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Accepted for publication 18 September 2009. Published 4 December 2009.

First Report of *Soilborne wheat mosaic virus* on *Triticum aestivum* in Washington State

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Murray, T. D., Pappu, H. R., and Smiley, R. W. 2009. First report of *Soilborne wheat mosaic virus* on *Triticum aestivum* in Washington State. Online. Plant Health Progress doi: 10.1094/PHP-2009-1204-01-BR.

Wheat soilborne mosaic (WSBM) was first discovered in the central plains of the USA in 1919 and, by 1923, *Soilborne wheat mosaic virus* (SBWMV) was identified as the cause. SBWMV is vectored by the soilborne plasmodiophorid, *Polymyxa graminis*.

Symptoms of WSBM range from a mild green to yellow mosaic on the leaves. Symptoms are most apparent on early-spring growth and seldom appear in autumn. Within fields, disease may be uniform but is often found in patches reflecting distribution of its soilborne vector (Fig. 1). New leaves and leaf sheaths of infected plants appear mottled and develop dashes and streaks parallel to the veins. Rising temperatures in spring slow and eventually stop symptom development. WSBM is a disease primarily of autumn-sown wheat, although spring wheat is susceptible. Yield loss varies with cultivar, virus strain, and environment and range from minor to entire fields.

Fig. 1. Winter wheat field near Walla Walla, WA, with yellowish patches of stunted wheat where *Soilborne wheat mosaic virus* was found.

Fig. 2. Stunting and mosaic of wheat plants caused by *Soilborne wheat mosaic virus*.

In April 2008, samples of wheat cultivars ORCF 101, ORCF 102, and WB528 were collected from three commercial fields in Walla Walla Co., WA with patches of wheat plants exhibiting mosaic and yellowing (Figs. 1 and 2). Samples were tested for *Cereal/Barley yellow dwarf virus*, *Wheat spindle streak mosaic virus*, and *Wheat streak mosaic virus* (1); none of these viruses were found. Symptomatic plants were positive for SBWMV by ELISA (Agdia Inc., Elkhart, IN) in all three fields. Rod-shaped

particles of bimodal length (140 and 280 nm) were observed under an electron microscope in partially purified virus preparations using negatively stained grids (2) indicating the presence of a furovirus (Fig. 3). To further verify SBWMV, reverse transcription polymerase chain reaction (RT-PCR) was done on total nucleic acid extracts (3) using primers specific to the SBWMV RNA-2 (2). The primer pair specific to the coat protein gene of SBWMV consisted of 5'-AAAGAGTCTIGCGTRTARCAATC-3' and 5'-AACGGTGTAGTAARYTRGGKGA-3' (4). RT-PCR gave an expected amplicon of ca. 300 bp from symptomatic but not healthy plants. The amplicon was cloned and sequenced and the 338 bp nucleotide sequence shared the highest (96%) identity with the SBWMV sequence (accession no. L07938) in GenBank.

Fig. 3. Electron microscopic image of *Soilborne wheat mosaic virus* particles from wheat collected in Walla Walla, WA in spring 2008.

SBWMV was recently reported from an adjacent county in Oregon (4). Confirmation of SBWMV in Washington highlights the need for increased awareness of the disease and implementing measures to contain its further spread in the region. Growing disease resistant cultivars is the only practical control, but little is known about the reaction to SBWMV of wheat cultivars adapted to Washington or the variability of virus strains present in the region.

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