

**ADDITIONS TO THE PARASITIC FUNGI OF  
WEST PAKISTAN - III**

by

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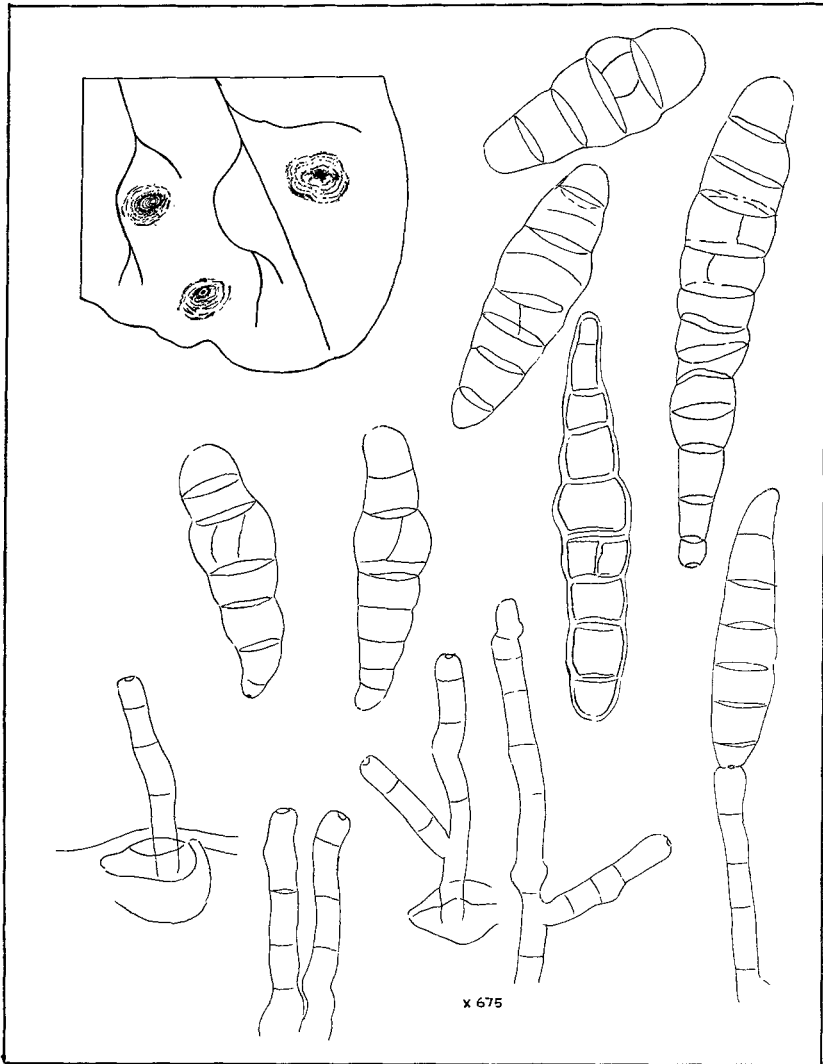
In the present paper three new species of fungi and seven collected for the first time from West Pakistan are described.

21. *Alternaria brassicicola* (SCH.) WILTSHIRE  
*Mycol. Pap. Imp. Mycol. Inst.*, 20, p. 10, 1947.

Leaf-spots circular to sub-circular or oval, light brown, more darker at the center, 0.2—1.6 cm, in diam., older spots concentrically ringed and covered by a black fungal bloom.

Fruiting amphigenous; stromata lacking; conidiophores erect, medium to dark brown, arising through stomata singly or in bundles of 2—4-stalks, fascicles medium spreading, straight to mildly curved, frequently branched, 2—11-septate, not constricted at the septa, 0 to 3-times geniculate, 16—129 × 3.5—6.3  $\mu$ , spore scar medium, clearly visible at the tip; conidia elongate-fusoid to obclavate, muriform, medium to dark olivaceous brown, straight to mildly curved, beakless, spore body 29—89 × 9.5—17(20.4)  $\mu$  with 3—11 transversal and 0—3 rarely 4 longitudinal septa, constricted at the septa, with one or rarely two scars.

On living leaves of *Brassica oleracea* var. *botrytis* L., Tando Mohd. Khan, 10-11-1967, S. A. Khan, Herb. C.M.I. Kew, England, no. I.M.I.132087.

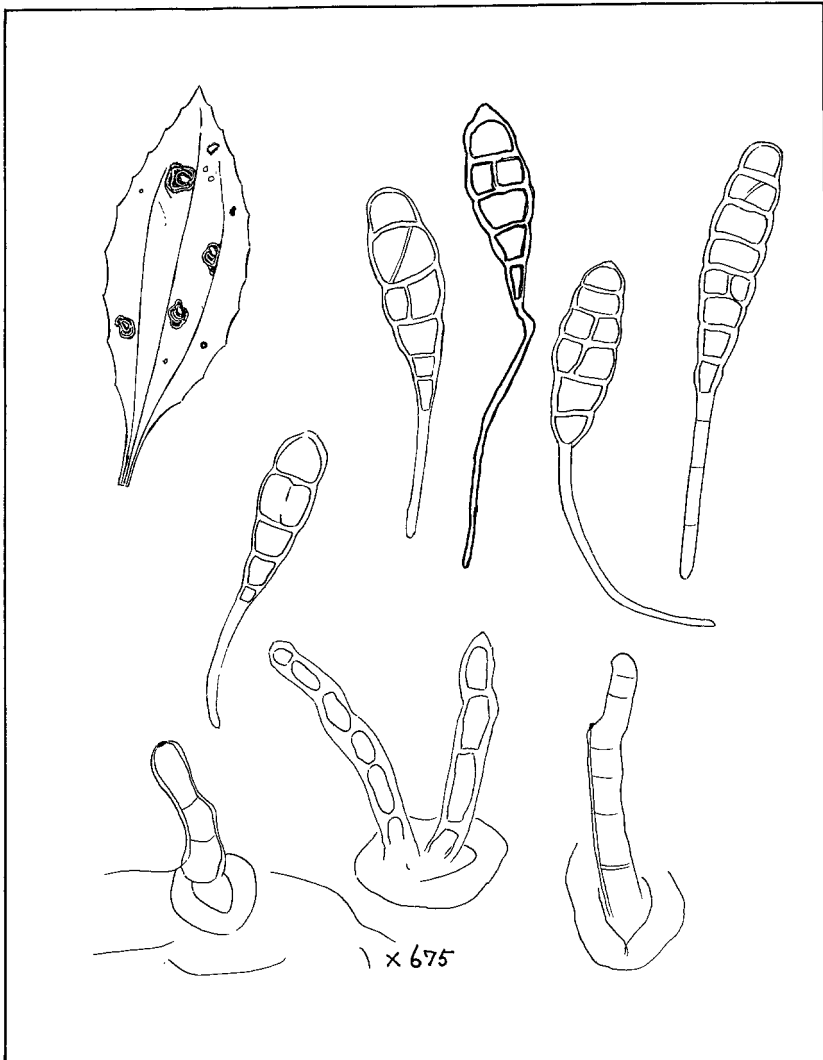


Drawing I. *Alternaria brassicicola* (SCH.) WILTSHIRE

22. *Alternaria enhydrae* SP. NOV.

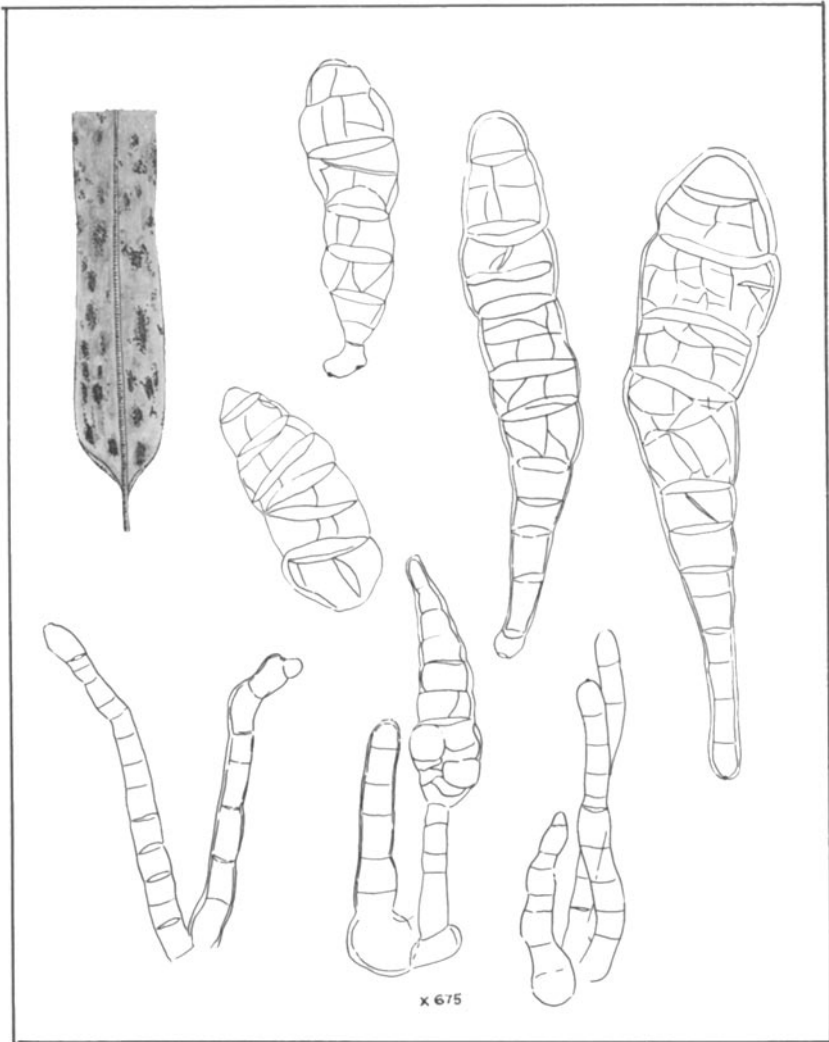
Leaf-spots circular to sub-circular with raised borders, pinkish in the beginning turning dark brown, lighter towards center which is dull white in colour, 2—9 mm in diam., faint concentric zonation evident when examined against light.

Fruiting amphigenous, stroma lacking or indistinct; conidiphores thick-walled, medium to dark brown, arising through sto-

Drawing II. *Alternaria enhydrae* sp. nov.

mata singly or in groups of 2 to 3 or rarely up to 4, straight to mildly curved, many septate, septa evident, occasionally branched, once to twice prominently geniculate,  $21-62 \times 5.4-6.2(7) \mu$ , spore scar medium, clearly visible; conidia obclavate, muriform, 6-14-celled, with 1-3 rarely up to 6 oblique septa, constricted at the septa, smooth-walled, medium pale brown, beaked, beak long, thin, hyaline, septate,  $1-2 \mu$  wide along most of its length, broader at the base, conidia measuring  $37-120$  (including beak)  $\times 9.4-12.5(15.4) \mu$ .

Fructificationes amphigenae; stroma nullum vel indistinctum; conidiophora parietibus crassis ornata, medianiter vel fusce brunnea, emergentia per stomata singula vel fasciculatim bina vel terna vel rarius quaterna, recta vel molliter curvata, pluriseptate, septis claris, interdum furcata, semel bisve eminenter geniculata,  $21-62 \times 5.4-6.2(7) \mu$ , sporarum cicatricibus medianis, patenter visibilibus; conidia obclavata, muriformia, 6-14-cellularia, septis 1-3, rarius ad 6, obliquis, ad septa constricta, parietibus levibus, subpallide brunnea, rostrata, rostro longo, tenui, hyalino, septato,



Drawing III. *Alternaria hordei* SAWADA

1—2  $\mu$ , lato sed latiore ad basin, conidia, rostro incluso, 37—120  $\times$   $\times$  9.4—12.5 (15.4)  $\mu$ .

On living leaves of *Enhydra fluctuans* LOUR., Jati near Sujawal (West Pakistan), 12-10-1966, S. A. Khan, I.M.I. 124352 (type).

The collection belongs to *Alternaria macrospora* series with very narrow beak (1—2  $\mu$  wide) and as far as known no *Alternaria* spp. has been described on *Enhydra*.

### 23. *Alternaria hordei* SAWADA

*Special Publ. College Agri. Taiwan Uni.*, no. 8, 1939.

Leaf-spots oval to fusoid, up to 2 cm. long and 1—3 mm broad, light brown, covered by a dark sooty black fungal growth on one or both surfaces.

Fruiting amphigenous; conidiophores arising singly or in groups of 2 to 5, medium fuliginous brown, straight to mildly curved, sometimes strongly curved, 3—13-septate, usually 1 to 3 times geniculate, sometimes branched, some conidiophores slightly attenuated towards tip, 19—98  $\times$  4—7 (9)  $\mu$ , spore scar medium, visible under high power; conidia obclavate, muriform, medium fuliginous brown, straight to mildly curved, 22—113  $\times$  12.6—24  $\mu$ , with 3—14 transversal and 1—14 longitudinal septa, constricted at the septa.

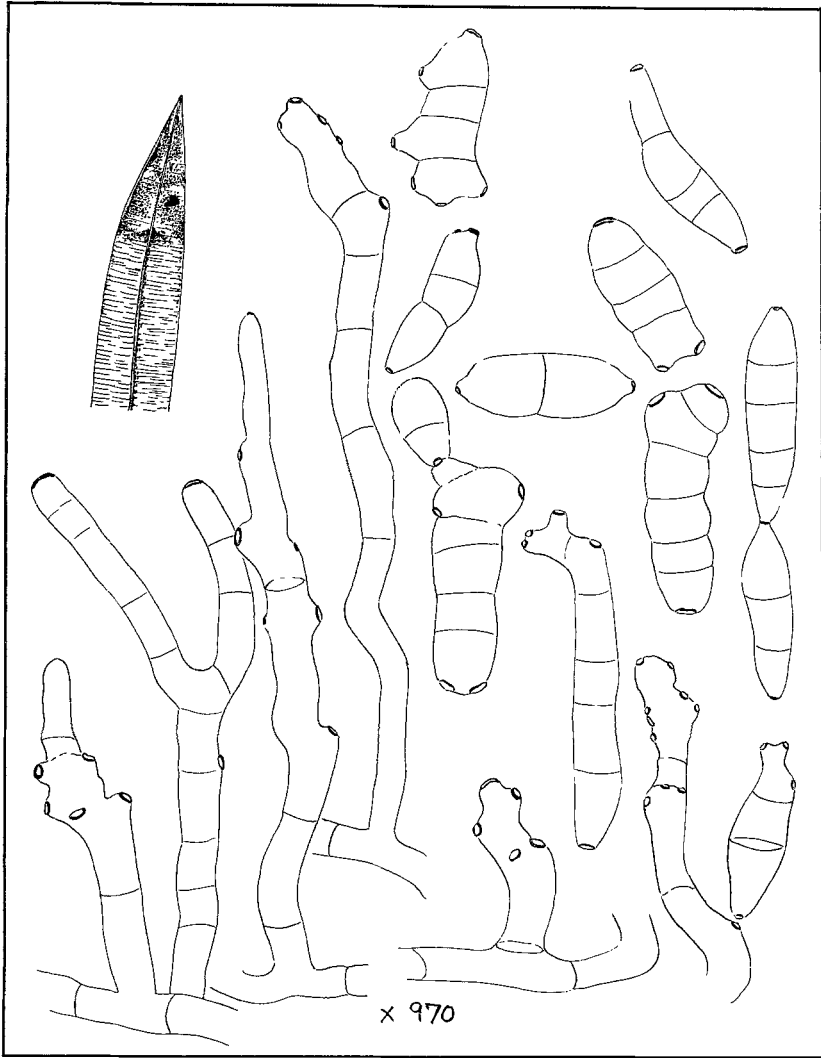
On living leaves of *Hordeum vulgare* L., Tandojam, 18-2-1964 and later collections, S. A. Khan, I.M.I. 104707 & 112618.

The present collection agrees with the description of *Alternaria hordei* SAWADA except for the conidial measurements which are greater 22—113  $\times$  12.6—24  $\mu$  as against 26—90  $\times$  8—20  $\mu$  given by SAWADA.

### 24. *Cladosporium nerivicola* sp. nov.

Conidiophores arising from procumbent branched mycelial threads which are septate and 2.8—4  $\mu$  in diameter, not in definite fascicles, light to dark fuliginous brown, one to many times geniculate, 3—11-septate, not constricted at the septa, straight to curved or creeping on the surface of the leaves, simple to branched, 13—58 (98)  $\times$  2.6—4 (4.5)  $\mu$ , spore scar thickened, medium, visible under high power; Conidia numerous, catenulate, oblong to cylindrical, medium to dark fuliginous brown, 1—5-septate, usually 2—3-septate, straight to mildly curved, 11—25  $\times$  3.3—4.5 (5.2)  $\mu$ .

Conidiophora emergentia e funibus mycelii procumbentibus furcatis, septatis, diametentibus 2.8—4  $\mu$ , non definite fusciculate, pallide vel fusce fuliginosobrunnea, semel vel pluries geniculata, 3—11-septata, non constricta ad septa, recta vel curva vel repentia in superficie foliorum, simplicia vel furcata, 13—58 (98)  $\times$  2.6—4 (4.5)  $\mu$ , cicatrice sporarum incrassata, media, visibili sub potentia alta; conidia plura, catenulata, oblonga vel cylindrica, medianiter



Drawing IV. *Cladosporium neriicola* sp. nov.

vel fusce fuliginoso-brunnea, 1—3-septata, vulgo 2—3-septata, recta vel molliter curvata,  $11-25 \times 3.3-4.5(5.2) \mu$ .

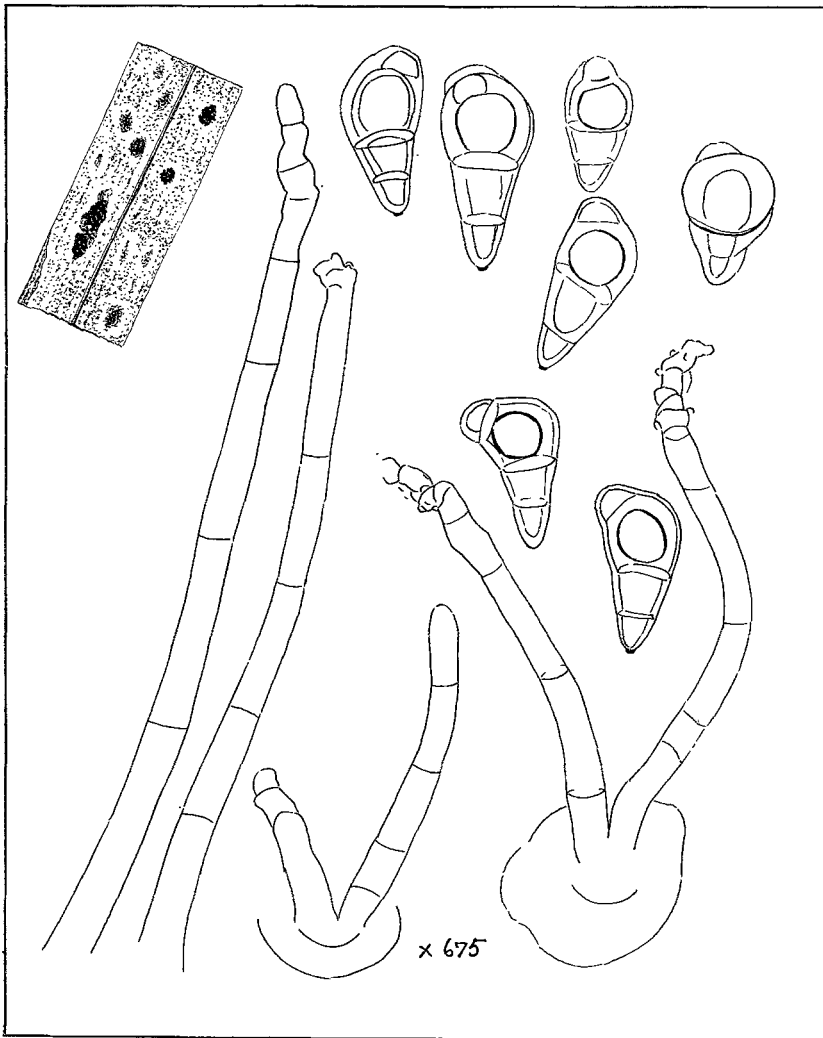
On leaves of *Nerium indicum* MILL, Tando Mohd. Khan (West Pakistan), 11-10-1966, S. A. Khan, I.M.I. 123901 (type).

The fungus forms a thin sooty black film on dead areas at margins and tips of leaves. DR. M. B. ELLIS of the C.M.I. Kew informs that the present collection does not match with *Cladosporium microsporium* RABENH. nor the description of *C. nerii* GZ. FRAG., the two *Cladosporia* described on *Nerium* (personal communication, 1967).

25. *Curvularia penniseti* (MITRA) BOEDIJN  
*Bull. Jard. Bot. Buitenz., Service III, 13: 128, 1933.*

Spots on the leaves and leaf-sheaths oval, yellowish brown in the beginning, later coalescing and turning into large brown areas, upto 1 cm in extent.

Fruiting amphigenous; stroma lacking or indistinct; conidiophores arising through stomata singly or in bundles, 2—6 usually 2—4 stalks in a bundle, unbranched, 3—10-septate, septa visible, rigid, erect, pale greyish brown in colour, gradually attenuated to-



Drawing V. *Curvularia penniseti* (MITRA) BOEDIJN

wards tip,  $41-189 \times 5.5-7 \mu$ , straight to mildly curved, occasionally strongly curved, conidiophore tip somewhat swollen and very closely geniculate, spore scar not conspicuous; Conidia clavate or pear-shaped, 3-septate, curved or sometimes straight, medium to dark greyish brown, the third cell from the base conspicuously larger, broader, and darkest in colour than the others, the apical cell with a smoothly rounded tip, the basal cell obconical and narrowing below to a basal scar indicating the point of attachment to the conidiophore,  $22-38 \times 11-14(16) \mu$ .

On living leaves of *Pennisetum typhoideum* RICH., Tandojam (17-9-1961) and Hala (18-10-1968), S. A. Khan, I.M.I. 89671 & I37418.

The fungus has been reported from West Pakistan on the seeds of *Daucus carota* L. (AHMAD, 1956) but according to the author the identity of the fungus is doubtful. The present collection is therefore a new record for West Pakistan. MATHUR, MATHUR & BHATNAGAR (1960) consider this fungus as a synonym of *Curvularia lunata* (WAKK.) BOED.

26. *Curvularia verruculosa* TANDON & BILGRAMI ex M. B. ELLIS  
*Current Science*, 31, 254; 1962.

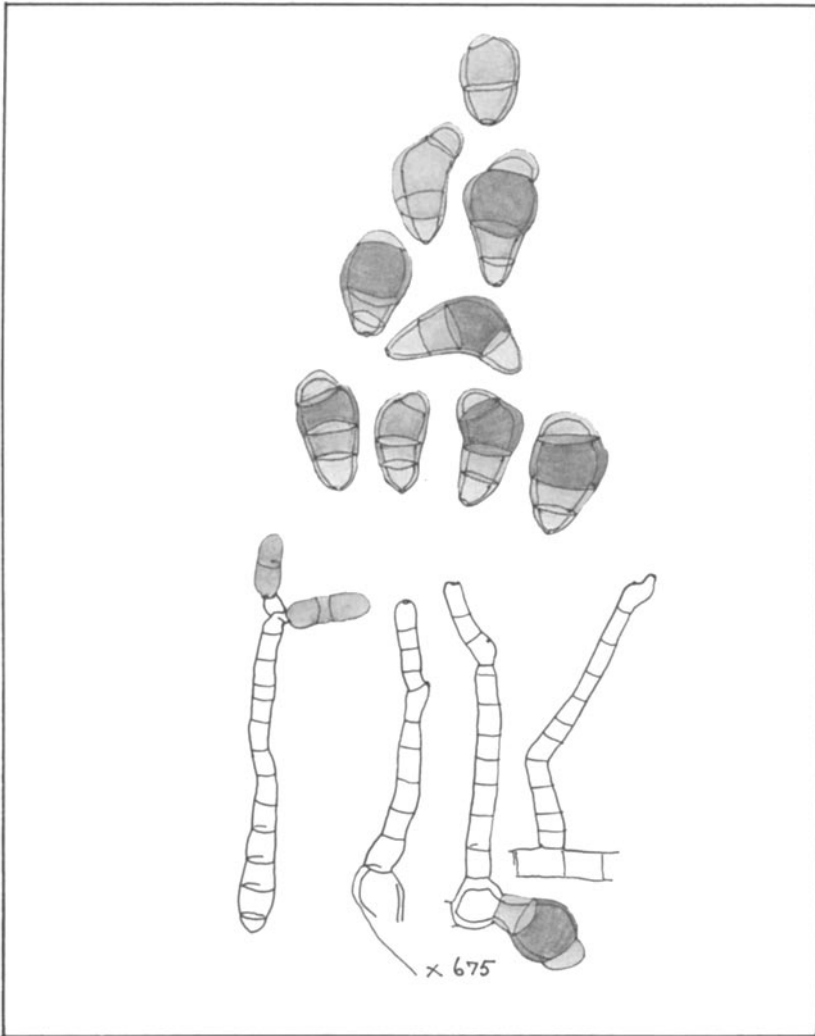
Conidiophores solitary or in groups of 2 to 3, medium brown, unbranched, 3-12- or more septate, septa distinct, straight to mildly curved, geniculate near the tip,  $18-90 \times 3-5.4 \mu$ ; conidia medium brown, 3-septate, ventricose-fusiform, straight to curved, third cell from the base larger, broader and darker than the rest, apical cell with a broadly rounded tip, basal cell crucible-shaped with a distinct scar, sometimes the second cell is concolorous with the third cell, apical and basal cells light brown in colour, wall of the conidia finely verruculose,  $19-25 \times 9.4-12.5(13.3) \mu$ .

On living leaves of *Oryza sativa* L., Tandojam (18-8-1963) and Dokri (10-7-1967), S. A. Khan, I. M. I. 128779 (b).

The fungus is close to *Curvularia trifolii* (KAUFF) BOED but differs in the (1). Verruculose nature of the conidial wall and (2). In the absence of a markedly protuberant hilum as present in *C. trifolii*.

DR. ELLIS informs that in the conidia of *C. verruculosa* the cell at each end or the basal cell only is subhyaline or pale brown and smooth-walled, one or both intermediate cells and sometimes also the terminal cells are brown or dark brown and often become distinctly verruculose (personal communication, 1969).





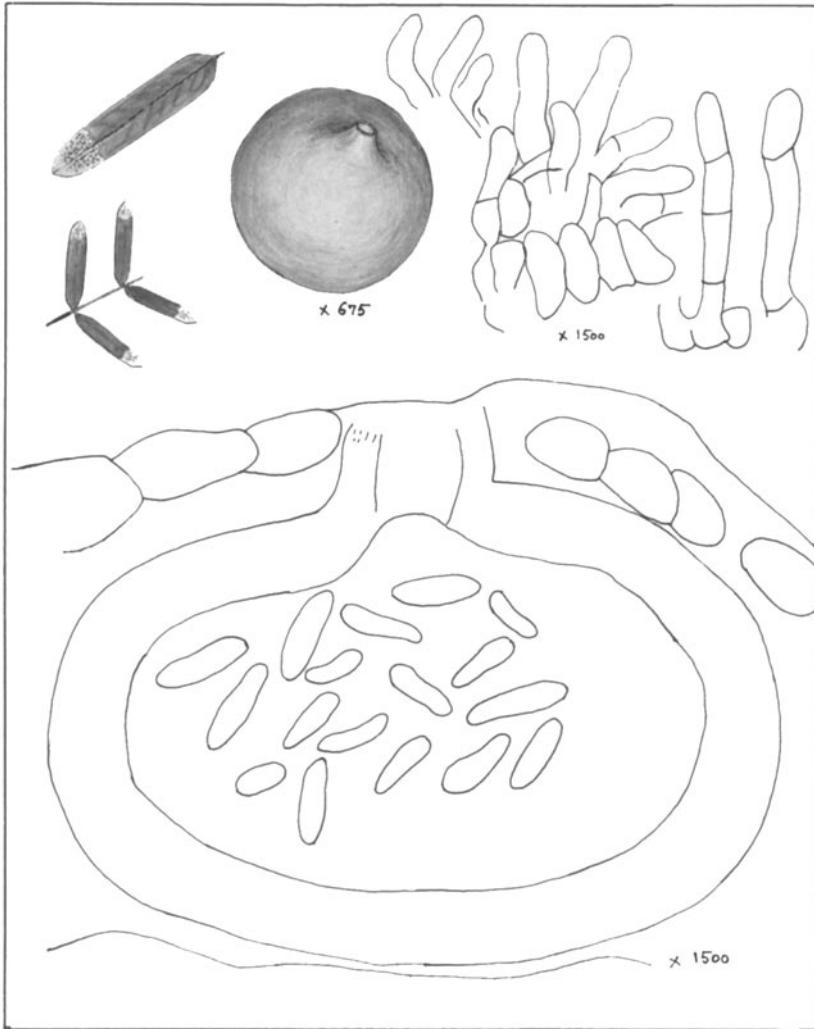
Drawings VI. *Curvularia verruculosa* TANDON & BILGRAMI ex M. B. ELLIS

27. *Macrophoma prosopidis* SP. NOV.

Leaf-spots none in the beginning, leaf-lets dry from the tip downwards the base, rarely on the margins, light brown; pycnidia globose to spherical, epiphyllous, subepidermal, isolated, dark brown to black,  $100-180 \times 80-167 \mu$ , beaked at maturity, beak upto  $30 \mu$  long, ostiolate; conidiophores hyaline, unbranched, 0-3-septate, not constricted at the septa, straight to curved,  $6-26 \times 1.4-3 \mu$ ; conidia hyaline, longovoid to elongate, 1-celled, straight or nearly so,  $10-20 \times 3.5-4.5(5) \mu$ .

Foliola sicca ex apice versus basin, rarius ad margines, pallide brunnea; pycnidia e globosis sphaerica, epiphylla, subepidermalia, disjuncta, brunnea vel nigra,  $100-180 \times 80-167 \mu$ , ad maturitatem rostrata, rostro ad  $30 \mu$  longo, ostiolato; conidiophora hyalina, non furcata, 0-3-septata, non constricta ad septa, recta vel curva,  $6-26 \times 1.4-3 \mu$ ; conidia hyalina, elongo-ovoideis elongata, unicellularia, recta vel fere recta,  $10-20 \times 3.5-4.5(5) \mu$ .

On living leaves of *Prosopis glandulosa* TORR., Tandojam, 14-8-1966, S. A. Khan, I. M. I. 124348 (type).

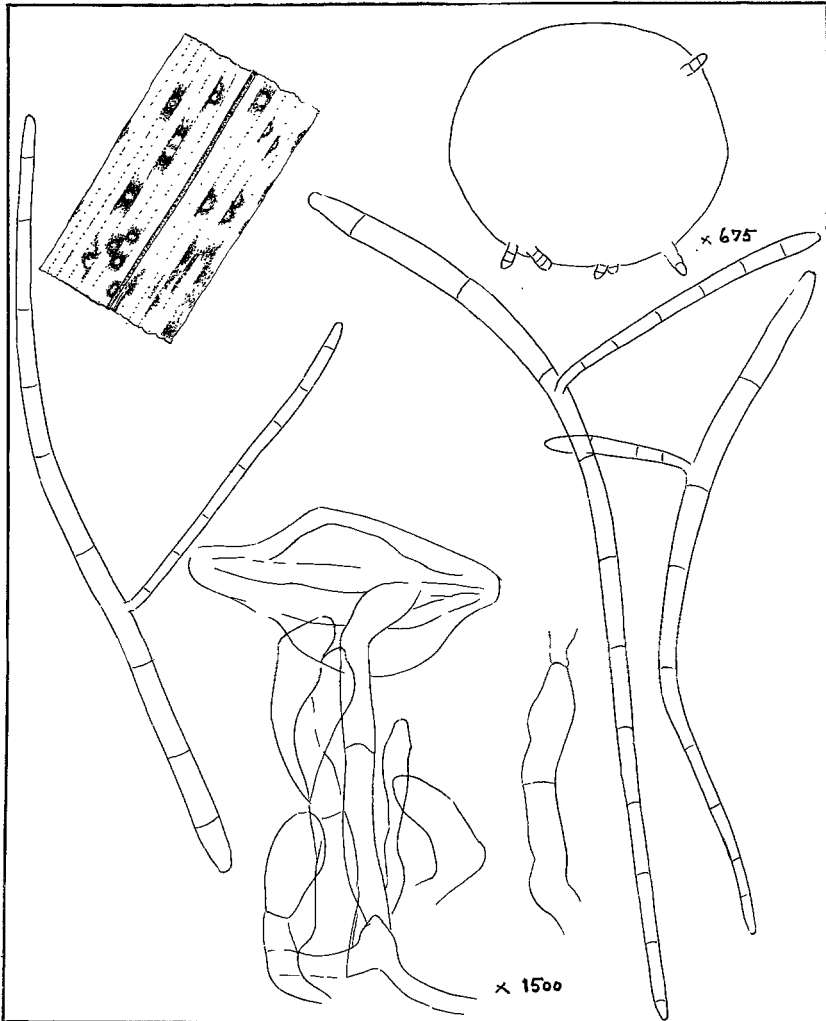


Drawing VII. *Macrophoma prosopidis* sp. nov.

In the present collection the pycnidia are dispersed in the dead tissues, and appear as black dots to the naked eye. As far as known no species of *Macrophoma* has been reported on the host genus.

28. *Ramulispora sorghicola* HARRIS  
*Trans. Brit. Mycol. Soc.*, 43; 80—84, 1960.

Leaf-spots elliptical to elongate, with conspicuous dark-red margins, upto  $8 \times 3$  mm, delimited by leaf-veins, becoming irregular by confluence, center of the spots straw coloured.



Drawing VIII. *Ramulispora sorghicola* HARRIS

Fruiting amphigenous, chiefly hypophyllous; sporodochia small, hyaline, arising from sub-stomatal stomata; conidiophores short, hyaline, subclavate, 0—3-septate, scarcely protruding stomata, 9—26(38)  $\mu$  long and upto 1.3—4  $\mu$  broad at the widest part; conidia numerous, agglutinated in gelatinous masses, filiform, straight to curved, hyaline, tapering towards the subacute tip, 2—13-septate, 18—82  $\times$  1.2—2.3  $\mu$ , some conidia branched, bearing one lateral branch; sclerotia superficial, black, subhemispherical to flattened globose, 35—198  $\times$  35—176  $\mu$ , bearing 0 to 12 or more setae, setae stout, simple, straight, medium brown, septate, 0—5-septate, tapering towards the apex which is obtuse, 10—29  $\mu$  long and 3.2—8.6  $\mu$  wide at the base.

On living leaves of *Sorghum vulgare* PERS., Tandojam, 20-8-1961, S. A. Khan, I.M.I. 112559 & 134706.

Black superficial sclerotia are visible to the naked eye particularly on the undersurface of the leaves and could easily be broken with a slight pressure. The collection differs from *Ramulispora sorghi* (ELL. & EV.) OLIVE & LEFEB. in having glabrous, setose sclerotia which are relatively sparse.

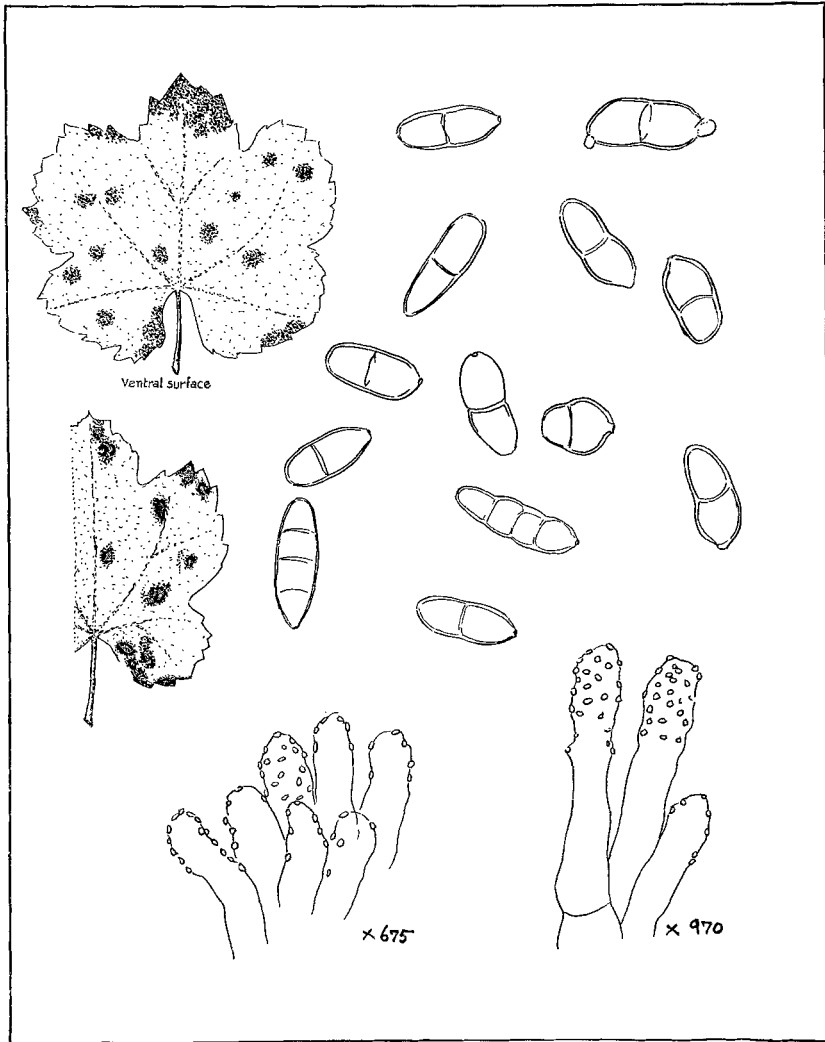
29. *Stigmina esfandiarii* PETRAK  
*Sydowia*, 4; 35, 1950.

No definite leaf-spots in the beginning, fungus forming sooty black stipitate growth on the under-surface of the leaves, later circular to subcircular or irregular leather brown lesions on the corresponding upper surface.

Conidiophores short, densely to very densely clustered, emerging through stomata, cylindrical to conic, 0—3-septate, not constricted at the septa, unbranched, medium olivaceous brown, 15—31  $\times$  6—9  $\mu$ , spore scar medium, thickened, clearly visible under high power; Conidia numerous, ovoid to ellipsoid or cylindrical, light olivaceous brown, 0—3-septate, mostly 1—2-septate, 9.4—25  $\times$  6—9.5  $\mu$ .

On living leaves of *Vitis vinifera* L., Tandojam, 21-11-1967, S. A. Khan, I.M.I. 73622, 98259 (b), and 104708 (a).

The present collection shows considerable variation especially in conidial dimensions, shape and septation but Mr. F. C. DEIGHTON of the C.M.I., Kew informs that he has seen several collections of this fungus from different parts of the world and is sure that only one species is involved (personal communication, 1970). The fungus affects the leaves only and together with *Cladosporium roesleri* CATTAN and *Pseudocercospora vitis* (LÉV.) SPEG. causes severe leaf damage in the region.

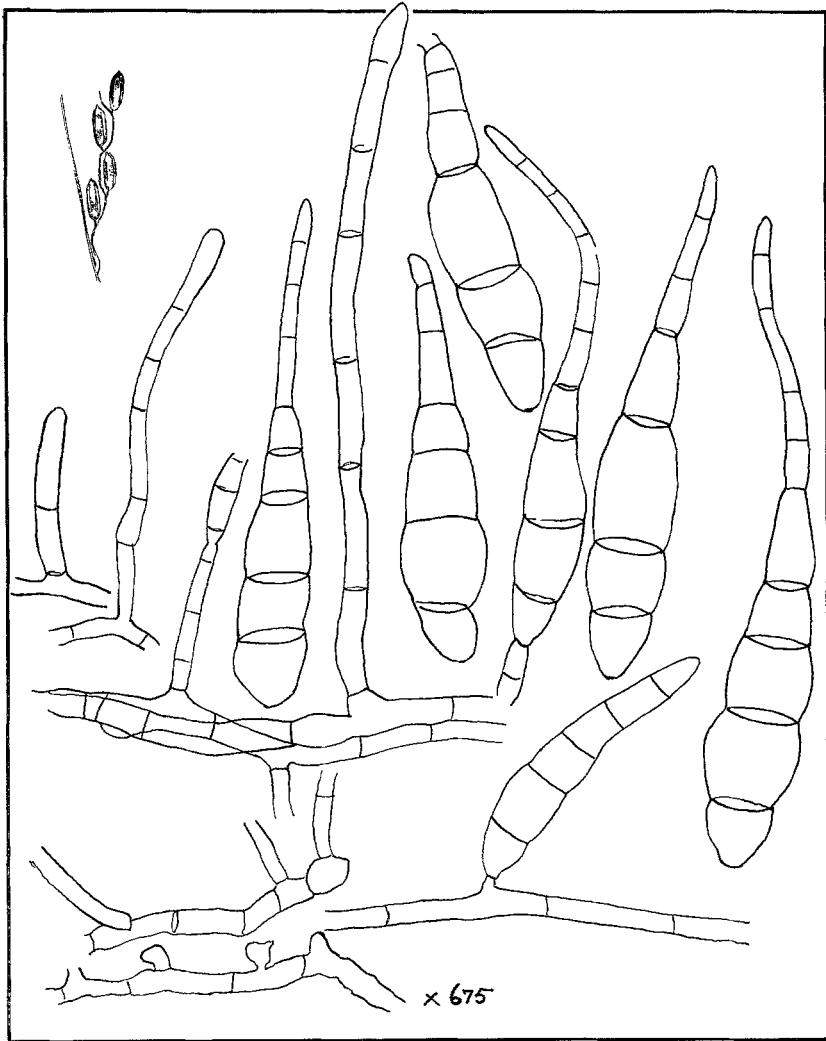
Drawing IX. *Stigmina esfandiarii* PETRAK

30. *Trichoconis padwickii* GANGULY  
*J. Ind. Bot. Soc.* XXVI, 0; 238, 1947  
*Padwick* 39; 1950.

Mycelium well developed, profusely branched, consisting of hyphae which are yellow in colour; conidiophores erect, not sharply distinguishable from mature hyphae, arising at right angles to the main axis, constricted at the point of origin, septate, usually 1—6-septate, variable in length, up to  $224 \mu$  long; Conidia elongated fusoid,

with a long appendage at the tip, creamy yellow in colour, body of the spore 3—5-septate, constricted at the septa, second or third cell from the base larger than the rest, appendage straight to mildly curved, 2—6-septate, up to  $51\ \mu$  long and  $3\text{--}4.7\ \mu$  thick, conidia measuring  $69\text{--}123 \times 7.6\text{--}16.5\ \mu$  (including the appendage); sclerotia of the fungus not seen.

On grains of *Oryza sativa* L., Dokri, 30-10-1963, S. A. Khan, I.M.I. 104329.



Drawing X. *Trichoconis padwickii* GANGLY

Drawings I to VI, IX and X. showing disease symptoms, conidiophores and conidia.  
 Drawing VII. showing disease symptoms, pycnidia, conidiophores, and conidia.  
 Drawing VIII. showing disease symptoms, conidiophores, conidia and sclerotium.

The fungus is known to cause stackburn disease of rice and was first recorded at Dacca Farm, Bengal in 1945. It produces reddish-brown spots on the grains with a conspicuous white area at the center and differs from *Trichoconis caudata* (APP. & STR.) CLEMT. in its longer and broader spores, longer spore body of 4 to 6 cells, constrictions at the septa, and the thicker, longer, and more rigid conidial appendage.

### Acknowledgements

The writers wish to place on record the valuable help received from DR. M. B. ELLIS and Mr. F. C. DEIGHTON of the Commonwealth Mycological Institute, Kew, England. Thanks are also due to Father H. Santapau of the St. Xavier's College, Bombay, India for the latin translation of the new species.

### References

- AHMAD, SULTAN (1956) Fungi of West Pakistan, Bio. Soc. of Pakistan, Mono. 1, Lahore, West Pakistan.
- DEIGHTON, F. C. (1970) Personal correspondance, Jan. 5.
- ELLIS, M. B. (1967) Personal correspondance, Jan.
- ELLIS, M. B. (1969) Personal correspondance, Sept. 23.
- MATHUR, R. L., MATHUR, B. L., & BHATNAGAR, G. C. (1960) Blackening of Bajra (*Pennisetum typhoides* STAFF. & HUBB.) grains in ear-heads caused by *Curvularia lunata* (WAKK.) BOED. Syn. *Curvularia penniseti* (MITRA) BOED., Proc. nat. Acad. Sci. India, Sect. B, 30, 4, p. 323—330 (original not seen, R. A. M., 41, p. 225, 1962).
- PADWICK, G. W. (1950) Manual of Rice Diseases, C. M. I. Kew, England.