

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

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한국산 *Cercospora* 및 관련 속의 분류학적 연구(XI)

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ABSTRACT: This paper is the eleventh contribution towards taxonomic studies on *Cercospora* and allied genera, and contains ten species of Korean cercosporoid fungi; viz., *Cercospora castaneae*, *C. dispori*, *C. ilicisopacae*, *C. malvarum*, *Phaeoramularia valerianicola*, *Pseudocercospora clematidis*, *P. cotoneasteris*, *P. handelii*, *P. lespedezicola*, and *Ramularia chaerophylli*. Morphological characteristics of taxonomic value are described and illustrated for these species to contribute towards a mycological monograph of Korean cercosporoid fungi.

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

One hundred cercosporoid fungi from Korea, comprising 40 *Cercospora*, one *Cercosporiella*, one *Distocercospora*, three *Mycovellosiella*, two *Neoramularia*, five *Pasalora*, one *Phaeoisariopsis*, one *Phacellium*, one *Phaeoramularia*, 29 *Pseudocercospora*, four *Pseudocercosporiella*, 11 *Ramularia*, and one *Stenella* species were treated in previous contributions of this series (Kim and Shin, 1998a-d, 1999a-f). The present paper deals with ten additional cercosporoid taxa from Korea, namely four *Cercospora*, one *Phaeoramularia*, four *Pseudocercospora*, and one *Ramularia* species that are described and illustrated. The specimens examined are preserved at the mycological herbarium (SMK) of the Department of Agricultural Biology, Korea University, Seoul, Korea.

Descriptions

1. *Cercospora castaneae* A.S. Mull. & Chupp, Arch. Inst. Biol. Vegetal, Rio de Janeiro 3: 92 (1936) Fig. 1

Leaf spots amphigenous, scattered, distinct, subcircular to irregular, 1~10 mm diam., initially appearing reddish brown to yellowish brown, later centre becoming brown to greyish brown with dark brown margins. **Caespituli** amphigenous, but mostly hypophyllous. **Mycelium** internal, hyphae septate, branched, hyaline, 2~3 μm wide. **Stromata** small to medium, rudimentary to moderately developed, subglobular to angular, brown to dark brown, 10~25 μm diam., composed of a few brown hyphal cells. **Conidiophores** 1~8 in a loose fascicle, arising from sub-

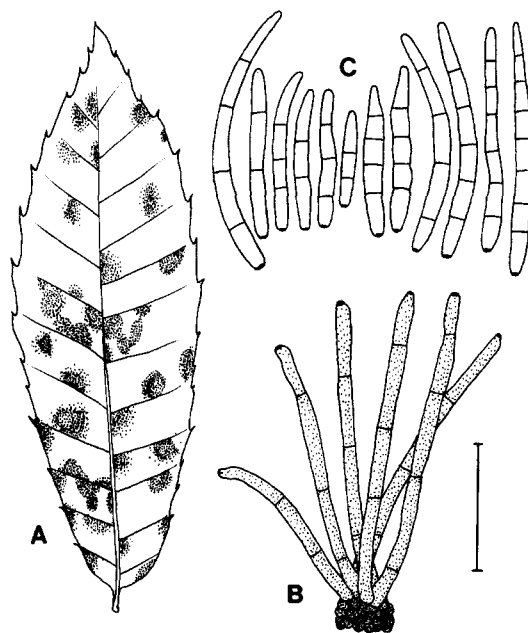


Fig. 1. *Cercospora castaneae*. (A) Leaf spots on the upper leaf surface of *Castanea crenata* (0.7 \times) (B) Conidiophores. (C) Conidia. Bar = 30 μm .

stomatal stomata, or occasionally erumpent through the cuticle, olivaceous brown to brown, sometimes paler towards the apex, straight to slightly curved, not geniculate, not branched, 2~4-septate, 20~62 \times 3.0~4.5 μm ; conidial scars minute, 1.0~1.5 μm wide, but conspicuous at the apex. **Conidia** solitary, obclavate to cylindrical-obclavate, straight to mildly curved, hyaline to subhyaline, 1~8-septate, non-constricted or rarely slightly constricted at the septa, obtuse to subobtuse at the apex, subtruncate to su-

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boobtuse at the base, $20\sim70\times3.0\sim5.0\ \mu\text{m}$; hilum conspicuously thickened, darkened, and non-protuberant.

Habitat: On living leaves of *Castanea crenata* Sieb. & Zucc. and *C. crenata* var. *kusakuri* (Bl.) Nakai (Fagaceae).

Specimens examined: On *Castanea crenata*, SMK 14392 (9 X 1997, Namyangju); on *C. crenata* var. *kusakuri*, SMK 14789 (17 VIII 1998, Seoul).

Distribution: Brazil and Korea.

Notes: This is the first record of this species from Korea. In Korean collections, the caespituli are mostly hypophyllous, although a few caespituli are present on the upper surface of SMK 14392. In SMK 14392, the conidiophores are arranged in more dense fascicles than those of SMK 14789. The hypophyllous conidiophores of SMK 14789 are arranged in loose fascicles and longer than epiphyllous ones. Stromata are very small or absent. Brazilian collection for *Cercospora castaneae* (Chupp, 1954) possesses hypophyllous fructification, rarely septate conidiophores, and subhyaline to pale olivaceous green conidia. Since, these features seem to be within the variations of this species. Therefore, the Korean collections are referred to *C. castaneae*.

2. *Cercospora dispori* Togashi & Maki, Trans. Sapporo Nat. Hist. Soc. 17: 98 (1942) Fig. 2

Leaf spots amphigenous, scattered to confluent, usually

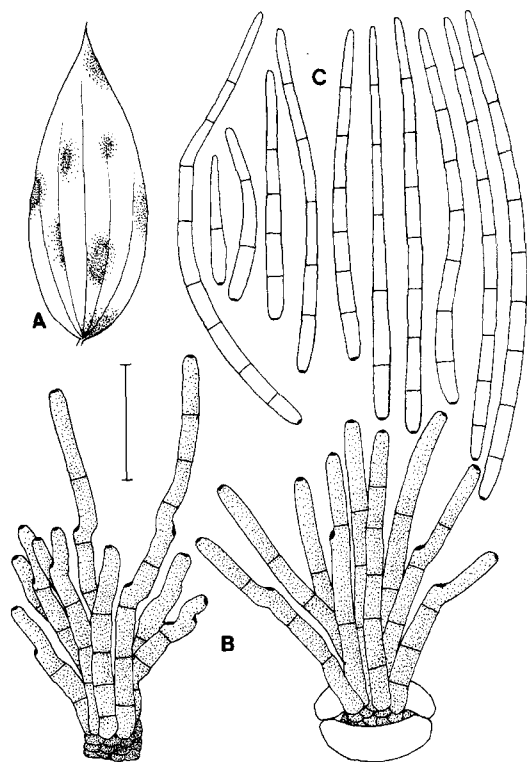


Fig. 2. *Cercospora dispori*. (A) Leaf spots on the upper leaf surface of *Disporum smilacinum* (0.7 \times). (B) Conidiophores. (C) Conidia. Bar = 30 μm .

vein-limited, elliptical to angular, 5~15 mm diam., or extending over the entire leaf surface when coalescing, initially appearing as reddish brown discolorations, later turning brown to yellowish brown, finally becoming dark brown with or without blackish brown margins on the upper surface. **Caespituli** amphigenous. **Mycelium** internal, hyphae septate, branched, hyaline to very pale pigmented, 2.0~3.5 μm wide. **Stromata** small to large, slightly to well-developed, dark to blackish brown, subglobular to globular, 15~45 μm diam. **Conidiophores** 2~15 in a loose to dense fascicle, olivaceous brown or sometimes paler towards the apex, irregular in width, straight to slightly curved, 1~2 times geniculate at the upper portion, not branched, 1~7(~9)-septate, subobtuse to obtuse at the apex, 20~100 (~170) \times 3.5~5.5(~6.0) μm ; conidial scars large, 1.5~2.5 μm wide, conspicuous, apical or on shoulders of conidiogenous cells caused by geniculation. **Conidia** solitary, hyaline to subhyaline, cylindrical to subcylindrical-filiform, 1~10-septate, non-constricted at the septa, obtuse to subobtuse at the apex, truncate to subtruncate at the base, 30~128 \times 3.5~5.5 μm ; hilum conspicuously thickened, darkened, and non-protuberant.

Habitat: On living leaves of *Disporum smilacinum* A. Gray (Liliaceae).

Specimen examined: SMK 16622 (6 VII 1999, Pyongchang).

Distributions: Japan and Korea.

Notes: This is the first record of this species from Korea. According to the original description (Togashi and Maki, 1942), *Cercospora dispori* was characterized as follows: Conidiophores arranged in a dense fascicle, 4~10-septate, 10~60(~170) \times 4~7 μm ; conidia acicular to obclavate-cylindrical, hyaline, 25~140(~170) \times 3~6 μm . Though the conidiophores of the Korean collection are somewhat longer, they are within the variation of this species. The Korean collection agrees well with *C. diospori*.

3. *Cercospora ilicis-opacae* Chupp, A Monograph of the Fungus Genus *Cercospora*: 53 (1954) Fig. 3

Leaf spots amphigenous, scattered to confluent, subcircular to circular, 1~5 mm diam., initially appearing grey to greyish brown, later centre becoming white to whitish grey with purplish margins. **Caespituli** amphigenous. **Mycelium** internal, hyphae septate, branched, hyaline, 2~4 μm wide. **Stromata** lacking to small, slightly developed, globular to subglobular, brown to dark brown, 8~25 μm diam., composed of a few brown hyphal cells. **Conidiophores** 3~15 in a divergent fascicle, arising from substomatal stromata and emerging through the cuticle, straight to slightly curved or even tortuous, olivaceous brown throughout, sometimes irregular in width, 1~5 times mildly geniculate, not

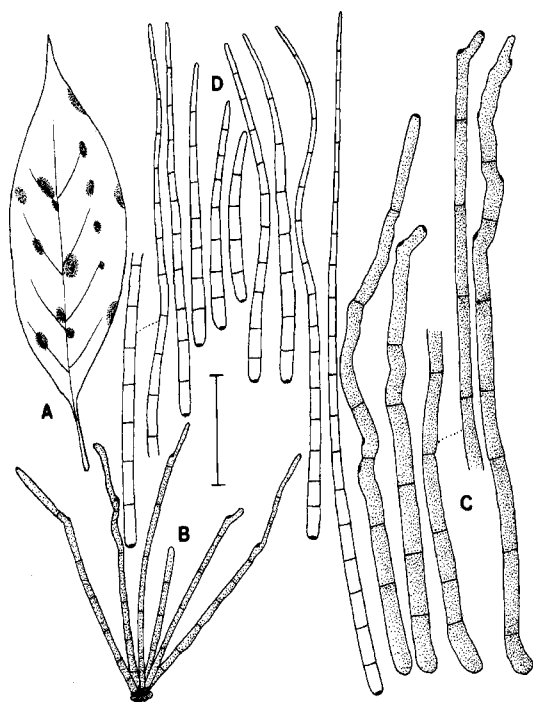


Fig. 3. *Cercospora ilicis-opacae*. (A) Leaf spots on the upper leaf surface of *Ilex serrata* (0.7 \times). (B) and (C) Conidiophores. (D) Conidia. Bar = 30 μ m (but 75 μ m for B).

branched, 1~9-septate, 45~170(~235) \times 3.5~5.0 μ m; conidial scars large, 2~3 μ m wide, conspicuous, apical or on shoulders of conidiogenous cells caused by geniculation. Conidia solitary, acicular to filiform or even obclavate-cylindric in shorter ones, hyaline, straight to slightly curved or even undulate, 4~23-septate, non-constricted at the septa, acute to subacute at the apex, truncate to subtruncate, 50~150(~216) \times 3.0~5.0 μ m; hilum conspicuously thickened, darkened, and non-protuberant.

Habitat: On living leaves of *Ilex serrata* Thunb. (Aquifoliaceae).

Specimen examined: SMK 15443 (9 X 1998, Chunchon).

Distribution: Korea and USA.

Notes: The taxonomy of cercosporoid taxa on *Ilex* spp. is somewhat complicated. Several species of *Cercospora* have been reported on *Ilex*. Of these, only *C. ilicis-micrococcae* and *C. ilicis-opacae* seem to be allied to the present collection. However, *C. ilicis-micrococcae* was transferred to *Pseudocercospora* (Hsieh and Goh, 1990). Therefore, *C. ilicis-opacae* is the only comparable species. It was described to have branched conidiophores and much shorter (25~90 μ m long) conidia than those of the Korean collection. Since these features seem to be the variation of the species, the Korean collection is referred to *C. ilicis-opacae*.

4. *Cercospora malvarum* Sacc., *Michelia* 2: 365 (1881)

Fig. 4

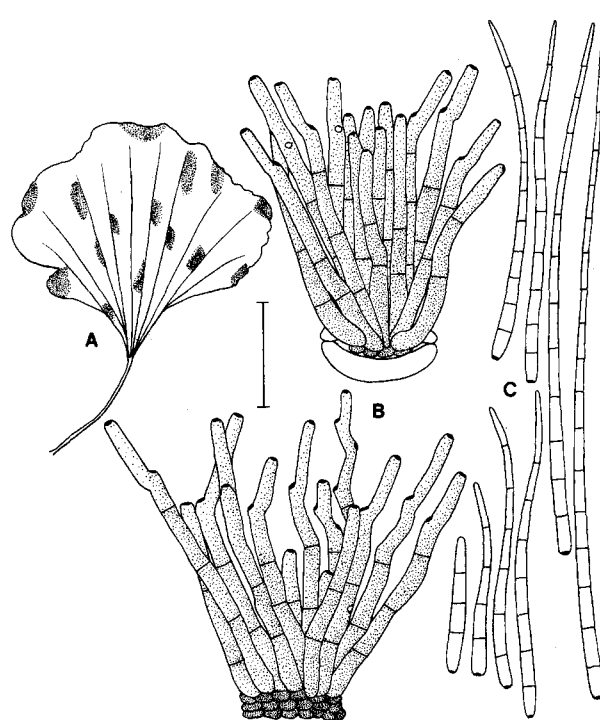


Fig. 4. *Cercospora malvarum*. (A) Leaf spots on the upper leaf surface of *Malva verticillata* (0.3 \times). (B) Conidiophores. (C) Conidia. Bar = 30 μ m.

Leaf spots amphigenous, scattered to confluent, sub-circular to circular, 1~5 mm diam., or up to 10 mm when coalescing, initially appearing pale brown to yellowish brown, later becoming tan to greyish brown, finally centre turning greyish white to dingy grey with dark brown margins. **Caespituli** amphigenous. **Mycelium** internal, hyphae septate, branched hyaline, usually 3~4 μ m wide. **Stromata** small, slightly developed, subglobular to angular, brown to dark brown, 8~15 μ m diam, composed of a few swollen hyphal cells. **Conidiophores** 3~25 in a loose to dense fascicle, arising through stomatal opening and erumpent through the cuticle, straight to slightly curved, olivaceous brown throughout, uniform in width, 0~3 times geniculate at the upper portion, not branched, 1~3-septate, 45~165 \times 4.0~5.5 μ m; conidial scars large, 2.0~3.5 μ m, conspicuous, apical or on shoulders of conidiogenous cells caused by geniculation. **Conidia** solitary, acicular-filiform to filiform or even obclavate-cylindric in shorter ones, straight to mildly curved, hyaline, 3~18-septate, non-constricted at the septa, subacute to subobtuse at the apex, truncate to subtruncate at the base, 40~210 \times 3.0~4.0 μ m; hilum conspicuously thickened, darkened, and non-protuberant.

Habitat: On living leaves of *Malva verticillata* L. (Malvaceae).

Specimens examined: SMK 14768 (13 IX 1998, Yangku), 15430 (9 X 1998, Chunchon).

Distribution: France, Korea, and USA.

Notes: Chung *et al.* (1977) first listed *Cercospora* sp. on the same host species from Korea, but the specimen concerned cannot be proven, since it is not preserved. Therefore, this is the first record of this species from Korea. In SMK 15430, the conidiophores are somewhat shorter and more frequently geniculate than those of the other. For French material on *M. moschata* described by Chupp (1954) as follows: Stromata small, conidiophores very pale olivaceous brown, conidial scars large, conidia a-cylindrical to cylindrical. Hence, the Korean collection agrees well with Chupp's description. The Korean collections are sometimes somewhat different, but they belong clearly to this species. *Cercospora malvicola* Ellis & Everh. is clearly distinguished by having much shorter conidiophores (15~35 × 3.0~4.5 μm) arranged in pseudo-fascicles, and by somewhat shorter conidia (20~125 × 3.0~5.0 μm).

5. *Phaeoramularia valerianicola* H.D. Shin & U. Braun, Mycotaxon 49: 354 (1993) Fig. 5

Leaf spots amphigenous, scattered, angular to irregular, usually vein-limited, 2~20 mm diam., at first effuse to indistinct, later becoming dark brown with greenish yellow haloes. **Caespituli** hypophyllous, inconspicuous. **Mycelium** internal, hyphae septate, branched, hyaline, 2~3 μm wide. **Stromata** small, well-developed, globular, 10~20 μm diam., olivaceous brown to pale brown, composed of several swollen hyphal cells. **Conidiophores** 5~20 in a divergent to dense fascicle, arising from substomatal stromata, pale olivaceous brown to olivaceous brown at the basal

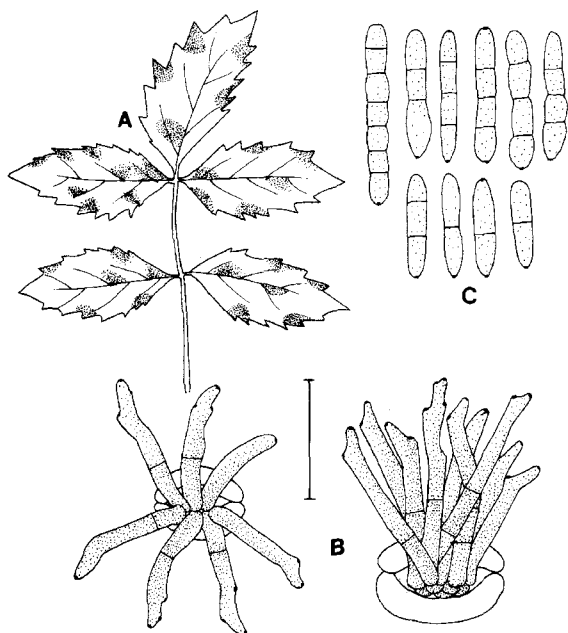


Fig. 5. *Phaeoramularia valerianicola*. (A) Leaf spots on the lower leaf surface of *Valeriana fauriei* (0.6×). (B) Conidiophores. (C) Conidia. Bar = 30 μm.

portion, straight to slightly curved, 1~3 times mildly geniculate, not branched, 0~2-septate, 20~56 × 3.0~5.0 μm; conidial scars small, ca. 1 μm wide, conspicuous, apical or on small shoulders of conidiogenous cell caused by geniculation. **Conidia** solitary or in unbranched short chains (1~2), cylindrical to narrowly fusiform, straight, subhyaline to greenish, 1~6-septate, usually constricted at the septa, usually subobtuse to somewhat attenuated at both ends, 15~50 × 4.0~7.5 μm; hilum minute, somewhat thickened, darkened, and non-protuberant.

Habitat: On living leaves of *Valeriana fauriei* Briq. (Valerianaceae).

Specimens examined: SMK 11851 (10 VIII 1992, Pyongchang) (holotype), 12151 (10 X 1992, Pyongchang)

Distribution: Only known from the type locality, Korea.

Notes: Shin and Braun (1993) first recorded this fungus from Korea as a new species with full morphological description and detailed illustration. They published the characters of this species as follows: Leaf spots usually vein-limited; stromata small; conidiophores arranged in loose to dense fascicles; conidia solitary to catenate, cylindrical, pale greenish, usually 1~3-septate. The other Korean collection, SMK 12151, is in accordance with SMK 11851, though conidiophores are arranged in more dense fascicles, and conidia are usually subhyaline to pale greenish and somewhat attenuated towards both ends. *Ramularia valerianae* (Speg.) Sacc. var. *valerianae* (Braun, 1998) is clearly different from the present collection as follows: Stromata colourless; a few superficial secondary hyphae creeping on the leaf surface; conidiophores rarely branched and 0~1-septate; conidia hyaline, faintly rough and non-constricted at the septa.

6. *Pseudocercospora clematidis* Goh & W.H. Hsieh, Trans. Mycol. Soc. R. O. C. 4: 6 (1989) Fig. 6
= *Cercospora clematidis* Sawada, Taiwan Agric. Res. Inst. Rept. 87: 83 (1944) (nomen non rite publicatum, sine descriptione latina).

Leaf spots amphigenous, scattered to confluent, sub-circular to angular or irregular, 1~5 mm diam., or up to 10 mm when coalescing, initially appearing dark brown to blackish brown with yellowish brown haloes, sometimes centre becoming greyish white with dark brown to blackish brown margins on the upper surface, greyish brown to dark brown on the lower surface. **Caespituli** hypophyllous, effuse to subeffuse. **Primary mycelium** internal, hyphae septate, branched, hyaline, 2~3 μm wide. **Secondary mycelium** external, hyphae septate, branched, creeping on the leaf surface, 2.5~3.5 μm wide. **Stromata** small to large, well-developed, subglobular, brown to dark brown, 10~35 μm diam., composed of swollen, brown hyphal cells.

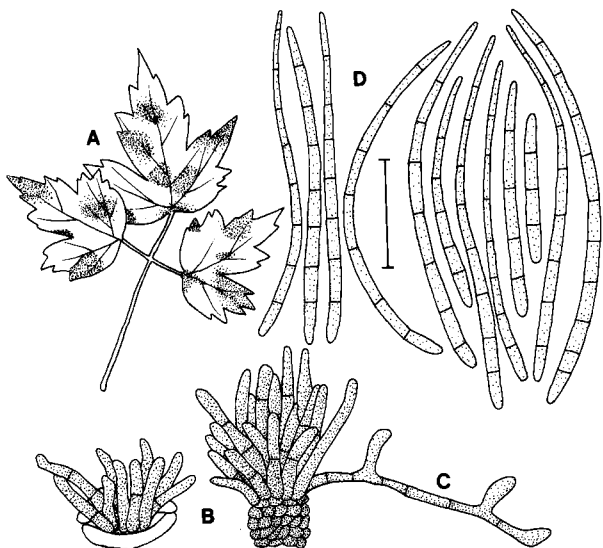


Fig. 6. *Pseudocercospora clematidis*. (A) Leaf spots on the lower leaf surface of *Clematis apiifolia* (0.7 \times). (B) Conidiophores. (C) External secondary hyphae arising from a fascicle of primary conidiophores, bearing secondary conidiophores as lateral branches. (D) Conidia. Bar = 30 μ m.

Conidiophores 5–20 in a dense fascicle, emerging through substomatal stomata, olivaceous brown throughout, irregular in width, straight to slightly curved, not geniculate, not branched, subobtuse to obconic at the apex, 0–3-septate, 10–48 \times 3.0–4.5 μ m; conidial scars inconspicuous. **Conidia** solitary, filiform to obclavate, very pale olivaceous to subhyaline, substraight to moderately curved, or even undulate, 3–10-septate, non-constricted at the septa, obtuse to subacute at the apex, obconic to subtruncate at the base, 40–120 \times 3.0–4.0 μ m; hilum unthickened and not darkened.

Habitat: On living leaves of *Clematis apiifolia* A.P. DC. (Ranunculaceae).

Specimen examined: SMK 15229 (24 IX 1998, Kangnung).

Distribution: China, Korea, and Taiwan.

Notes: This is the first record of this species from Korea. Hsieh and Goh (1990) described the characters for *Pseudocercospora clematidis* based on Taiwanese collections: Secondary mycelium absent; stomata small; conidiophores somewhat shorter (8–23 μ m long); conidia mostly curved to undulate, 40–100 \times 2.5–4.0 μ m. Guo and Hsieh (1995) added the following features; secondary mycelium developed, conidia narrowly obclavate and acute to obtuse at the apex. These features are, however, usually within the variation of the species. Therefore, the Korean collection is in accordance with *P. clematidis*. *Pseudocercospora squalidula* (Peck) Y.L. Guo & X.J. Liu (Guo, 1989) was published as a new combination based on *Cercospora squalidula* Peck, and reallocated as a synonym of

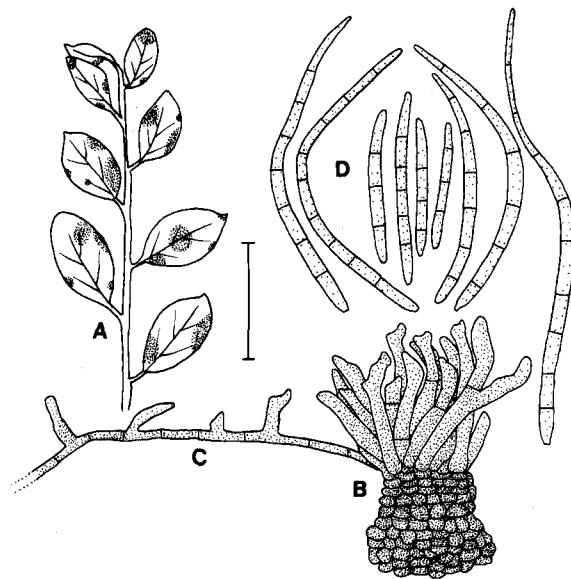


Fig. 7. *Pseudocercospora cotoneasteris*. (A) Leaf spots on the upper leaf surface of *Cotoneaster integririma* (0.7 \times). (B) Conidiophores. (C) External secondary hyphae arising from a fascicle of primary conidiophores, bearing secondary conidiophores as lateral branches. (D) Conidia. Bar = 30 μ m.

this species by Guo and Hsieh (1995). However, Braun (in Braun and Melnik, 1997) checked the type material of *C. squalidula*, and replaced it into *Passalora*. Hence *P. squalidula* is clearly distinct from the present species.

7. *Pseudocercospora cotoneasteris* (Katsuki & Tak. Kobay.) Deighton, Trans. Brit. Mycol. Soc. 88: 389 (1987)

Fig. 7

= *Cercospora cotoneasteris* Katsuki & Tak. Kobay., Trans. Mycol. Soc. Japan 17: 276 (1976)

Leaf spots amphigenous, scattered to confluent, indistinct, subcircular to irregular, 1–4 mm diam., or up to 8 mm when coalescing, brown to dark brown with pale yellowish brown haloes on the upper surface, pale brown to greyish brown without definite margins on the lower surface. **Caespituli** amphigenous. **Primary mycelium** internal, hyphae septate, branched, hyaline, 1–2 μ m wide. **Secondary mycelium** external, hyphae septate, branched, creeping on the leaf surface, olivaceous brown, 1.5–2.5 μ m in width. **Stromata** large, well-developed, subglobular, brown to dark brown, 20–60 μ m diam., composed of some swollen hyphal cells. **Conidiophores** 10–30 in a dense fascicle, sometimes arise singly as lateral branches from external secondary mycelium, olivaceous brown to brown throughout or paler towards the apex, straight to slightly curved, not geniculate, sometimes branched, somewhat denticulate at the apical portion, obconic to obtuse at the apex, aseptate or uniseptate, 10–45 \times 3.0–4.0 μ m; conidial scars incon-

spicuous. **Conidia** solitary, straight to moderately curved, very pale olivaceous to subhyaline, cylindrical to cylindrical-obclavate, obtuse to subacute at the apex, obconically truncate to subtruncate at the base, 3~9-septate, non-constricted at the septa, $35\sim120\times2.5\sim3.5\ \mu\text{m}$; hilum unthickened, not darkened.

Habitat: On living leaves of *Cotoneaster integririma* Medicus (Rosaceae).

Specimen examined: SMK 15144 (18 IX 1998, Jinju).

Distribution: China, Japan, Korea, and USA.

Notes: This is the first record of this species from Korea. Katsuki and Kobayashi (1976) recorded this species under *Cercospora cotoneastris* on *Cotoneaster salicifolia* with a full morphological description and detailed illustration. *C. cotoneastris* was characterized by having aseptate conidiophores ($13\sim33\times2.5\sim3.0\ \mu\text{m}$), hyaline to pale olivaceous or sometimes pale greenish brown conidia ($40\sim83\times2.5\sim3.8\ \mu\text{m}$). Deighton (1987) referred this species to *Pseudocercospora*, and added the following features; secondary mycelium superficial, conidiophores branched. Therefore, the Korean collection agrees well with *Pseudocercospora cotoneastris*, although minor differences have been observed in the present collection, they belong to the variation of this species.

8. *Pseudocercospora handelii* (Bubák) Deighton, Trans. Brit. Mycol. Soc. 88: 390 (1987) Fig. 8

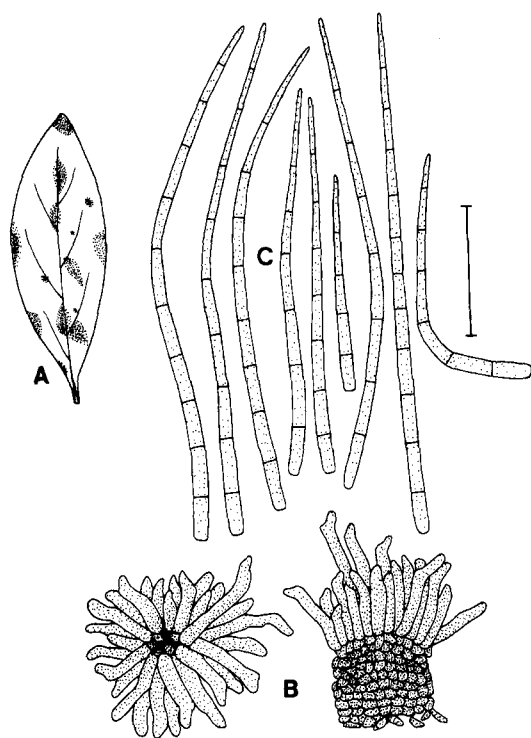


Fig. 8. *Pseudocercospora handelii*. (A) Leaf spots on the upper leaf surface of *Rhododendron indicum* (0.7 \times). (B) Conidiophores. (C) Conidia. Bar = 30 μm .

\equiv *Cercospora handelii* Bubák, Konigl. Naturhist. Hofmus. 23: 106 (1909)

\equiv *Cercoseptoria handelii* (Bubák) Deighton, Mycol. Papers 140: 166 (1976)

$=$ *Cercospora rhododendri* Marchal & Verpl., Bull. Soc. Roy. Bot. Belg. 59: 24 (1926)

Leaf spots amphigenous, scattered to confluent, sub-circular to angular, or irregular, 2~10 mm diam., initially appearing brown to dark brown, later centre becoming greyish white with dark brown to dark reddish brown margins on the upper surface, pale brown to brown with purplish brown or greyish brown haloes on the lower surface. **Caespituli** amphigenous, but abundantly epiphyllous, punctiform to subeffuse. **Mycelium** internal, hyphae septate, branched, hyaline, 2~4 μm wide. **Stromata** small to large, well-developed, subglobular to globular, dark brown, 20~50 μm diam., composed of several swollen hyphal cells. **Conidiophores** 10~40 in a dense fascicle, usually erumpent through the cuticle, occasionally emerging through substomatal openings, pale olivaceous brown throughout, uniform in width, straight to mildly curved or occasionally undulate, sometimes somewhat attenuated towards the upper portion, not geniculate, not branched, aseptate, $9\sim32\times2.5\sim4.0\ \mu\text{m}$; conidial scars inconspicuous. **Conidia** solitary, acicular to filiform, straight to mildly curved or rarely moderately curved, subhyaline to hyaline, 4~11-septate, non-constricted at the septa, acute to subacute at the apex, truncate to subtruncate at the base, $50\sim132\times2.5\sim3.5\ \mu\text{m}$; hilum unthickened and not darkened.

Habitat: *Rhododendron indicum* (L.) Sweet. (Ericaceae).

Specimen examined: SMK 13648 (10 IX 1996, Kangnung).

Distribution: Belgium, China, Czech Republic, Japan, Korea, New Zealand, Republic of South Africa, Russia, and USA.

Notes: This is the first record of this species from Korea. Chupp (1954) and Katsuki (1965) described this species under *Cercospora handelii*. *C. handelii* is characterized as follows: Stromata variable in shape and size; conidiophores subhyaline to pale olivaceous, somewhat longer (15~70 μm long); conidia narrowly linear to distinctly obclavate, somewhat narrower (1.5~3.0 μm wide). Deighton (1976) transferred the name of this species to *Cercoseptoria* and later (Deighton, 1987) to *Pseudocercospora* when he also transferred to *Pseudocercospora* several other species which he had previously placed in *Cercoseptoria* or *Cercospora*. *Pseudocercospora handelii* collected in China (Guo and Hsieh, 1995) possesses slightly geniculate conidiophores, narrowly linear to obclavate conidia. However, these features are usually within the variation of this species. Therefore, the Korean collection is in

agreement with *P. handelii*. *Pseudocercospora rhododendricola* (J.M. Yen) Deighton is close to this species, but easily distinguished from the latter as follows: Fructification epiphyllous; conidiophores denticulate, 1~2-septate, conidia filiform, somewhat shorter and narrower ($54\sim 96 \times 2.0\sim 2.5 \mu\text{m}$).

9. *Pseudocercospora lespedezicola* Goh & W.H. Hsieh, in Hsieh and Goh, *Cercospora* and Similar Fungi from Taiwan: 192 (1990) Fig. 9

Leaf spots amphigenous, scattered to confluent, circular to irregular, 1~5 mm diam., or up to 10 mm when coalescing, initially appearing pale brown to fuliginous without definite margins, later centre becoming dark brown to blackish brown with brown border lines. **Caespituli** amphigenous, effuse to punctiform. **Primary mycelium** internal, hyphae septate, branched. **Secondary mycelium** external, hyphae septate, branched, $2.0\sim 3.5 \mu\text{m}$ wide, emerging through substomatal openings and running on the host surface. **Stromata** large, well-developed, subglobular, brown to dark brown, $20\sim 45 \mu\text{m}$ diam., composed of some swollen hyphal cells. **Conidiophores** 10~40 in a very dense fascicle, emerging through substomatal stromata and erumpent through the cuticle, pale olivaceous brown throughout, uniform in width, straight to slightly curved, 1~2 times mildly geniculate at the apical portion, not branched, obtuse to subobtuse at the apex, 0~2-septate, $8\sim 40 \times 3.0\sim 4.5 \mu\text{m}$; conidial scars inconspicuous. **Conidia** solitary, cylindrical to obclavate-cylindric, straight to mildly

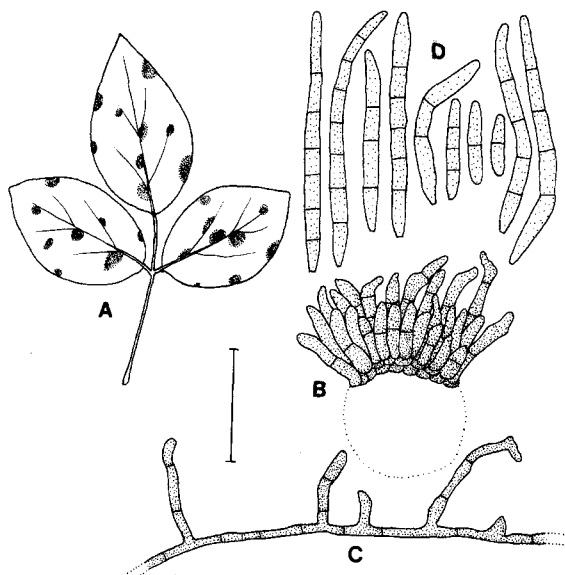


Fig. 9. *Pseudocercospora lespedezicola*. (A) Leaf spots on the lower leaf surface of *Lespedeza maximowiczii* (0.7 \times). (B) Conidiophores. (C) Secondary conidiophores borne on the external mycelium. (D) Conidia. Bar = $30 \mu\text{m}$.

curved, subhyaline to very pale olivaceous brown, 1~7-septate, non-constricted at the septa, obtuse to subobtuse at the apex, short obconically truncate to subtruncate at the base, $16\sim 80 \times 3.0\sim 4.5 \mu\text{m}$; hilum unthickened and not darkened.

Habitat: On living leaves of *Lespedeza maximowiczii* Schneid. (Leguminosae).

Specimen examined: SMK 14265 (27 IX 1997, Chuncheon).

Distribution: China, Korea, and Taiwan.

Notes: This is the first record of this species from Korea. Chupp (1954) mentioned *Cercospora lespedezae* Ellis & Dearn as a synonym of *Cercospora latens* Ellis & Everh. Braun (in Braun and Melnik, 1997) studied the type materials of the two species, *C. latens* and *C. lespedezae* on *Lespedeza capitata*, and transferred the former species into *Pseudocercospora*. But, it differs from the Korean collection by its hypophyllous fruiting and the absence of external secondary mycelium. *C. lespedezae* is, however, a true *Cercospora* s. str. with thickened, darkened conidial scars and acicular to obclavate-subcylindric, hyaline conidia; stromata almost absent; conidiophores arranged in small fascicles. Hsieh and Goh (1990) described the characters of *Pseudocercospora lespedezicola* as follows: Fructification amphigenous, stromata well-developed, secondary mycelium superficial, conidiophores ($10\sim 35 \times 3.0\sim 4.5 \mu\text{m}$) arranged in loose to dense fascicles, conidia ($8\sim 65 \times 2.5\sim 4.0 \mu\text{m}$) cylindrical to obclavate-cylindric. Therefore, the Korean collection is in accordance with *P. lespedezicola*.

10. *Ramularia chaerophylli* Ferraris, Malpighia 16: 473 (1902) Fig. 10

= *Ramularia anthrisci* Höhn., Hedwigia 42: 178 (1903)

= *Ramularia chaerophylli* f. *aurei* Gonz. Frag., Trab. Mus. Nac. Cienc. Nat. Madrid, Ser. Bot. 9: 94 (1916)

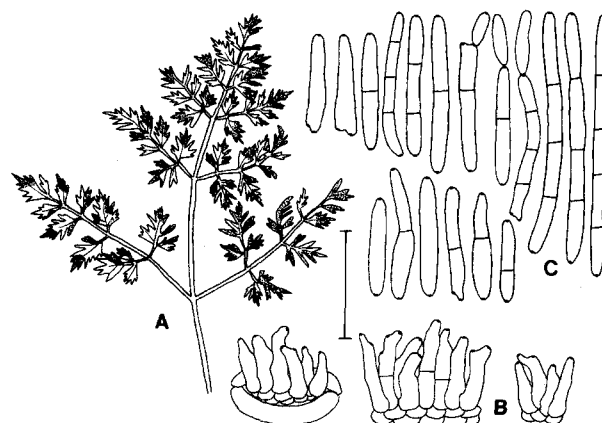


Fig. 10. *Ramularia chaerophylli*. (A) Leaf spots on the upper leaf surface of *Anthriscus sylvestris* (0.5 \times). (B) Conidiophores. (C) Conidia. Bar = $30 \mu\text{m}$.

Leaf spots amphigenous, scattered, indistinct, often vein-limited, angular to irregular, 1~5 mm diam., initially appearing pale greenish discolourations, later becoming yellowish brown to brown, finally centre turning greyish brown to greyish white without definite margins. **Caespituli** amphigenous, punctiform, whitish grey. **Mycelium** internal, hyphae septate, branched, hyaline, 2.0~3.0 μm wide. **Stromata** small to medium, slightly to moderately developed, subglobular to globular, colourless, 10~35 μm wide, composed of several swollen hyphal cells. **Conidiophores** 4~12 in a loose fascicle, arising from substomatal stromata or erumpent through the cuticle, hyaline, straight to geniculate-sinuous, 0~1 time geniculate, not branched, 0~1-septate, but usually aseptate, 12~25 \times 3.5~5.0 μm ; conidial scars conspicuous, apical or on small shoulders of conidiogenous cells caused by geniculation. **Conidia** catenate, in short (1~3) branched or unbranched chains, occasionally solitary, cylindrical to slightly fusiform, straight to mildly curved, hyaline, 0~3(~4)-septate, non-constricted or occasionally slightly constricted at the septa, obtuse at both ends, sometimes attenuate towards the apex, 10~72 \times 3.5~5.0 μm ; hilum somewhat thickened, darkened, and non-protuberant.

Habitat: On living leaves of *Anthriscus sylvestris* Hoffm. (Umbelliferae).

Specimen examined: SMK 15773 (5 V 1999, Samchok).

Distribution: Austria, Caucasus, France, Italy, Korea, Siberia, USA, and Uzbekistan.

Notes: This is the first record of this species from Korea. Braun (1998) described the following characters of this species with detailed illustration: Stromata small to moderately large; conidiophores subcylindrical to geniculate-sinuous, 0~1-septate, 10~25 \times 2.0~4.0 μm ; conidia catenate, cylindrical, 15~70 \times 2.0~5.0 μm . *Ramularia rhaetica* (Sacc. & G. Winter) Jaap. on *Laserpitium* and *Peucedanum* is morphologically indistinguishable from the present species, except for branched conidiophores. The hosts of both species are unrelated and belong to different genera of the Umbelliferae. Therefore, the Korean collection agrees well with Braun's (1998) description.

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적 요

본 연구는 1990년부터 국내에서 채집하여 고려대학교 농생물학과 진균표본보관소(SMK)에 보존하고 있는 *Cer-*

cospora 및 관련 속의 진균을 대상으로 분류학적 연구를 실시한 결과의 열 한 번째 보고이다. 이번 보고에서는 *Cercospora* 4종, *Phaeoramularia* 1종, *Pseudocercospora* 4종 및 *Ramularia* 1종에 대한 균학적 특징을 기재 묘사하였다. 밤나무와 산밤나무에서 *Cercospora castaneae*, 애기나리에서 *C. dispori*, 낙상홍에서 *C. ilicis-opacae*, 아욱에서 *C. malvarum*, 쥐오줌풀에서 *Phaeoramularia valerianicola*, 사위질빵에서 *Pseudocercospora clematidis*, 개야광나무에서 *P. cotoneasteris*, 영산홍에서 *P. handelii*, 조록싸리에서 *P. lespedezicola*, 그리고 전호에서 *Ramularia chaerophylli*를 각각 동정하였다.

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