Diseases Caused by Fungi and Fungus-Like Organisms

First Report of the Blast Pathogen, *Pyricularia oryzae*, on *Eragrostis tef* in the United States

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Eragrostis tef (Zucc.) Trotter, commonly known as “teff,” is a warm season crop grown primarily in the western United States for its versatile, gluten-free grain and has recently been gaining wider popularity as a summer forage and as a groundcover for weed exclusion (DeBoer et al. 2017). In late July 2019, leaf lesions, 3 to 6 mm in diameter, with light-colored centers and dark, purple-red edges were observed on leaves of flowering teff plants (cv. ‘Dessie’) grown as a summer cover at the University of Kentucky Research Farm in Lexington, KY. Following rainfall, the symptoms rapidly progressed to plant death, with 50 to 60% of plants in an area of a few hundred square feet being affected. Diseased plants were collected, and infected leaves from five plants were placed overnight on a damp paper towel in a Petri dish at 26°C. Conidiophores bearing pyriform, hyaline, bisepate conidia (21.95 to 31.2 × 8.3 to 10.1 µm [$n = 30$]; length of apical cell 5.8 to 9.3 µm; middle cell 6.7 to 10.2 µm; basal cell 8.8 to 13.9 µm) erupted from the lesions. Two single-spore cultures were established (EtKY19-1 and -2) and grown on oatmeal agar medium at 26°C under constant fluorescent light, producing velvety colonies with mid to dark gray pigmentation and profuse sporulation. Eighteen-day-old plants of commercial *E. tef* seeds (Bob’s Red Mill, Milwaukie, OR) were spray inoculated with 10 ml of conidial suspension (10⁵ conidia/ml in 0.25% gelatin) until run-off (three pots per isolate).

Inoculations were also performed with isolates from rice (Guy11; Leung et al. 1988) and perennial ryegrass (LpKY97; Farman 2002) (two pots each) to test for general susceptibility to *Pyricularia oryzae*. Controls were sprayed with a 0.25% gelatin suspension. Treated plants were incubated under 16 h of light at 27°C and 8 h of dark at 21°C for up to 10 days. Leaves inoculated with EtKY19-1 and -2 showed rapid symptom development and shriveled within 5 days postinoculation. Characteristic diamond-shaped, pale-bordered lesions were observed adjacent to the dead tissues. Abundant conidia were reisolated from all leaf lesions, thereby fulfilling Koch’s postulates. Mock-inoculated plants, and those inoculated with Guy11 and LpKY97, showed no disease whatsoever after 10 days, showing that *E. tef* is not generally susceptible to *P. oryzae*. The inoculation experiments were repeated twice with the same results. DNA was extracted from a 5-day-old culture of monospore isolate EtKY19-1 grown in liquid complete medium (Valent et al. 1986), and a genome sequence was acquired using Illumina technology and assembled using Velvet version 2.9 (Zerbino and Birney 2008). A phylogenomic analysis identified EtKY19-1 as being most closely related to *P. oryzae* strain G17 (also from *Eragrostis*), with a sequence divergence of 0.68%, compared with >10% relative to neighbor *Pyricularia* species). The two isolates are preserved in the Farman lab at the University of Kentucky, and the genome assembly and sequences of widely used diagnostic loci (CAL, CHS, EF-1 α , ACT, BAC6, β t-1, CH7-BAC7, CH7-BAC9, MPG1, and NUT1; Couch et al. 2005) are available at NCBI (PRJNA604303). Given the current interest in increasing teff usage as a summer forage (DeBoer et al. 2017), and considering the severity of disease and rapidity of symptom progression to plant death, we recommend identifying blast-resistant teff varieties before expanding the acreage planted.

References:

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