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Disease Notes

First Report of *Phakopsora pachyrhizi* on Soybean Causing Rust in Tanzania

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Phakopsora pachyrhizi Syd. was reported on legume hosts other than soybean in Tanzania as early as 1979 (1). Soybean rust (SBR), caused by *P. pachyrhizi*, was first reported on soybean in Africa in Uganda in 1996 (3), and its introduction into Africa was proposed to occur through urediniospores blowing from western India to the African east coastal areas by moist northeast monsoon winds (4). The fungus rapidly spread and was reported on soybean in South Africa in 2001, in western Cameroon in 2003, and in Ghana and the Democratic Republic of the Congo in 2007 (5). A second species causing SBR on soybean, *P. meibomiae*, has not been reported in Africa or elsewhere, outside of the Americas. From 2012 to 2014, symptomatic leaf samples were collected in the major soybean growing areas of the Tanzanian Southern Highlands (Iringa, Mbeya, and Ruvuma regions). Symptoms of SBR included yellowing of leaves and tan sporulating lesions. These symptoms were observed at flowering through seed maturity. From fields surveyed in 2012, 2013, and 2014, SBR was observed in 5 of 14, 7 of 11, and 14 of 31 fields, respectively. Some of the leaves sampled had up to 80% of the leaf area affected. When microscopically examined, urediniospores were elliptical, echinulate, and hyaline to pale yellowish brown. In 2014, sporuliferous uredinia were observed on leaf material collected from the Iringa and Ruvuma regions of Tanzania, and a subset of these samples was sent by APHIS permit to the University of Illinois. To confirm the pathogen, symptomatic soybean leaf tissue of approximately 1 cm^2 was excised from each of the samples, and DNA was extracted using the FastDNA Spin Kit (MP Biomedicals, Solon, OH), with further purification using the MicroElute DNA Clean-up Kit (Omega Bio-Tek, Norcross, GA). The DNA was subjected to quantitative PCR using published Taqman assays for *P. pachyrhizi*, *P. meibomiae*, and a multiplexed exogenous internal control reaction to validate negative results (2). *P. pachyrhizi* DNA was detected in excess of 66,000 genome equivalents/cm^2 in all samples, and *P. meibomiae* DNA was determined to be absent from all samples (limit of quantification ~2 pg DNA/cm^2). Free surviving urediniospores were dislodged from 12 samples and inoculated onto susceptible soybean cultivar Williams 82, which produced sporulating SBR lesions after 2 weeks of incubation in a detached-leaf assay. Thus, Koch's postulates were completed. This is the first report of *P. pachyrhizi* causing rust on soybean in Tanzania. In vivo cultures have been established from most of these samples, and ongoing research includes an evaluation of the *P. pachyrizi* virulence on a differential set, and characterization of the genetic diversity.

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