kamal & Moghal. 1968).

Rhizopus sp.

Gossypium sp. seed (Kamal & Moghal. 1968).

Syncephalastrum recemosum* Cohn ex. Schroet, in Cohn's Kryptogamenflora von Schlesien **3 (1): 217 (1886).

Gossypium hirsutum seed, Multan.

CMH. 57, 70 IMI. 179007, 179025.

ASCOMYCETES

Eurotiales

THIELAVIA COACTILIS Nicot ex Nicot and Longis, C.r. hebd. S'eanc. Acad. Sci. Paris, **253**: 304. (1961).

Gossypium hirsutum stem, Multan.

CMH. 136 IMI. 184683.

Hypocreales

Neocosmospora vasinfecta E.F. Smith; Sacc. Syll. Fung. XXV: 250.

Gossypium sp. roots (Ahmad, 1956).

Pleosporales

Didymosphaeria verrucispora Ahmad in Sydowia **2**: 74 (1948).

Gossypium sp. dead branches (Ahmad, 1956).

Pleospora infectoria Fuckel. Wehmeyer, 1961.

(conidial state)

Gossypium hirsutum seed, Multan.

CMH. 11, 26 IMI. 170808, 170796 (Saleem, *et al* 1974).

Sphaeriales

Chaetomium anguipilum* L. Ames in Mycologia, **41: 640 (1949).

Gossypium hirsutum roots, Multan.

CMH. 140 IMI. 184687.

C. globosum* Kunze ex. Fr. Syst. Myc., **3: 225 (1829).

Gossypium hirsutum seed, Multan.

CMH. 120 IMI. 184676.

Cochliobolus spicifer* Nelson in Mycologia, **56: 198 (1969).

(conidial state)

Gossypium hirsutum seed and bolls, Multan.

CMH. 56, 113 IMI. 179012, 184854.

Hypoxyton latissimum Speg; Sacc. Syll. Fung. IX: 557.
Gossypium sp. dead branches (Ahmad, 1956).

NEUROSPORA CRASSA Shear and Dodge.
 (conidial state)
Gossypium hirsutum bolls, Multan.
 CMH. 101 IMI. 184847.

BASIDIOMYCETES

Agaricales

Schizophyllum radiatum Fr. Nov. Symb. Myc., 41 (1851).
Gossypium arboreum roots (Khan & Kamal, 1968).

DEUTEROMYCETES

Sphaeropsidales

Botryodiplodia gossypii Ell. & Berth: Jour. Mycol., 8: 175 (1902).
Gossypium sp. dead branches (Ahmad, 1956).

B. theobromae Pat. Ann. Roy. Bot. Perad, 4: 459-60 (1910).
Gossypium hirsutum seed, stem and boll. Multan.
 CMH. 95, 145 IMI. 188828, 188829.
Gossypium neglectum and *G. arboreum* (Ahmad, 1956, 69).

**Ceuthospora phacidioides* Grev. Scot. Cr. Flor. pl. 253 (1823).
Gossypium hirsutum leaf. Multan.
 CMH. 127 IMI. 184860.

Haplosporella gossypii (Died.) Petr & Syd: Sacc. Syll. Fung. XXV:250.
Gossypium sp. dead branches (Ahmad, 1956).

M. phaseolina (Tassi.) Goid, Annali Della Sperimentazione Tanzione Agraria,
 Roma, 1: 449 (1947).
Gossypium hirsutum root. Multan.
 CMH. 83 IMI. 179031.
Gossypium hirsutum roots (Khan & Kamal, 1968)

Microxyphiella hibiscifolia Bat. Nasc. & Cif., Batista, C.A.d R. ciferri (1963).
Gossypium hirsutum leaf (Ghaffar & Abbas, 1972).

Phoma gossypii Sacc. Syll. Fung. III: 121.
Gossypium sp. (Ahmad, 1956).

PODOXYPHIUM INDICUM Sharma, Mukerji and Behera apud Sharma.
Gossypium hirsutum leaf, Multan.
 CMH. 126 IMI. 184677.

Phyllosticta sp.

Gossypium hirsutum leaf (Kamal & Moghal, 1968).

Melanconiales

Colletotrichum capsici Butler & Bisby in Sci. Monogr. Imp. Agr. Res. coun. p. 152. (1933).

Gossypium hirsutum stem & bolls, Multan.

CMH. 98 IMI. 184672.

Gossypium hirsutum (Kamal & Moghal, 1968) as *C. indicum* Dastur).

Moniliales

Acremonium strictum W. Gams; Saleem *et al* in The pak. Cottons **18** (4): 165-167 (1974)
Gossypium hirsutum bolls, Multan.

CMH. 15 IMI. 170798 (Saleem *et al* (1974).

ACROPHIALOPHORA LEVIS Samson & T. Mahmood.

Gossypium hirsutum roots, Multan.

CMH. 130 IMI. 184685.

A. FUSISPORA (Saksena) M.B. Ellis. Dematiaceous Hyphomycetes CMI. Kew, Surrey, England.

Gossypium hirsutum roots, Multan.

CMH. 82, 116 IMI. 179030, 184855.

Alternaria alternata* (Fr.) Keissler Beih. Bot Centr. **29: 434 (1912).

Gossypium hirsutum seed and leaf, Multan.

CMH. 55, 75 IMI. 179011, 188838.

A. GOSSYPINA (Tum) Hopkins.

Gossypium hirsutum boll, Multan.

CMH. 45 IMI. 184842.

A. macrospora Zimm.: Sacc. Syll. Fung. IV:546.

Gossypium hirsutum boll, Multan.

CMH. 44 IMI. 484841.

G. hirsutum (Ahmad, 1956 as a variety *A. brassicae*).

Alternaria sp.

Gossypium hirsutum (Kamal & Moghal, 1968).

ASPERGILLUS EGYPTIACUS Moubasher.

Gossypium hirsutum seed, Multan.

CMH. 50 IMI. 179005.

**A. flavus* Link. Thom & Raper: 263, 1945.

Gossypium hirsutum leaf and boll Multan.

CMH. 17, 35, 130 IMI. 170813, 184863, 170800.

- **A. fumigatus* Fres; Thom & Raper, A manual of Aspergillii p. 148 Baltimore (1945).
Gossypium hirsutum seed and boll, Multan.
CMH. 71 IMI. 179008, 188835.
- **A. luchuensis* Inui. Thom and Raper, A manual of Aspergillii p. 148 Baltimore (1945).
Gossypium hirsutum seed, Multan.
CMH. 37
- **A. nidulans* (Eid.) Went, Rab. Krypt. Fr. **112**: 62 (1884).
Gossypium hirsutum seed, Multan.
CMH. 58. 94 IMI. 179023
- A. niger* van Tiegh; Thom & Raper. A manual of Aspergillii p. 216 Baltimore (1945).
Gossypium hirsutum boll, Multan.
CMH. 7, 129 IMI. 184862.
G. hirsutum boll (Kamal & Moghal 1968, Kamal & Naeem. 1969).
- **A. terreus* Thom; Thom and Church, Am. J. Bot. **5**: 85-86 (1918).
Gossypium hirsutum boll. Multan.
CMH. 24, 106, 111 IMI. 170806, 184850.
- A. ustus* (Bain.) Thom & Church. The Aspergillii p. 227. Williams & Wilkins co.
Baltimore (1926).
Gossypium hirsutum boll, Multan.
CHM. 109 IMI. 184852.
Gossypium hirsutum (Kamal & Moghal, 1968).
- **A. versicolor* (Vuill.) Tiraboschi in Thom & Church. The Aspergillii p. 142-144
Williams and Wilkins co. Baltimore (1926)
Gossypium hirsutum boll, Multan.
CMH. 22, 34 IMI. 170804, 170812.
- Cercospora gossypina* Cook. Grevillea **12**: 13 (1883).
Gossypium arboreum, *Gossypium* sp. *G. hirsutum* (Ahmad, 1956. Khan
& Kamal, 1968. Akhtar, 1971).
- **Cladosporium cladosporioides* (Fresen.) de Vries. Contribution to the knowledge of
the genus *Cladosporium* Link ex Fr. Vitgeverij and Drukkerij, Holland
Press, Baarn.
Gossypium hirsutum seed, Multan.
CMH. 36 IMI. 170814.
- **C. oxysporum* Berk & Curt. Cuban Fung. n. 640 (1867-68).
Gossypium hirsutum boll, Multan.
CMH. 19 IMI. 170802.
- C. sphaerospermum* Penzig, Michelia, **2**: 473 (1882).
Gossypium arboreum leaves (Khan & Kamal, 1968).

- Curvularia lunata* (Walker) Boed, Bull. Jard. Bot. Buitenz. 3, 13:127 (1933).
Gossypium hirsutum leaf & seed, Multan.
 CMH. 8,32,52, 123 IMI. 170794, 170810, 109010, 184858.
Gossypium hirsutum seed (Saleem *et al.* 1974 as conidial *Cochliobolus lunatus* (Nelson and Haasis).
- **C. verruculosa* Tandon & Bilgrai ex. Ellis Mycol. paper CMI. 106:120 (1966).
Gossypium hirsutum seed, Multan.
 CMH. 33 IMI. 170811.
- Curvularia* sp.
Gossypium hirsutum (Kamal & Moghal. 1968).
- DRECHSLERA HALODES* (Drechsler) Subram & Jain; Curr. Sci. 35: 354 (1966).
Gossypium hirsutum leaves, Multan.
 CMH. 89 IMI. 184845.
- D. HAWAIIENSIS* (Bugn.) Subram & Jain ex M.B. Ellis. Subram & Jain Curr. Sci., 35: 354 (1966).
Gossypium hirsutum seed No.
 CMH. 67 IMI. 179013
- D. papandorfii* (Van. du Aa) M.B. Ellis, Dematiaceous Hyphomycetes CMI Kew, Surrey Englan.
Gossypium hirsutum. leaf, Multan.
 CMH. 125 IMI. 184859.
- Fusarium dimerum* penzig in Sacc. Michelia, 2: 484 (1882).
Gossypium hirsutum seed (Khan & Kamal. 1968).
- F. equiseti* (Corda) Sacc; Syll. Fung. 4: 707-708 (1886).
Gossypium hirsutum root, Multan.
 CMH. 87 IMI. 179017 (Saleem *et al.* 1975).
- F. moniliforme* Sheldon; Rep. Neb. Agri: Res. exp. Sta. 17: 23-32 (1904).
Gossypium hirsutum seed, Multan.
 CMH. 49, 131, 135 IMI. 179022, 184843, 184682, 184678.
 (Saleem *et al.* 1975).
- F. oxysporum* Schlecht ex. Fr; Flora berol, 2: 139 (1824).
Gossypium hirsutum boll (Khan and Kamal, 1968).
- F. semitectum* Berk and Rev. in Berkley, Grevillea, 3: 98 (1875).
Gossypium hirsutum seed, root, leaf & boll, Multan.
 CMH. 3, 14, 18, 134 IMI. 170797, 184681, 184688
 (Saleem *et al.* 1975).
Gossypium hirsutum, *G. arboreum* (Khan & Kamal, 1968).

- F. solani* (Mart.) Sacc. *Michelia* 2:296 (1881) emend: Snyder & Hansen Pro. Parte, Am. J. Bot., 27: 740 (1941).
Gossypium hirsutum seed, soil and root, Multan.
CMH. 2, 4, 6, 20, 137 IMI. 170789, 170791, 170793, 184084 (Saleem *et al* 1975).
Gossypium hirsutum (Khan & Kamal, 1968).
- F. vasinfectum* Atk. Sacc. Syll. Fung. XXII: 1481.
Gossypium sp. stem, root (Ahmad, 1956).
- Fusarium* sp.
Gossypium sp. seed, boll and root. (Kamal & Moghal 1968).
- GLIOCLADIUM ROSEUM* (Link) Thom; Bain in Bull. Soc. Myc. Fr. 23 (1907).
Gossypium hirsutum root, Multan.
CMH. 79 IMI. 179028.
- Moniliella* sp.
Gossypium hirsutum seed, Multan.
CMH. 16 IMI. 170799 (Saleem *et al* 1975).
- Myrothecium roridum* Tode ex. Fr. Syst. Myed. 3: 217 (1829).
Gossypium hirsutum leaf, Multan.
CMH. 87 IMI. 184668 (Tanveer & Akhtar, 1974).
- **Nigrospora sphaerica* (Sacc.) Mason, Trans. Br. Myc. Soc. 12: 158 (1927).
Cotton soil, Multan.
CMH. 59 IMI. 179024
- **Paecilomyces terricola* (Miller, Giddens & Foster) Onions & Barron.
Gossypium hirsutum boll, Multan.
CMH. 115 IMI. 188834.
- **P. varioti* Bainier, Bull-Soc. Myc. Fr., 23: 26 (1907).
Gossypium hirsutum seed, Multan.
CMH. 88 IMI. 184844.
- **Penicillium citrinum* Thom; U.S. Dept. Agri. Bur. Anim. Ind. Bull. 118: 61-63 (1910)
Gossypium hirsutum seed, Multan.
CMH. 47 IMI. 179004
- **P. oxalicum* Currie and Thom; Jour. Biol. Chem, 22: 289 (1915).
Gossypium hirsutum leaf and root, Multan.
CMH. 104, 133 IMI. 184680, 184849.
- P. THOMII* Maire in Bull Soc. Hist. Nat Afrique du Nord. 8: 189-192 (1917).
Gossypium hirsutum boll, Multan.
CMH. 105 IMI. 184674.

Penicillium sp.

Gossypium hirsutum seed (Kamal and Moghal, 1968).

SCOPULARIOPSIS BREVICAULIS (Sacc.) Bainier, Bull. Triemest Soc. Mycol. Fr., **23**: 98-100 (1907)

Gossypium hirsutum leaf, Multan.

CMH. 128 IMI. 184861.

**Stachybotrys atra* Corda, Sacc. Syll. Fung. IV: 269.

Gossypium hirsutum boll, Multan.

CMH. 110 IMI. 184853.

TRICHODERMA AUREOVIRIDE Rifai agg. Mycol. Pap. 116., 1969.

Gossypium hirsutum seedling, Multan.

CMH. 144 IMI. 188830.

**T. koningii* Oudem. in Ouden mans et Koning in Archiv Neerl (1902).

Gossypium hirsutum seed and boll, Multan.

CMH. 53. 103 IMI. 179006, 184673.

T. pseudokoningii* Rifai, A revision of the genus *Trichoderma*, CMI. Mycol. Paper. **116: 56 (1969).

Gossypium hirsutum roots, Multan.

CMH. 90 IMI. 184669.

Trichothecium inaequalis Mars and Salm; Ann. Bot., **16** (1902).

Gossypium sp. dead branches (Ahmad, 1956).

Verticillium candelabrum Bonordon, Saleem *et al* in The Pak. Cottons **18**(4): 165-167 (1974).

Gossypium hirsutum seed and soil, Multan. (Saleem *et al.* 1974).

CMH. 39.

MYCELIA STERILIA

Rhizoctonia solani Kuhn, Die. Krankheiten d. G. Kulturgewachse: 224 (1858).

Gossypium hirsutum. root, soil, Multan.

CMH. 10, 86, 142, 143 IMI. 170795, 184667, 188831, 188832.

Gossypium hirsutum soil (Kamal and Moghal, 1968) as *Corticium solani*.

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