

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

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한국산 *Cercospora* 및 관련 속의 분류학적 연구 (V)

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ABSTRACT: This paper is the fifth contribution towards taxonomic studies on *Cercospora* and allied genera, and contains ten species of Korean cercosporoid fungi; viz., *Cercospora adusta*, *C. chrysanthemi*, *C. ludwigiana*, *C. zebra*, *Passalora depressa*, *Pseudocercospora destructiva*, *P. lonicericola*, *P. nojimai*, *Pseudocercospora inconspicua*, and *Ramularia major*. Morphological characteristics of taxonomic value are described and illustrated for these species to contribute towards a mycological monograph of Korean cercosporoid fungi.

KEYWORDS: *Cercospora*, *Passalora*, *Pseudocercospora*, *Pseudocercospora*, *Ramularia*, Monograph

In previous contributions of this series (Kim and Shin, 1998a, 1998b, 1998c, 1998d), 40 cercosporoid fungi from Korea comprising 15 species of *Cercospora*, one *Cercospora*, one *Distocercospora*, two *Mycovellosiella*, three *Passalora*, one *Phaeoisariopsis*, one *Phacellium*, nine *Pseudocercospora*, one *Pseudocercospora*, and six *Ramularia* were treated. The present paper deals with ten additional cercosporoid taxa from Korea, namely four *Cercospora*, one *Passalora*, three *Pseudocercospora*, one *Pseudocercospora*, and one *Ramularia* species that are respectively 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 adusta* Heald & F.A. Wolf, Mycologia 3: 14 (1911) Fig. 1

Leaf spots scattered to confluent, distinct, large, usually 5~10 mm diam., or up to 20 mm when confluent, circular, often zonate, greyish brown with wide pale brown borders, later becoming whitish grey with pale brown margins. **Caespituli** amphigenous, centres on both leaf surfaces may be blackened by heavy fructification. **Mycelium** internal, hyphae septate, branched. **Stromata** rudimentary to slightly developed, brown. **Conidiophores** 3~16 in a loose

fascicle, uniformly pale olivaceous brown or paler upwards, 4~7-septate, straight to curved, slightly to abruptly geniculate several times at the upper part, not branched, 30~100×4.0~5.5 μm; conidial scars large, 1.5~2.5 μm wide, conspicuous, apical or on shoulders of conidiogenous cells caused by geniculation, obtuse to subtruncate at the apex. **Conidia** solitary, acicular, filiform to obclavate-cylindric, straight to slightly curved, subhyaline, 3~11-septate, some septa inconspicuous, non-constricted at the septa, obtuse to subacute at the apex, subtruncate to truncate at the base, variable in length, 30~104×(3.5~)4.0~6.0 μm; hilum conspicuously thickened, darkened, and non-protuberant.

Habitat: On living leaves of *Ligustrum ovalifolium* Hassk. (Oleaceae).

Specimen examined: SMK 13275 (29 X 1994, Chunchon).

Distribution: Korea, USA and Zimbabwe.

Notes: Shin and Braun (1996) listed this fungus for the first time from Korea, and Shin (1998) provided a brief morphological description based on a Korean specimen. Chupp (1954) described the conidia of this species as usually long, narrow (50~350×1.5~3.0 μm) and hyaline in colour. The features fall within the accepted variation for this fungus, and the Korean collection thus fits Chupp's description. *C. ligustricola* Tai on *Ligustrum* spp. is different from the present fungus by somewhat longer and wider conidiophores (130~265×7.0~10.0 μm), and extremely wide conidia (16~20 μm wide). Therefore, Chupp (1954) excluded this species from *Cercospora*. Several cer-

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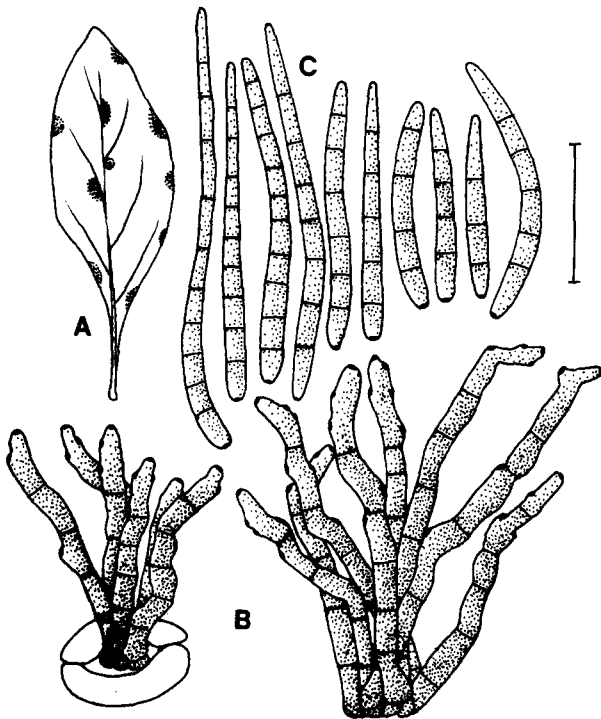


Fig. 1. *Cercospora adusta*. (A) Leaf spots on the upper leaf surface of *Ligustrum ovalifolium* (0.7 \times). (B) Conidiophores. (C) Conidia. Bar=30 μ m.

cosporoid taxa occur on this host. Deighton (1976) distinguished *C. ligustri* Roum. [= *Pseudocercospora ligustri* (Roum.) Deighton] from the present species as follows: Fructification epiphyllous, conidiophores (20~40 \times 4.0~6.0 μ m) rather short, conidia (20~65 \times 3.0~6.0 μ m) obclavate-cylindrical and usually 1~3-septate. *Passalora oleacearum* (Chidd.) U. Braun (\equiv *Cercospora oleacearum* Chidd.) on *Ligustrum japonicum* is confusable with the present fungus, but differs in having much shorter and wider conidiophores (10~40 \times 2.5~7 μ m), conidia (35~40 \times 4~7 μ m) with 1~3 septa, and hardly thickened but darkened conidial scars.

2. *Cercospora chrysanthemi* Heald & F.A. Wolf, Mycologia 3: 15 (1911) Fig. 2

= *Cercospora chrysanthemi* Puttemans, Bull. Soc. Roy. Bot. Belg. 48: 244 (1911)

= *Cercospora chrysanthemi-coronarii* Sawada, Dept. Agric. Govt. Res. Inst. Taiwan Rept. 2: 147 (1922)

Leaf spots scattered, often confluent, distinct, circular to irregular, often zonate, 2~6 mm diam., or up to 10 mm when confluent, pale tan to dingy grey with narrow brown raised margins. **Caespituli** amphigenous, later appearing dirty grey due to heavy fructification of the fungus. **Mycelium** internal, hyphae septate, branched. **Stromata** small or occasionally medium, slightly developed. **Coni-**

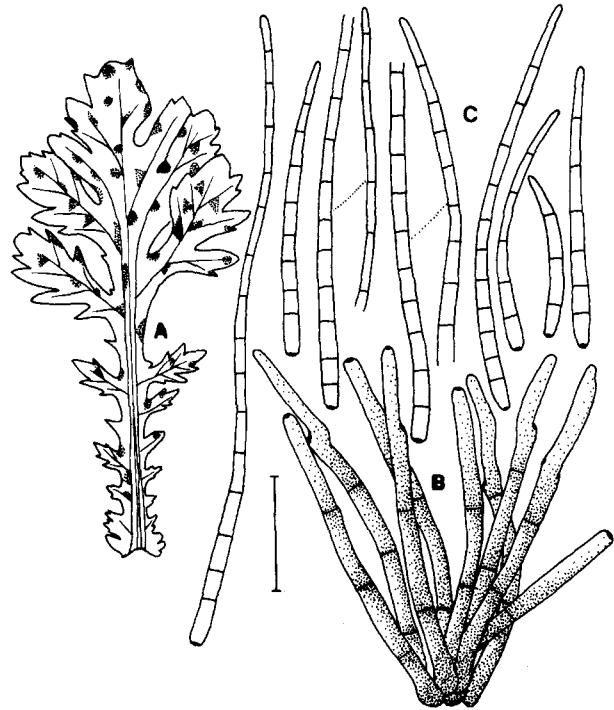


Fig. 2. *Cercospora chrysanthemi*. (A) Leaf spots on the upper leaf surface of *Chrysanthemum coronarium* var. *spatiosum* (0.6 \times). (B) Conidiophores. (C) Conidia. Bar=30 μ m.

diophores 4~20 in a loose to dense fascicle, uniformly pale olivaceous brown or paler upwards, 0~2-septate, straight to 1~2 times slightly geniculate at the upper portion, not branched, 40~110 \times 4.0~5.0 μ m; conidial scars large, 1.5~2.0 μ m wide, conspicuous, apical or on shoulders of conidiogenous cells caused by geniculation. **Conidia** solitary, acicular to filiform, sometimes shorter ones cylindrical, substraight to mildly curved, hyaline, 3~21-septate, non-constricted at the septa, obtuse to subacute at the apex, truncate to subobtuse at the base, greatly variable in length, 30~200 \times 3.0~4.5 μ m; hilum conspicuously thickened, darkened, and non-protuberant.

Habitat: On living leaves of *Chrysanthemum coronarium* var. *spatiosum* Bailey (Compositae).

Specimens examined: SMK 13350 (6 XI 1994, Kangnung), 15139 (23 X 1998, Koyang).

Distribution: Brazil, Burma, China, India, Japan, Korea, Mauritius, Philippines, USA and Taiwan.

Notes: Shin and Braun (1996) recorded this fungus for the first time from Korea. Chupp (1954) described shorter conidiophores (20~80 μ m long) and conidia (40~125 μ m long) than those of the Korean specimen. A Japanese collection (Katsuki, 1965) possessed straight to slightly curved conidiophores (33~72 \times 3.7~5.0 μ m), and clavate or cylindrical conidia (73~85 \times 2.5~3.7 μ m) with 4~9 septa. Hsieh and Goh (1990) mentioned conidiophores, 20~82 \times 3.5~5.0 μ m and conidia acicular, 25~150 \times 2.0~3.5 μ m. The

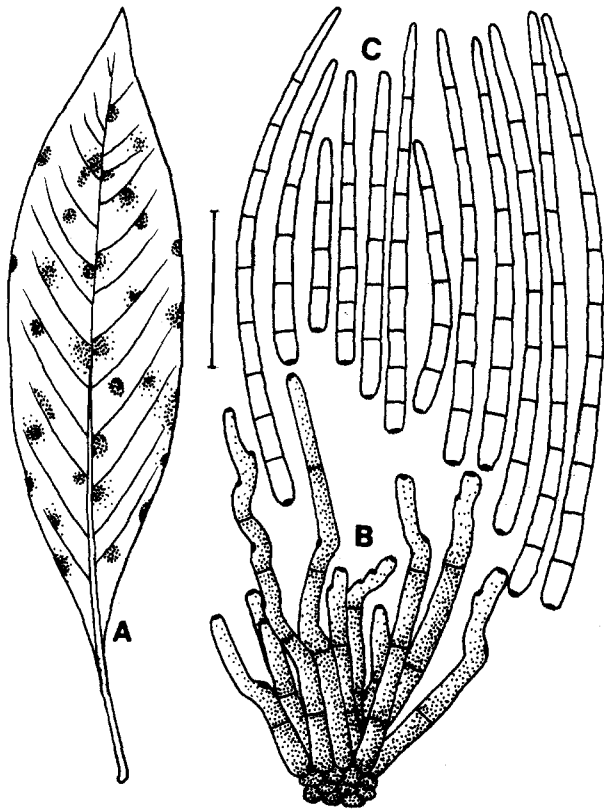


Fig. 3. *Cercospora ludwigiana*. (A) Leaf spots on the upper leaf surface of *Ludwigia prostrata* (0.8 \times). (B) Conidiophores. (C) Conidia. Bar=30 μ m.

Korean collection, therefore, agrees well with previous descriptions.

3. *Cercospora ludwigiana* Bagyanarayana, U. Braun & Jagadeswar, Cryptog. Bot. 5: 363 (1995) Fig. 3

Leaf spots amphigenous, scattered, distinct to indistinct, often as small spots, circular to irregular, 1~4 mm diam., reddish brown to dingy brown with narrow dark brown margins. **Caespituli** amphigenous. **Mycelium** internal, hyphae septate, branched. **Stromata** absent to small, rudimentary to slightly developed, composed of a few brown, swollen hyphal cells. **Conidiophores** 3~12 in a divergent fascicle, pale olivaceous brown or paler upwards, straight to slightly curved, 1~4-septate, 1~4 times sparingly geniculate, not branched, 30~120 \times 3.5~4.5 μ m; conidial scars large and conspicuous, apical or on shoulders of conidiogenous cells caused by geniculation. **Conidia** solitary, acicular, straight to mildly curved, hyaline to subhyaline, 3~10-septate, non-constricted at the septa, obtuse to subobtuse, or sometimes subacute at the apex, truncate to subtruncate at the base, very variable in length, 40~125 (~250) \times 3.5~4.5 μ m; hilum conspicuously thickened, darkened, and non-protuberant.

Habitat: On living leaves of *Ludwigia prostrata* Roxb.

(Onagraceae).

Specimen examined: SMK 13064 (25 IX 1994, Kangnung).

Distribution: India, Japan, Korea and USA.

Notes: Shin and Braun (1996) recorded this fungus for the first time from Korea. Chupp (1954) regarded Japanese collections from the same host as being separated from *C. ludwigiae* G.F. Atk. by small morphological differences, and designated it as a new species, *C. yoshinagiana* Chupp. *C. ludwigiae* is similar to this fungus but differs from the latter in several respects; viz., shorter conidiophores (10~60 μ m long), obclavate conidia with long obconically truncate bases. Chupp (1954) suggested that *C. ludwigiae* is very close to *C. jussiaeae* G.F. Atk. [= *Pseudocercospora jussiaeae* (G.F. Atk.) Deighton]. Based on the inconspicuous and unthickened conidial scars, Braun and Castañeda (1991) reduced *C. ludwigiae* to synonymy with *Pseudocercospora jussiaeae*. Bagyanarayana *et al.* (1995) described the following characters of this species on *Ludwigia* sp. from India: Caespituli amphigenous, conidiophores (30~100 \times 3~6 μ m) arranged in small groups, and conidia (50~120 \times 1.5~4.0 μ m) acicular. Therefore, the Korean collection agrees well with the original description, although the conidia are somewhat wider. *Cercospora onagrae* Purkayastha & Mallik differs from this species in having wider, coloured conidia with a few septa.

4. *Cercospora zebrina* Pass., Hedwigia 16: 124 (1877)

Fig. 4

= *Cercosporina zebrina* (Pass.) Matsuura, J. Plant Prot. 17: 1 (1930)

= *Cercospora helvola* Sacc., Michelia 2: 556 (1882)

= *Cercospora stolziana* Magnus, Die Pilze von Tirol. 3: 558 (1905)

= *Cercospora helvola* var. *zebrina* Ferraris, Fl. Ital. Cryptog. 1(8): 423 (1905)

Leaf spots amphigenous, scattered, often confluent, distinct, angular to irregular, often vein-limited, small to fairly large, 1~10 μ m diam., pale tan to dingy grey centre with dark or purplish brown margins; also on rachis and floral axis, forming subcircular to linear lesions. **Caespituli** amphigenous, but abundantly hypophyllous, later appearing as greyish brown patch due to heavy fructification of the fungus. **Mycelium** internal, hyphae septate, branched. **Stromata** small, slightly developed, brown, composed of a few brown hyphal cells. **Conidiophores** 3~20 in a divergent fascicle, pale olivaceous brown throughout, 2~4-septate, straight to slightly curved, usually not geniculate but occasionally 1~3 times mildly geniculate, not branched, 45~105 \times 3.0~4.5 μ m; conidial scars large and con-

spicuous, apical or on shoulders of conidiogenous cells caused by geniculation. **Conidia** solitary, filiform to acicular, straight to mildly curved, hyaline or subhyaline due to dense cytoplasm and oil drops, guttulate, 3~16-septate, non-constricted at the septa, subobtuse to subacute at the apex, truncate at the base, variable in length, $40\sim 180 \times 2.5\sim 4.0 \mu\text{m}$; hilum conspicuously thickened, darkened, and non-protuberant.

Habitat: On living leaves of *Trifolium repens* L. (Leguminosae).

Specimens examined: SMK 11376 (22 X 1991, Kangnung), 11546 (20 XI 1991, Kangnung), 11704 (17 VI 1992, Kangnung), 11807 (27 VII 1992, Kangnung), 13379 (10 XI 1994, Kangnung), 13521 (12 VI 1995, Kangnung), 13538 (15 VI 1995, Kangnung), 13749 (4 V 1997, Namyangju), 15374 (7 X 1998, Namyangju).

Distribution: Worldwide where the plant is growing, including China, Japan and Korea.

Notes: Shin and Braun (1996) listed this fungus for the first time from Korea, and Shin (1998) provided a brief morphological description based on Korean material. Chupp (1954) described that conidiophores are usually straight, sinuous and repeatedly to abruptly geniculate. However, these characters are variable in this species, and are of minor taxonomic value. A Japanese collection (Katsuki, 1965) agrees with our collection, although the conidiophores are in dense fascicles and the conidia are

somewhat wider ($4.5\sim 5.0 \mu\text{m}$ wide).

5. *Passalora depressa* (Berk. & Broome) Sacc., Nuovo Giorn. Bot. Ital. 8: 187 (1876) Fig. 5

≡ *Cladosporium depressum* Berk. & Broome, Ann. Mag. Nat. Hist., II, 7: 99 (1851)

≡ *Fusicladium depressum* (Berk. & Broome) Roum., Fungi Gallici exs. No. 86 (1879)

≡ *Scolecotrichum depressum* (Berk. & Broome) J. Schröt., in Cohn, Krypt-Fl. Schles., Pilze II: 497 (1897)

≡ *Cercospora depressa* (Berk. & Broome) Vassiljevsky, in Vassiljevsky & Karakulin, Fungi Imperfecti Parasitici, I. Hyphomycetes: 356 (1937)

≡ *Megacladosporium depressum* (Berk. & Broome) Viennot-Bourgin, Les Champignons Parasites des Plantes Cultivees, II: 1488 (1949) (nomen non rite publicatum)

≡ *Cercosporidium depressum* (Berk. & Broome) Deighton, Mycol. Papers 112: 37 (1967)

= *Passalora polythrincioides* Fuckel, Symbolae Mycologicae: 353 (1870)

= *Fusicladium peucedani* Syd. & P. Syd., Anns Mycol. 5: 340 (1907), non *F. peucedani* Ellis & Holw., Bull. Labs Nat. Hist. St. Univ. Iowa 3: 42 (1895)

Leaf spots amphigenous, scattered, distinct, subcircular to irregular, 1~8 mm diam., at first only small black spots, later becoming black raised pustules on the lower surface,

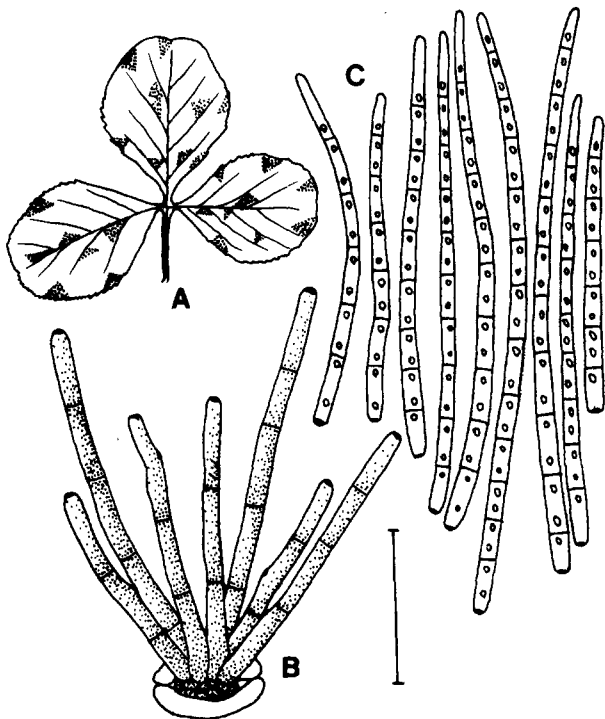


Fig. 4. *Cercospora zebrina*. (A) Leaf spots on the lower leaf surface of *Trifolium repens* (0.8×). (B) Conidiophores. (C) Conidia. Bar=30 μm .

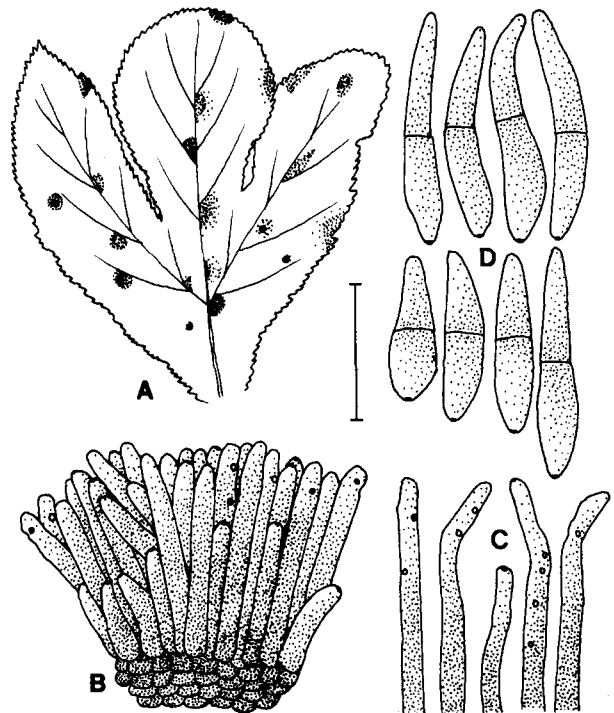


Fig. 5. *Passalora depressa*. (A) Leaf spots on the lower leaf surface of *Angelica gigas* (0.3×). (B) Conidiophores. (C) Upper portion of conidiophores showing the apices. (D) Conidia. Bar=30 μm .

appearing as vein-limited, yellowish discolourations on the upper surface, later leaves turning yellow. **Caespituli** hypophyllous, blackish brown due to heavy fructification of the fungus. **Mycelium** internal, hyphae septate, branched. **Stromata** small, but well-developed, composed of several hyphal cells. **Conidiophores** ca. 10~50 or more in a dense fascicle from stomata, brown to olivaceous brown throughout, usually darker than conidia in colour, aseptate, substraight to mildly sinuous, not geniculate, not branched, 20~56×5.0~8.0 μm ; conidial scars small, but somewhat conspicuous. **Conidia** solitary, obclavate to obclavate-fusiform, straight to mildly curved near the middle portion, olivaceous brown, uniseptate, non-constricted at the septa, obtuse at the apex, obconic to obconically truncate at the base, 20~60×7.5~12.0 μm ; hilum somewhat thickened, darkened, non-protuberant, but occasionally protuberant.

Habitat: On living leaves of *Angelica gigas* Nakai (Umbelliferae).

Specimens examined: SMK 12557 (20 VIII 1993, Suwon), 12607 (3 IX 1993, Suwon).

Distribution: Canada, Czechoslovakia, Germany, Great Britain, Ireland, Korea, Rumania, Sweden and USA.

Notes: Shin and Braun (1996) first listed this fungus from Korea, and Shin (1998) made a brief morphological description based on Korean material. Deighton (1967) redefined *Passalora* Fr. and distinguished *Cercosporidium* Earle by well-developed stomata. Therefore, Braun reduced *Passalora depressa* to synonymy with *Cercosporidium depressum*. Von Arx (1983) treated *Cercosporidium* as synonymous with *Passalora* and this has been followed by Castañeda and Braun (1989), Deighton (1990), and Braun (1992). Braun (1995) emended *Passalora* in several aspects: The conidial scars (*Passalora*-type) are almost unthickened to slightly thickened and slightly to obviously darkened; conidia are colourless to pigmented, fairly broad, obclavate to cylindrical, and usually 0~4-septate. Therefore, Braun reintroduced *Passalora* and reduced *Cercosporidium depressum* to synonymy with *Passalora depressa*. On the Korean material, some fascicles have long conidiophores (sometimes up to 50 μm long) bearing conidial scars only at the apex. Such conidiophores are usually straight or incurved. Similar fascicles of long conidiophores bearing conidial scars only at the apex are to be found on some collections of *Passalora angelicae* (Ellis & Everh.) U. Braun (\equiv *Cercosporidium angelicae* Ellis & Everh.; cf. Deighton, 1967), and it would be difficult to distinguish *P. angelicae* from the present species on the basis of such conidiophores. *Passalora angelicae* has usually been confused with this species, but differs from the latter in several aspects: Conidiophores distinctly geniculate, conidia commonly acute at the apex and usually constricted at the septa. Braun and Melnik (1997) men-

tioned that some Russian records of the present species on *Aegopodium*, *Apium*, *Macroscadium*, *Paraligusticum* and *Seseli* are doubtful and possibly belong to one of the other *Passalora* species known from hosts of the Apiaceae.

6. *Pseudocercospora destructiva* (Ravenel) Y.L. Guo & X. J. Liu, Acta Mycol. Sinica 11(2): 131 (1992) Fig. 6
 \equiv *Cercospora destructiva* Ravenel, J. Mycol. 3: 13 (1887)

Leaf spots amphigenous, scattered, distinct, circular to irregular, 2~8 mm diam., sometimes confluent, grey to brown with definite rusty raised margins, centre greyish white or deep grey to pale brown, sometimes pale yellowish brown haloes on the upper surface, grey to pale greyish brown with reddish brown to blackish brown margins on the lower surface. **Caespituli** amphigenous, but abundantly epiphyllous. **Mycelium** internal, hyphae septate, branched, hyaline. **Stromata** very large, 50~130 μm diam., dark brown, well-developed, globular to subglobular. **Conidiophores** ca. 20~50 or more in a very dense fascicle, erumpent through the cuticle, pale olivaceous brown, aseptate, not branched, straight to slightly curved or sinuous, not geniculate, usually irregular in width, 7~30×3.0~4.0 μm , gently tapered at the apical portion; conidial scars inconspicuous. **Conidia** solitary, filiform, cylindrical to obclavate-cylindrical, straight to mildly curved, hyaline to

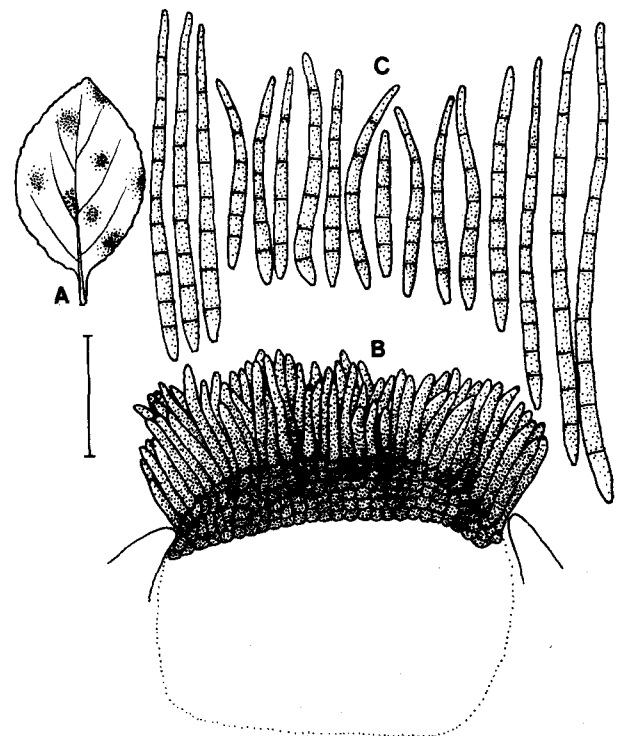


Fig. 6. *Pseudocercospora destructiva*. (A) Leaf spots on the upper leaf surface of *Euonymus japonicus* (0.6×). (B) Conidiophores. (C) Conidia. Bar=30 μm .

subhyaline, 3~11-septate, non-constricted or sometimes slightly constricted at the septa, obtuse to subacute at the apex, obconically truncate to subtruncate at the base, $32\sim 110 \times 2.5\sim 3.5 \mu\text{m}$; hilum unthickened, and not darkened.

Habitat: On living leaves of *Euonymus japonicus* Thunb. (Celastraceae).

Specimens examined: SMK 10396 (13 IX 1990, Kangnung), 10678 (7 XI 1990, Kangnung), 11146 (26 IX 1991, Kangnung), 12021 (29 IX 1992, Kangnung), 15102 (23 IX 1998, Seoul).

Distribution: China, Japan, Korea and North America.

Notes: Shin and Braun (1993) first listed this fungus from Korea, and Shin (1998) provided a brief morphological description. Chupp (1954) described the following characters: Conidiophores without visible conidial scars, arranged in an extremely dense fascicle, conidia cylindrical to obclavate-cylindrical, short ($15\sim 55 \mu\text{m}$ long) and 1~3-septate. Therefore, he regarded *Cercospora destructiva* Ravenel as a species of *Didymaria*. Guo and Liu (1992) described the following characters of this fungus: Stromata very large ($40\sim 135 \mu\text{m}$ diam.), conidia ($25\sim 95 \times 2.0\sim 4.0 \mu\text{m}$) cylindrical to obclavate-cylindrical, 3~18-septate. The very densely fasciculate conidiophores, cylindrical to obclavate-cylindrical conidia and the inconspicuous conidial scars fit with *Pseudocercospora*. Therefore, they placed this species in *Pseudocercospora destructiva*. The fungus collected in Korea is very similar to Chupp's description, except for the shorter, 1~3-septate conidia. *Cercospora euonymi* Ellis (= *Cercosporella euonymi* Erikss.) is close to *C. destructiva* described by Chupp (1954), but differs from it in having hyaline conidiophores, somewhat wider conidia ($4\sim 7 \mu\text{m}$ wide) and conspicuous conidial scars.

7. *Pseudocercospora lonicericola* (W. Yamam.) Deighton, Mycol. Papers 140: 146 (1976) Fig. 7

= *Cercospora lonicericola* W. Yamam., J. Soc. Trop. Agric. 6: 604 (1934)

Leaf spots amphigenous, scattered, often confluent, invisible or indistinct on the upper surface, brown to dark brown without definite margins on the lower surface. **Caespituli** hypophyllous, appearing as pale fuliginous angular patches. **Primary mycelium** internal, hyphae septate, branched, hyaline. **Secondary mycelium** creeping on epidermis, emerging through stomata or arising from lateral conidiophores. **Stromata** small, but well-developed, brown, globular. **Conidiophores** 10~20 in a loose to dense fascicle, emerging through stomatal openings, uniformly olivaceous brown to brown, 0~3-septate, not branched, not geniculate, straight to curved or tortuous, sometimes denticulate, irregular in width, $20\sim 50 \times 3.0\sim 4.5 \mu\text{m}$; conidial scars inconspicuous. **Conidia** solitary, fili-

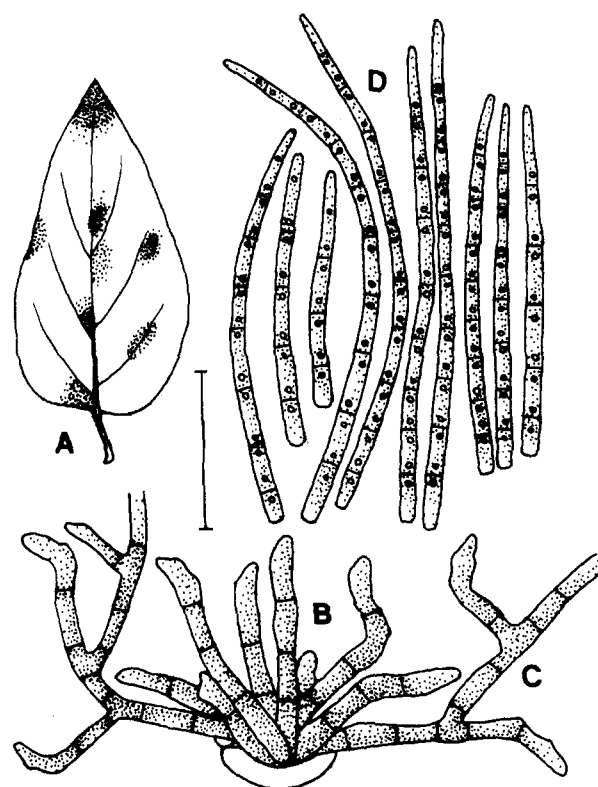


Fig. 7. *Pseudocercospora lonicericola*. (A) Leaf spots on the lower leaf surface of *Lonicera japonica* ($0.8\times$). (B) Conidiophores. (C) External secondary hyphae arising from a fascicle of primary conidiophores, bearing secondary conidiophores as lateral branches. (D) Conidia. Bar= $30 \mu\text{m}$.

form, cylindrical to obclavate-cylindrical, straight to curved, subhyaline to hyaline, guttulate, 3~11-septate, non-constricted at the septa, subacute to subobtuse at the apex, subtruncate to truncate at the base, $45\sim 110 \times 2.5\sim 3.5 \mu\text{m}$; hilum unthickened, and not darkened.

Habitat: On living leaves of *Lonicera japonica* Thunb. (Caprifoliaceae).

Specimens examined: SMK 11332 (15 X 1991, Kangnung), 11391 (23 X 1991, Kangnung), 12337 (29 X 1992, Kangnung), 13803 (25 V 1997, Namyangju), 14894 (25 VIII 1998, Kyungju).

Distribution: Japan, Korea, New Zealand and Taiwan.

Notes: Shin and Braun (1993) first listed this fungus from Korea, and Shin (1998) provided a brief morphological description based on Korean material. Lee *et al.* (1991) reported the following characters of a *Cercospora* sp. from the same host plant: Conidiophores $20\sim 46 \times 4.0 \mu\text{m}$; conidia $76\sim 104 \times 3.0\sim 3.5 \mu\text{m}$, hyaline, 4~5-septate. Although this description matches that of our collection, the identity of the specimen concerned can not be proven, since it was not preserved. *Cercospora loniceriae* Chupp (Chupp, 1954) is similar to the Korean collection, but differs somewhat from it in having very short conidiophores

(5~25 μm long) arranged in a dense fascicle, conidia with subtruncate bases and large stromata (15~60 μm diam.).

8. *Pseudocercospora nojimai* (Togashi & Katsuki) Y.L. Guo & X.J. Liu, *Mycosystema* 5: 105 (1992) Fig. 8
 ≡ *Cercospora nojimai* Togashi & Katsuki, *Sci. Rep. Yakohama Nat. Univ. Sect. II.* 1: 5 (1952)

Leaf spots amphigenous, scattered to confluent, angular to irregular, 1~5 mm diam., pale brown to brown without definite margins, yellowish brown on the upper surface, pale olivaceous brown on the lower surface. **Caespituli** amphigenous. **Primary mycelium** internal, hyphae septate, branched. **Secondary mycelium** emerging through stomata or arising through the cuticle. **Stromata** lacking or rudimentary to slightly developed, composed of a few swollen, brown hyphal cells. **Conidiophores** 3~15 in a loose to dense fascicle, or arising singly as lateral branches on the external hyphae, olivaceous brown to brown, uniform in colour, irregular in width, substraight to curved, not branched, usually not geniculate, but rarely 1~2 times geniculate, 1~3-septate, 20~55 \times 3.0~4.5 μm ; conidial scars inconspicuous. **Conidia** solitary, filiform, cylindrical to obclavate-cylindrical, subhyaline to hyaline, guttulate, straight to moderately curved, 3~10-septate, subobtuse at the apex, subtruncate to truncate at the base, 45~105 \times 2.5~4.5 μm ; hilum unthickened, and not darkened.

Habitat: On living leaves of *Impatiens balsamina* L. and *I. textori* Miq. (Balsaminaceae).

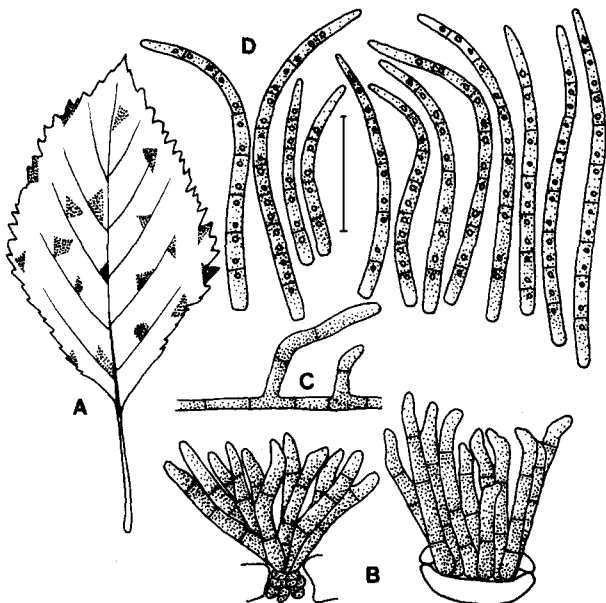


Fig. 8. *Pseudocercospora nojimai*. (A) Leaf spots on the lower leaf surface of *Impatiens textori* (0.6 \times). (B) Conidiophores. (C) Branched conidiophores borne on the external mycelium. (D) Conidia. Bar=30 μm .

Specimens examined: On *Impatiens balsamina*, SMK 13268 (29 X 1994, Chunchon); On *I. textori*, SMK, 13030 (20 IX 1994, Yangku), 13075 (28 IX 1994, Kangnung), 13137 (2 X 1994, Yangku), 13324 (1 XI 1994, Samchok), 13684 (20 IX 1996, Kangnung), 14053 (26 VIII 1997, Kangnung), 14151 (16 IX 1997, Yangku), 15334 (4 X 1998, Yangku).

Distribution: China, Japan and Korea.

Notes: Shin (1995) first reported this fungus as the causal agent of a leaf spot disease on *Impatiens textori*, with a brief morphological description from Korea, and Shin and Braun (1996) listed this fungal species for the second time from Korea. Deighton (1976) pointed out that the present fungus is the same as *Pseudocercospora balsaminae* (Syd.) Deighton. However, the description shows that *P. balsaminae* is different from the Korean specimen in its shorter and narrower conidiophores and very narrow conidia. Chinese collections (Guo and Hsieh, 1995) are characterized by somewhat wider conidiophores and conidia, but these differences are due to the variability of this species. This fungus is similar to *Passalora campi-silii* (Speg.) U. Braun [= *Cercosporidium campi-silii* (Speg.) X. J. Liu & Y.L. Guo], but conidial scars of the latter are somewhat conspicuous and thickened.

9. *Pseudocercospora inconspicua* (G. Winter) U. Braun, *Nova Hedwigia* 47: 343 (1988) Fig. 9

≡ *Cylindrosporium inconspicuum* G. Winter, in *Rabenh.-Winter, F. eur. extraeur. exs.* (ed. nov., Ser. sec.), cent. 12 (resp. cent. 32), Nr. 3178, Dresden (1884) and 34.

Jahresber. Nat. Ges. Graubünden: 69 (1890)

≡ *Cercospora inconspicua* (G. Winter) Höhn., *Annl. Mycol.* 1: 413 (1903) and *Hedwigia* 42: 178 (1903)

= *Cercospora hungarica* Bäumler, *Verh. Zool.-Bot. Ges. Wien* 38: 707 (1888)

≡ *Pseudocercospora hungarica* (Bäumler) Sivan., *The Bitunicate Ascomycetes and Their Teleomorphs:* 202, Vaduz (1984)

= *Cercospora liliicola* Richon, *Cat. Champ. Marne*, No. 2032 (1889)

≡ *Cercospora liliicola* (Richon) Sacc., *Syll. Fung.* 10: 566 (1892)

= *Cylindrosporium inconspicuum* ssp. *candidum* Sacc. & Fautrey, in *Sacc., Syll. Fung.* 16: 1019 (1902)

= *Cercospora lilii* Dearn., *Mycologia* 21: 327 (1929)

= *Septocylindrium picridis* Sacc., in herb.

Teleomorph: *Mycosphaerella martagonis* v. Arx, *Proc. k. Ned. Akad. Wet., Ser. C*, 86: 15 (1983)

Leaf spots amphigenous, scattered, subcircular to irregular, often somewhat zonate, 3~20 mm diam., at first slightly discoloured to pale greenish, later becoming pale

tan to yellowish brown, centre greenish white with dark brown margins. **Caespituli** amphigenous, but abundantly hypophyllous, greyish white, not very conspicuous. **Mycelium** internal, hyphae septate, branched, hyaline, 2~4 μm wide. **Stromata** small to medium, 20~30 μm diam., well-developed, subglobular to globular, hyaline to very pale olivaceous brown, composed of a few swollen hyphal cells. **Conidiophores** 1~10 in a loose fascicle, arising from stomatal openings, sometimes erumpent through the cuticle, hyaline, bottle-shaped to cylindric, aseptate, not branched, straight to sometimes slightly curved near the upper portion, not geniculate, 10~30 \times 4.0~8.0 μm ; conidial scars inconspicuous. **Conidia** solitary, cylindric to subcylindric-obclavate, sometimes fusiform, straight to slightly curved, hyaline, 1~6-septate, non-constricted at the septa, but sometimes slightly constricted at the septa, subobtuse at the apex, obconically truncate to subtruncate at the base, usually gently tapered towards the each end, 30~90 \times 3.5~6.5 μm ; hilum unthickened, and not darkened.

Habitat: On living leaves of *Lilium distichum* Nakai (Liliaceae).

Specimens examined: SMK 12884 (21 VI 1994, Pyongchang), 13526 (13 VI 1995, Pyongchang), 13863 (27 V 1997, Pyongchang).

Distribution: Worldwide where the plant is growing, including Japan, Korea and Far East of Russia.

Notes: Lee *et al.* (1980) first listed this fungus as *Cer-*

cosporella inconspicua (G. Winter) Höhn. on *Lilium longiflorum* Thunb., and Shin and Braun (1996) recorded this fungus as *Pseudocercospora inconspicua* (G. Winter) U. Braun on *L. distichum* Nakai from Korea. Petrak (1925) introduced *Cercoseptoria* for cercosporoid hyphomycetes with pigmented conidiophores and conidia, but later he confused the situation by adding colourless taxa. Deighton (1973) and Arx (1983) discussed *Pseudocercospora*, *Cercospora* and *Cercoseptoria*. Sivanesan (1984) stated that some *Cercospora* and *Cercoseptoria* species with unthickened conidial scars belong to *Pseudocercospora*. He suggested that this species belongs to *Pseudocercospora*, and proposed the combination *P. hungarica* (Bäumler) Sivan. Braun (1988) agreed with Sivanesan (1984) that this species belongs to *Pseudocercospora*. However, he treated this fungus as *P. inconspicua* since the oldest, valid name is *Cylindrosporium inconspicuum* G. Winter. Braun (1988) described the characters of this species as follows: Conidiophores (5~25 \times 2.5~8.0 μm) solitary or arranged in a loose group of fascicles, aseptate; conidia (30~110 \times 2~6 μm) 1~7-septate, subcylindric-obclavate; stromata large (10~80 μm), well-developed. Therefore, this fungus agrees well with Braun's description (1988).

10. *Ramularia major* (Unger) U. Braun, Nova Hedwigia 47: 340 (1988)

Fig. 10

- \equiv *Cylindrospora major* Unger, Die Exantheme der Pflanzen: 168 (1883)
- \equiv *Fusidium petasitidis* Pass., in Thüm., Mycoth. Univ. 1473 (1879)
- \equiv *Ramularia cervina* Speg., Decad. Mycol. Ital.: 107, Conegliano (1879)
- \equiv *Cylindrospora cervina* (Speg.) J. Schröt., in Cohn, Krypt.-Fl. Schles., Pilze II: 488, Breslau (1897)
- \equiv *Ramularia variegata* Ellis & Holw., in Arth., Rep. Bot. Minnes.: 34 (1886)
- \equiv *Ramularia cervina* var. *petasites* Bäumler, Verh. Zool.-Bot. Ges. Wien 50: 715 (1888)
- \equiv *Ramularia petasitis* (Bäumler) Jaap, F. sel. exs. 796 (1916)
- \equiv *Ramularia variegata* var. *petasitis-officinalis* Allesch., Hedwigia 34: 385 (1895)
- \equiv *Ramularia variegata* var. *petasitis-tomentosae* Karakulin, in Karakulin & Lobik, Mat. Mikol. Obsl. Ross. 2: 82 (1915)
- \equiv *Ramularia petasitis-tomentosae* Săvul. & Sandu, Hedwigia 73: 121 (1933)
- \equiv *Ramularia dacica* Săvul. & Hulea, Mem. Sect. Sci. Acad. Rom., Ser. 3, 15: 478 (1940) and in Herb. Mycol. Rom., Fasc. XXV, no. 1241 (1940)
- \equiv *Ramularia formosana* Sawada, Taiwan Agric. Res.

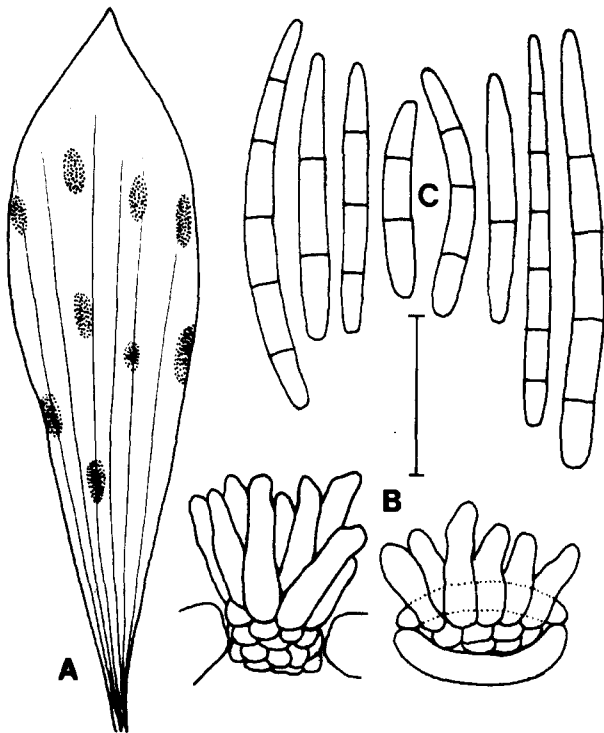


Fig. 9. *Pseudocercospora inconspicua*. (A) Leaf spots on the lower leaf surface of *Lilium distichum* (0.8 \times). (B) Conidiophores. (C) Conidia. Bar=30 μm .

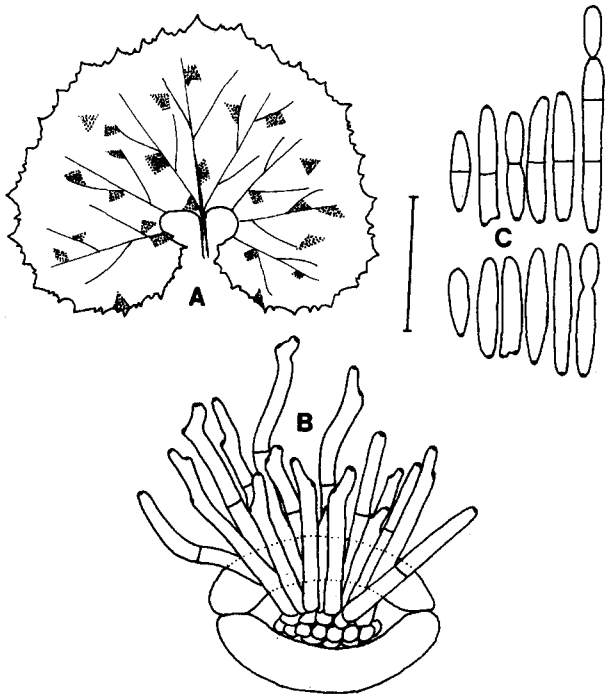


Fig. 10 *Ramularia majar*. (A) Leaf spots on the lower leaf surface of *Petasites japonicus* (0.4 \times). (B) Conidiophores. (C) Conidia. Bar=30 μ m.

Inst. Rept. 86: 159 (1943), nom. inval.!

Leaf spots amphigenous, scattered, angular to irregular, often vein-limited, small, 1~5 mm diam., white to tan, centre with narrow brown margins, later yellowish grey with dark borders on the upper surface, when confluent, forming large brown patches, up to 20 mm diam. **Caespituli** hypophyllous, effuse to punctiform, white to greyish white. **Mycelium** internal, hyphae septate, branched, hyaline, 2~5 μ m wide, secondary mycelium absent. **Stromata** medium, 10~25 μ m diam., well-developed, subglobular, hyaline to pale olivaceous brown, composed of swollen hyphal cells. **Conidiophores** 5~20 in a divergent to dense fascicle, emerging through stomata, hyaline throughout, substraight to mildly flexuous, mostly 0~1-septate, not branched, but sometimes branched at the basal portion, usually tapered towards the apex, 1~2 times geniculate near the apical portion, 24~75 \times 2.5~5.0 μ m; conidial scars minute, slightly conspicuous, apical or on small shoulders of conidiogenous cells caused by geniculation. **Conidia** solitary, sometimes in short (2~3) branched or unbranched chains, cylindrical, ellipsoidal to fusiform, hyaline, mostly 0~1-septate, but rarely 2-septate, usually non-constricted, but occasionally somewhat constricted at the septa, obtuse to subobtuse at both ends, sometimes obconically tapered towards each end, 10~40 \times 2.5~5.0 μ m; hilum minute, conspicuously thickened, darkened, and non-protuberant.

Habitat: On living leaves of *Petasites japonicus* (S. &

Z.) Max. (Compositae).

Specimens examined: SMK 10474 (29 IX 1990, Kangnung), 10581 (16 X 1990, Kangnung), 10827 (3 VII 1991, Kangnung), 10909 (20 VII 1991, Pyongchang), 10926 (26 VII 1991, Kangnung), 11216 (3 X 1991, Kangnung), 11724 (22 VI 1992, Kangnung), 12024 (29 IX 1992, Kangnung), 12101 (9 X 1992, Kangnung), 12136 (10 X 1992, Kangnung), 12232 (21 X 1992, Kangnung), 12245 (21 X 1992, Kangnung), 12256 (21 X 1992, Kangnung), 12370 (8 XI 1992, Kangnung), 12502 (6 VIII 1993, Kangnung), 12695 (13 X 1993, Kangnung), 12819 (2 VI 1994, Kangnung), 13216 (25 X 1994, Kangnung), 13316 (1 XI 1994, Samchok), 13366 (8 XI 1994, Kangnung), 13590 (23 VI 1995, Kangnung), 13851 (27 V 1997, Pyongchang), 13971 (15 VI 1997, Namyangju), 15068 (8 IX 1998, Seoul), 15179 (24 IX 1998, Pochon).

Distribution: Caucasus, China, Europe, Japan, Korea, North America, Siberia, Taiwan and Far East of Russia.

Notes: Park (1967), Chung *et al.* (1977), and Shin and Braun (1993) listed this fungus as *Ramularia variegata* Ellis & Holw., *Cercospora petasitides* Shirai & Sono and *Ramularia major* (Unger) U. Braun, respectively. Lee *et al.* (1991) described the morphology of *R. variegata*, and Shin (1998) provided a brief morphological description of *R. major* based on the Korean specimens. Braun (1998) described this fungus: Caespituli amphigenous; secondary hyphae usually developed and superficial; conidiophores partly branched, 10~150 \times 2~5.5 μ m; conidia ellipsoid-ovoid, cylindrical, fusiform, 15~45 \times 2.5~6 μ m, 0~3-septate. Therefore, our collections agree well with Braun's description, although secondary superficial mycelia have not been observed. *Ramularia purpurascens* G. Winter on *Petasites fragrans* differs from the present species in having fairly short conidiophores (10~25 μ m long) in a small fascicle. The present fungal species is morphologically very close to *R. cylindroides* Sacc., but the latter species usually has conidiophores erumpent through the cuticle and occurs on *Pulmonaria* (Braun, 1998).

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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 다섯 번째 보고이다. 이번 보고에서는 *Cercospora* 4종, *Passalora* 1종, *Pseudocercospora* 3종, *Pseudocercosporella* 1종 및 *Ramularia* 1종에 대한 균학적 특징을 기재, 묘사하였다. 왕취뽕나무에서 *Cercospora adusta*, 쑥갓에서 *C. chrysanthemi*, 여뀌바늘에서 *C. ludwigiana*, 토끼풀에서 *C. zebrina*, 참당귀에서 *Passalora depressa*, 사철나무에서 *Pseudocercospora destructiva*, 인동에서 *P. lonicericola*, 봉선화와 물봉선에서 *P. nojimai*, 말나리에서 *Pseudocercosporella inconspicua*, 그리고 머위에서 *Ramularia majar*를 각각 동정하였다.

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