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Disease Reports

Powdery Mildew of *Inula britannica* var. *chinensis* in Korea

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Inula britannica var. *chinensis* (syn. *Inula japonica*), called Geum-Bul-Cho in Korean, is a perennial herb with yellow flowers, native to East Asia including Korea. It has been cultivated or gathered for medicinal purposes in China and Korea. Recently planting of wild flowers along roads and in gardens has become popular in Korea and new businesses have developed to provide seedlings. Dense planting of this plant in nurseries and also in gardens has resulted in powdery mildew infections since 1990 in Suwon and other areas of Korea (Shin, unpublished). Though the morphological characteristics of the fungus were concordant to those of the genus *Golovinomyces*, its accurate identification could not be made due to absence of the teleomorphic state. In September 2009, formation of the chasmothecia on the infected leaves was found in the garden of National Institute of Horticultural and Herbal Science, Suwon, for the first time in Korea.

White superficial colonies developed amphigenously on leaves and stems (Fig. 1A & B). Chasmothecia were formed abundantly, especially on the lower leaf surface. Conidiophores were 110-180×10-12.5 μm, straight at the base, producing conidia in chains with sinuate edge-line. Conidia were ellipsoid to barrel-shaped, 32-38×16-20 μm, without conspicuous fibrosin bodies. Chasmothecia were 90-120 μm in diam., blackish brown, depressed globose. Appendages were about 10-25 in number, mycelioid, curved to tortuous, olivaceous brown throughout or paler upwards, 0-5-septate. Asci were 6-14 per chasmothecium, 55-75×30-42 μm, 2-spored. Ascospores were ellipsoidal to oval, 18-28×12.5-17.5 μm (Fig. 1C). Based on these morphological characteristics, this fungus was identified as *Golovinomyces cichoracearum* (DC.) V.P. Heluta (Braun, 1987). To confirm the identification, the ITS region of rDNA was amplified and sequenced, and the resulting sequence was deposited in GenBank (Accession No. GU143089). Molecular phylogenetic reconstructions were performed using MEGA4, version 4.0 for neighbor-joining (using Tajima-Nei distances). Comparison with the sequences available in the GenBank database revealed that the ITS sequence shares 94% similarity with those of *G. cichoracearum* parasitic on the hosts belonging to the Helianthеae. In the phylogenetic tree (Fig. 2), the Korean isolate was nested within *G. cichoracearum* clade (cf. Matsuda and Takamatsu, 2003).

Fig. 1. (A) Heavy infections of powdery mildew on *Inula britannica* var. *chinensis*. (B) Close-up of symptoms on leaves and stems. (C) Chasmothecium of *Golovinomyces cichoracearum* producing several asci with two ascospores each. Bar = 100 μm.

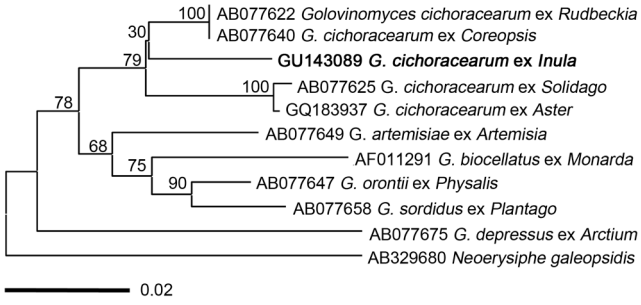

Fig. 2. Phylogenetic relationship between *Golovinomyces cichoracearum* on *Inula britannica* var. *chinensis* and other *Golovinomyces* species, inferred by neighbor-joining method using the ITS rDNA region. Numbers above the branches represent the bootstrap values. Bar = Number of nucleotide substitutions per site.

The powdery mildew disease of *Inula britannica* associated with *G. cichoracearum* has been recorded from most parts of Europe (Farr and Rossman, 2009). In Japan, the powdery mildew on *I. britannica* var. *chinensis* was identified as *G. cichoracearum*, based on its anamorphic state in 1951 (cf. Nomura, 1997), and no further records of the disease have been published. To our knowledge, this is the first report of *G. cichoracearum* infections of *I. britannica* var. *chinensis* in Korea. This disease seems not to be a serious threat to the health of established plants. Severe outbreaks of powdery mildew as found in Hongcheon in 2008 and Suwon in 2009 can greatly detract from the beauty of this native plant in landscape plantings.

References

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