

Taxonomic Studies on *Cercospora* and Allied Genera in Korea (VI)

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한국산 *Cercospora* 및 관련 속의 분류학적 연구 (VI)

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ABSTRACT: This paper is the sixth contribution towards taxonomic studies on *Cercospora* and allied genera, and contains ten species of Korean cercosporoid fungi; viz., *Cercospora apii*, *C. aristolochiae-contortae*, *C. violae*, *Neoramularia bidentis*, *Phaeoramularia weigelicola*, *Pseudocercospora cantuariensis*, *P. cydoniae*, *P. profusa*, *Pseudocercospora sublineolata*, and *Ramularia plantaginis*. Morphological characteristics of taxonomic value are described and illustrated for these species to contribute towards a mycological monograph of Korean cercosporoid fungi.

KEYWORDS: *Cercospora*, *Neoramularia*, *Phaeoramularia*, *Pseudocercospora*, *Pseudocercospora*, *Ramularia*, Monograph

In previous contributions of this series (Kim and Shin, 1998a, 1998b, 1998c, 1998b, 1999), 50 cercosporoid fungi from Korea including 19 species belonging to *Cercospora*, one to *Cercospora*, one to *Distocercospora*, two to *Mycovellosiella*, four to *Passalora*, one to *Phacellium*, one to *Phaeoisariopsis*, 12 to *Pseudocercospora*, two to *Pseudocercospora*, and seven *Ramularia* have been reported. In the present paper, based on Korean specimens, ten cercosporoid fungi, namely three species belonging to *Cercospora*, one to *Neoramularia*, one to *Phaeoramularia*, three to *Pseudocercospora*, one to *Pseudocercospora*, and one to *Ramularia* are described and illustrated, respectively. The specimens examined are preserved at the mycological herbarium (SMK) of the Department of Agricultural Biology, Korea University, Seoul, Korea.

Descriptions

1. *Cercospora apii* Fresen., Beitr. Mykol. 3: 91 (1863) Fig. 1
= *Cercospora penicillata* var. *apii* Fuckel, Hedwigia 2:
132 (1863)

Leaf spots amphigenous, scattered to confluent, distinct, circular to irregular, small to fairly large, 2~6 mm diam., or up to 15 mm when confluent, greyish to dark brown with narrow darker margins. **Caespituli** amphigenous, but mostly hypophyllous. **Mycelium** internal, hyphae septate, branched, hyaline. **Stromata** small, rudimentary to slightly

developed, composed of several swollen, brown hyphal cells. **Conidiophores** 5~20 in a divergent fascicle, olivaceous brown throughout, or paler upwards, 1~4-septate, straight to slightly curved, 1~3 times mildly geniculate, sometimes once abruptly geniculate, not branched, 30~176×3.5~6.0 μm; conidial scars small but conspicuous, apical or on shoulders of conidiogenous cells caused by geniculation. **Conidia** solitary, acicular-filiform, substraight to mildly curved, hyaline, 5~18-septate, non-constricted at the septa, subobtuse to subacute at the apex, subtruncate to obconically truncate at the base, 30~170×3.5~6.0 μm; hilum large and conspicuously thickened, darkened, and non-protuberant.

Habitat: On living leaves of *Apium graveolens* L. (Umbelliferae).

Specimen examined: SMK 12541 (18 VIII 1993, Pyongchang).

Distribution: Worldwide where the crop is cultivated, including China, Japan, Korea and Taiwan.

Notes: Nakata and Takimoto (1928) first reported this fungus from Korea, and Cho *et al.* (1997) added a short morphological note. Chupp (1954) published the following characters of *Cercospora apii*: Conidiophores (25~300×4~6.5 μm) long and rarely branched, conidia (25~315×3~6 μm) long and acicular, with truncate bases. Japanese materials have been described with olivaceous, cylindrical to acicular-obclavate conidia (Katsuki, 1965), and Indian collections with obclavate and subhyaline conidia (Vasudeva, 1961). The characters indicated by these two previous authors somewhat differ from our fungus. The Korean col-

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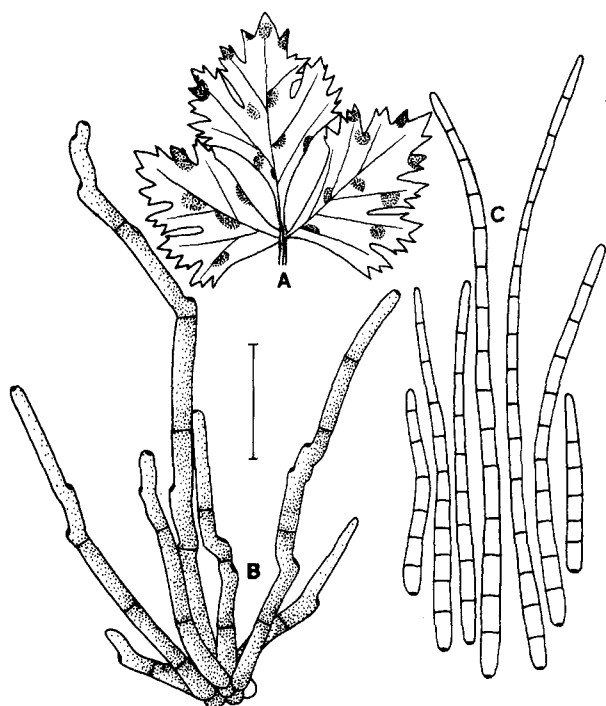


Fig. 1. *Cercospora apii*. (A) Leaf spots on the upper leaf surface of *Apium graveolens* (0.4 \times). (B) Conidiophores. (C) Conidia. Bar=30 μ m.

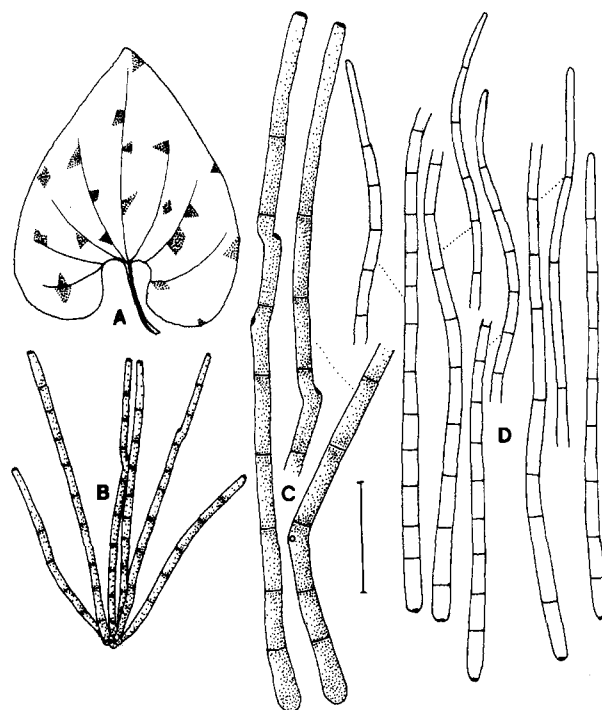


Fig. 2. *Cercospora aristolochiae-contortae*. (A) Leaf spots on the upper leaf surface of *Aristolochia contorta* (0.5 \times). (B) and (C) Conidiophores. (D) Conidia. Bar=30 μ m (but 75 μ m for B).

lection agrees well with Chupp's description (1954). Chupp (1954) listed several varieties of *C. apii*, which he considered to be separate species in their own right. These have been treated elsewhere, as *Cercospora carotae* (Pass.) Kazn. & Siemaszko and *Passalora pastinacae* (Sacc.) U. Braun. Pons and Sutton (1988) mentioned that *C. apii* is not restricted to genera of the Umbelliferae. They concluded that this species is very variable, and the length of conidiophores and conidia can be strongly influenced by changes in the relative humidity, temperature and light conditions. According to Braun (in litt.), there are new unpublished inoculation experiments and molecular investigations indicating that *C. apii* belongs to a polyphagous, weakly pathogenic complex with very wide host range. But the whole complex is complicated, and very numerous names are involved. Comprehensive investigations are necessary for final conclusions. Hence, at present, it seems to be the best way to maintain the traditional taxonomy of the taxa concerned.

2. *Cercospora aristolochiae-contortae* H.D. Shin & U. Braun, Mycotaxon 58: 158 (1996) Fig. 2

Leaf spots amphigenous, scattered, often confluent, distinct, angular, vein-limited, 1–5 mm diam., blackish brown without definite margins. **Caespituli** hypophyllous. **Mycelium** internal, hyphae septate, branched, hyaline.

Stromata small, rudimentary to slightly developed, composed of a few swollen, brown hyphal cells. **Conidiophores** 3–10 in a divergent fascicle, uniformly olivaceous brown or paler towards the upper portion, 4–10-septate, straight to sometimes slightly curved, usually not geniculate, but occasionally 1–2 times slightly geniculate, not branched, 150–380 \times 4.0–5.5 μ m; conidial scars large, conspicuous, apical and on shoulders of conidiogenous cells caused by geniculation. **Conidia** solitary, filiform to somewhat acicular, straight or curved to undulate, hyaline, 7–19-septate, non-constricted at the septa, obtuse to subobtusate at the apex, truncate to subtruncate at the base, 120–440 \times 3.5–5.0 μ m; hilum large and conspicuously thickened, darkened, and non-protuberant.

Habitat: On living leaves of *Aristolochia contorta* Bunge (Aristolochiaceae).

Specimen examined: SMK 13034 (20 IX 1994, Chunchon) (holotype).

Distribution: Only known from type locality, Korea.

Notes: Shin and Braun (1996) first recorded this fungus with detailed morphological description and illustration from Korea. They described that the conidiophores (160–340 μ m) are somewhat longer, straight or slightly geniculate, and conidia are filiform to acicular with truncate bases, not or hardly attenuated. Chupp (1954) published several *Cercospora* species from *Aristolochia* spp. as *Cercospora olivascens* Sacc., *C. guttulata* Ellis & Kellerm., *C.*

serpentaria Ellis & Everh., and *C. bangalorensis* Thirum. & Chupp. *C. olivascens* is similar to this species, but distinguished from it by having shorter (50~200 μm long), strongly and densely geniculate conidiophores, and shorter (35~150 μm long), obclavate-cylindric, rarely acicular conidia with obconically truncate bases. *C. guttulata* is characterized by very short conidiophores (5~20 μm long) and subhyaline, obclavate conidia with rounded bases. *C. serpentaria* differs from the present species in having large stromata (70 μm diam.), shorter conidiophores (50~100 μm long) and pale yellowish olivaceous, clavate to obclavate-cylindric conidia (30~80 \times 3.0~4.5 μm). *C. bangalorensis* [= *Pseudocercospora bangalorensis* (Thirum. & Chupp) Deighton] is also clearly different from our fungus in many respects (cf. Deighton, 1976).

3. *Cercospora violae* Sacc., Nuov. Giorn. Bot. Ital. 8: 187 (1876) Fig. 3

- = *Cercospora violae-sylvaticae* Oudem., Versl. en. Meded. d. k. Ak. v. Afd. Naturk. 3, Reeks. 7: 323 (1890)
- = *Cercospora violae-tricoloris* Briosi & Cavara, Atti Ist. Bot. Pavia. 2: 285 (1892) and Hedwigia 31: 143 (1892)
- = *Cercospora violae* var. *minor* Rota-Rossi, Atti Ist. Bot. Pavia. Ser. 2. 13: 199 (1914)
- = *Cercospora trinctatis* Pass., in litt.
- = *Cercospora violae-kiusianae* Sawada, Taiwan Agric. Res. Inst. Rept. 85: 126 (1943) (nomen non rite publicatum, sine descriptione latina)
- = *Cercospora difformis* Tehon, Mycologia 40: 322 (1948)

Leaf spots amphigenous, scattered, rarely confluent, distinct, circular to subcircular, 1~4 mm diam., pale tan to grey, centre with or without narrow brown margins. **Caespituli** amphigenous. **Mycelium** internal, hyphae septate, branched, hyaline. **Stromata** small, rudimentary to slightly developed, composed of a few swollen, brown hyphal cells. **Conidiophores** 3~20 in a divergent fascicle, emerging through the cuticle, uniformly olivaceous brown or paler upwards, 2~6-septate, straight to slightly curved, usually 2~6 times mildly geniculate, but occasionally 1~2 times abruptly geniculate above the middle part, not branched, 30~190 \times 3.5~5.5 μm ; conidial scars large, conspicuous, apical or on shoulders of conidiogenous cells caused by geniculation. **Conidia** solitary, filiform to acicular, straight to mildly curved, hyaline, 3~16-septate, non-constricted at the septa, subobtuse to subacute at the apex, truncate to subtruncate at the base, greatly variable in length, 45~220 \times 3.0~5.0 μm ; hilum large and conspicuously thickened, darkened, and non-protuberant.

Habitat: On living leaves of *Viola hondoensis* W. Becker & H. Boiss, *V. mandshurica* W. Becker, *V. patrinii* DC., *V. rossii* Hemsl., *V. selkirkii* Pursh, and *V. verecunda* A.

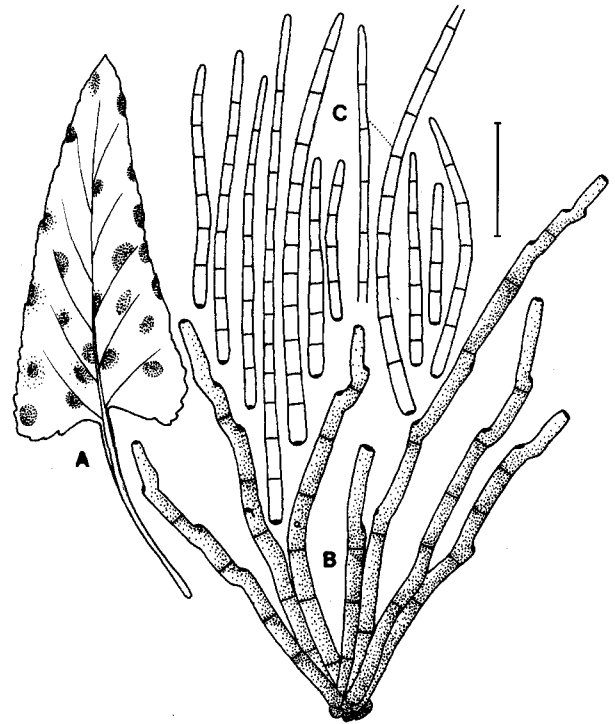


Fig. 3. *Cercospora violae*. (A) Leaf spots on the upper leaf surface of *Viola patrinii* (0.6 \times). (B) Conidiophores. (C) Conidia. Bar=30 μm .

Gray (Violaceae).

Specimens examined: On *Viola hondoensis*, SMK 11460 (6 XI 1991, Kangnung); On *V. mandshurica*, SMK 13732 (30 X 1996, Suwon); On *V. patrinii*, SMK 13020 (14 IX 1994, Chongju), 13734 (30 X 1996, Suwon), 13922 (4 VI 1997, Suwon), 14458 (23 X 1997, Suwon), 15057 (8 IX 1998, Suwon); On *V. rossii*, SMK 10649 (31 X 1990, Kangnung), 13206 (25 X 1994, Kangnung); On *V. selkirkii*, SMK 12972 (7 IX 1994, Kangnung); On *V. verecunda*, SMK 10838 (4 VII 1991, Kangnung).

Distribution: Worldwide where the plants are growing, including China, Japan, Korea and Taiwan.

Notes: Shin and Braun (1993) first listed this fungus from Korea, and Shin (1998) provided a brief morphological description. Chupp (1954) mentioned that *Cercospora violae-tricoloris* Briosi & Cavara and *C. violae* var. *microcarpa* Bres. differ from the present species in having slightly different conidiophores and somewhat darker coloured conidiophores, respectively. He discussed *C. violae-sylvaticae* Oudem. and referred it to *Ramularia*, although he did not see any original material of this species. According to the original description, *C. violae-sylvaticae* is undoubtedly not identical with the *Ramularia* and belongs to *C. violae* (Braun, 1998).

4. *Neoramularia bidentis* H.D. Shin & U. Braun, Mycotaxon 49: 352 (1993) Fig. 4

Leaf spots amphigenous, scattered to confluent, marginal, distinct, subcircular to somewhat irregular, 2~10 mm diam., or up to 20 mm when confluent, at first dark purplish brown spots, later becoming yellowish brown, centre with dark purplish margins. **Caespituli** chiefly hypophyllous, usually on veins. **Mycelium** internal, hyphae septate, branched. **Stromata** absent, rudimentary to poorly developed. **Conidiophores** solitary or 3~6 in a loose fascicle, erumpent through the cuticle, straight to curved, mostly not branched, but very rarely branched, hyaline, 0~2-septate, cylindrical with slightly bulbous at the basal portion, usually somewhat attenuated towards the apex, 10~45×3.5~5.5 μm , but up to 7 μm wide at the very base; conidial scars inconspicuous. **Conidia** solitary or catenate, cylindrical to subcylindrical-fusiform, hyaline, 0~2-septate, non-constricted but appeared deeply constricted in catenate spores, subobtuse at the apex, subobconic to subtruncate at the base, 10~35×3.5~6.0 μm ; hilum unthickened, and not darkened.

Habitat: On living leaves of *Bidens tripartita* L. (Compositae).

Specimens examined: SMK 11797 (22 VII 1992, Kangnung), 11888 (29 VIII 1992, Kangnung)(holotype), 11985 (3 IX 1992, Kangnung), 13066 (25 IX 1994, Kangnung), 13956 (14 VI 1997, Seoul).

Distribution: Only known from type locality, Korea.

Notes: Shin and Braun (1993) recorded this fungus as new species from Korea, and described the following

characters of the present fungus: Conidiophores (20~32×4 μm) solitary or arranged in small groups, conidia (10~34×3.5~5 μm) cylindrical to fusiform, conidial scars inconspicuous and unthickened. Braun (1991) introduced the genus *Neoramularia* for *Ramularia*-like species with unthickened, inconspicuous conidial scars. Therefore, this fungus was described in *Neoramularia*. Some Korean specimens (SMK 13066, 13956) are in accordance with SMK 11888 (holotype), although conidiophores are not branched. Shin and Braun (1993) distinguished it from all known *Neoramularia* species by its predominantly solitary conidiophores, erumpent through the cuticle. *Ramularia concomitans* Ellis & Holw. on *Bidens* spp. (Braun, 1998) is morphologically similar to this species, but differs from it in having very small and somewhat thickened conidial scars.

5. *Phaeoramularia weigelicola* U. Braun & H.D. Shin, Mycotaxon 58: 163 (1996)

Fig. 5

≡ *Ramularia weigeliae* Speg., Michelia 1: 475 (1879)

non *Phaeoramularia weigeliae* Y.L. Guo & X.J. Liu, in Guo, Acta Mycol. Sinica, Suppl. 1: 342 (1986)

Leaf spots amphigenous, indistinct to distinct, scattered to confluent, sometimes vein-limited, angular to irregular, 2~5 mm diam., greyish brown to greyish white, light brown centre with dark purplish brown to dark brown margins. **Caespituli** hypophyllous. **Mycelium** internal, hyphae septate, branched, hyaline to subhyaline, 2~4 μm wide. **Stromata** lacking to small, rudimentary to slightly developed, composed of a few swollen, brown hyphal cells.

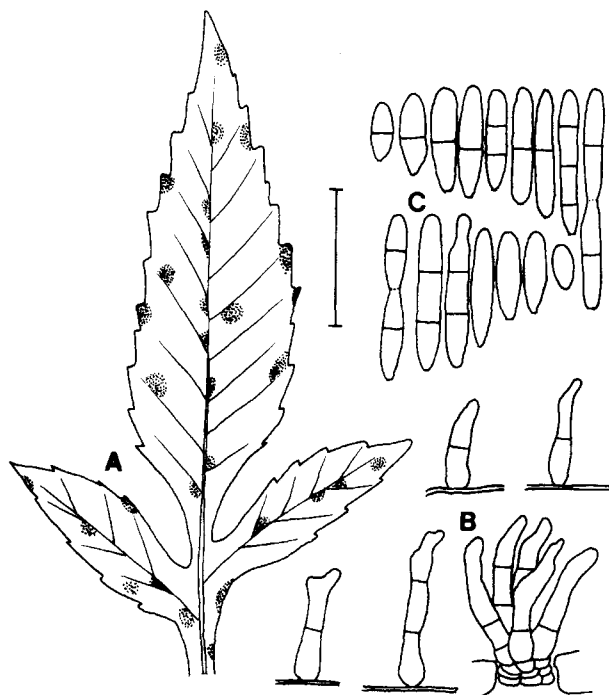


Fig. 4. *Neoramularia bidensis*. (A) Leaf spots on the lower leaf surface of *Bidens tripartita* (0.7×). (B) Conidiophores. (C) Conidia. Bar=30 μm .

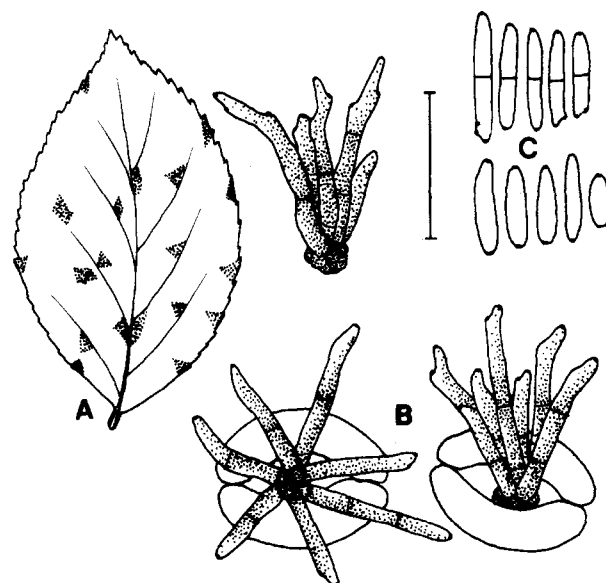


Fig. 5. *Phaeoramularia weigelicola*. (A) Leaf spots on the lower leaf surface of *Weigela florida* (0.8×). (B) Conidiophores. (C) Conidia. Bar=30 μm .

Conidiophores 2–8 in a loose fascicle, emerging through stomata, pale olivaceous brown near the basal portion, paler towards the apex, straight to geniculate-sinuous, not branched, 0–2-septate, $10\text{--}50 \times 2.5\text{--}3.5 \mu\text{m}$; conidial scars small and somewhat conspicuous, apical or on small shoulders of conidiogenous cells caused by geniculation. **Conidia** solitary to catenate, occasionally branched chains, subcylindric to ellipsoid, straight, hyaline, 0–1-septate, non-constricted at the septa, obtuse or shortly obconic to subacute at both ends, $8\text{--}25 \times 2.0\text{--}4.0 \mu\text{m}$; hilum small, somewhat conspicuously thickened, somewhat darkened, and non-protuberant.

Habitat: On living leaves of *Weigela florida* (Bunge) A. DC. (Caprifoliaceae).

Specimens examined: SMK 13032 (20 IX 1994, Chunchon), 14172 (15 IX 1997, Chunchon).

Distribution: Asia (Korea) and Europe.

Notes: Shin and Braun (1996) first recorded this fungus as new species, and Shin (1997) added a brief morphological description with phytopathological notes. They described the characters of the present fungus as follows: Conidiophores ($32\text{--}76 \mu\text{m}$) rather long and arranged in a loose fascicle; conidia somewhat narrower ($2.4\text{--}3.6 \mu\text{m}$ wide), hyaline and cylindric-ellipsoid. They discussed that *Phaeoramularia weigela* Y.L. Guo & X.J. Liu is distinguished from the present species by having longer and wider brown conidiophores, and longer and above all wider conidia ($4.0\text{--}7.5 \mu\text{m}$ wide, 1–3-septate). Braun (1998) reported that the conidia of some European collections are subhyaline to pale yellowish green in colour.

6. *Pseudocercospora cantuariensis* (E.S. Salmon & Wormald) U. Braun, Mycotaxon 48: 281 (1993) Fig. 6
 ≡ *Cercospora cantuariensis* E.S. Salmon & Wormald, J. Bot. Lond. 61: 134 (1923)
 ≡ *Centrospora cantuariensis* (E.S. Salmon & Wormald) Deighton, Mycol. Papers 124: 5 (1971)
 ≡ *Mycocentrospora cantuariensis* (E.S. Salmon & Wormald) Deighton, Taxon 21: 716 (1972)

Leaf spots amphigenous, scattered to often confluent, subcircular to irregular, 1–5 mm diam., or up to 10 mm when confluent, greyish white, centre reddish brown with yellowish brown zone on the upper surface, greyish brown to grey on the lower surface. **Caespituli** amphigenous, but abundantly hypophyllous. **Primary mycelium** internal, hyphae septate, branched, hyaline, $3\text{--}4 \mu\text{m}$ wide. **Secondary mycelium** creeping on the leaf surface, almost hyaline, hyphae septate. **Stromata** absent, rudimentary to poorly developed, composed of a few brown hyphal cells. **Conidiophores** 2–6 in a loose fascicle, arising through stomata or emerging through the cuticle, and singly erect

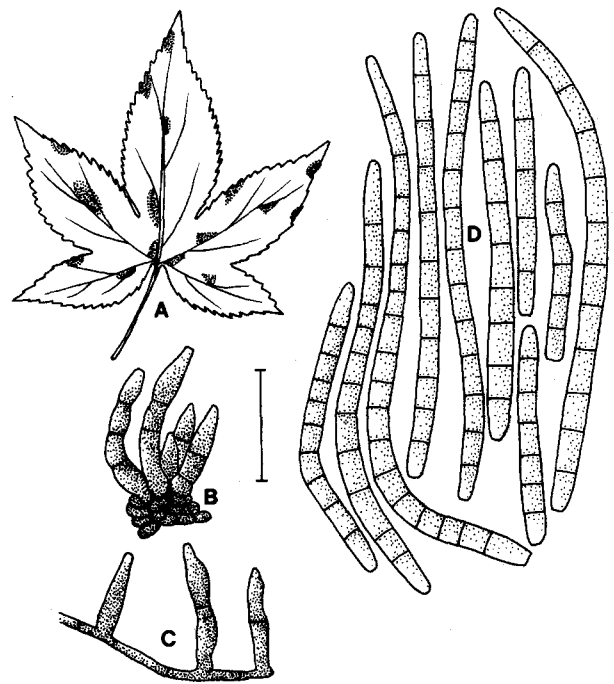


Fig. 6. *Pseudocercospora cantuariensis*. (A) Leaf spots on the upper leaf surface of *Humulus japonicus* (0.5 \times). (B) Conidiophores. (C) Secondary conidiophores borne on the external mycelium. (D) Conidia. Bar=75 μm .

from lateral branches of secondary superficial hyphae, olivaceous brown, sometimes paler towards the apical portion, straight to slightly curved, not branched, not geniculate, obconically truncate at the apex, 0–3-septate, $30\text{--}140 \times 12\text{--}20 \mu\text{m}$; conidial scars inconspicuous. **Conidia** solitary, filiform to cylindric, straight to moderately curved, subhyaline, 4–15-septate, usually non-constricted at the septa, but rarely constricted at some septa, somewhat narrower at the apical portion, obtuse to subobtuse at the apex, truncate to subtruncate at the base, sometimes slightly or gradually tapered towards the truncate base, $140\text{--}500 \times 10\text{--}20 \mu\text{m}$; hilum unthickened, and not darkened.

Habitat: On living leaves of *Humulus japonicus* S. & Z. (Moraceae).

Specimens examined: SMK 13180 (18 X 1994, Kangnung), 14165 (14, IX 1997, Chunchon), 14272 (27 XI 1997, Chunchon), 14410 (12 X 1997, Dongduchon), 15075 (8 IX 1998, Seoul), 15335 (4 X 1998, Yangku).

Distribution: England, Germany, Korea and Russia.

Notes: Shin and Braun (1996) first listed this fungus from Korea. Deighton (1971) published the following characters of this fungus as *Centrospora cantuariensis* (E. S. Salmon & Wormald) Deighton: Conidiophores ($50\text{--}70 \times 15.5\text{--}18 \mu\text{m}$) arising singly or arranged in small groups and usually have only with terminal conidial scars, conidia ($114\text{--}508 \times 10\text{--}21 \mu\text{m}$) subcylindric and 5–19-septate. The fungus collected in Korea agrees with Deighton's description, although the conidial scars are unthickened. In all

Korean specimens, the conidial scars could not be observed. Braun (1993) preferred to place this species in *Pseudocercospora* because of the coloured conidiophores, conidia, and unthickened conidial scars. *P. humuli-japonici* (Sawada) Goh & W.H. Hsieh [\equiv *P. humuli* (Hori) Y.L. Guo & X.J. Liu] is clearly different from it by having shorter and narrower conidiophores and conidia.

7. *Pseudocercospora cydoniae* (Ellis & Everh.) Y.L. Guo & X.J. Liu, Mycosystema 5: 103 (1992) Fig. 7
 \equiv *Cercospora cydoniae* Ellis & Everh., J. Mycol. 8: 72 (1902)
 \equiv *Cercospora cydoniae* Rangel, Bol. Agric. São Paulo Ser. 16A. 4: 322 (1915)
 \equiv *Pseudocercospora cydoniae* (Ellis & Everh.) U. Braun & H.D. Shin, in Shin & Braun, Mycotaxon 49: 356 (1993)

Leaf spots amphigenous, scattered to confluent, distinct, subcircular to irregular, usually vein-limited, 1–5 mm diam., brown to dark brown, centre with pale yellowish brown margins on the upper surface, pale brown to brown on the lower surface. **Caespituli** amphigenous, but abundantly epiphyllous. **Mycelium** internal, hyphae septate, branched, hyaline. **Stromata** medium, 20–40 μ m diam., well-developed, subglobular to globular, dark brown. **Conidiophores** 20–45 in a dense fascicle, arising through the cuticle, pale olivaceous brown throughout, straight to slightly curved or mildly sinuous, not branched, not geniculate, aseptate, narrower at the apical portion, 10–27 \times 2.5–4.0 μ m; conidial scars inconspicuous. **Conidia**

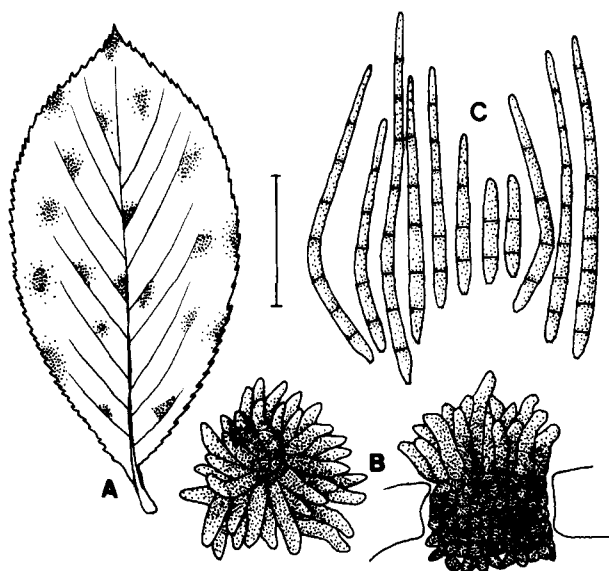


Fig. 7. *Pseudocercospora cydoniae*. (A) Leaf spots on the upper leaf surface of *Chaenomeles lagenaria* (0.7 \times). (B) Conidiophores. (C) Conidia. Bar=30 μ m.

solitary, filiform to obclavate-cylindric, straight to curved, hyaline to subhyaline, 2–9-septate, non-constricted at the septa, but some spores slightly constricted at the septa, obtuse to subacute at the apex, obconically truncate at the base, 20–85 \times 2.5–3.5 μ m; hilum unthickened, and not darkened.

Habitat: On living leaves of *Chaenomeles lagenaria* (Loisel) Koidz. and *C. sinensis* Köhne (Rosaceae).

Specimens examined: On *Chaenomeles lagenaria*, SMK 11227 (4 X 1991, Suwon); On *C. sinensis*, SMK 13368 (8 XI 1994, Kangnung), 15159 (28 IX 1998, Jinju).

Distribution: China, Japan, Korea, South America and USA.

Notes: Shin and Braun (1993, 1996) first recorded this fungus from Korea on *Chaenomeles lagenaria* and *C. sinensis*, respectively. Guo and Hsieh (1995) described that this fungus possesses large stromata (20–60 μ m diam.) and cylindric to obclavate, straight to slightly curved conidia with 3–6 septa. The differences in these characters are within the variation of this species, and our fungus agrees well with Chinese collections. Immature conidiophores in Korean material are irregular in width, and usually swollen at the upper portion.

8. *Pseudocercospora profusa* (Syd. & P. Syd.) Deighton, Trans. Brit. Mycol. Soc. 88(3): 388 (1987) Fig. 8
 \equiv *Cercospora profusa* Syd. & P. Syd., Anns Mycol. 7: 175 (1909)

Leaf spots invisible or indistinct, vein-limited, 1–5 mm diam., pale yellowish on the upper surface, but dark brown to greyish black without definite margins on the lower surface. **Caespituli** hypophyllous, effuse, velvety. **Mycelium** internal, hyphae septate, branched. **Stromata** lacking to very small, rudimentary to poorly developed, composed of a few brown hyphal cells. **Conidiophores** 6–20 in a divergent fascicle, olivaceous brown or paler upwards, darker than conidia in colour, 2–8-septate, not branched, straight to mildly sinuous, not geniculate, 30–80 \times 3.5–5.0 μ m; conidial scars inconspicuous. **Conidia** solitary, filiform to cylindric, substraight to moderately curved, subhyaline to hyaline, 3–9-septate, non-constricted at the septa, obtuse to subobtusate at the apex, obconically truncate to truncate at the base, 40–88 \times 4.0–5.5 μ m; hilum unthickened, and not darkened.

Habitat: On living leaves of *Acalypha australis* L. (Euphorbiaceae).

Specimens examined: SMK 10202 (8 IX 1989, Kangnung), 14781 (17 VIII 1998, Seoul), 15016 (4 IX 1998, Seoul), 15041 (6 IX 1998, Seoul).

Distribution: China, India, Japan, Korea and USA.

Notes: Shin and Braun (1993) listed this fungus for the

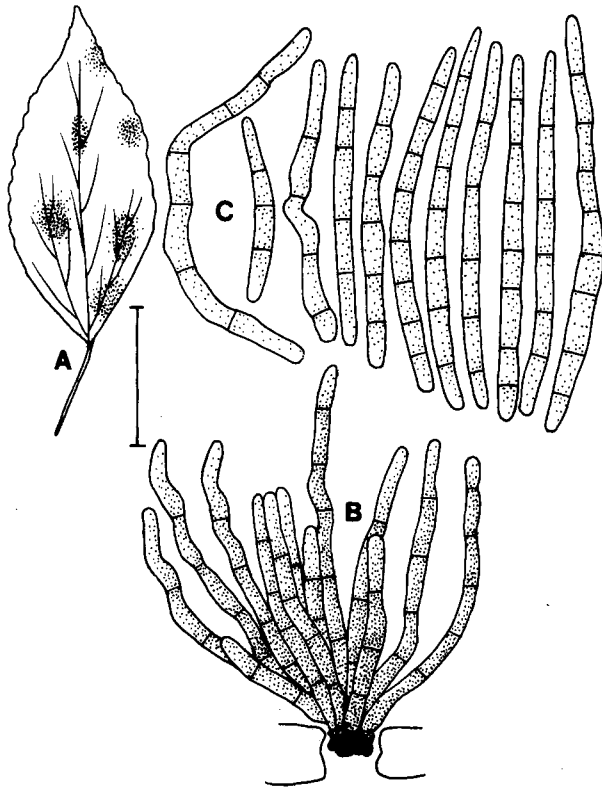


Fig. 8. *Pseudocercospora profusa*. (A) Leaf spots on the lower leaf surface of *Acalypha australis* (0.7 \times). (B) Conidiophores. (C) Conidia. Bar=30 μ m.

first time from Korea. Chupp (1954) described *Cercospora profusa* (\equiv *Pseudocercospora profusa*) as follows: Conidiophores (20~150 \times 4~6 μ m) nonfasciculate or arranged in a dense fascicle, the apex of conidia obtuse. These characters are variable in this species, and the Korean collection is in accordance with Chupp's description. *Pseudocercospora acalyphae* (Lasy & Thirum.) Raghu Ram, Mallaiiah & U. Braun, in Braun (1995), *P. acalyphigena* J.M. Yen (1980) and *P. transvaalensis* (Syd.) Deighton (1976) on *Acalypha* spp. differ from our species in their shorter and narrower conidiophores and conidia. The present fungus has been confused with *Mycovellosiella acalyphae* (Tharp) U. Braun, but the latter species differs from it in several aspects: Secondary mycelium well-developed, conidiophores solitary or arranged in a loose fascicle, conidia catenate, and conidial scars and hilum thickened and darkened. *Cercospora acalyphaecola* J.M. Yen is similar to our species, but differs from the present fungus in having amphigenous fructification, shorter conidiophores (18~50 μ m long), and conspicuously thickened conidial scars.

9. *Pseudocercospora sublineolata* (Thüm.) U. Braun, Nova Hedwigia 47: 345 (1988) Fig. 9

\equiv *Septoria sublineolata* Thüm., Bull. Soc. Imp. Nat.

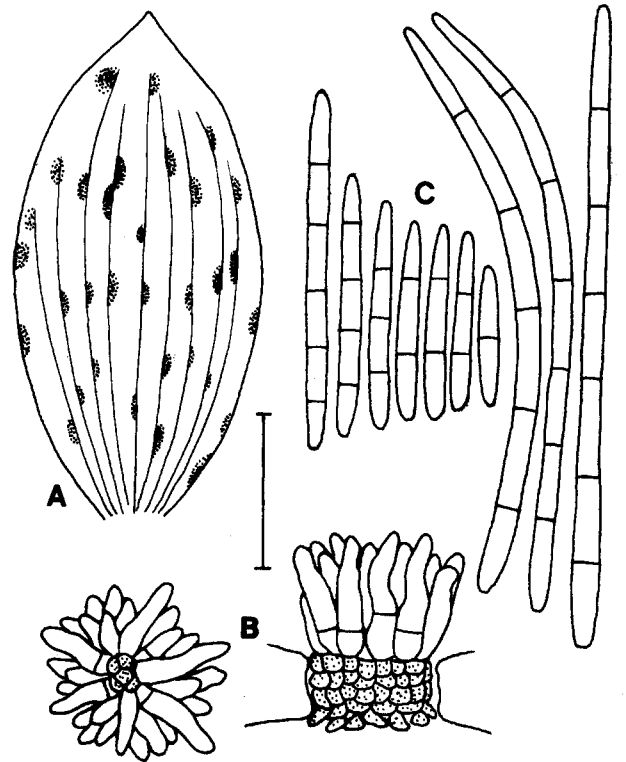


Fig. 9. *Pseudocercospora sublineolata*. (A) Leaf spots on the upper leaf surface of *Veratrum patulum* (0.3 \times). (B) Conidiophores. (C) Conidia. Bar=30 μ m.

Mosc. 52: 151 (1877)

\equiv *Septocylindrium sublineolatum* (Thüm.) J. Schröt., in Cohn, Krypt.-Fl. Schles., Pilze II: 494, Breslau (1897)

\equiv *Cercospora sublineolata* (Thüm.) Höhn., Annl. Mycol. 22: 198 (1924)

\equiv *Cercoseptoria sublineolata* (Thüm.) Petr., Sydowia 1: 230 (1947)

\equiv *Cylindrosporium veratrinum* Sacc. & G. Winter, in Rabenh.-Winter, F. eur. extraeur. exs. (ed. nov., Ser. sec.), cent. 9 (resp. cent.) 29, Nr. 2879, Dresden (1882) and Hedwigia 22: 14 (1883)

\equiv *Cercospora veratrina* (Sacc. & G. Winter) Höhn., Österr. Bot. Z. 66: 106 (1916), comb. inval.! and Annl. Mycol. 22: 198 (1924)

\equiv *Cercospora terminalis* Peck, N. Y. State Mus. Bull. 157: 28, 107 (1912)

\equiv *Ramularia veratri* Peck, in herb.

Leaf spots amphigenous, scattered to dense, circular to irregular, often striiform, usually vein-limited, often confluent, 5~15 mm diam., at first small, later becoming necrotic, dark brown to almost black, sometimes surrounded by yellowish green to greyish brown haloes. **Caespituli** amphigenous, abundantly epiphyllous. **Mycelium** internal, hyphae septate, branched, hyaline. **Stromata** small to large, well-developed, subglobular to angular, hyaline to

faintly pigmented, 10–30 μm diam., composed of colourless hyphal cells. **Conidiophores** 10–45 in a dense fascicle, arising through stomata, erumpent through the cuticle, straight to geniculate-sinuous, simple, not branched, 0–1-septate, usually aseptate, but occasionally uniseptate near the basal portion, hyaline, 5–25 \times 3.5–6.0 μm ; conidial scars inconspicuous. **Conidia** solitary, subcylindric to filiform, sometimes obclavate, straight to mildly curved, non-constricted at the septa, hyaline, 1–6-septate, obtuse to subobtuse at the apex, obconically truncate to subtruncate at the base, 30–125 \times 3.0–5.5 μm ; hilum unthickened, and not darkened.

Habitat: On living leaves of *Veratrum patulum* Loes. fil. (Liliaceae).

Specimens examined: SMK 13498 (22 V 1995, Kangnung), 13539 (16 VI 1995, Kangnung).

Notes: Shin (1997) first recorded this fungus with a brief morphological description from Korea. Petrak (1947) referred this species to *Cercoseptoria*, although the conidiophores and conidia are hyaline. Braun (1988) re-allocated this fungus to *Pseudocercospora*, and reduced *Septoria sublineolata* Thüm. to synonymy with the present species. He described the following characters of *Pseudocercospora sublineolata*: Stromata large (20–80 μm diam.) and well-developed, conidiophores (4–25 \times 2–5 μm) arranged in a dense fascicle, conidia (60–120 \times 2–5 μm) usually 1–5-septate. Therefore, the Korean specimens agree well with Braun's description. The present species has been confused with *Mycocentrospora veratri* (Peck) U. Braun, but Braun (1991) distinguished this species by solitary conidiophores with broad, flat conidial scars, and the rostrate conidia.

10. *Ramularia plantaginis* Ellis & G. Martin, Am. Nat. 16: 1003 (1882) Fig. 10
= *Ramularia kriegieriana* Bres., Hedwigia 39: 328 (1900)

Leaf spots amphigenous, scattered to confluent, circular to somewhat irregular, distinct, small, 1–10 mm diam., or up to 15 mm when confluent, partly zonate, at first pale greenish, later becoming brown to dark brown, pale to greyish centre with dark brown to purplish brown or narrow brown margins. **Caespituli** amphigenous but abundantly hypophyllous. **Mycelium** internal, hyphae septate, branched, hyaline, 2–4 μm wide. **Stromata** small, subglobose, 10–20 μm diam., moderately developed, composed of several swollen hyphal cells in the substomatal cavities. **Conidiophores** 5–12 in a divergent fascicle, emerging through stomata, or erumpent through the cuticle, hyaline throughout, 1–3-septate, not branched, straight to curved, usually geniculate-sinuous, or 1–3 times geniculate near the apical portion and near the septation, 30–100 \times 2.5–4.0

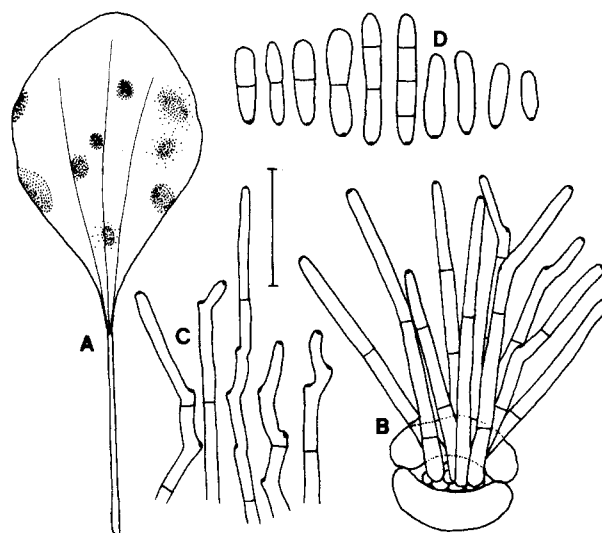


Fig. 10. *Ramularia plantaginis*. (A) Leaf spots on the lower leaf surface of *Plantago asiatica* (0.6 \times). (B) Conidiophores. (C) Upper portion of conidiophores showing the apices. (D) Conidia. Bar=30 μm .

μm ; conidial scars minute, but conspicuous, apical or on shoulders of conidiogenous cells caused by geniculation. **Conidia** solitary or in short branched chains, cylindric to obclavate-ellipsoid, hyaline, mostly 0–1-septate, but very rarely 2–3-septate, usually non-constricted, but occasionally slightly constricted at the septa, obtuse to subobtuse at both ends, sometimes gently attenuated towards the each end, 10–40 \times 4.0–6.5 μm ; hilum minute, conspicuously thickened, slightly darkened, and non-protuberant.

Habitat: On living leaves of *Plantago asiatica* L. (Plantaginaceae).

Specimens examined: SMK 12796 (28 V 1994, Chuncheon), 15343 (4 X 1998, Yangku).

Distribution: Chile, Europe, Korea, Russia and USA.

Notes: Shin and Braun (1996) first listed this fungus from Korea, and Shin (1998) provided a brief morphological note based on a Korean collection. Braun (1998) characterized this fungus as follows: Caespituli amphigenous, secondary mycelium absent to well-developed, conidiophores (10–100 \times 2–4 μm) sometimes branched, conidia (10–35 \times 3–6 μm) 0–3-septate and verruculose. These features are variable in this species, and the Korean collections agree well with Braun's conception. *R. rhabdospora* (Berk. & Broome) Nannf. is very close to this species. Therefore, Braun (1998) suggested that *R. rhabdospora* and *R. plantaginis* are easily distinguishable by the ornamentation of the conidial surface; echinulate in *R. rhabdospora* and verruculose in the latter species.

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적 요

본 연구는 1990년부터 국내에서 채집하여 고려대학교 농생물학과 진균표본보관소(SMK)에 보존하고 있는 *Cercospora* 및 관련 속의 진균을 대상으로 분류학적 연구를 실시한 결과의 여섯 번째 보고이다. 이번 보고에서는 *Cercospora* 3종, *Neoramularia* 1종, *Phaeoramularia* 1종, *Pseudocercospora* 3종, *Pseudocercospora* 1종 및 *Ramularia* 1종에 대한 균학적 특징을 기재, 묘사하였다. 셀러리에서 *Cercospora apii*, 취방울덩굴에서 *C. aristolochiae-contortae*, 아욱제비꽃, 제비꽃, 흰제비꽃, 고갈제비꽃, 피제비꽃 및 콩제비꽃에서 *C. violae*, 가막사리에서 *Neoramularia bidentis*, 붉은병꽃나무에서 *Phaeoramularia weigelicola*, 환삼덩굴에서 *Pseudocercospora cantuariensis*, 명자꽃과 모과나무에서 *P. cydoniae*, 깨풀에서 *P. profusa*, 박새에서 *Pseudocercospora sublineolata*, 그리고 질경이에서 *Ramularia plantaginis*를 각각 동정하였다.

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