Camelina Infected by Downy Mildew (Hyaloperonospora camelinae) in the Western United States: A First Report

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_Camelina sativa_ (L.) Crantz is grown for its seed, the oil of which may be used for cooking, biofuel, or as a lubricant, and the crop has potential as an alternative to canola. Camelina is relatively new to the Pacific Northwest and is currently being grown on a small scale in Oregon, Washington, Idaho, and Montana.

During a field trial in Oregon, twisted stems, stunting, and poor flowering were observed in May 2009 on plants seeded in late September 2008. Symptomatic plants showed an abundant white woolly growth on the undersides of leaves and on stems (Fig. 1). Symptoms were also observed on the upper stems, flowers, and seed pods following rain events in early June (Fig. 2). Sporulation of a downy mildew organism was present. Conidiophores (Fig. 3) were hyaline, straight, measured 11.2-19.2 µm at the widest, and tapered slightly from the region of the first branch down to the base, which was occasionally faintly bulbous. In length conidiophores ranged from 192-332.8 µm, were monopodially branched, and had (3-)4-6(-7) branches terminating in recurved tips. Terminal branchlets averaged 3.2 µm wide at the base, and ranged from 14.4-24 µm in length. Conidia were broadly ellipsoidal, and measured 19.2-24.3 × 25.6-26.9 µm. Oogonia, occasionally found in stems but abundant in leaf tissues, were irregularly round to oval, somewhat angular, and dark amber with age (Fig. 4). The oogonia measured 44.8-65.3 × 44.8-51.2 µm. Oospores were pleurotic, with a mean diameter of 33.7 µm (28.8-38.4 µm).
Sporulating leaf tissue was ground and total DNA was extracted using a FastSpin kit (MP Biomedicals). The mRNA ITS region was amplified using primers DC6 and ITS4 (1) and sequenced. The nucleotide profile obtained was compared to those in GenBank and gave 100% identity to *Hyaloperonospora camelinae* strain MG (accession AY531456.1) over 566 nucleotides.

Three-week-old greenhouse-grown camelina plants were inoculated by rubbing sporulating stem sections on moist leaves and enclosing the stem piece and plant in a plastic bag to maintain humidity. Six plants were inoculated and maintained on the greenhouse bench under shade cloth. Two plants were not inoculated but were wetted, bagged, and maintained similarly. Sporulation on inoculated plants occurred after eight days. All six inoculated plants became symptomatic; neither of the control plants became diseased. DNA from affected leaves was extracted and sequenced as described above, and again gave 100% similarity to *H. camelinae* strain MG.

Downy mildew on camelina has been reported in Minnesota (3), where it was identified as *Peronospora camelinae* (now *Hyaloperonospora camelinae*), although no supporting evidence was given. In Montana, a downy mildew on camelina was identified as *P. parasitica* (now *Hyaloperonospora parasitica*) (2). To our knowledge, this is the first time *H. camelinae* has been confirmed in the western USA. Severely affected plants produce little or no seed, and susceptibility to downy mildew may limit the areas in which camelina can successfully be grown.
Literature Cited