Diseases Caused by Fungi and Fungus-Like Organisms

First Report of Powdery Mildew on *Astragalus sinicus* (Chinese Milk Vetch) Caused by *Erysiphe trifoliorum* in China

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Astragalus sinicus L. (Chinese milk vetch) is a traditional leguminous green manure that plays a significant role in maintaining paddy soil fertility to enhance the yield and quality of rice in China. It is also found in gardens, roadsides, farms, fields, riverbanks, and open wastelands and is often used as livestock feed. From February 2019 to 2021, severe powdery mildew infections were observed on hundreds of *A. sinicus* plants grown in gardens and at roadsides of Fuzhou city, China. The disease incidence was up to 100% on leaves and stems of *A. sinicus*. White superficial fungal colonies (circular to irregular patches) were present on both sides of the leaves. Hyphae were flexuous to straight, branched, 4 to 8 µm wide, and septate. Hyphal appressoria were lobulate and solitary or in opposite pairs. Conidiophores were erect and straight, hyaline, and 60 to 120 × 8 to 10 µm ($n = 30$). Foot cells were cylindrical, straight to slightly curved, 22 to 38 × 8 to 10 µm, and followed by two to three shorter cells. Conidia were cylindrical-oval to doliform, 30 to 48 × 13.5 to 24 µm with a length/width ratio of 1.6 to 2.4 ($n = 30$), formed singly, and without fibrosin bodies. Conidial germ tubes were produced in the subterminal position. No chasmothecia were found in the collected samples. The morphological characteristics of asexual structures were consistent with the descriptions of *Erysiphe trifoliorum* (Wallr.) U. Braun in Braun and Cook (2012). To verify the identification of the pathogen, the ITS and part of the large subunit (LSU) rDNA gene of the isolates were amplified using ITS1/ITS4 and LSU1/LSU2 primers (Scholin et al. 1994; White et al. 1990), respectively, and sequences were deposited in GenBank (ITS: MZ021332, MZ021333; LSU: MZ021334, MZ021335). In BLASTn searches, the ITS and LSU sequences were 99 to 100% identical with those of *E. trifoliorum* parasitic on *Lathyrus magellanicus* (LC010015), *Medicago littoralis* (LC270860), *Melilotus officinalis* (LC009924), and *Trifolium* spp. (MN216308, KY660821) as well as

E. baeumleri (Bradshaw et al. 2022) on *Vicia nigricans* (LC010014). A pathogenicity test was performed by gently pressing a diseased leaf onto 10 young leaves of three healthy potted plants, while three noninoculated plants were used as controls. All plants were maintained in a greenhouse at 20 to 25°C, without humidity control, and natural light. Symptoms developed 7 days after inoculation, whereas the control leaves remained symptomless. The morphology of the fungus on the inoculated leaves was identical to that observed on the originally diseased leaves. Powdery mildew on *A. sinicus* has been reported as *E. pisi* and *E. polygoni* from Korea and China (Shin 2000; Tai 1979), respectively. Amano (1986) listed *E. pisi* and *Microsphaera astragali* (now *E. astragali*) on *A. sinicus* from China and Japan. To our knowledge, this is the first report of powdery mildew caused by *E. trifoliorum* on *A. sinicus* in China and in general. *E. astragali* is the most common and widespread powdery mildew species on *Astragalus* spp. (Braun and Cook 2012) and would be expected on *A. sinicus*, but this species is clearly genetically different from *E. trifoliorum* (Bradshaw et al. 2022). The *E. trifoliorum* complex (clade) is composed of several morphologically well-distinguishable species, besides *E. trifoliorum* it also includes *E. baeumleri* (on *Vicia* spp.), *E. hyperici* (on *Hypericum* spp.), and *E. euonymi* (on *Euonymus* spp.), but based on the combination of sequence and host identity, the collection on *A. sinicus* can be assigned to *E. trifoliorum* (Bradshaw et al. 2022). The information in this study extended the host range of *E. trifoliorum* and will inform future studies on *A. sinicus* in relation to powdery mildew outbreaks in China.

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