Diseases Caused by Viruses

First Report of Grapevine Rupestris Vein Feathering Virus in Grapevines from Washington State

Nomatter Chingandu, Sridhar Jarugula, Jati Adiputra, Basavaraj Bagewadi, Raphael Adegbola, Chandrasekhar Thammina, and Rayapati Naidu[†]

Department of Plant Pathology, Washington State University, Irrigated Agriculture Research and Extension Center, Prosser, WA 99350

Current address for J. Adiputra: Center for Diagnostic Standards of Agricultural Quarantine, Indonesia Agricultural Quarantine Agency, Ministry of Agriculture, Indonesia. Current address for B. Bagewadi: University of Agriculture Sciences, Dharwad, Karnataka, 580005, India.

Funding: Funding was provided by Washington State Department of Agriculture-Grapevine Research Program, The Wine Research Advisory Committee, The Washington Wine Commission, and Washington State Grape & Wine Research Program, and WSU Agricultural Research Center. Plant Dis. 105:717, 2021; published online as <https://doi.org/10.1094/PDIS-08-20-1662-PDN>. Accepted for publication 15 September 2020.

Since the first report of grapevine rupestris vein feathering virus (GRVfV; genus *Marafivirus*, family *Tymoviridae*) in a Greek grapevine causing chlorotic discoloration of leaf veins (El Beaino et al. 2001), GRVfV was reported in some European countries and in Australia, China, South Korea, New Zealand, Uruguay, and Canada (Blouin and MacDiarmid 2017; Cho et al. 2018; Reynard et al. 2017). In the United States, the virus was reported only from California in vines showing Syrah decline symptoms (Al Rwahnih et al. 2009). During virus surveys conducted between 2015 and 2019, 424 samples (petioles from individual or composite of five vines, with four petioles per vine) with and without discernible symptoms were collected randomly from 39 *Vitis vinifera* cultivars in vineyards and nurseries in eastern Washington State. Total RNA was isolated from these samples separately using Spectrum Plant Total RNA Kit (Sigma-Aldrich) and subjected individually to Illumina RNAseq (Huntsman Cancer Institute, Salt Lake City, UT). An average of ~28 million 120-base pair (bp) paired-end reads using the HiSeq2500 platform and an average of ~18 million 145-bp paired-end reads using the NovaSeq 6000 platform were obtained per sample. The contigs from

de novo assembly of quality-filtered reads from each sample (CLC Genomics Workbench 12) were subjected to BLASTn analysis against the virus database from GenBank. In addition to grapevine viruses and viroids previously reported in Washington State, GRVfV-specific sequences were obtained in samples from 11 of the 39 cultivars, namely, Muscat Ottonel, Pinot gris, and Sangiovese from vineyards and Aglianico, Bonarda, Cabernet Sauvignon, Chardonnay, Garnacha Tinta, Riesling, Tempranillo, and Valdiguié from nurseries. BLASTn analysis of the 73 GRVfV-specific contigs, ranging in size between 500 and 6,474 nt, showed sequence identity between 79.4 and 95.5% with GRVfV sequences deposited in GenBank. The data also revealed that GRVfV was always present as a coinfection with one or more viruses and viroids (grapevine leafroll-associated virus 3, grapevine red blotch virus, grapevine virus A and B, grapevine rupestris stem pitting-associated virus, hop stunt viroid, and grapevine yellow speckle viroid 1), making it difficult to correlate presence of the virus with specific symptoms. To confirm the presence of GRVfV, samples from cultivars Sangiovese ($n = 45$) and Pinot gris ($n = 1$) were tested by RT-PCR using custom-designed primers SaF-215 (5'-TACAAGGTGAATTGCTCCACAC-3') and SaR-1027 (5'-TCATTGGCGATGCGTTTCG-3') to amplify the 813-bp sequence covering the partial replicase associated polypeptide region of the virus genome. Sanger sequence analysis of four amplicons (MT782067 to MT782070) showed identities from 86% (700 bp out of 813 bp) with an Australian isolate (MT084811.1) to 90.9% (738 bp out of 813 bp) with an isolate from New Zealand (MF000326.1). Additional studies are in progress to examine the etiology, genetic diversity, and impact of GRVfV in Washington vineyards.

References:

- Al Rwahnih, M., et al. 2009. Virology 387:395.
- Blouin, A. G., and MacDiarmid, R. M. 2017. Plant Dis. 101:2156.
- Cho, I. S., et al. 2018. Plant Dis. 102:1471.
- El Beaino, T., et al. 2001. Vitis 40:65.
- Reynard, J. S., et al. 2017. Plant Dis. 101:1062.

The author(s) declare no conflict of interest.

Keywords: Grapevine rupestris vein feathering virus, grapevine, *Vitis vinifera*, Washington State

[†]Indicates the corresponding author.

E-mail: naidu.rayapati@wsu.edu (N. R.)