Diseases Caused by Viruses

First Report of Barley virus G in the United States and California

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Barley (*Hordeum vulgare*) is a valuable annual cereal crop grown widely throughout the United States and the world. The majority of barley grown commercially in California and throughout the United States is used for livestock feed, with the remainder being used by the malting industry and, to a lesser extent, direct food consumption; it is also often employed as a cover crop (Lazicki et al. 2016). Yellow dwarf viruses (YDVs), in the family *Luteoviridae*, which infect barley and other cereal crops, are common and widely distributed throughout California and the United States (Griesbach et al. 1989; Seabloom et al. 2009). In April 2018, five barley samples exhibiting typical symptoms of YDV infection (primarily yellowing of leaf margins and tips) collected from fields in Yolo county planted with cultivar Butta 12 were tested for viruses. Total RNA was extracted from leaf tissue using TRIzol reagent, according to the manufacturer's protocol. RNA was used as template in a multiplexed RT-PCR assay designed for the generic detection of barley and cereal infecting YDVs, using the protocol established by Malmstrom and Shu (2004). A 372 base pair amplicon indicative of polerovirus infection was amplified from two of the samples and sequenced (Quintara Biosciences), and the resulting data analyzed via a BLASTn search. No further testing or work was done with the three samples that tested negative. Not unexpectedly,

the top result returned for one of the positive samples was cereal yellow dwarf virus-RPV (CYDV-RPV; 98% identity), a virus common to cereals in California and the United States. Unexpectedly, however, the top result returned for the other sample was barley virus G (BVG), sharing 98.43% identity with the Uiseong BVG isolate (GenBank accession LC259081). To further confirm the presence of BVG in the sample, the full-length viral genome was amplified using two-step RT-PCR with primers targeting the extreme 5' and 3' ends of the viral genome, using the PrimeScript RT and PrimeSTAR GXL DNA Polymerase kits (Takara Bio), cloned into the binary vector pJL89, and a BLAST search of the resulting 5,621 nucleotide full-length sequence (100% query coverage) once again returned results showing the YDV to be BVG. The full-length sequence was deposited into GenBank (MW853785). Nucleotide sequence comparisons showed that the California BVG isolate shares 96.62, 96.57, and 96.02% identity with the sequences of the BVG-Gimje (KT962089), BVG-Uiseong (LC259081), and BVG-Aus8 (LC500836) isolates, respectively. To our knowledge, this is the first report of barley virus G in California and in the United States. Currently the prevalence, host range, and mode and timing of introduction of BVG in California and the United States are unknown; its impact on cereal production and yield in any location in which it has been identified thus far is also unknown and may warrant further investigation.

References:

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