

Disease Note

Diseases Caused by Fungi and Fungus-Like Organisms

First Report of Ug99 Race TTKTT of Wheat Stem Rust (*Puccinia graminis* f. sp. *tritici*) in Iraq

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A wheat rust survey was conducted in Iraq in 2019 and collected 27 stem rust (caused by *Puccinia graminis* Pers.:Pers. f. sp. *tritici* Erikks. & E. Henn.) samples. Seven samples were viable, and they were tested for races of *P. graminis* f. sp. *tritici* at the Regional Cereal Rust Research Center (RCRRC) in Izmir, Turkey, under strict quarantine procedures. Two 0.5-cm segments of each infected stem sheath were incubated in a Petri dish at 20°C for 3 h for rehydration of urediniospores, which were multiplied on 10-day-old seedlings of susceptible cultivar Morocco grown in a spore-free growth chamber at 18°C and 16-h light. Inoculated seedlings underwent a dew period at 18°C for 16-h dark and 8-h fluorescent light and 95% relative humidity. Three days after moving the pots to a growth chamber with 8-h dark at 18°C and 16-h light (300 $\mu\text{mol m}^{-2}\text{s}^{-1}$), each pot was covered using a cellophane bag. Bulk urediniospores of each collection were collected 14 days postinoculation from a cellophane bag using a mini cyclone spore collector connected to a gelatin capsule. One milliliter of 3M Novec oil was added to each capsule, and spores were inoculated onto 20 North American stem rust differential lines using the standard procedures (Jin et al. 2008). Preinoculation, inoculation, incubation, and postinoculation conditions were the same as above. Seedling infection types (ITs) were recorded 14 days postinoculation using a 0 to 4 scale (Stakman et al. 1962). Race designation followed the five-letter code nomenclature described by Jin et al. (2008). Out of the seven samples, four were typed

as TKKTF, two as TKTTF, and one collected from an advanced breeding bread wheat line 'Shahoo 2' (Inqalab 91*2/Tukuru) in a trial site at Halabja governorate showed mixed ITs of 11+ and 3+ for lines carrying *Sr11*, *Sr24*, *Sr36*, and *Sr31*. Three single pustule (SP) isolates were developed from the IT of 3+ pustules collected from the *Sr31* tester line, and one SP isolate was developed from the IT 11+ pustule collected from the *Sr11* source. After spore multiplication, the SP-derived isolates were inoculated on the 20 North American differential lines. To confirm virulence/avirulence on *Sr24*, *Sr31*, and *Sr36*, cultivars Siouland (PI 483469, *Sr24* + *Sr31*) and Sisson (PI 617053, *Sr36* + *Sr31*) were also inoculated. All seedling assays were repeated three times. The three SP isolates virulent on *Sr31* were designated as race TTKTT, and the SP isolate avirulent on *Sr11* was designated as TKTTF. Seedling ITs of 3+ and 0; were recorded for Siouland and Sisson against TTKTT, respectively, and both cultivars showed IT of 1+ against TKTTF. Race TKTTF was similar to TKKTF, except for additional virulence on *Sr36*, and TTKTT differed from the other two races being virulent on *Sr24* and *Sr31*. DNA analysis of three TTKTT isolates from Kenya and the TTKTT isolate from Iraq using a diagnostic qPCR assay developed by the USDA-ARS Cereals Disease Laboratory (Ug99 RG stage 1, Szabo unpublished) confirmed that all tested isolates belonged to the Ug99 lineage. Race TTKTT was first reported from Kenya in 2014 (Patpour et al. 2016) and from Ethiopia in 2018 (Hei et al. 2020). We report the first detection of TTKTT in Iraq and the Middle East region. This represents only the third instance of a member of the Ug99 race group outside of Africa since the first detection of race TTKSK in Yemen in 2006 and Iran in 2007 (Nazari et al. 2009). The continued spread of stem rust races with complex virulence and the increasing frequency and early onset of stem rust infections in the Middle East give cause for concern. Continuous support for rust surveillance and race typing in this region remains crucial.

References:

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