Diseases Caused by Fungi and Fungus-Like Organisms

First Report of Powdery Mildew Caused by *Erysiphe trifoliorum* on *Trifolium hybridum* in Korea

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Trifolium hybridum L., known as alsike clover, is native to mainland Europe. In Korea, it was accidentally introduced between 1981 and 1993, and it is widely distributed as a weed throughout Korea including Jeju Island (Song and Yang 2005). In November 2014, hundreds of alsike clover with symptoms of powdery mildew were found in a public garden in Daegu, Korea. White superficial mycelia and conidia were present on both sides of the leaves, as well as on stems, forming circular to irregular patches. Similar symptoms on alsike clovers were also found in Ulsan (November 2014), Busan (November 2015), and Hoengseong (July 2019). Four voucher specimens have been deposited in the Korea University Herbarium (KUS-F28516, F28551, F29103, and F31089). The hyphae were septate, branched, and 4 to 8 µm in width. Appressoria on the epigenous hyphae were well-developed, lobed, and solitary or in opposite pairs. Conidiophores were cylindrical, 60 to 140 × 8 to 9 µm, and composed of three to four cells. Foot cells of conidiophores were straight, cylindric, and 25 to 45 µm long. Singly produced conidia were cylindric-oval to oblong, 30 to 46 × 16 to 22 µm ($n = 30$) with a length/width ratio of 1.6 to 2.4, devoid of distinct fibrosin bodies, and showed angular/rectangular wrinkling of outer walls. Germ tubes were produced on the perihilar position of conidia. These structures are typical of the powdery mildew anamorph of the genus *Erysiphe*. No chasmothecia were found during our routine field forays. The measurements and host genus were compatible with those of *Erysiphe trifoliorum* (Wallr.) U. Braun (Braun and Cook 2012). The internal

transcribed spacer (ITS) and the partial large subunit (LSU) rDNA regions of isolate KUS-F28516 were amplified using the powdery mildew-specific primers ITS5/P3 (Takamatsu et al. 2009) and NL1/NLP2 (Mori et al. 2000), respectively, and the resulting sequences were deposited in GenBank (MN216307 and MT380914). In BLASTn searches, the ITS sequence was identical with those of *E. trifoliorum* parasitic on *Trifolium dubium* (KY660894), *Trifolium campestre* (KY660821), *Medicago littoralis* (LC270860), and *Lathyrus magellanicus* (LC010015), but the LSU sequence revealed 100% similarity with *E. trifoliorum* on *Medicago littoralis* (LC270860) and 99.98% similarity with those of an isolate from *Melilotus officinalis* (LC009924), *Vicia nigricans* (LC010014), and *Lathyrus magellanicus* (LC010015). Pathogenicity was confirmed through inoculation by dusting conidia onto leaves of five healthy potted *T. hybridum* plants. Five noninoculated plants served as controls. Inoculated plants were isolated from non-inoculated plants in separate rooms in a greenhouse at 24 to 30°C without humidity control. Inoculated plants developed symptoms after 7 to 10 days, whereas the controls remained symptomless. The fungus present on the inoculated plants was morphologically identical to that originally observed on diseased plants. Previously, *E. trifoliorum* has been recorded on several species of *Trifolium* globally. All records of *E. trifoliorum* on *T. hybridum* have been made from Europe and North America (Farr and Rossman 2020). To our knowledge, this is the first report of powdery mildew on *T. hybridum* from Asia as well as in Korea. Our field observations suggest that the disease would be a potential threat to the health of alsike clover, especially under the condition in which the plants are densely grown in the shade.

References:

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