Disease Note

Diseases Caused by Fungi and Fungus-Like Organisms

First Report of Powdery Mildew Caused by *Erysiphe cruciferarum* on *Camelina sativa* in Montana

Benzhong Fu and Qing Yan[†]

Department of Plant Sciences and Plant Pathology, Montana State University, Bozeman, MT 59717

Funding: This research was supported by the U.S. Department of Energy, Office of Science, Office of Biological and Environmental Research, Genomic Science Program (grant no. DE-SC0021369). Plant Dis. 106:1995, 2022; published online as https://doi.org/10.1094/PDIS-10-21-2362-PDN. Accepted for publication 24 November 2021.

Camelina sativa, also known as false flax, is an annual flowering plant in the family Brassicaceae that originated in Europe and Asia. In recent years, it has been cultivated as an important biofuel crop in Europe, Canada, and the northwest United States. In June 2021, severe powdery mildew disease was observed on *C. sativa* 'Suneson' plants under greenhouse conditions (temperature 18.3°C/22.2°C, night/day) in Bozeman, Montana (45°40′ N, 111°2′ W). The disease incidence was 80.67% (150 pots, one plant per pot). White ectophytic powdery mildew including mycelia and conidia was observed on the upper leaves, usually developed from bottom tissues to top parts, and was also present on stems and siliques. Mycelia on leaves were amphigenous and in patches, often spreading to become effused. These typical symptoms were similar to a previous report of powdery mildew on broccoli raab (Koike and Saenz 1997). Appressoria were lobed, and foot cells were cylindrical and 18 to 26 × 7 to 10 µm. Conidia were cylindrical and produced singly, 35 to 50 × 12 to 21 µm and with a length/width ratio greater than 2 (Koike and Saenz 1997). No chasmothecia were observed in the greenhouse conditions. The symptoms and fungal microscopic characters are typical of the powdery mildew *Pseudoidium* anamorph of *Erysiphe* (Braun 1995). The specific measurements and characteristics are consistent with previous records of *Erysiphe cruciferarum* Opiz ex L. Junell (Braun and Cook 2012; Vellios et al. 2017). To identify the pathogen, the partial internal transcribed spacer (ITS) region of rDNA of sample CPD-1 was amplified using primers ITS1 and ITS4 (White et al. 1990). The amplicons were subsequently sequenced. The resulting 559-bp sequence was deposited in GenBank (CPD-1, accession no. OK160719). A GenBank BLAST search of the ITS sequences showed an exact match (100% query cover, E-value 0, and 100% identity 559/559 bp) with those of *E. cruciferarum* on hosts *Brassica* sp. (KY660929.1) and *Brassica juncea* from Vietnam (KM260718.1) and China (KT957424.1). A phylogenetic tree was built with the CPD-1 ITS sequence and several ITS sequences of closely related species with different hosts obtained from GenBank. Isolate CPD-1 grouped with pathogens from *Brassica* hosts rather than the holotype strain (KU672364.1) from papaveraceous hosts. To fulfill Koch's postulates, pathogenicity was confirmed through inoculation by dusting conidia onto leaves of seven healthy, potted, 14-day-old *C. sativa* 'Suneson' seedlings. Seven noninoculated plants served as a control treatment. The plants were incubated in a greenhouse with a temperature of 18 (night) to 22°C (day). The inoculated plants developed similar symptoms after 7 days, whereas the control plants remained symptomless. The fungus on the inoculated plants was morphologically identical to what was originally observed on the diseased plants. Though many *Brassica* spp. have been known to be infected by *E. cruciferarum* throughout the world, powdery mildew of *C. sativa* 'Crantz' in natural conditions by *E. cruciferarum* has been reported only in the province of Domokos in Central Greece (Vellios et al. 2017). To our knowledge, this is the first report of powdery mildew caused by *E. cruciferarum* on *C. sativa* 'Suneson' in Montana. Although the powdery mildew on *C. sativa* was observed in greenhouse conditions in this work, it poses a potential threat to the production of this biofuel crop in the northwest United States.

References:

Braun, U. 1995. The Powdery Mildews (Erysiphales) of Europe. VEB Gustav Fisher Verlag, Jena, Germany.

Braun, U., and Cook, R. T. A. 2012. Taxonomic Manual of the Erysiphales (Powdery Mildews). CBS Biodiversity Series No. 11. CBS, Utrecht, the Netherlands.

Koike, S. T., and Saenz, G. S. 1997. Plant Dis. 81:1093.

Vellios, E., et al. 2017. Emir. J. Food Agric. 29:639.

White, T. J., et al. 1990. Page 315 in: PCR Protocols: A Guide to Methods and Applications. Academic Press, San Diego, CA.

The author(s) declare no conflict of interest.

e-Xtra

Keywords: *Camelina sativa*, *Erysiphe cruciferarum*, Montana, powdery mildew

[†]Indicates the corresponding author.
Q. Yan; qing.yan@montana.edu