

HABITAT.— Isolated from soil.

DISTRIBUTION.— India, known from two isolations.

***Neocosmospora parva*** Mahoney, *Mycologia* 68: 1111. 1976.

Anamorph: *Acremonium*-like.

HABITAT.— Isolated from soil.

DISTRIBUTION.— Ecuador: Galápagos Islands, known only from the type (ex-type CBS 466.70).

***Neocosmospora spinulosa*** Pfenning, *Sydowia* 47: 66. 1995.

Anamorph: *Acremonium*-like.

HABITAT.— Isolated from soil under *Theobroma cacao*.

DISTRIBUTION.— Brazil, known only from the type.

***Neocosmospora tenuicristata*** S. Ueda & Udagawa, *Mycotaxon* 14: 387. 1983.

Anamorph: *Acremonium tenuicristatum* S. Ueda & Udagawa, *Mycotaxon* 14: 387. 1983.

HABITAT.— Isolated from marine sludge.

DISTRIBUTION.— Japan, known only from the type.

***Neocosmospora vasinfecta*** var. ***africana*** (Arx) P. Cannon & D. Hawksw., *Trans. Brit. Mycol. Soc.* 82: 676. 1984.

≡ *Neocosmospora africana* Arx, *Antonie van Leeuwenhoek Ned. Tijdschr. Hyg.* 21: 161. 1955.

Anamorph: *Acremonium*-like.

HABITAT.— Isolated from soil.

DISTRIBUTION.— Warm temperate and tropical regions.

**NEONECTRIA** Wollenw., *Ann. Mycol.* 15: 52. 1917.

Type: *Neonectria ramulariae* Wollenw. (≡ *Nectria ramulariae* (Wollenw.) E. Müll.).

= *Chitinonectria* Morelet, *Bull. Soc. Sci. Nat. Archéol. Toulon Var* 178: 6. 1969. — Type: *C. coccinea* (Pers. : Fr.) Morelet (≡ *Sphaeria coccinea* Pers. : Fr.), herein recognized as *Neonectria coccinea*.

Ascomata superficial on a minute basal stroma or on an erumpent, previously conidial stroma, or at the base of a synnema; subglobose to broadly obpyriform, collapsing laterally or not collapsing when dry, non-papillate or with a minute papilla, red, KOH+ dark red, yellow in lactic acid, smooth, varnished to scurfy. Ascomatal wall 50 or more  $\mu\text{m}$  thick, of two or three regions: outer region of conspicuously angular cells, 10–15  $\mu\text{m}$  diam, with 1.5–2  $\mu\text{m}$  thick walls; middle region, if present, of thick-walled cells oriented perpendicular to the centrum; inner region of thin-walled, hyaline, elongate cells. Asci fusiform to clavate, sessile, apex simple or

## KEY TO THE SPECIES OF *NEOCOSMOSPORA*

The following key to the species is modified from Udagawa *et al.* (1989) with the addition of one recently described species, *N. spinulosa*.

1. Ascospores with conspicuous spines, reddish-brown in mass, translucent through the hyaline ascomatal wall ..... *N. spinulosa*
1. Ascospores variously ornamented with longitudinal or transverse striae or with bumps, ridges, flanges or reticulations, yellowish-brown in mass ..... 2
2. Ascospores with transversely striate flanges or ridges ..... 3
2. Ascospores with longitudinal ridges, reticulations or rugose to cerebriform ornamentation 4
3. Ascospores 7.5–12  $\times$  5–6.5  $\mu\text{m}$ , with 6–10 transverse, hyaline flanges ..... *N. striata*
3. Ascospores 13.5–17  $\times$  10–11.5  $\mu\text{m}$ , with many inconspicuous transverse ridges ..... *N. tenuicristata*
4. Ascospores 8.5–10.5  $\times$  4.5–6  $\mu\text{m}$ , verruculose ..... *N. parva*
4. Ascospores more than 10  $\mu\text{m}$  long, reticulate or conspicuously rugose to cerebriform ... 5
5. Ascospores ellipsoid, 12.5–16  $\times$  9–10  $\mu\text{m}$ , reticulate, although reticulations partially obscured by an episporium layer ..... *N. indica*
5. Ascospores globose to slightly ellipsoid, 9–15.5  $\times$  7.5–12  $\mu\text{m}$ , conspicuously rugose to cerebriform ..... 6
6. Ascospores conspicuously rugose ..... *N. vasinfecta* var. *vasinfecta*
6. Ascospores with cerebriform ornamentation ..... *N. vasinfecta* var. *africana*

with a refractive ring, ascospores biseriolate. Ascospores ellipsoid to fusiform, medially 1-septate, smooth, hyaline. Anamorph, where known, *Cylindrocarpon*. On woody substrata.

NOTES.— *Neonectria* was described as being similar to *Mycosphaerella* and *Calonectria* as well as close to *Nectria* and *Hypomyces*; it was differentiated by the anamorph that was placed at first in *Ramularia*, and later in *Cylindrocarpon*. The type specimen of *Neonectria ramulariae* contains a few immature ascomata along with its anamorph, *Cylindrocarpon magnusianum*. In the protologue Wollenweber (1917) refers to his *Fusaria autographice delineata* no. 67 that includes drawings of the teleomorph from the ex-type culture. Because only immature ascomata remain on the type specimen, this illustration is herein regarded as the iconotype. Based on this illustration and the immature ascomata on the type specimen, *Neonectria* is an available generic name for species related to *N. ramulariae*. The unspecific genus *Chitinonectria* was established for species of *Nectria* having a chitinoid ring in the ascal apex. Because the presence of a chitinoid ring in the ascal apex is a relatively common feature among members of the *Hypocreales*, this genus has not been accepted as a segregate of *Nectria*.

At present, nectrioid species having *Cylindrocarpon* anamorphs are placed in five groups that are differentiated as follows: (1) Species having few to numerous ascomata clustered on wood, ascomatal walls thinner than 50  $\mu\text{m}$ , of relatively thick-walled, small cells, and ascospores that are generally smooth, have been placed in the '*Nectria* coccineal/galligena-group' (Booth, 1959). At present only species of this group are formally recognized as *Neonectria*. (2) Species having a distinctive '*Nectria* mammoidea'-type ascomatal wall structure as defined initially by Booth (1959) and later by Samuels & Brayford (1993), spinulose ascospores, and a non-microconidial anamorph constitute the '*Nectria* mammoidea'-group. (3) Species having an ascomatal wall thicker than 50  $\mu\text{m}$ , of large, thick-walled cells and striate ascospores are placed in the '*Nectria* rugulosa'-group (Samuels & Brayford, 1994). (4) Species in the '*Nectria* radicolica'-group have warted, usually solitary, ascomata with walls of large, thick-walled cells, and smooth ascospores (Samuels & Brayford, 1990). (5) Species having ascomata with a flattened or knobby apex, ascomatal walls of thick-walled cells, and tuberculate ascospores are placed in the '*Nectria* veuillotiana'-group (Brayford & Samuels, 1993). It has not yet been determined what are the limits of these groups nor whether they should be included in *Neonectria* or as separate genera. For these reasons, only a few species are recognized in *Neonectria* at present.

***Neonectria ramulariae*** Wollenw., Ann. Mycol. 15: 52. 1917. — Plate 33, f.

≡ *Nectria ramulariae* (Wollenw.) E. Müll., Beitr. Kryptogamenfl. Schweiz 11(2): 634. 1962.

Anamorph: *Cylindrocarpon magnusianum* (Sacc.) Wollenw., Fusaria autogr. del., ed. 2, no. 463. 1926.

≡ *Septocylindrium magnusianum* Sacc., Michelia 1: 130. 1878.

≡ *Ramularia magnusiana* (Sacc.) Lindau, in Rabenh., Kryptogamenfl. 1/8: 483. 1906.

Ascomata solitary or caespitose, up to fifteen developing from a central point, without a subtending stroma, with sparse white hyphae between the ascomata; ascomata superficial, obpyriform, 200–300  $\mu\text{m}$  high  $\times$  210  $\mu\text{m}$  diam, with a broadly rounded apex, collapsing laterally when dry, red-orange, KOH+; papilla integrated, indistinct, smooth. Ascomatal wall 40–45  $\mu\text{m}$  thick, of two regions: outer region about 25–35  $\mu\text{m}$  thick, of thick-walled cells that are irregularly elongate perpendicular to the ascomatal wall, cells often becoming thin-walled toward the apex, forming a *textura epidermoidea* and meandering, in the upper regions of the ascomata, cells more regularly oriented outward and slightly clavate, thus appearing circular in surface view. Asci narrowly clavate, 8-spored. Ascospores ellipsoid, (11–)12–15(–20)  $\times$  3–4 (–4.5)  $\mu\text{m}$ , 1-septate, when germinating 1–3-septate, hyaline, smooth.

ANAMORPH: Conidia cylindrical, 19–27  $\times$  3–5  $\mu\text{m}$ , straight, slightly wider and obliquely rounded at the distal end, 1–3-septate, hyaline.

TYPE.— GERMANY. Rhineland, Nordrhein-Westfalen, near Vohwinkel, on living *Rubus fruticosus* branches, Wollenweber, winter of 1915–1916, producing *Cylindrocarpon magnusianum* in culture (B – holotype; *Fusaria autographice delineata* no. 67, iconotype).

NOTES.— Domsch *et al.* (1980) followed Wollenweber (1928) in recognizing *Neonectria ramulariae* (as *Nectria ramulariae*) to be the teleomorph of *Cylindrocarpon magnusianum* and stated that the ascomata were only known from Wollenweber's type specimen. No asci or ascospores were seen on the type specimen and are described here from the protologue. *Neonectria ramulariae* needs to be more fully characterized based on living cultures.

#### ADDITIONAL SPECIES OF *NEONECTRIA*:

***Neonectria coccinea*** (Pers. : Fr.) Rossman & Samuels, *comb. nov.* — Plate 22, i (page 26); Plate 33, c–d.

≡ *Sphaeria coccinea* Pers. : Fr., Persoon, Icon. & Descr. Fung. 2: 47. 1800 : Fries, Syst. Mycol. 2: 412. 1823.

≡ *Nectria coccinea* (Pers. : Fr.) Fr., Summa Veg. Scand. 2: 388. 1849.

= *Sphaerostilbe caespitosa* Fuckel, Jahrb. Nassauischen Vereins Naturk. 27–28: 33. 1873.

= *Neonectria caespitosa* (Fuckel) Wollenw., Angew. Bot. 8: 192. 1926.

Anamorph: *Cylindrocarpon candidum* (Link) Wollenw., Fus. Autogr. Del., ed. 2, no. 655. 1926.

= *Fusidium candidum* Link, Observationes I, Mag. Ges. Naturf. Freunde Berlin 3: 6. 1809.

= *Fusidium fractum* Sacc. & Cav., N. Giorn. Bot. ital. 7: 308. 1900.

= *Cylindrocarpon fractum* (Sacc. & Cav.) Wollenw., Fus. Autogr. Del., ed. 1, no. 655. 1924.

Booth (1966) stated that *Neonectria caespitosa* is a synonym of *Nectria coccinea*, based on an examination of type material (K, isotype, Fuckel, Fungi rhenani 2533). Seifert (1985) examined the holotype of *S. caespitosa* at G and isotypes at BR and K and confirmed Booth's evaluation. *Nectria coccinea* was lectotypified by Booth (1959) with a Persoon specimen.

SPECIMEN ILLUSTRATED.— UNITED STATES. Maine: Washington Co., near Princeton, on *Fagus*, Dec 1934, E. Brower, V. Mentzer (BPI 551493).

**Neonectria galligena** (Bres.) Rossman & Samuels, *comb. nov.*

= *Nectria galligena* Bres., in Strasser, Verh. K.K. Zool.-Bot. Ges. Wien 51: 413. 1901.

Anamorph: *Cylindrocarpon heteronema* (Berk. & Broome) Wollenw., Z. Parasitenk. (Berlin) 1: 149. 1928.

= *Fusarium heteronema* Berk. & Broome, Ann. Mag. Nat. Hist. Ser. 3, 15: 1051. 1865.

= *Fusarium mali* Allesch., Ber. Bot. Ver. Landshut 12: 130. 1892.

= *Cylindrocarpon mali* (Allesch.) Wollenw., Z. Parasitenk. (Berlin) 1: 150. 1928.

This species was described and illustrated by Booth (1959) and Booth (1966), in which *Cylindrocarpon heteronema* is cited as the correct name for the anamorph.

SPECIMENS ILLUSTRATED:

'*Nectria*' *jungeri* in *N. mammoidea*-group. FRENCH GUIANA. Saül, Saut Mais, 17 km E from Saül, on bark of newly fallen log, 2 Nov 1986, A.Y. Rossman 2957, C. Feuillet & L. Skog (BPI 1107212). PUERTO RICO. Luquillo Mountains, Bisley Watershed, on branch of *Manilkara* sp., 8 May 1995, S.M. Huhndorf 1397, D.J. Lodge PR 2280, & G.J. Samuels (BPI 745420): Plate 33, e, g.

**OPHIONECTRIA** Sacc., *Michelia* 1: 323. 1878.

Lectotype, designated by Seaver (1909a): *O. trichospora*

(Berk. & Broome) Sacc. (= *Nectria trichospora* Berk. & Broome).

Ascomata solitary to aggregated in small groups, hyphal stroma sometimes present, superficial, short ovoid to elongate-ovoid, red-orange to scarlet, KOH+ bay, not collapsing when dry, surface warted; warts of loose, globose, thick-walled, pigmented cells. Asci clavate, apex simple. Ascospores long-fusiform, multiseptate, hyaline, with faint longitudinal striations or smooth. Anamorph, where known, *Antipodium*. On decaying woody substrata.

NOTES.— Saccardo proposed the genus *Ophionectria* with three species of *Nectria*-like fungi having very long, septate ascospores. Rossman (1977) circumscribed the genus based on the ascomatal wall structure, the long fusiform ascospores, and the unusual anamorph and retained only the type species. One other species has been added to the genus since then, namely *O. magniverrucosa* Rossman (1983).

**Ophionectria trichospora** (Berk. & Broome) Sacc., *Michelia* 1: 323. 1878. — Plate 22, j, k (page 96); Plate 34, a–c.

= *Nectria trichospora* Berk. & Broome, J. Linn. Soc., Bot. 14: 115. 1873.

= *Tubeufia trichospora* (Berk. & Broome) Petch, Ann. Roy. Bot. Gard. Peradeniya 5: 285. 1912.

= *Calonectria cinnabarina* Henn., *Hedwigia* 36: 220. 1897.

= *Ophionectria cinnabarina* (Henn.) Henn., *Hedwigia* 41: 7. 1902.

= *Calonectria ornata* A.L. Smith, J. Linn. Soc. Bot. 35: 18. 1901.

= *Calonectria theobromae* Pat., in Duss, Énum. Champ. Guadeloupe p. 81. 1903.

= *Ophionectria portoricensis* Chardón, *Mycologia* 13: 285. 1921.

[= *Ophionectria anomala* Petch, Trans. Brit. Mycol. Soc. 27: 143. 1944, non Racib. 1907].

Anamorph: *Antipodium spectabile* Piroz., *Canad. J. Bot.* 52: 1144. 1974.

Ascomata gregarious to scattered, superficial, sometimes seated on a white to bright-yellow subiculum of thick-walled, minutely warted, septate, 5–7.5 µm wide hyphae, each cell swollen at one end. Ascomata ovoid to cylindrical, often truncate at the apex, 400–600 µm high × 250–350 µm diam, red-orange to scarlet, KOH+ dark red, sometimes collapsing laterally when dried; covered with conspicuous, concolorous warts, 25–100 µm high, of loosely compacted, irregularly globose cells, 10–25 µm diam, with thickened, pigmented walls; ascomata often naked toward the apex; ostiole, 45–50 µm diam. Ascomatal wall of two regions: outer region 15–90 µm thick, of large, irregularly globose cells 10–25 µm diam, with thickened, pigmented walls forming a *textura globulosa*; inner region