Disease Notes

Diseases Caused by Fungi and Fungus-Like Organisms

First Report of Rust Disease Caused by *Puccinia emaculata* on Switchgrass in Georgia

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Switchgrass (*Panicum virgatum* L.), native to North America, has been selected by the U.S. Department of Energy as a model herbaceous bioenergy crop. However, there are several foliar diseases that may impact switchgrass biomass yield and quality. In the spring of 2008, different switchgrass cultivars and breeding lines of two major ecotypes, upland and lowland, were included in the Southern Switchgrass Diversity Panel planted in Watkinsville, GA. In the summer of 2009, brown to black rectangular lesions in a linear pattern were observed on the leaves of most of switchgrass lines. The spores were consecutively collected from the field in 2011 and 2012, dehydrated, and stored at -80°C . In 2016, one field isolate from year 2011 was rehydrated, recovered, and inoculated on the seedlings of switchgrass cultivars Alamo, Kanlow, Summer, and Blackwell planted in disease-free magenta boxes. The inoculated plants were kept in the dark at room temperature for 8 h and then moved to a growth chamber at 28°C with a 16-h light/8-h dark cycle. Uredinia formed on the abaxial leaf surface 7 days postinoculation (dpi) and then developed primarily on the adaxial leaf surfaces. The morphology of uredinia on the switchgrass cultivars in the magenta boxes was identical to what was previously observed on the susceptible switchgrass lines in the field. Uredinia were dark brown, elongated, and cauliculous. Urediniospores were cinnamon brown, globose to broadly ellipsoid, with a width of 21.7 to $28.1\ \mu\text{m}$ (average $24.2\ \mu\text{m}$) and length of 27.3 to $30.8\ \mu\text{m}$ (average $28.1\ \mu\text{m}$) ($n = 50$). The thickness of cell wall was 1.0 to $2.0\ \mu\text{m}$ (average $1.4\ \mu\text{m}$) ($n = 50$). Urediniospores were

isolated, and single-spore inoculation was made on the leaves of Alamo, Kanlow, Summer, and Blackwell using a detached-leaf assay. Uredinia appeared on the abaxial surface of leaves at 7 dpi, and the morphology of isolated urediniospores was consistent with the original inoculum. Teliospores were observed in the field in late summer and were two-celled, appeared dark brown in color with an oblong to ellipsoid shape, and averaged $33.2 \pm 4.1\ \mu\text{m}$ in length ($n = 50$). The apical cell width and basal cell width averaged 17.5 ± 1.3 and $15.7 \pm 1.9\ \mu\text{m}$ ($n = 50$), respectively. Urediniospore and teliospore morphology confirmed the identification of collected rust spores as *Puccinia emaculata* Schwein. (Ramachar and Cummins 1965). Genomic DNA was extracted from a uredinium derived from a single urediniospore on the infected detached leaf of cultivar Blackwell. A 1.2-kb fragment of 18S rDNA was amplified using primers designed by Frazier et al. (2013). The 18S rDNA sequence (GenBank MN699697.1) was blasted in GenBank, and the sequence showed 99.92% identity with the 18S rDNA of *P. emaculata* (GenBank EU915294.1). Based on the morphological and genetic information, the rust pathogen was identified as *P. emaculata* (Ramachar and Cummins 1965). *P. emaculata* has also been reported in Tennessee, Arkansas, and Virginia (Frazier et al. 2013; Hirsch et al. 2010; Zale et al. 2008), but to our knowledge, this is the first report of *P. emaculata* on switchgrass in Georgia. Switchgrass rust is currently affecting the growth of many switchgrass cultivars with various levels of susceptibility. This pathogen reduces switchgrass biomass yield, and therefore the identification and control of it are vital for switchgrass biofuel production in the United States.

References:

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