Diseases Caused by Bacteria and Phytoplasmas

First Report of Bacterial Leaf Streak Caused by *Xanthomonas translucens* pv. *undulosa* on Cultivated Wild Rice (*Zizania palustris*) in Minnesota

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Plant Dis. 105:2711, 2021; published online as <https://doi.org/10.1094/PDIS-02-21-0407-PDN>. Accepted for publication 31 March 2021.

Known by the indigenous peoples of the Great Lakes region of North America as manoomin, wild rice (*Zizania palustris*) is a native aquatic grass that is honored and central to Anishinaabe culture. Cultivated wild rice, the domesticated form of this cereal bred primarily for resistance to shattering, is grown commercially in paddies. In this study we examined four isolates (CIX303, CIX306, Xt-8, and Xt-22) of *Xanthomonas translucens*, the causative agent of bacterial leaf streak (BLS) on cereals and weedy grasses, in molecular and host range studies to confirm the pathovar identity of strains associated with cultivated wild rice. Two of the strains examined (CIX303 and CIX306), were isolated from cultivated wild rice in 2016 as part of a survey of the pathogen in Minnesota (Ledman 2019). Xt-8 and Xt-22 are historical strains of *X. translucens* isolated from symptomatic wild rice leaves collected in Minnesota in the late 1970s that were reported at the time to be *X. campestris* pv. *cerealis* (Bowden and Percich 1983). A host range assay was repeated twice in the greenhouse, where two leaves of six seedlings each of hard red spring wheat (cv. RB07), spring barley (cv. Quest), spring rye (cv. Prolific), oat (cv. Ogle), quackgrass, smooth brome grass, and cultivated wild rice (cv. Itasca Cycle-12) were inoculated via leaf infiltration (Curland et al. 2020). *X. translucens* pv. *cerealis* LMG 679^{PT}, *X. translucens* pv. *secalis* LMG 883^{PT}, *X. translucens* pv. *translucens* LMG 876^T, and *X. translucens* pv. *undulosa* LMG 892^{PT} were included as reference strains. Host response profiles were determined for each strain by recording character states 5 days postinoculation. Water-soaking and necrosis were considered pathogenic reactions, whereas chlorosis was not. Three pathotype strains, LMG 679^{PT}, LMG 876^T, and LMG 892^{PT}, caused

water-soaking in cultivated wild rice, whereas LMG 883^{PT} caused chlorosis. All four strains from cultivated wild rice produced water-soaking on wheat, barley, quackgrass, and cultivated wild rice, chlorosis or water-soaking on rye, chlorosis on oat, and reddish water-soaking on smooth brome. The character states generated by these four isolates were identical only to the host response profile for LMG 892^{PT}. LMG 679^{PT} differed, causing chlorosis on wheat, no symptoms on quackgrass, and water-soaking on smooth brome. A 2,645-bp concatenation of housekeeping genes (*rpoD*, *dnaK*, *fyuA*, and *gyrB*) was used to perform a Bayesian analysis (GenBank accessions MW528365 to MW528384) (Curland et al. 2018, 2020; Young et al. 2008). Subsequent phylogenies grouped all four strains from cultivated wild rice with LMG 892^{PT} and LMG 883^{PT}. A pairwise comparison revealed 100% identity between Xt-22 and LMG 892^{PT}. The percentage identity of CIX303, CIX308, and Xt-8 to LMG 892^{PT} was 99.96, 99.96, and 99.92, respectively. In contrast, when compared with LMG 679^{PT}, the four strains from cultivated wild rice had an identity between 97.43 and 97.50%. Based on host range studies combined with multilocus sequence analysis, we identified recent and historical isolates from *Z. palustris* as *X. translucens* pv. *undulosa*. Pathovar identity of strains causing BLS on cultivated wild rice in Minnesota is crucial when screening breeding materials for disease resistance. Furthermore, given that *X. translucens* pv. *undulosa* has been prevalent on wheat in Minnesota (Curland et al. 2018), expanding knowledge of its host range to include cultivated wild rice may inform disease management practices for both crops.

References:

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The author(s) declare no conflict of interest.

Keywords: prokaryotes, field crops, cereals and grains, pathogen detection

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