

Chiharu Nakashima · Shigeki Inaba · Ju-Young Park
Yoshio Ogawa

Addition and reexamination of Japanese species belonging to the genus *Cercospora* and allied genera. IX. Newly recorded species from Japan (4)

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Abstract *Pseudocercospora cyatheae* C. Nakash. & S. Inaba on *Cyathea* sp. as a new species is described. Three species belonging to the genus *Cercospora* and allied genera are newly added to the mycoflora of Japan. They are *Cercospora armoraciae* on *Armoracia rusticana*, *Passalora passaloroides* on *Amorpha fruticosa*, and *Pseudocercospora nogalesii* on *Cytisus scoparius*.

Key words *Cercospora* · *Passalora* · *Pseudocercospora* · *Pseudocercospora cyatheae*

Introduction

In recent years, taxonomic reexamination of *Cercospora* Fresen. and allied genera has been carried out worldwide based on new generic concepts (Braun 1995, 1998; Crous and Braun 2003). In Japan, Katsuki (1965) published a monograph of Japanese *Cercosporae* including 226 species. However, his monograph should be revised because it was based on old genus concepts. In this series, many species of this group are added to the Japanese mycoflora (Kobayashi et al. 1998, 2002; Nakashima et al. 2002; Nakashima 2004a,b). In this article, one new species (*Pseudocercospora cyatheae*) and three species of *Cercospora* and related genera with no previous record in Japan are identified, described, and discussed. The dried specimens and living

cultures are deposited in the herbarium of National Institute of Technology and Evaluation (NBRC), Japan.

Pseudocercospora cyatheae C. Nakash. & S. Inaba, sp. nov.

Figs. 1, 4, 5

Maculis in foliis vivis clare brunneis vel atro-brunneis, irregularibus, margine obscuro vel distincto, 2–5 mm diametro; stromatibus claris, epiphyllis, pallide brunneis vel brunneis, rotundatis, 60–110 µm diametro; conidiophoris dense fasciculatis, infra brunneis vel pallide brunneis, superne pallidis, rectis vel sinuosis, laevibus, 25–50 × 3–5 µm, cicatibus indistinctis incrassatis praeditis; conidiis cylindricis vel obclavatis, sigmoideis, leviter curvatis, solitariis, apice subacutis vel obtusis, basim truncatis vel obconicis, rare apiculatis, pallide brunneis, 3–8-septatis, 30–50 × 3.7–5.5 µm.

Type specimen: On *Cyathea* sp. Tomigusuku, Ishigaki, Okinawa Prefecture, Japan (24°22'15" N, 124°11'1" E), March 28, 2003, by Shigeki Inaba (NBRC H-12398; holotype) (ex-type culture: NBRC 101080).

Leaf spots are distinct, brown to dark brown, irregular, with indistinct or distinct border, 2–5 mm in size. Stromata epiphyllous, pale brown to brown, distinct, globose, and 60–110 µm in diameter. Conidiophores arising from upper part of stromata, brown to pale brown, pale color to apex, densely fascicled, straight or mildly sinuous, smooth, and 25–50 × 3–5 µm. Conidiogenous cells integrated. Conidial scars inconspicuous, thin, rimlike or cicatrized on the tip. Conidia various, cylindrical to obclavate, sigmoid, mildly curved, solitary, obtuse to acute head, unthickened, obconically truncated or rounded at basal end, occasionally formed beak, pale brown, 3–8-septated, and 30–50 × 3.7–5.5 µm.

Host: *Cyathea* sp. (Cyatheaceae).

Specimen examined: The type specimen.

Note: On Cyatheaceae, two species of *Cercospora* were hitherto known, namely, *Cercospora athyrii* J.M. Mend. on plant genus *Athyrium* and *C. asplenii* Jaap. (= *Mycosphaerella asplenii*) on *Alsophila* (Cyatheaceae). These two species are confirmed as the species of the genus *Cercospora* sensu stricto by Crous and Braun (2003). On the other hand, the species of *Pseudocercospora* Speg. was

C. Nakashima (✉)
Faculty of Bioresources, Mie University, 1577 Kurima-machiya, Tsu,
Mie 514-8507, Japan
Tel. +81-59-231-9638; Fax +81-59-231-9450
e-mail: chiharu@bio.mie-u.ac.jp

S. Inaba · J.-Y. Park
Division of Biotechnology, National Institute of Technology and
Evaluation, Chiba, Japan

Y. Ogawa
College of Pharmacy, Nihon University, Chiba, Japan

Fig. 1. *Pseudocercospora cyatheae*. **a** Stroma and conidiophores. **b** Conidia. Bars 10 μ m

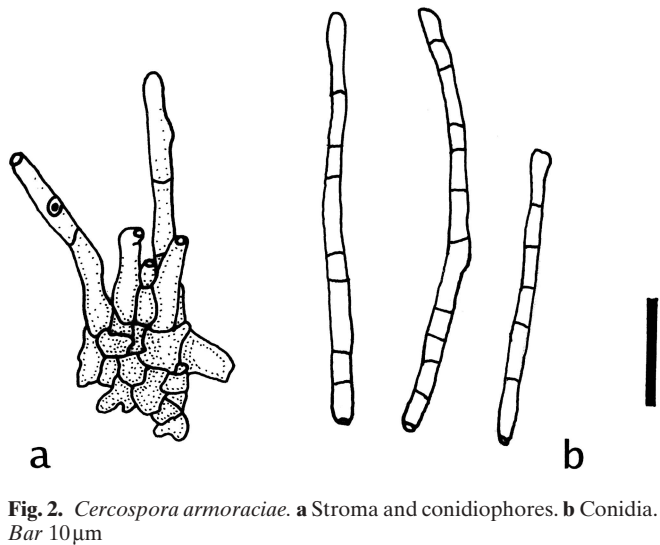
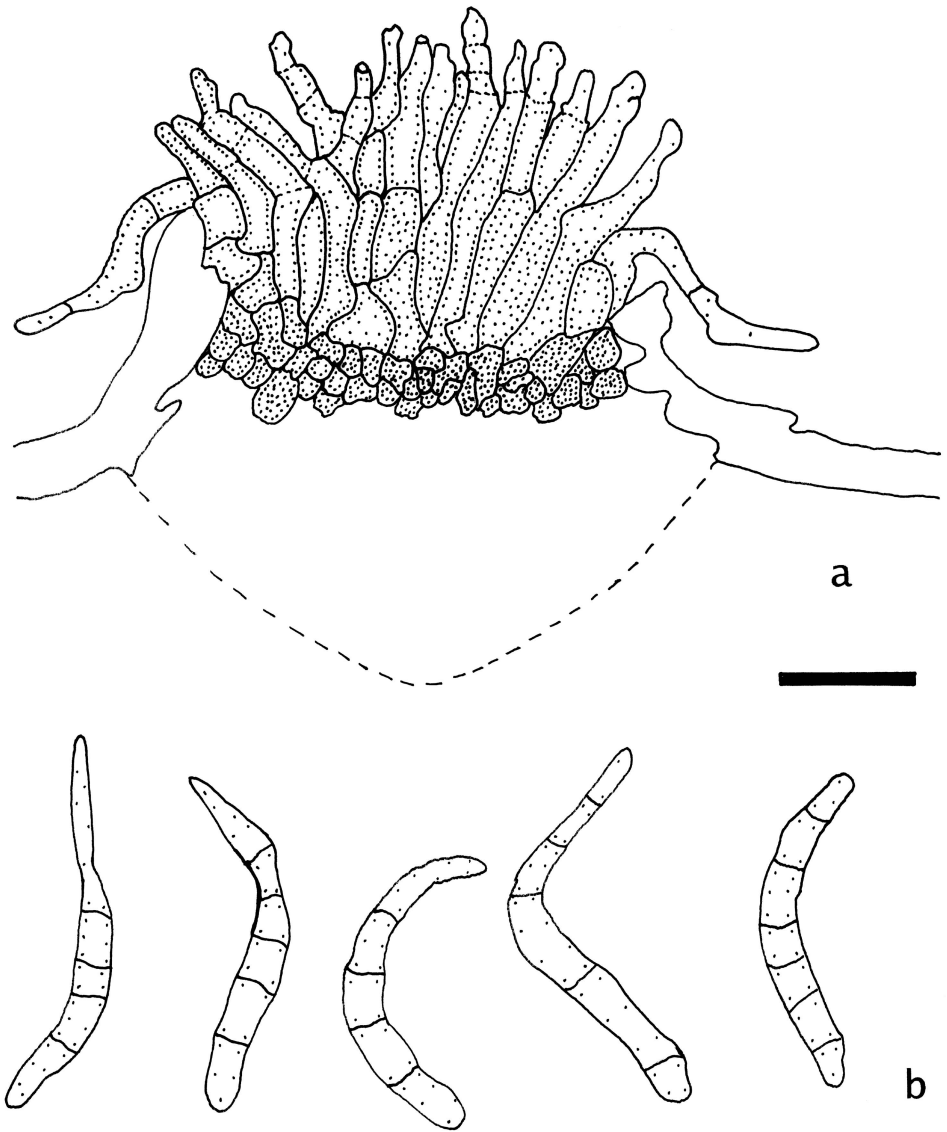


Fig. 2. *Cercospora armoraciae*. **a** Stroma and conidiophores. **b** Conidia. Bar 10 μ m

not recorded on Cyatheaceae. *Pseudocercospora cyatheae* is similar to species of the genus *Cercostigmia* U. Braun with slightly thickened (rimlike) or cicatrized scars. The genus *Cercostigmia* is proposed to be transferred to the genus *Pseudocercospora* based on morphological characteristics and phylogenetic relationship (Crous and Braun 2003). Furthermore, *P. cyatheae* is similar to *Mycocentrospora fusarioides* Matsush. (Matsushima 1987) on *Alsophila* with caudate conidia and rimlike scars. However, the genus *Mycocentrospora* is different from the genus *Pseudocercospora* because the fruiting bodies of the former are hyaline.

Cercospora armoraciae Saccardo, Nuovo Giorn. Bot. Ital. 8: 188, 1876; Shin & Kim, *Cercospora* and allied genera from Korea: 128, 2001.

Figs. 2, 6, 7
[=*Cercospora apii* sensu lato; Crous and Braun 2003].
Leaf spots distinct, scattered, circular to irregular, often confluent, dark brown or pale brown with brown center,

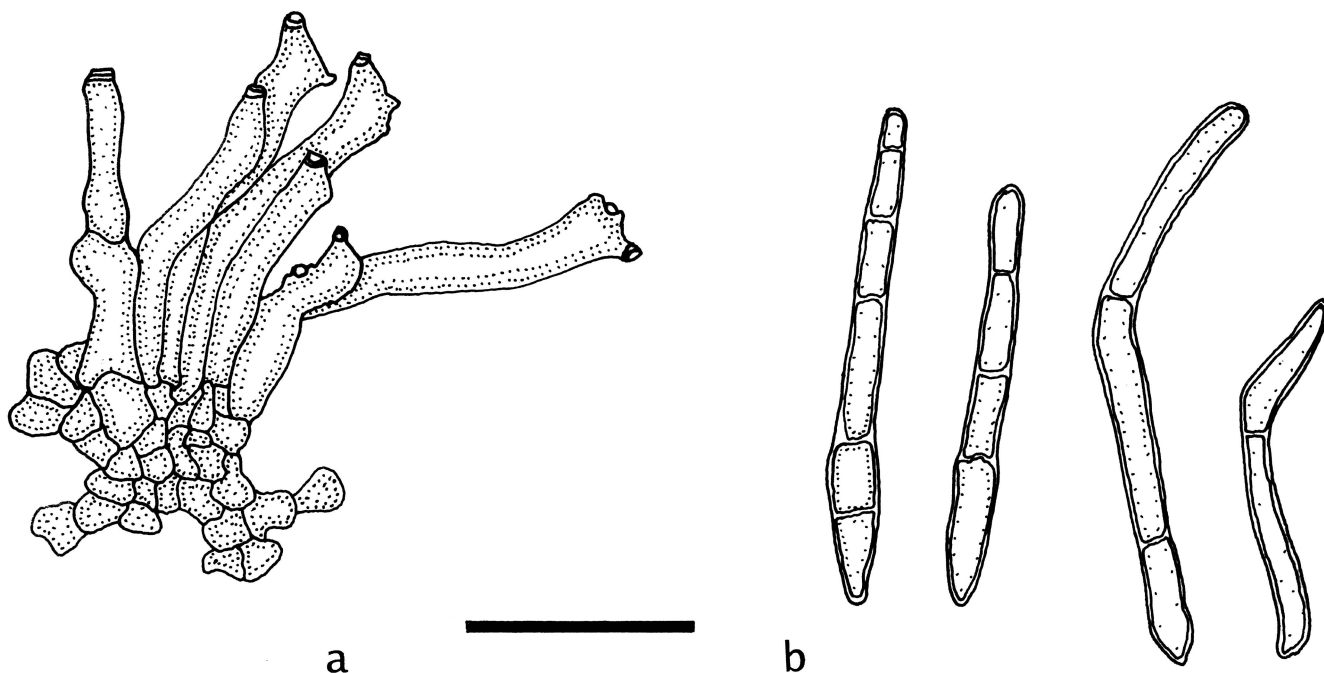


Fig. 3. *Passalora passaloroides*. a Stroma and conidiophores. b Conidia. Bar 20 μm

and 2–6 mm in diameter. Fruit bodies amphigenous. Stromata pale to brown, composed from few cells and 17.5–50 μm in diameter. Conidiophores straight to sinuous, solitary or slightly synnematos, pale to pale brown, pale colored to apex, continuous or septated, not branched, 15–75 \times 2.5–3.8 μm , and 0–3-septated. Conidial scars distinctly thickened. Conidia solitary, straight to slightly sinuous, smooth, long-obclavate to cylindrical, hyaline, 15–125 \times 2.5–5 μm , 1–11-septated, thickened and truncated at basal end, and obtuse at the apex.

Host: *Armoracia rusticana* P. Gaertn., B. Mey. & Scherb. (Cruciferae; “Wasabi-daikon” in Japanese).

Specimen examined: the Medicinal Plants Garden of Nihon University, Narashinodai, Funabashi, Chiba Prefecture, Japan (35°43'30" N, 140°3'13" E), December 2, 2002, Chiharu Nakashima (CN), Ju-Young Park (PJ), and Yoshio Ogawa (YO) (NBRC H-12399) (culture: NBRC 101081).

Distribution: Africa, Australia, Bulgaria, Canada, Georgia, Great Britain, Israel, Italy, Korea, Latvia, Lithuania, Moldova, New Zealand, Philippines, Poland, Romania, Russia (European part), Sweden, Ukraine, Uzbekistan, United States, Venezuela, Zimbabwe (fide Crous and Braun 2003), and Japan.

Note: The conidiophores and conidia of the observed specimen were slightly smaller than those of the described Korean specimen (Shin and Kim 2001) and in Chupp (1954). However, the sizes of conidiophores and conidia of *Cercospora apii* sensu lato frequently vary in their collected condition (i.e., humidity and maturity). Also, Crous and Braun (2003) indicated the variation of the sizes of *C. apii* sensu lato [conidiophores (10–)20–350(–450) \times (2–)3–6

(–8) μm ; conidia (10–)30–250(–380) \times (1.5–)2–5(5.5) μm]. Therefore, the observed conidiophores and conidia were concluded to be the range of sizes of fruiting bodies of *C. armoraciae*.

The host plant (*Armoracia rusticana*) is important for the food industry in Japan because it is used not only as a fresh herb but also as a stock for the instant condiment “Wasabi” instead of the true Wasabi (*Entrema japonica* (Miq.) Koidz.). *Cercospora armoraciae* are reported from a wide geographical range (as described above) and are recorded from various host plants, namely *Armoracia lapathifolia* Gilib. ex Usteri, *A. rusticana*, *Brassica chinensis* L., *B. pekinensis* (Lour.) Rupr., *B. rapa* L., *Raphanus sativus* L., and *Rorippa amphibia* (L.) Besser. However, *C. armoraciae* in Japan is reported from horseradish as a host plant and in a confined area. Therefore, the geographical distribution and the expansion of alternate host plants such as Cruciferae should be observed, and this spread must be contained because it will cause serious damage to the food industry.

Passalora passaloroides (G. Winter) U. Braun & Crous, in Crous & Braun, *Mycosphaerella* and its anamorphs: 1. Names published in *Cercospora* and *Passalora*: 309, 2003.

Figs. 3, 8, 9

\equiv *Cercospora passaloroides* G. Winter, *Hedwigia* 22:71, 1883.

\equiv *Cylindrosporium passaloroides* (G. Winter) Gilman & W.A. Archer, *Iowa State Coll. J. Sci.* 3:334, 1929.

\equiv *Mycovellosiella passaloroides* (G. Winter) J.K. Bai & M.Y. Cheng, *Acta Mycol. Sin.* 11:120, 1992; Shin & Kim, *Cercospora* and allied genera from Korea: 128, 2001.

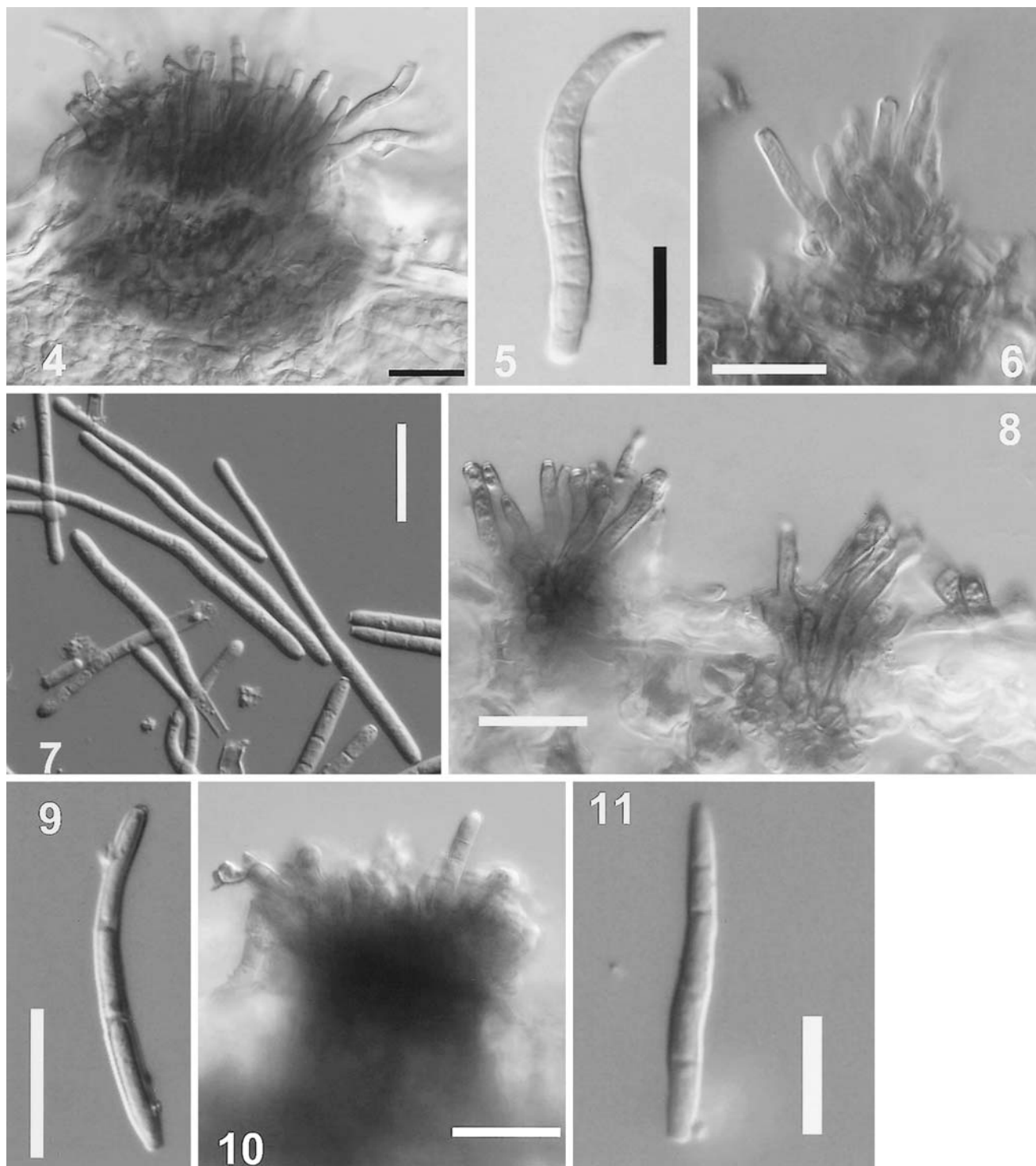


Fig. 4. Stroma and conidiophores of *Pseudocercospora cyatheae*. Bar 10 μ m

Fig. 5. Conidium of *Pseudocercospora cyatheae*. Bar 15 μ m

Fig. 6. Stroma and conidiophores of *Cercospora armoraciae*. Bar 10 μ m

Fig. 7. Conidia of *Cercospora armoraciae*. Bar 15 μ m

Fig. 8. Stromata and conidiophores of *Passalora passaloroides*. Bar 20 μ m

Fig. 9. Conidium of *Passalora passaloroides*. Bar 15 μ m

Fig. 10. Stroma and conidiophores of *Pseudocercospora nogalesii*. Bar 15 μ m

Fig. 11. Conidium of *Pseudocercospora nogalesii*. Bar 10 μ m

Leaf spots scattered, first tiny brown spots, later frequently confluent, dark brown center with indefinite and brown to reddish-brown margin, irregular to circular, and 1–6 mm in diameter. Conidial masses observed on undersurface of spots. Fruit bodies hypophyllous. Stromata absent or small, composed from few pale brown cells, hypophyllous, and 20–27.5 µm in diameter. External hypha arising from stromata with lateral branched conidiophores on the undersurface of leaf spots. Conidiophores arising from stromata or external hyphae, straight or branched, sinuous emerging from external hyphae, septated or continuously, brown, pale-colored to apex, shortly sympodial or percurrent proliferated, polyblastic, and 20–50 × 2.5–6.3 µm. Conidia pale to slightly pale brown, solitary or frequently catenated, cylindrical, filiform to obclavate, straight to slightly curved, obconically truncated at basal end, obtuse at the apex, 22–63 × 2.5–7.5 µm, and 0–6-septated. Conidial scars distinct and small on conidiophores and conidia and on both ends of catenated conidia.

Host: *Amorpha fruticosa* L. (Leguminosae; “Itachihagi” in Japanese).

Specimen examined: Tochigi Prefectural Forestry Research Center, Koike, Utsunomiya, Tochigi Prefecture, Japan (36°40′27″ N, 139°48′48″ E), September 17, 2002, CN (NBRC H-12400) (culture: NBRC 101082).

Distribution: Canada, China, Korea, United States (fide Shin and Kim 2001), and Japan.

Note: The present species had been described as a species of the genus *Cercospora* by Winter. Then, Bai and Cheng (1992) transferred it to the genus *Mycovellosiella* based on its morphological characteristics. In recent years, *Mycovellosiella passaloroides* was redescribed as a species belonging to the genus *Passalora* by Crous and Braun (2003). Transferring the genus *Mycovellosiella* to the genus *Passalora* is still open to dispute. In the case of specimen collected in Japan, the morphological characteristics exactly coincide with the genus *Passalora* such as distinct stromata and poor “external hyphae.” Therefore, the authors accepted the treatment by Crous and Braun (2003).

Pseudocercospora nogalesii (Urries) U. Braun & M. Dick, in Braun et al., Australas. Plant Pathol. 32:91, 2003.

Figs. 4, 10, 11
 ≡ *Cercospora nogalesii* Urries, An. Inst. Bot. Cavanilles 14:165, 1956.

Stem spots dark brown to blackish-purple, angular to irregular, slightly and distinctly swollen, often confluent, and 2–5 mm in size. Conidial masses grayish-white to gray. Stromata absent or composed from few cells to distinctly formed, up to 38 µm in diameter, brown, with external hyphae. Conidiophores emerging from stromata or external hyphae, short, pale to pale brown, straight to mildly geniculated, and 10–25 × 2.5–3.8 µm. Conidia pale-colored, narrowly obclavate to cylindrical, smooth, straight to mildly curved, truncated and unthickened at basal end, dull head at apex, 7.5–43 × 2.5–3.8 µm, and 2–6-septated.

Host: *Cytisus scoparius* (L.f.) Link (Leguminosae; “Enishida” in Japanese).

Specimen examined: the Medicinal Plants Garden of Nihon University, Narashinodai, Funabashi, Chiba Prefecture, Japan (35°43′30″ N, 140°3′13″ E), December 2, 2002, CN, PJ, and YO (NBRC H-12401) (culture: NBRC 101083).

Distribution: United States (fide Chupp 1954) and Japan.

Note: Two species of *Cercospora* and allied genera, *Cercospora cytisi* and *P. nogalesii*, were hitherto known on the genus *Cytisus*. These species have never been reported in hosts other than *Cytisus*. According to Crous and Braun (2001), *Cercospora cytisi* belongs to *Cercospora sensu stricto* (producing long, multiseptate, acicular conidia with truncate base and acute to subacute apices). Therefore, the collected fungus in Japan differs from *C. cytisi*. On the other hand, the fungus is quite similar to *Pseudocercospora nogalesii*. *Cytisus*, the host plant of *P. nogalesii*, (Leguminosae) is native to Europe, northern Africa, and southern Asia.

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