

spines. Chlamydospores generally present. Most species homothallic. Anamorph, where known, *Acremonium*-like. On herbaceous substrata, isolated from soil.

NOTES.— Within the *Nectriaceae*, *Neocosmospora* most closely resembles *Cosmospora* in having relatively thin-walled, red, KOH+ ascospores, and *Acremonium*-like anamorphs. Unlike *Cosmospora*, *Neocosmospora* species are not fungicolous. Using sequences of 18S and 28S rDNA, Rehner & Samuels (1995) and Spatafora & Blackwell (1993) demonstrated that *Neocosmospora* is closely related to *Haematonectria haematococca* and suggested that the *Acremonium*-like anamorph of *Neocosmospora vasinfecta* is comparable to the microconidial form of a *Fusarium* (O'Donnell, 1996). Most of the *Acremonium*-like anamorphs of species of *Neocosmospora* are morphologically simple and have remained unnamed. *Neocosmospora* as defined herein excludes species having green ascospores and *Penicillifer* anamorphs, which are removed to *Viridispora*. Cannon & Hawksworth (1984) monographed *Neocosmospora* with descriptions and illustrations of five species, to which Udagawa *et al.* (1989) added two species. Species of *Neocosmospora* are commonly isolated from soil and *N. vasinfecta* is known to be plant pathogenic.

***Neocosmospora vasinfecta*** E.F. Sm., U.S.D.A. Div. Veg. Pathol. Bull. 17: 45. 1899. — Plate 33, a–b.

[= *Nectriella tracheiphila* E.F. Sm., Proc. Amer. Assoc. Advancem. Sci. 1895: 190. 1895, nom. inval. (Arts. 32, 34) (as '*trocheiphila*')].

= *Neocosmospora vasinfecta* var. *tracheiphila* E.F. Sm., U.S.D.A. Div. Veg. Pathol. Bull. 17: 45. 1899.

= *Neocosmospora vasinfecta* var. *nivea* E.F. Sm., U.S.D.A. Div. Veg. Pathol. Bull. 17: 45. 1899.

= *Pseudonectria ornata* Bat. & Maia, Anais Soc. Biol. Pernamb. 13: 74. 1955.

= *Neocosmospora vasinfecta* var. *major* Rama Rao, Mycopath. Mycol. Appl. 21: 218. 1963.

[= *Neocosmospora ornamentata* Barbosa, García de Orto 13: 17. 1965, nom. inval. (Art. 37)].

Anamorph: *Acremonium*-like.

Mycelium white to pale buff, floccose, hyphae 1–4(–5)  $\mu\text{m}$  wide, septate, tending to aggregate in strands, anastomosing. Ascospores globose, (200–)300–500  $\mu\text{m}$  high  $\times$  (170–)280–480  $\mu\text{m}$  diam, orange-brown to red, KOH+ dark red, glabrous with an inconspicuous hyphal web at the base, ostiolate, neck (20–)30–70(–100)  $\mu\text{m}$  long, 40–100(–150)  $\mu\text{m}$  diam. Ascospore wall of two regions: outer region pigmented, of thick-walled *textura angularis* with cells 8–20  $\mu\text{m}$  diam; inner region hyaline, of *textura angularis*. Periphyses of verti-

cally oriented rows of hyaline thin-walled cells, evanescent at an early stage. Asci cylindrical, 80–95(–105)  $\times$  10.5–15(–16)  $\mu\text{m}$ , apex simple, 8- (rarely 6–7)-spored, ascospores uniseriate. Ascospores globose to ellipsoid, (9–)10–15.5(–18)  $\times$  (7–)7.5–12(–13.5)  $\mu\text{m}$ , non-septate, hyaline to pale yellow, buff to salmon pink in mass, rugose.

ANAMORPH: Conidiogenous cells elongate-cylindrical (20–)30–100(–150)  $\mu\text{m}$  long, 1–2  $\mu\text{m}$  diam, hyaline, usually arising directly from the vegetative mycelium. Conidia cylindrical to oblong-ellipsoid, sometimes allantoid, 5–13  $\times$  (1.5–)2–3.5  $\mu\text{m}$ , non-septate, hyaline, aggregating in a gummy mass at the apex of the conidiogenous cell. Chlamydospores often present, hyaline to pale yellow, globose to obovoid, terminal or intercalary, smooth, 5–10  $\times$  4–8  $\mu\text{m}$ . Description modified from Cannon & Hawksworth (1984).

HABITAT.— Isolated from soil, also from nematodes, pathogenic on crop plants causing root- and fruit-rots and seedling damping-off of *Cucurbitaceae*, *Fabaceae* (soybean stem rot), *Malvaceae*, *Piperaceae*, and others, and diseases in nurseries (Domsch *et al.*, 1980).

DISTRIBUTION.— Warm temperate and tropical regions.

TYPES.— UNITED STATES. South Carolina: Cameron, on *Gossypium herbaceum*, Oct. 1902, W.A. Orton (BPI 630336, neotype designated by Cannon & Hawksworth, 1984); *ibid.*, Monetta, on *Citrullus vulgaris*, 10 Oct 1904, W.W. Gilbert (BPI 630324 neotype of *N. vasinfecta* var. *nivea*, designated by Cannon & Hawksworth, 1984). BRAZIL. Pernambuco, Recife, on living leaves, 22 Sep. 1955, A. Chaves Batista, Fungos do Brasil no. 2960 (NY, isotype of *Pseudonectria ornata*).

ILLUSTRATIONS.— Cannon & Hawksworth (1984, Figs. 1–5, 7–10); Carris & Glawe (1989, Figs. 322–328, Fig. 422); Domsch *et al.*, 1980, Fig. 215; Rossman *et al.* (1993, Fig. 29); Smith (1899, Pl. 1–3, 5).

NOTES.— *Neocosmospora vasinfecta* was originally described as the cause of a wilt disease of cotton, watermelon, and cowpea. This fungus has since been associated with a variety of vascular plants and isolated from soil and soil environments e.g. infecting nematodes and as a saprobe on roots.

ADDITIONAL TAXA OF *NECOSMOSPORA*:

***Neocosmospora boninensis*** Udagawa, Horie & P. Cannon, Sydowia 41: 350. 1989.

Anamorph: *Acremonium*-like.

HABITAT.— Isolated from forest soil.

DISTRIBUTION.— Japan, known only from the type (ex-type CBS 446.93).

***Neocosmospora indica*** Wadhvani, Indian Bot. Reporter 2 (1983): 158. 1984.

Anamorph: *Acremonium*-like.

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.— Educador: 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*