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Addition and reexamination of Japanese species belonging to the genus *Cercospora* and allied genera. IV. Newly recorded species from Japan (1)

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Abstract In the fourth report of the present series, five species of the genus *Cercospora* and allied genera were added to the Japanese fungus flora: *Cercospora brunckii* Ellis et Galloway, *C. richardiaecola* Atkinson, *Pseudocercospora annonicola* Hsieh et Goh, *P. xenosyzygiicola* Crous, and *P. celosiarum* (Kar et Mandal) Deighton. Three species names recorded in the early report were revised based on their nomenclature.

Key words *Cercospora* · New records · *Pseudocercospora*

Introduction

In recent years, taxonomic reexamination of *Cercospora* and allied genera has been carried out throughout the world. Katsuki (1965) wrote a monograph on Japanese *Cercospora* including 226 species based on Chupp's old criteria. Since his work, no critical studies have been done on Japanese species of *Cercospora* and allied genera based on Deighton's new criteria. Moreover, many species belonging to these genera have to be added to Japanese fungus flora. In this article, 5 species are described as newly added species to the Japanese fungus flora.

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1. *Cercospora brunckii* Ellis et Galloway, J. Mycol. 6:33, 1890 (Saccardo, Sylloge Fung. 10:620, 1892); Chupp, A monograph of the fungus genus *Cercospora* (M.C.): 240, 1953. Figs. 1, 6a,b

Synonym: *Cercospora pelargonii* Mendoza, Philipp. J. Sci. 75:176, 1941 (fide Chupp 1953).

Leaf spots at first as small brown dots, later becoming large and circular or irregular, white with brown border and 2–5 mm in diameter. Conidiomata amphigenous. Stromata consisting of large brown cells. Conidiophores loosely fasciculate, straight, occasionally geniculate, brown with distinct and thickened conidial scars at their shoulders, 12–150 × 2–2.5 μm. Conidia hyaline, acicular, smooth, with thickened and truncate basal end, 35–380 × 2–5 μm.

Host: *Pelargonium* sp. (Zeranium).

Disease name: Circular leaf spot (Japanese name: Maruhoshi-byo).

Specimen examined: Kitamihara, Wada-machi, Chiba Prefecture, September 19, 1998, by S. Uematsu (SU) and C. Nakashima (CN).

2. *Cercospora richardiaecola* Atkinson, J. Elisha Mitchell Sci. Soc. 8:51, 1892 (Saccardo, Sylloge Fung. 10:653, 1892); Chupp, M.C.: 60, 1953; Crous and Braun, Mycotaxon 57:305, 1996. Figs. 2, 5a, 6c,d

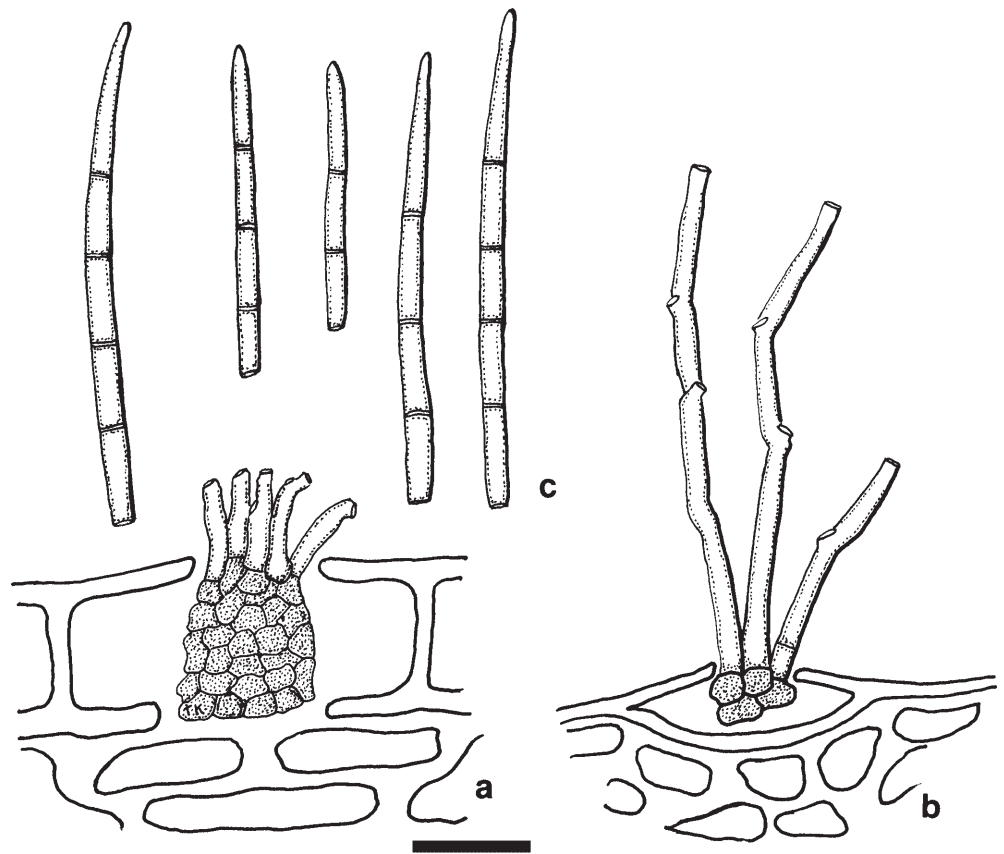
Leaf spots spindle-form, white to gray at the center with reddish-brown border, confluent, occasionally bored, 5–10 mm. Conidiomata amphigenous and mainly hypophyllous. Stromata pale brown, composed of a few large brown cells or large masses (30–55 μm in diameter) without external hyphae. Conidiophores arising from the upper part of stromata, densely fascicular, pale brown, multiseptate, simple, straight with thickened conidial scars at shoulders, 25–52.5 × 3.8–5 μm. Conidia obclavate to acicular with multisepta, hyaline, smooth, with thickened basal end and acute head, 50–300 × 3.8–5 μm.

Disease name: Brown leaf spot (Japanese name: Kappan-byo).

Host: *Zantedeschia* sp. (Kara).

Fig. 1. *Cercospora brunckii*.

a Stroma and conidiophores on upper leaf surface. **b** Stroma and conidiophores on lower leaf surface. **c** Conidia. Bar 20 µm



Specimen examined: Nakaseiwa, Kimitsu-shi, Chiba Prefecture, August 1997 by T. Kobayashi (TK) and CN; September 18, 1998, by SU and CN.

Note: On *Zantedeschia*, only *Cercospora callae* Peck et Clinton has been reported, except *C. richardiaeicola*. *Cercospora callae* is different from the present fungus in its geniculate or sinuous conidiophores and wide and short conidia.

This species is recorded on the genera *Anthurium*, *Epipremnum*, and *Zantedeschia* in araceous plants from North America (USA), Central America (Puerto Rico, Guatemala), West Indies, and Africa (South Africa) (Alfieri et al. 1984; Chupp 1953; Doidge 1950; Farr et al. 1989; Stevenson 1975). This is the first record of *Cercospora richardiaeicola* from Asia.

3. *Pseudocercospora annonicola* Hsieh et Goh, *Cercospora* and similar fungi from Taiwan: 22, 1990; Guo and Hsieh, The genus *Pseudocercospora* in China: 16, 1995.

Figs. 3, 5b,c, 6e,f

Leaf spots amphigenous, irregular, 5–20 mm, primarily dark brown, later gray with brown border. Spots on seriously attacked fruits black with pale grayish white conidial masses, 5–30 mm in diam. Conidiomata on leaf amphigenous. Stromata distinct, olive to pale olivaceous brown with external hyphae, up to 50 µm in diameter. Conidiophores arising from the upper part of stromata as dense

fascicle or from external hyphae as solitary branch, pale olive, occasionally branched with unthickened conidial scars, 15–30 × 2–2.5 µm. Conidia hyaline to pale olivaceous, cylindrical to obclavate, smooth, straight, or slightly curved with unthickened and truncate scars, 20–50 × 2–2.5 µm and 2–8 septated.

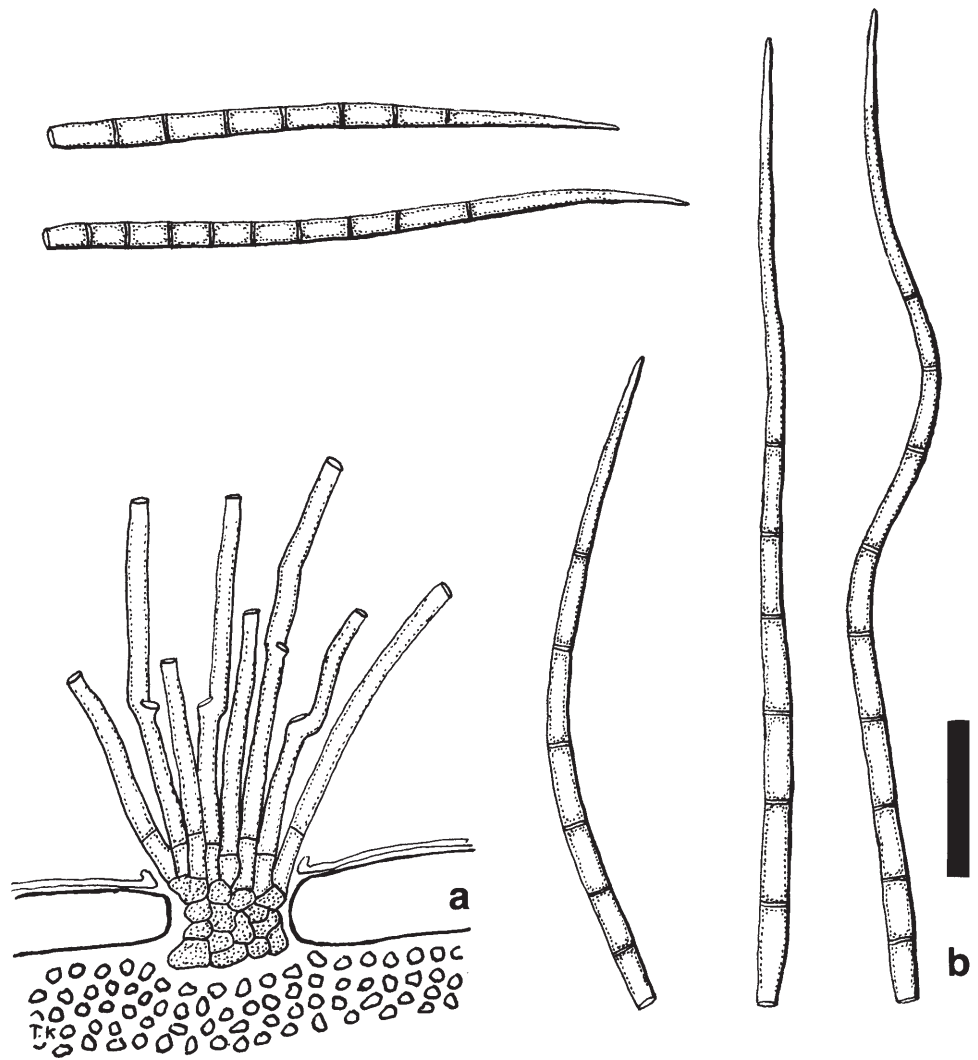
Host: *Annona atemoya* Hort. et Wester. (Atemoya).

Disease name: Sooty spot (Japanese name: Susukabi-byo).

Specimen examined: Okinawa Agriculture College, Nago, Okinawa Prefecture, November 1999, by K. Uehara (KU); March 29, 2000, by CN and KU.

Note: On *Annona*, four species of the genus *Cercospora* and related genera have been known. *Pseudocercospora annonicola* was described by Hsieh and Goh (1990) from Taiwan. Guo and Hsieh (1995) noted distinguishing points between the present species and the other species on *Annona*. The differences are *Cercospora caracasensis* Chupp et Muller on *A. purpurea* differs from this species in its angular leaf spots, epiphyllous conidiomata, and wider conidia. *Cercospora annonae* Muller et Chupp on *A. squamosa* differs in its longer conidiophores (20–110 µm), and cylindrical, longer, and wider conidia (50–150 × 5–6 µm). *Cercospora oblecta* Sydow on *A. senegalensis* differs in its darker, longer, and wider (40–120 × 4–4.5 µm) conidia. *Cercospora scitula* Sydow on *A. senegalensis* differs in having hypophyllous and dark conidiomata, brown, longer, and wider conidiophores (60–220 × 4–6 µm) and conidia (50–110 × 5–8 µm).

Fig. 2. *Cercospora richardiaeicola*.
a Stroma and conidiophores.
b Conidia. Bar 20µm



4. *Pseudocercospora xenosyzygiicola* Crous, Mycol. Res. 103:618, 1999. Fig. 4, 5d, 6g,h

Synonym: *Cercospora eugeniae* Sawada (nom. illeg.), Taiwan Agric. Res. Inst. Rep. 85:104, 1943.

Leaf spots reddish-brown to brown with indistinct border, irregular, often confluent, 5–20mm. Stromata epiphyllous, olive, 25–55µm in diameter. Conidiophores arising from the upper part of stroma, rough to smooth, simple or occasionally branched, loose to dense fascicle, pale olive to olive, 7–47 × 2.5–3.8(–5)µm. Conidia cylindrical to obclavate with 1–7 septa, smooth, pale to pale brown, straight, 15–60 × 2–3.8µm. Basal end of conidia truncate without thickening.

Host: *Eugenia javanica* Lam. (Renbu).

Disease name: Brown spot (Japanese name: Kappanbyo).

Specimen examined: Okinawa, Okinawa Prefecture, March 7, 1998 by TK and CN.

Note: On *Eugenia* (Myrtaceae), many species of *Cercospora* and allied genera have been described, and are sometimes causing confusion. *Cercospora eugeniae* Sawada (nom. illeg.) (Sawada 1943) was treated as a synonym of *C.*

eugeniae (Rangel) Chupp based on Sawada's original description and the illustration by Chupp (1953). Thereafter, Hsieh and Goh (1990) and Dianese et al. (1993) described that *C. eugeniae* (Rangel) Chupp would have to be treated as *Pseudocercospora*. Crous et al. (1997) proposed that *Cercospora eugeniae* Chupp, *C. eugeniae* (Rangel) Chupp, *C. eugeniae* (Rangel) Chantarasrikul et Puckdeedindan, *Cercosporina sphaerellae eugeniae* (Rangel) Saccardo, and *Cercospora eugeniae* Sawada were synonyms of *Pseudocercospora sphaerellae-eugeniae* (Saccardo) Crous of the anamorph stage of *Mycosphaerella eugenicola* Crous (Crous et al. 1997). Afterward, Crous found the conidiomata on the holotype specimen of *C. eugeniae* Sawada. It was quite distinct from the obclavate conidia of *P. sphaerellae-eugeniae*. As Sawada's epithet was never validly published, Crous (1999) newly treated Sawada's species as *Pseudocercospora xenosyzygiicola* nom. nov. A fresh Japanese sample on *Eugenia* from Japan was identified as *P. xenosyzygiicola* Crous based on its accordance of their morphological characteristics except multiseptated (1–7) conidia and the host plant (Table 1).

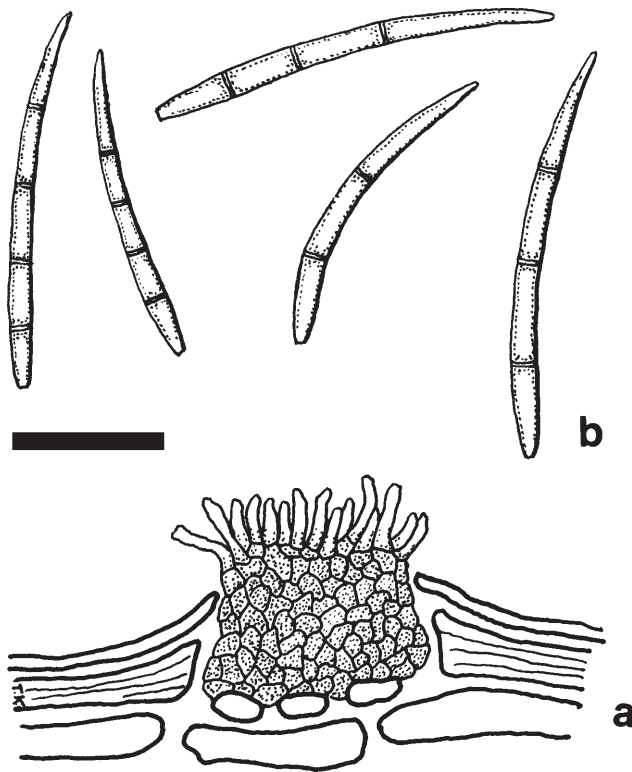


Fig. 3. *Pseudocercospora annonicola*. a Stroma and conidiophores. b Conidia. Bar: 20µm

5. *Pseudocercospora celosiarum* (Kar et Mandal) Deighton, Mycol. Pap. 140:141, 1976.

Basionym: *Cercospora celosiarum* Kar et Mandal, Trans. Br. Mycol. Soc. 54:423, 1970.

Leaf spots angular to irregular, brown. Conidiomata amphigenous with distinct mycelial mat on the lower surface of leaves. Stromata small, composed from a few brown large cells with external hyphae. Conidiophores arising from stromata or external hyphae, loose fascicle, simple, pale brown, straight or geniculate, 20–75 × 2.5–3µm. Conidial scars unthickened. Conidia acicular, smooth, pale to pale brown, with truncate and thin basal end, 30–90 × 2.5–3µm, 3–8 septated.

Host: *Celosia cristata* L. (Keito).

Specimen examined: Soeda-machi, Tagawa-gun, Fukuoka Prefecture, September 13, 1949, by S. Katsuki (SK-2401 and 2278).

Note: The specimen cited above was identified and published by Katsuki (1965) as *Cercospora celosiae*. However, conidia of *C. celosiae* have distinct thickened scars and are hyaline (Hsieh and Goh 1990). The specimen bore brown conidia with unthickened scars.

Supplement

The authors have described *Cercospora* and its allied genera in the present series (Nakashima and Kobayashi 2000; Nakashima et al. 1999). In the previous series, there

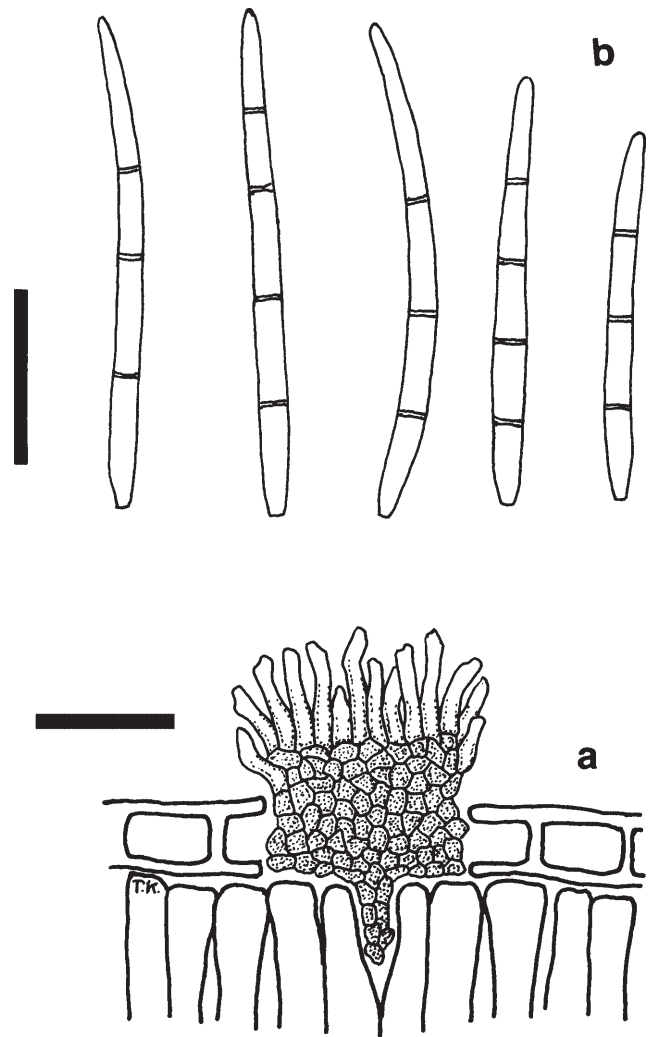


Fig. 4. *Pseudocercospora xenoszygicicola*. a Stroma and conidiophores. b Conidia. Bars 20µm

were some flaws of nomenclature. These specific names are recognized as a later homonym. Hence, in this supplement, these species are redescribed as nomen nova.

Pseudocercospora chionanthicola Nakashima et Kobayashi, nom. nov.

Basionym: *Cercospora chionanthi-retusi* Togashi et Katsuki, Sci. Rep. Yokohama Natl Univ. Sec. II. 1:1, 1952.

Synonym: *Pseudocercospora chionanthi-retusi* (Togashi et Katsuki) Nishijima, Nakashima et Kobayashi, in Nakashima et al., Mycoscience 40:270, 1999 (non-*P. chionanthi-retusi* Goh et Hsieh in Hsieh and Goh 1990).

Note: *Pseudocercospora chionanthi-retusi* (Togashi et Katsuki) Nishijima, Nakashima et Kobayashi (Nakashima et al. 1999) was a later homonym of *P. chionanthi-retusi* Goh et Hsieh in Hsieh and Goh (1990). Hsieh and Goh (1990) suggested that the fungus was synonymous with *Cercospora chionanthi-retusi* Togashi et Katsuki. If both fungi are the same species, their species epithet is illegal. If not, the species epithet has priority in the genus *Pseudocercospora*. Therefore, transferring of *Cercospora chionanthi-retusi* Togashi et

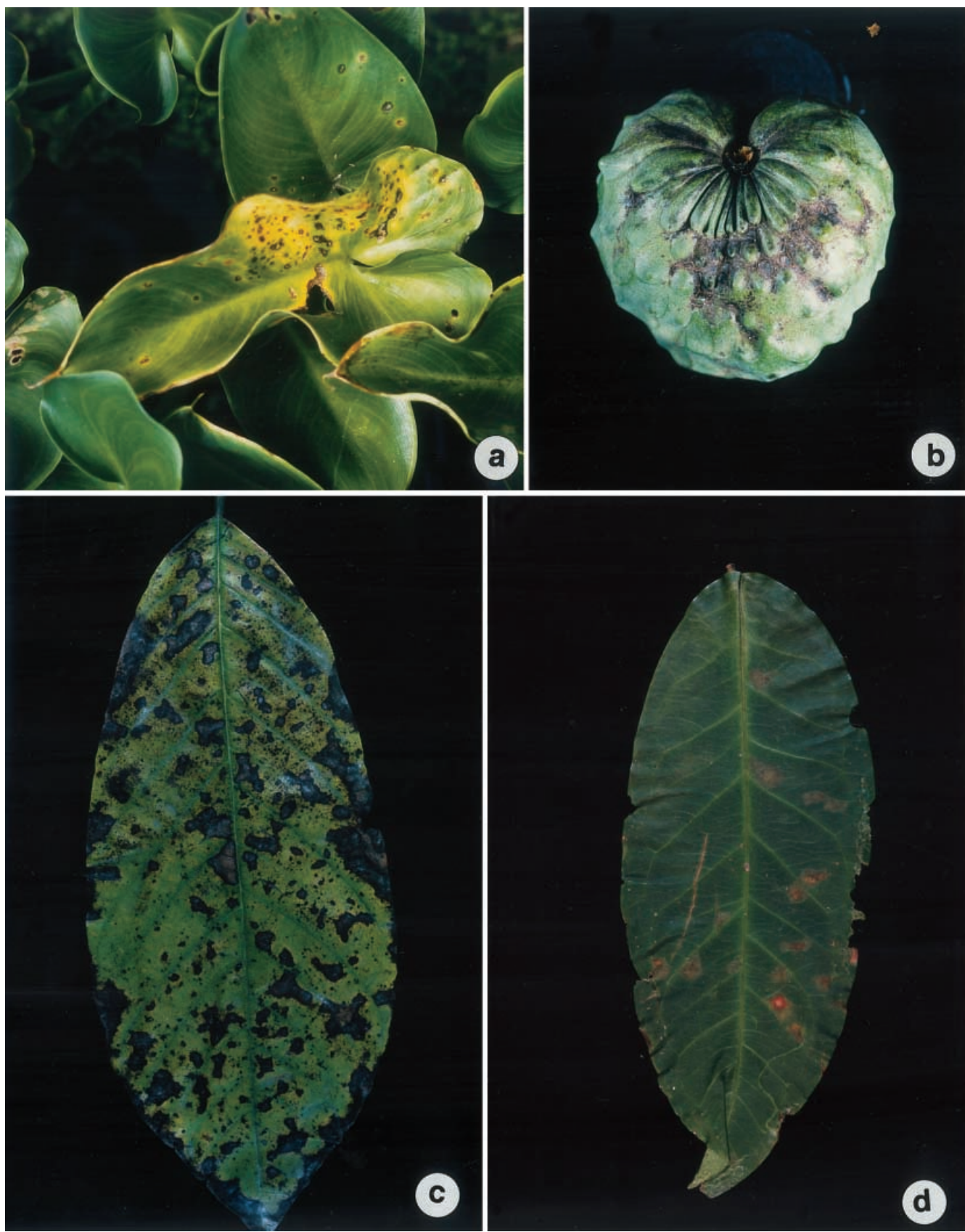


Fig. 5. Disease symptoms. **a** Leaf spots on *Zantedeschia* sp. **b,c** Spots on fruit and leaf of *Annona atemoya*. **d** Leaf spots on *Eugenia javanica*

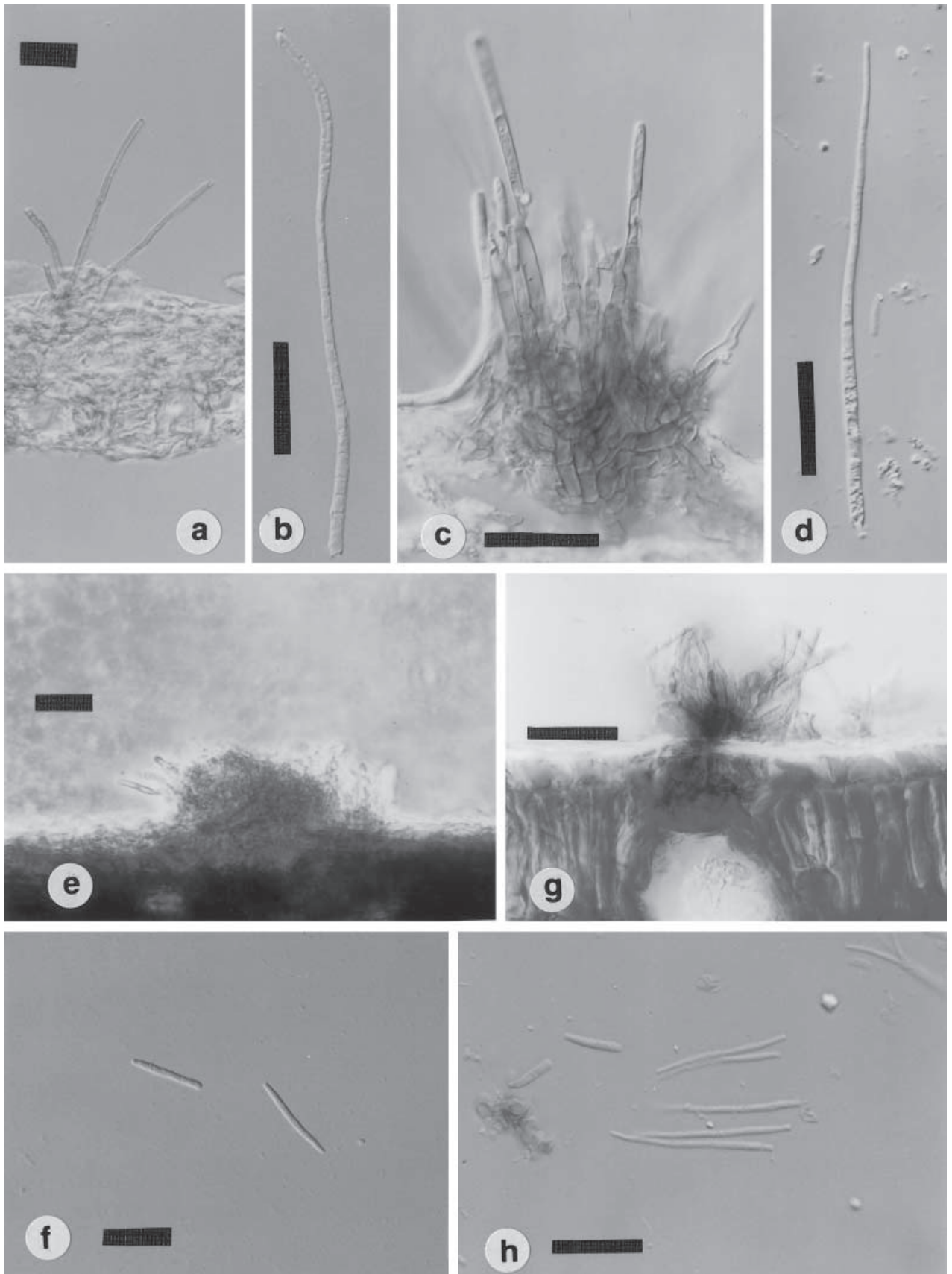


Fig. 6. *Cercospora brunckii* (a,b); *Cercospora richardiaecola* (c,d); *Pseudocercospora annonicola* (e,f); *Pseudocercospora xenosyzygiicola* (g,h). a, c, e, g Stromata and conidiophores. b, d, f, h Conidia. Bars 20µm

Table 1. Morphological characteristics of *Cercospora* and allied genera on *Eugenia*

Species (host plants)	Leaf spots (size, mm)	Stromata (diameter, µm)	Conidiophores (size, µm)(scar)	Conidia (size, µm)(scar)	References
<i>Pseudocercospora xenosyzygicola</i> Crous (<i>Syzygium samarangense</i> = <i>Eugenia javanica</i>)	Irregular, reddish-brown to brown with indistinct border, often confluent (5–20) Irregular to subcircular, light brown with dark brown toward a raised border (–6)	Epiphyllous, olive (25–55), without external hyphae Brown (–60)	Pale olive to olive, simple, occasionally branched, loose to dense fascicle (7–47 × 2.5–3.8) (unthickened) Light brown, finely verruculate, loose fascicle, unbranched (15–30 × 3.5–6 without conidiogenous cell (15–20 × 3.5–60)) Short, 0–1-septate, pale brown (18–39 × 3)	Pale to pale brown, cylindrical to obclavate, smooth, 1–7 septate (15–60 × 2–3.8) (thin) Olivaceous, smooth, cylindrical, base subtruncate, 1–4 septate (25–45 × 2–3)	The authors Crous (1999)
<i>C. eugeniae</i> Sawada (<i>Eugenia javanica</i>)	Dark brown, angular grayish-white with raised brown border center (2–10)	(26–70)	Loose fascicle, light medium brown, finely verruculate, not branched (30–70 × 4–7 and without conidiogenous cell: 20–40 × 4–6) (unthickened)	Straight or curved, cylindrical to obclavate, pale colored, 3 septate (26–41 × 2.5)	Sawada (1943)
<i>P. sphaerellae-eugeniae</i> (Sacc.) Crous (<i>Eugenia uniflora</i>)	Irregular to subcircular, medium brown with red-brown (2–5)	—	Fasciculate, olivaceous, smooth (15–30 × 3–5 without conidiogenous cell: 12–22 × 2.5–3.5)	Medium to light brown, finely verruculate, subcylindrical to narrowly obclavate, 1–3 septate (30–90 × 2–5)	Crous et al. (1997)
<i>P. syzygicola</i> Sutton et Crous (<i>Syzygii cardani</i>)	Irregular, vein-limited, confluent, light brown on upper surface, darker on the lower surface (2–4)	Medium brown, with external mycelium (20–40)		Pale olivaceous, smooth, cylindrical, truncate base, 1–11 septate (40–80 × 2–3)	Sutton and Crous (1997)

Katsuki to the genus *Pseudocercospora* with its specific epithet is illegitimate. For these reasons, a new specific epithet, *chionanthicola*, is given.

Pseudocercospora horii Nakashima et Kobayashi, nom. nov.

Basionym: *Cercospora paulowniae* Hori, in Hara, Jikken-Jumoku-Byogai-Hen (Manual of Tree Diseases) 116, 1927.

Synonym: *Pseudocercospora paulowniae* (Hori) Nakashima et Kobayashi, in Nakashima et al., Mycoscience 40:275, 1999 (non *P. paulowniae* Goh et Hsieh, in Hsieh and Goh 1990).

Note: *Pseudocercospora paulowniae* (Hori) Nakashima et Kobayashi (Nakashima et al. 1999) was the later homonym of *P. paulowniae* Goh et Hsieh in Hsieh and Goh 1990. Based on the reason described in the former species, a new specific epithet, *horii*, is given.

Pseudocercospora neophrymae Nakashima et Kobayashi, nom. nov.

Basionym: *Cercospora phrymae* Naito, Bull. Kagoshima Agric. Coll. Jpn 15:36, 1949.

Synonym: *Pseudocercospora phrymae* Nakashima et Kobayashi, Mycoscience 41:26, 2000.

Note: *Cercospora phrymae* Naito and *Pseudocercospora phrymae* Liu et Guo (in Guo and Liu 1991) are identical on the basis of their symptoms and morphological characteristics. However, in the genus *Pseudocercospora*, *Pseudocercospora phrymae* Liu et Guo has priority to *P. phrymae* (Naito) Nakashima et Kobayashi. Therefore, a new specific epithet, *neophrymae*, is given to this fungi.

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