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Notes on some Indian Cercosporae - VI.*)

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With Plates I—IV.

This is a continuation of the previous studies on the Cercosporae of India based on collections made in different places. Accounts of the species some of which are either new records for India or new to Science are presented in this paper. Type material of the new species are deposited in the Herb. Crypt. Ind. Orient. New Delhi, Herb. C.M.I., Kew England, Mycological Division, U.S.D.A., Beltsville, Maryland, U.S.A. and in the Mycological Herbarium, Cornell University, Ithaca, N.Y., U.S.A.

Cercospora erythroxylonis sp. nov.

Leaf spots circular to irregular, 2 to 4 mm. in diameter, reddish-brown in the centre and surrounded by light brown border. Fruiting mostly hypophyllous. Stroma of few brown cells, 15—40 μ in diameter. Conidiophores medium brown to pale olivaceous, unbranched and unseptate, straight or undulate, blunt at apex, 26—30 ⇌ 2.8—4.2 μ. Conidia subhyaline to pale olivaceous, obclavate to cylindric, obconical at base, blunt at apex, 1—5-septate, 8—30 ⇌ 2.8—5.7 μ.

On leaves of *Erythroxylon monogynum,* Nandi Hills, Mysore, 26-2-1953, leg. H. C. Govindu (Fig. 1).

Maculae circulares vel irregulares, 2—4 mm. in diam. in centro rubro-brunneae, pallide brunneo-marginatae. Caespituli plerumque hypophylli. Hypostroma e paucis cellulis compositum, 15—40 μ in diam. Conidiophora brunneola vel pallide olivacea, continua, simplicia, recta vel undulata, antice obtusa, 26—30 ⇌ 2.8—4.2 μ. Conidia subhyalina vel pallide olivacea, obclavata vel cylindrica, postice obconica, antice obtusa, 1—5-septata, 8—30 ⇌ 2.8—5.7 μ. There is no previous record of *Cercospora* species on this host family *Erythroxylaceae. C. lini* Ell. & Evr. is known on the closely related family *Linaceae.*

Cercospora trichodesmae sp. nov.

Infection spots circular to irregular, 5 to 7.5 mm. in diameter, greyish-brown, and greyish-white at the centre. Fruiting mostly hypophyllous. Stroma of few brown cells, 15—45 μ in diameter. Conidiophores pale brown to olivaceous, rarely branching, 1—5-septate, straight or undulate, 14—80 ⇌ 2.8—4.2 μ. Conidia subhyaline, straight or curved, narrowly obclavate obconically truncate at base, acute at tip, 1—12-septate, 21—85 ⇌ 4.2—5.7 μ.

*) Parts IV and V in Sydowia 1954, p. 221—230, 343—348.

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On the leaves of *Trichodesma zeylanica,* Savandurga, Mysore, 8-3-1953, leg. H. C. Govindu (Fig. 2).

Maculae circulares vel irregulares, 5—7.5 mm. in diam. griseo-brunneae, centro griseo-albae. Caespituli plerumque hypophylli. Hypostroma e paucis cellulis compositum, 15—45 μ in diam. Conidiophora pallide brunnea vel olivacea, vix ramosa, 1—5-septata, recta vel undulata, 14—80 ≒ 2.8—4.2 μ. Conidia subhyalina, recta vel curvata, angustissime obclavata, postice obconica, apice acuta, 1—12-septata, 21—85 ≒ 4.2—5.7 μ.

Several Cercosporae are known on the members of the *Boraginaceae*, but no species has previously been recorded on *Trichodesma*. *C. trichodesmae* differs from other species including *C. myxae* Syd. recorded from India.

Cercospora lepidagathidis sp. nov.

Infection spots circular to subcircular, distinct, 4—7 mm. in diameter, with greyish-white centre and surrounded by a pinkish or brown border. Fruiting amphigenous, stroma none or composed of few brown cells. Fascicles dense; conidiophores brown to pale olivaceous, rarely branched, 1—6-septate, strongly geniculate, hyaline at the tip, bulbous at the base, 33—183 ≒ 2.8—5.7 μ. Conidia hyaline, obclavate to cylindric, obconical at base, subacute at tip, 1—14-septate, 23—170 ≒ 2.8—4.2 μ.

On the leaves of *Lepidagathis cuspidata,* Sitalayyanagiri. Bababudans, Mysore, 20-5-1953, leg. H. C. Govindu (Fig. 3).

Maculae circulares vel subcirculares, 4—7 mm. in diam. in centro griseo-albae, roseo-vel brunneo-marginatae. Caspituli amphigeni. Conidiophora dense stipata, brunnea vel pallide olivacea, vix ramosa, 1—6-septata, forte geniculata, antice hyalina, postice bulbosa, 33—183 ≒ 2.8—5.7 μ. Conidia hyalina, obclavata vel clavata, postice obconica, antice subacuta, 1—14-septata, 23—170 ≒ 2.8—4.2 μ.

No species of *Cercospora* has been recorded on the host genus *Lepidagathis*. *C. acanthi* Pass. and *C. barlericola* Payak & Thirumalachar resemble to some extent *C. lepidagathidis,* but the conidial measurements and presence of stroma distinguish the species.

(4) *Cercospora* species.

Leaf spots distinct, angular to irregular 0.5 to 1 cm. in diameter dark brown to greyish-white, surrounded by a black border. Fruiting amphigenous, stroma of compactly grouped cells, medium-brown, often protruding above the epidermis, 30—80 μ in diameter. Conidiophores pale olivaceous to medium brown, unbranched, unseptate, short and stumpy, 7—21 ≒ 2.8—4.2 μ. Conidia subhyaline, straight or curved, 1—12-septate, obclavate to cylindric, obconically truncate at base, actute at tip. 30—120 ≒ 2.8—4.2 μ.

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On leaves of *Compositae* (*Vernonia* sp.?), Bababudangiri, Mysore, 20-5-1953, leg. H. C. Govindu (Fig. 4).

(5) *Cercospora oculata* Ellis & Kellermann **indica** var. nov. *C. oculata* Ellis & Kellermann Bull. Torrey Bot. Cl. **11**: 116, 1884.

Infection spots on leaves circular to polygonal, definite, 4—8 mm. in diameter, greyish to reddish brown, greyish-white at the centre, surrounded by raised margin, often coalescing to form larger patches. Fruiting body chiefly amphigenous. Stroma well developed, consisting of compactly grouped brown cells, 35—50 μ in diameter. Conidiophores arising in dense fascicles, medium-brown to light olivaceous-brown, indistinctly 1—5-septate, once geniculate at the tip which appear as bifurcations, 14—57 ⇌ 2.1—3.5 μ. Conidia subhyaline, narrowly obclavate to acicular, 1—12-septate, straight or curved, base obconically truncate tip acute, 28.5—85.5 ⇌ 2.1—3 μ.

On leaves of *Veronia bourneana,* Sitalayanagiri, Bababudans, Mysore, 20-5-1953, leg. H. C. Govindu (Fig. 5).

The fungus closely resembles *C. oculata* Ellis & Kellm. known so far only U.S.A. on *Veronia baldwinii.* The slight differences in the width of conidia, bifurcations of the apices of conidiophores in the species under study is taken as basis for separating the new variety.

6. **Cercospora knoxiae** sp. nov.

Infection spots on leaves subcircular to polygonal, 5—8 mm. in diameter, olivaceous brown in the centre, surrouded by reddish-brown zone, with pinkish border. Stroma well developed, compact, composed of dark-brown cells, 30—70 μ in diameter. Conidiophores in dense fascicles, medium brown to pale olivaceous, 1—8-septate, irregular in width, rarely branching, attenuated and hyaline at the apex, 21—71 ⇌ 2.4—4.2 μ. Conidia subhyaline, straight or flexuous, obclavate to cylindric, obconical at base and acute at tip, 1—8-septate, 28—64 ⇌ 2.8—4.2 μ.

On the leaves of *Knoxia corymbosa,* Doddabetta, Nilgiris, 20-6-1953, leg. H. C. Govindu (Fig. 6).

Maculae subcirculares vel angulosae, 5—8 mm. in diam., in centro olivaceo-brunneae, zonula roseo-brunnea cincta. Hypostroma bene evolutum, compactum, e cellulis brunneis compositum, 30—70 μ in diam. Conidiophora dense stipata, brunneola vel pallide olivacea, 1—8-septata, vix ramosa, antice hyalina et attenuata, 21—71 ⇌ 2.4—4.2 μ. Conidia subhyalina, recta vel flexuosa, obclavata vel cylindrica, postice obconica, antice acuta, 1—8-septata, 28—64 ⇌ 2.8—4.2 μ.

(7) *Cercospora venezuelae* Chupp. var. **indica** var. nov.

C. venezuelae Chupp. in Monog. Univ. Puerto Rico Ser. B. **2**: 254, 1934.

Infection spots on leaves circular to irregular 5 to 10 mm. in diameter, pale brown to olivaceous brown, surrounded by a dark

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brown margin. Fruiting amphigenous, but chiefly epiphyllous, stroma of dark brown cells. 30 to 80 μ in diameter. Conidiophores in dense fascicles, pale olivaceous to subhyaline, unbranched, somewhat undulate, 1—6-septate, not geniculate, tip conical or rounded, 15—64 ⇌2.8—4.2 μ. Conidia subhyaline, straight or slightly flexuous, obclavate to cylindric, 1—12-septate, base obconically truncate and apex rounded, 21—71 ⇌ 2.8—5 μ.

On leaves of *Solanum indicum,* Hosamande, Nilgiris, 19-6-1953, leg. H. C. Govindu (Fig. 7).

C. venezuelae was described by Chupp from Venezuela on *Solanum argenteum* and is so far known only from South America. There are several species of *Cercospora* known on *Solanum* species, but the one under study in placed near *C. venezuelae* on account of close spore measurements and narrow conidiophores. However, to indicate the few characteristic differences such as septate conidiophores, broader stroma etc. the new variety *indica* is allocated.

8. **Cercospora nilghirensis** sp. nov.

Infection spots circular to polygonal, yellowish brown with whitish centre, often coalescing with each other. Fruiting mostly amphigenous. Stroma absent, composed of few brown cells. Conidiophores medium brown to pale olivaceous, densely fasciculate, unbranched, 1—10-septate, strongly geniculate, attenuated and hyaline at the tip, 70—300 ⇌ 3.7—5 μ. Conidia hyaline, obclavate to acicular, straight or flexuous, obconically truncate to acicular, truncate at base, acute at apex, 1—28-septate, 50—200 ⇌ 3.7—5.5 μ.

On leaves of *Conyza ambigua,* Hosamande Niligiris, Madras, 18-6-1953, leg. H. C. Govindu (Fig. 8).

Maculae circulares vel angulosae, atro-brunneae, in centro albae, saepe confluentes. Caespituli amphigeni. Hypostroma nullum vel e cellulis paucis compositum. Conidiophora brunneola vel pallide olivacea, dense stipata, simplicia, 1—10-septata, plus minusve undulata, antice hyalina et attenuata, 70—300 ⇌ 3.7—5 μ. Conidia hyalina, obclavato-acicularia, recta vel curvula, postice truncata sursum attenuata et acuminata, 1—28-septata, 50—200 ⇌ 3.7—5.5 μ.

The conspicuously long conidia and conidiophores of the fungus under study distinguished it as a separate species. *C. blumeae* de Thum. on *Conyza viscosula (Blumea viscosula)* has effuse growth with non-fasciculate conidia, and *C. conyzae* described by Sawada from Japan is nomen dubium, since according to Dr. Chupp authentic material (Monogr. *Cercospora* p. 131, 1953) showed only a species of *Septoria.*

(9) *Cercospora eupatoricola* Govindu and Thirumalachar. Sydowia VIII. p. 225 (1954).

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On leaves of *Eupatorium glandulosum,* Hosamande, Nigiris, Madras, 18-6-1953, leg. H. C. Govindu (Fig. 9).

The same species was previously reported on *Eupatorium rheevesi* on the basis of collection made in Sibpur, Calcutta.

(10) *Cercospora rubi* Sacc. Nuov. Giorn. Bot. Ital. **8**: 188, 1876.

On leaves of *Rubus racemosus,* Ootacamund, 18-6-1953, leg. H. C. Govindu. Previously the same species had been recorded on *R. vulgaris* from Kemmangundi, Mysore, by Thirumalachar and Chupp (Mycologia **40**: 360, 1948) (Fig. 10).

(11) *Cercospora krugiana* Müller & Chupp. Arch. Inst. Biol. Veget. R. de Janeiro, **3**: 94, 1936.

Infection spots on leaves circular to irregular, 2 to 5 mm. in diameter, often coalescing with each other forming large patch, slightly raised, dark brown to tan, with greyish-white at the centre. Fruiting mostly amphigenous. Stromata absent or consists of few cells.

Conidiophores dark-olivaceous brown to medium brown, slightly swollen at the base, usually streight, unbranched, 1—8-septate, 1—2-geniculate and hyaline at the tip, 50—250 ⇌ 2.5—5.5 μ. Conidia hyaline, acicular, straight or slightly flexuous, 1—16-septate, 20—150 ⇌ 2—4.2 μ, truncate at base and acute at tip.

On leaves of *Boehmeria nivea* Gaud., Department of Agriculture Compound, Bangalore, 15-8-1953, eg. H. C. Govindu (Fig. 11).

C. krugiana was reported by Müller and Chupp from Brazil on the same host species and has so far not been known outside the type locality. The general characters in the collections studied by us is identical with the descriptions given by Müller and Chupp.

(12) *Cercospora waltheriae* Thirumalachar & Chupp. Mycologia **40**: 361—362, 1948.

On leaves of *Walteria indica* L., Nandi village, Mysore, 10-9-1952, leg. H. C. Govindu (Fig. 12).

(13) *Cercospora carthami* (H. & P. Sydow) Sunderaraman & Ramakri. Agr. Jour. India, **23**: 383, 1928.

On leaves of *Carthamus tinctorius* Linn., Hebbal, 4-10-1953, leg. H. C. Govindu (Fig. 13).

(14) *Cercospora medicaginis* Ell. & Evr. Proc. Acad. Nat. Sci. Phila. Part I, **43**: 91, 1891.

Leaf spots circular to irregular, 2—5 mm. in diameter, appearing as sooty patches, dark brown to almost black in the centre, with a definite yellowish-green border. Fruiting amphigenous. Stroma composed of few brown cells. Conidiophores pale brown to medium brown, hyaline at the apex, unbranched, 1—6-septate, geniculate at the tip, 24—85 ⇌ 4.2—5.7 μ. Conidia hyaline, obclavate to acicular, broad and truncate at the base, tip subacute, 1—16-septate, 28.5—115 ⇌ 2.8—4.2 μ.

On leaves of *Medicago sativa* Linn., Hebbal, Bangalore, 27-10-1953, leg. H. C. Govindu (Fig. 14).

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(15) *Cercospora corchori* K. Sawada. Agri. Exp. Sta. Formosa I. (Spezial Bull), **37**: 667, 1919.

On leaves of *Corchorus tridens,* Hebbal, Bangalore, 28-10-1953, leg. H. C. Govindu (Fig. 15).

(16) **Cercospora blainvilleae** sp. nov.

Infection spots on leaves angular to polygonal, 2—5 mm. in diameter, dark-brown, often coalescing with each other to form large patches. Fruiting amphigenous. Stroma absent, or consists of few brown cells. Conidiophores divergent, unbranched, 1—3-septate, medium olivaceous-brown subhyaline at the tip, 1—2-geniculate at the tip, 14—57 ⇌ 2.8—5.5 μ. Conidia hyaline, acicular, straight or curved, 1—20-septate, conical or truncate at base, acute at tip, 33—166 ⇌ 2.8—5.5 μ.

On leaves of *Blainvillea latifolia,* Hebbal, Bangalore 15-11-1953, leg. H. C. Govindu (Fig. 16).

Maculae angulares plus minusve irregulares, 2—5 mm. in diam., atro-brunneae, saepe confluentes. Caespituli amphigeni. Hypostroma nullum vel e paucis cellulis compositum. Conidiophora divergentia, simplicia, 1—3-septata, olivaceo-brunneola, antice subhyalina, apicem versus undulata, 14—57 ⇌ 2.8—5.5 μ. Conidia hyalina, acicularia, recta vel curvula, 1—20-septata, postice obconica et truncata, antice acuta, 33—166 ⇌ 2.8—5.5 μ.

(17) *Cercospora cheiranthi* Sacc. **brassicae** var. nov.
C. cheiranthi Sacc. in Nuovo Gior. Bot. Ital **8**: 187 1876.

Infection spots on siliqua indefinite, forming greyish-white patches. Condiophores fasciculate, arising from stroma, 10—30 μ in diameter, yellowish-brown, thick and stumpy, unbranched, 1—3-septate, 1—2-geniculate at the tip, 14—42.5 ⇌ 4.2—5.7 μ. Conidia hyaline, clavate, 1—6 septate, 14—38 ⇌ 2.8—3.5 μ, truncate at base, and rounded at the apex.

On the siliqua of *Brassica nigra,* Hebbal, Bangalore, 15-12-1953, leg. H. C. Gonvindu (Fig. 17).

The fungus has been observed only on the maturing pods and often gets associated with *Alternaria brassicae.* The fruiting bodies of the *Cercospora* are however quite distinct. In the absence of any collection made on the leaves, the species is referred to as a variety of *Cercospora cheiranthi* Sacc. known only on *Cheiranthus cheiris.* This species has some resemblance with the fungus studied by us on *Brassica nigra* in having short stumpy conidiophores of somewhat similar measurements. The conidia are however, longer in *C. cheiranthi* (20—100 μ as compared with 13—38 μ in the species under study), and is therefore referred to tentatively to a new variety.

(18) *Cercospora uramensis* Chupp & Müller. Bol. Soc. Venez. Cien. Nat. **8**: 58, 1942.

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Infection spots on leaves not observed. On maturing capsules spots none, fruiting bodies abundant forming effuse growth, greyish-white at first, turning greyish-black later on. Stroma consisting of few brown cells 1—25 μ in diameter. Conidiophores medium to olivaceous brown, paler and hyaline at the tip, unbranched, 1—12-septate, abruptly geniculate at the tip, 70—233 ⇌ 2.8—3.5 μ. Conidia hyaline, acicular, straight or flexous, 1—30-septate, truncate at base, acute at tip, 50—266 ⇌ 2—3.5 μ.

On fruits of *Cleome monophylla,* Hebbal, Bangalore, 15-10-1953, leg. H. C. Govindu (Fig. 18).

As in the previous case, infection has not been observed on leaves but only on the maturing capsules. The characteristic fruiting bodies with long unbranched conidiophores and conidia measuring more than 200 μ clearly indicates that fungus is *C. uramensis* also described on species of *Cleome.* Previously *C. cleomes* has been reported on the same host from India.

(19) *Cercospora caracasensis* Chupp & Muller. Bol. Soc. Venez. Cien. Nat. **8**: 39, 1942.

Leaf spots circular to irregular, 2—8 mm. in diameter, often coalescing to form large patches, greyish- white at the centre and dark brown along the margin. Fruiting amphigenous. Stroma well developed, globular, compactly grouped, composed of dark brown cells, 15—60 μ in diameter. Conidiophores medium, olivaceous brown, unbranched, unseptate and non-geniculate, 7.2—21 ⇌ 2—3 μ. Conidia subhyaline to pale olivaceous, straight or slightly curved, obclavate, obconical at base, acute at tip, 16—50 ⇌ 2.5—3 μ.

On leaves of *Anona squamosa* L., Hebbal, Bangalore, 1-12-1953, leg. H. C. Govindu (Fig. 19).

The identical spore measurements and structure of the stroma, conidiophores etc. indicate that the fungus under study is *C. caracasensis* known so far only from the type locality in Venezuela, South America. The very short conidiophores up to 21 μ developing from stroma and being unbranched, unseptate and nongeniculate distinguishes it from other species recorded on the host genus *Anona. Cercospora anonae* Müller & Chupp. was previously recorded by Mundkur and Ahmad (Mic. paper C.M.I., England, 18, llp. 1946) an *A. squamosa* from Bihar.

(20) **Cercospora oldenlandicola** sp. nov.

Leaf spots circular to irregular, 2—6 mm. in diameter, dark brown to black, often coalescing with each other involving infection of the entire leaf. Fruiting amphigenous. Stroma subepidermal, composed of brown cells, 10—25 μ in diameter. Conidiophores dark-brown, tip hyaline, short, bulbous at base, tapering at the apex, sterigma-like, unbranched, unseptate, 10—20 μ long, 2.8—4.2 μ at top, 3—7 μ at base.

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Conidia subhyaline, acicular, straight or curved, 1—16-septate, 21—78.5 ⇌ 2—3 μ.

On leaves of *Oldenlandia* sp., Hebbal, Bangalore, 30-11-1953, leg. H. C. Govindu (Fig. 20).

Maculae circulares vel irregulares, 2—6 mm. in diam., atro-brunneae vel nigrae, raro confluentes Caespituli amphigeni. Hypostroma subepidermale, atro-brunneum, compactum, 10—25 μ in diam. Conidiophora atro-brunnea, antice hyalina, brevia postice bulbosa, antice attenuata „sterigmatibus" similia, simplicia, continua, 10—20 μ longa, antice 2.8—4.2 μ, postice 3—7 μ crassa. Conidia subhyalina, acicularia, recta vel curvata, 1—16-septate, 21—78.5 ⇌ 2—3 μ.

The type of conidiophores being bulbous at base, and tapering like sterigmata, clearly distinguihes the species under study from *Cerc. oldenlandiae* Hansford, described on *Oldenlandia* sp. and *Borreria sinensis* from Uganda. The latter species has long septate conidiophores up to 100 μ long.

(21) *Cercosporia subsessilis*. H. & P. Syd. Ann. Mycol. **11**: 329, 1913.

Leaf spots circular to polygonal, 2—6 mm. in diameter, dark-brown to tan, sometimes with pink margin. Fruiting amphigenous, stroma well developed, composed of compactly grouped brown cells 20—50 μ in diameter. Conidiophores medium brown to yellowish-brown, mostly unbranched, unseptate, tubular, blunt and short, 14—35 ⇌ 2.8—4.2 μ. Conidia subhyaline to pale olivaceous, narrowly cylindric, 1—6-septate, obconically truncate at base, acute at tip, 14—57 ⇌ 2.8—4.2 μ.

On leaves of *Switenia mahogoni* Jacq., Sibpur, Calcutta, 9-1-1952, leg. H. C. Govindu (Fig. 21).

On the basis of the occurrence of identical morphological characters and spore measurements, Dr. Chupp identified the *Cercospora* sp. on *Switenia mahogoni* from Brazil as *C. subsessilis* first reported from India on *Melia azedarach* (Monogr. Cercospora 386 p. 1953). Study of the collections made by us on *S. mahogoni* has also characters identical with *C. subsessilis*.

In conclusion the writers wish to acknowledge their indebtedness to Dr. F. Petrak, Wien, Austria for kindly translating the descriptions of the news species into latin.

Explanation of Plate III—VI.

Magnification about 750.

Fig. 1. *Cercospora erythroxylonis*. — 2. *C. trichodesmae*. — 3. *C. lepidagathidis*. — 4. *C. sp.* on *Compositae*. — 5. *C. oculata* var. *indica*. — 6. *C. knoxiae*. — 7. *C. venezuelae* var. *indica*. — 8. *C. nilghirense*. — 9. *C. eupatoricola*. — 10. *C. rubi*. — 11. *C. krugiana*. — 12. *C. waltheriae*. — 13. *C. carthami*. — 14. *C. medicaginis*. — 15. *C. corchori*. — 16. *C. blainvilleae*. — 17. *C. cheiranthi* var. *brassicae*. — 18. *C. uramensis*. — 19. *C. caracasensis*. — 20. *C. oldenlandicola*. — 21. *C. subsessilis*.

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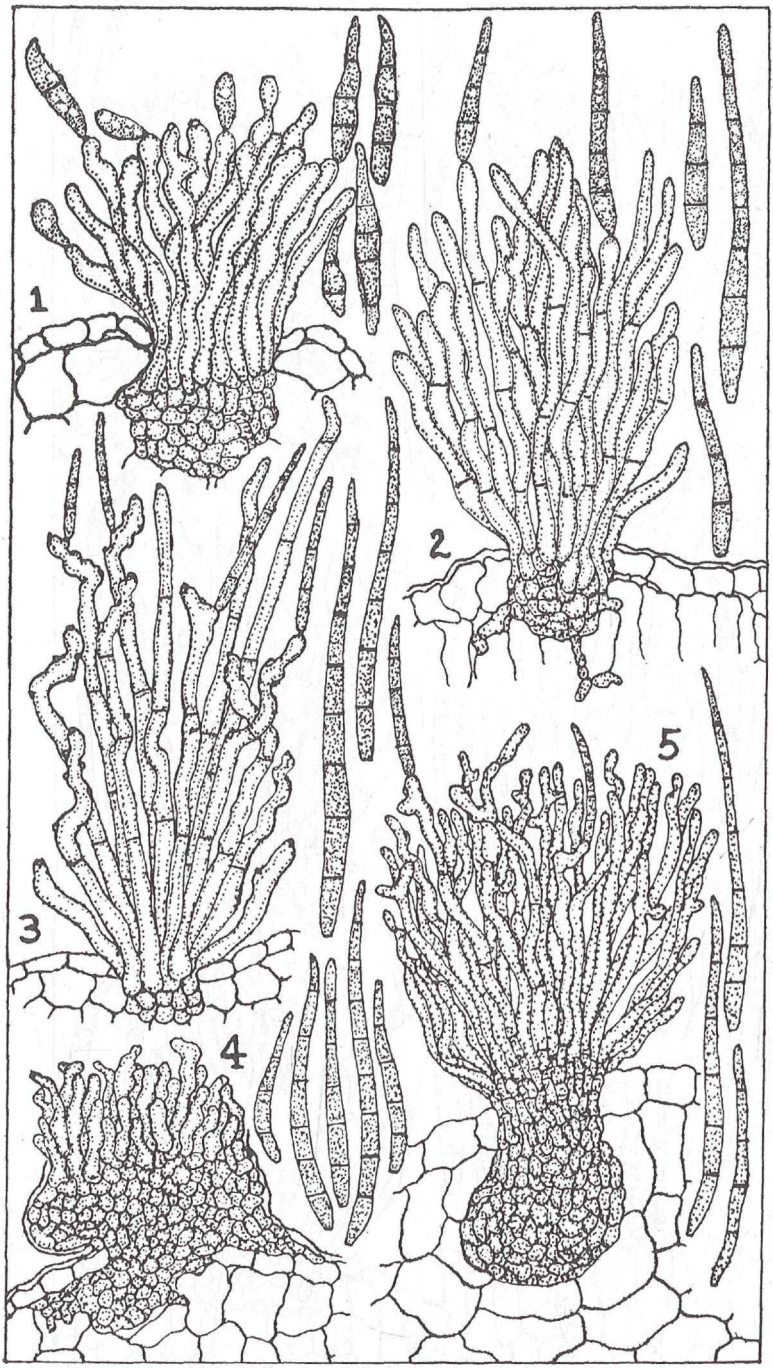

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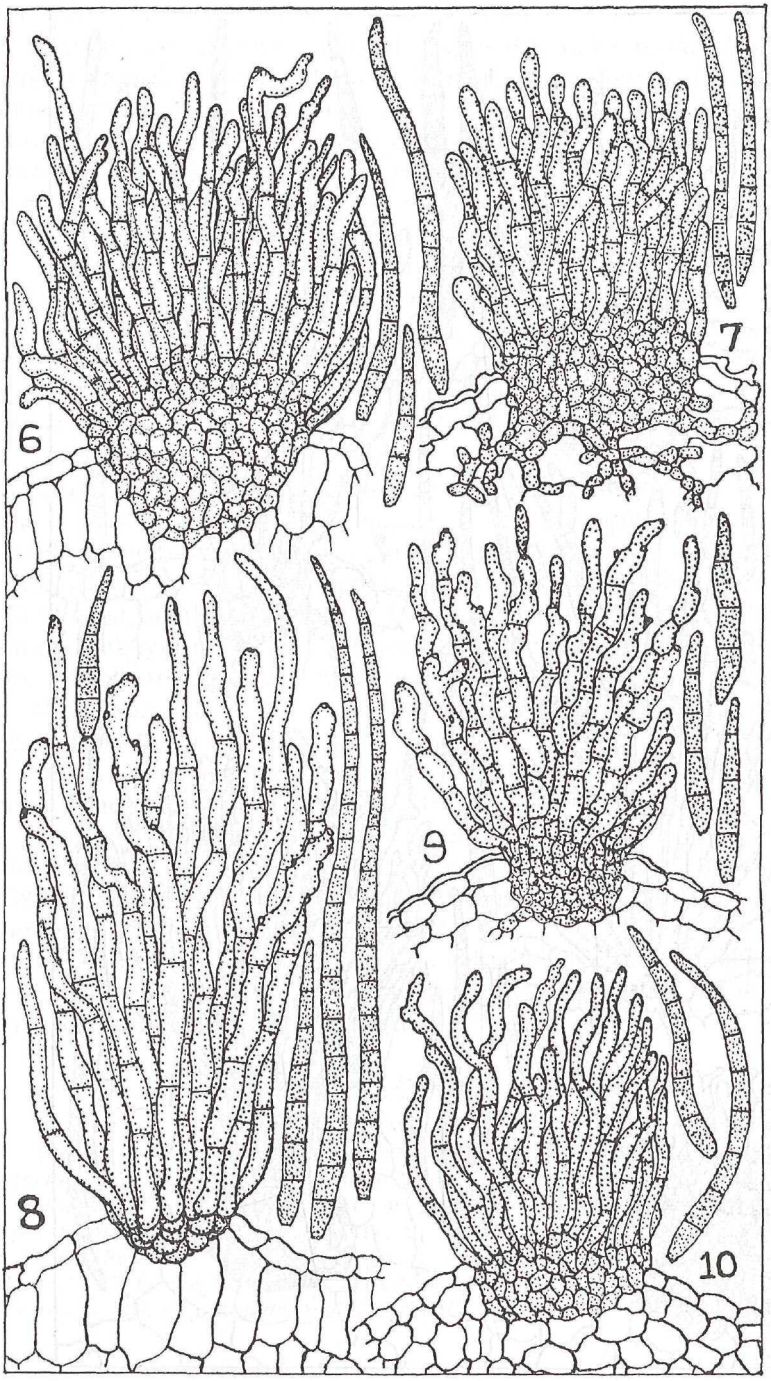

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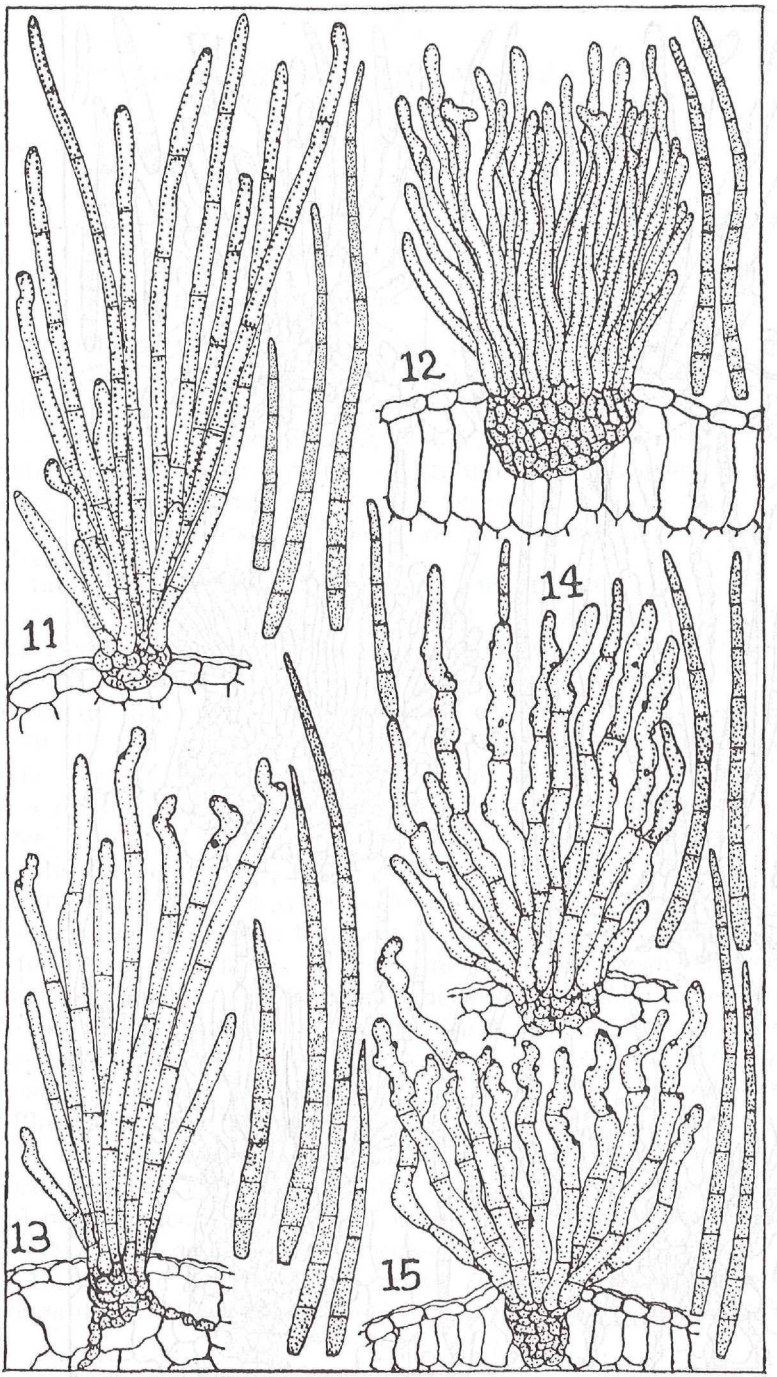

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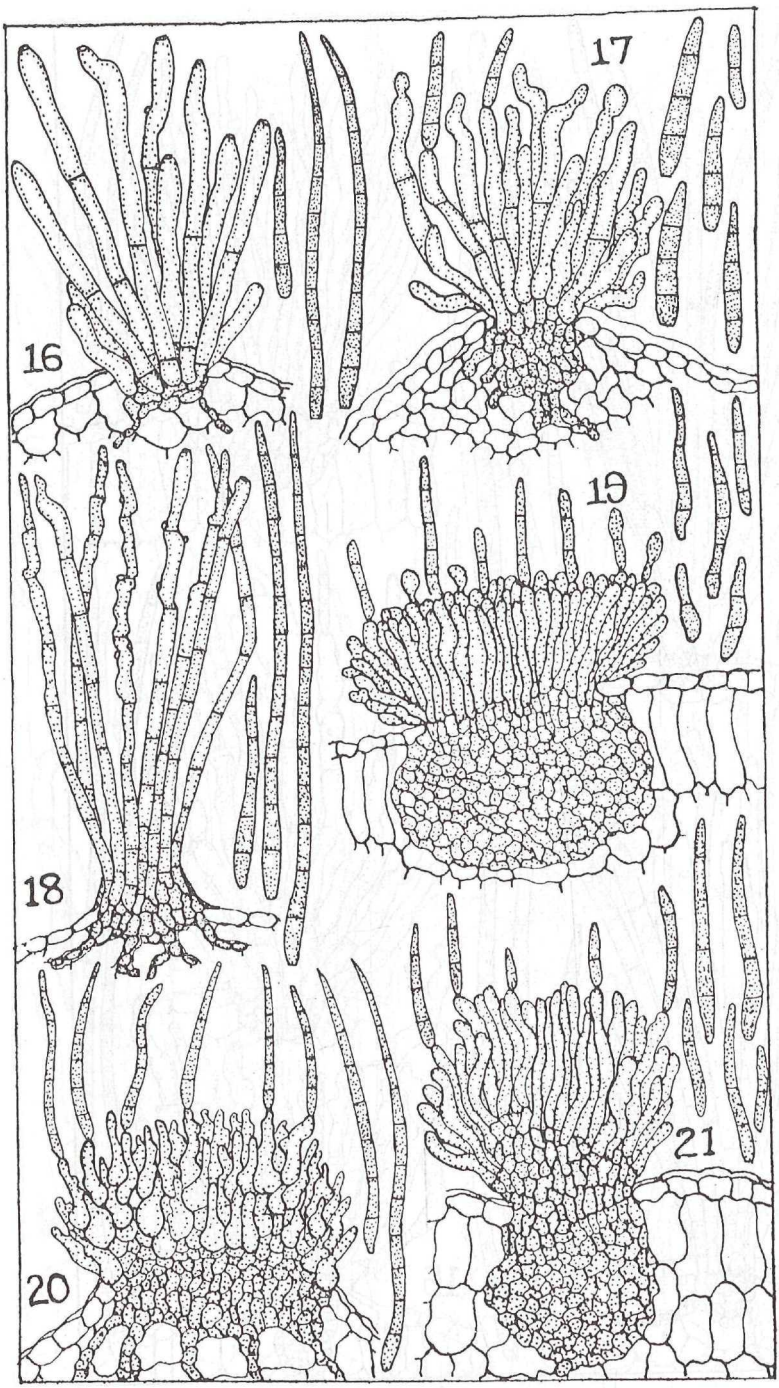

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