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# First Report of *Puccinia graminis* f. sp. *tritici* Race TTKTT in Ethiopia

N. B. Hei, T. Tsegaab, W. Getaneh, T. Girma, C. Obsa, A. Seyoum, E. Zerihun, K. Nazari, E. Kurtulus, H. Kavaz, I. Ozseven, and A. Yoseph

## Affiliations ∨

### Authors and Affiliations

N. B. Hei<sup>1</sup> †

T. Tsegaab<sup>1</sup>

W. Getaneh<sup>1</sup>

T. Girma<sup>2</sup>

C. Obsa<sup>2</sup>

A. Seyoum<sup>2</sup>

E. Zerihun<sup>3</sup>

K. Nazari<sup>4</sup>

E. Kurtulus<sup>4</sup>

H. Kavaz<sup>4</sup>

I. Ozseven<sup>4</sup>

A. Yoseph<sup>5</sup>

<sup>1</sup>Ethiopian Institute of Agricultural Research, Ambo Agricultural Research Center, Ambo, Ethiopia

<sup>2</sup>Oromia Agricultural Research Institute, Bore Agricultural Research Center, Bore, Ethiopia

<sup>3</sup>Oromia Agricultural Research Institute, Sinana Agricultural Research Center, Bale Robe, Ethiopia

<sup>4</sup>Turkey-ICARDA Regional Cereal Rust Research Center, Menemen, Izmir, Turkey

<sup>5</sup>CIMMYT, Addis Ababa, Ethiopia

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Stem rust, caused by *Puccinia graminis* f. sp. *tritici* (*Pgt*), is one of the most important diseases affecting wheat production in Ethiopia, with crop losses of up to 100% during epidemic years

([Olivera et al. 2015](#)). In recent years, different virulent races of *Pgt* have been identified in the major wheat production areas of the country. Ethiopia is considered as a hot spot for the development and spread of new *Pgt* races ([Singh et al. 2006](#)). During the 2018 main cropping season (June to December), wheat rust surveys were undertaken in major wheat growing regions of Ethiopia, and stem rust was recorded in 284 (39%) of the 727 wheat fields surveyed. A total of 333 stem rust samples were analyzed for race identity using 20 North American wheat lines to differentiate *Pgt* races following the standard protocol described by [Jin et al. \(2008\)](#). Race analysis was undertaken independently at Ambo Agricultural Research Center (AmARC), Ethiopia, and Regional Cereal Rust Research Center (RCRRC), Turkey. The analysis identified seven races, namely, TTTTF, TKTF, TTKTT, TKKF, TKPTF, TTRTF, and TTKTF. Of these, TTKTT was detected for the first time in Ethiopia. Race TTKTT was virulent to wheat differential lines containing *Sr5*, *Sr6*, *Sr7b*, *Sr8a*, *Sr9a*, *Sr9b*, *Sr9d*, *Sr9e*, *Sr9g*, *Sr10*, *Sr11*, *Sr17*, *Sr21*, *Sr24*, *Sr30*, *Sr31*, *Sr38*, *SrTmp*, and *SrMcN* and avirulent on lines with *Sr36*. This race was identified independently by AmARC and RCRRC in replicated tests from 18 isolates collected in Guji (southern Ethiopia), West Arsi (southeastern Ethiopia), Hararge (eastern Ethiopia), and East Wellega (western Ethiopia) zones of Oromia region and two isolates from East Gojam and South Wollo zones of Amhara region. Race TTKTT was identified from samples collected from commercial wheat varieties Hulluka, Senate, Shorima, Ogolcho, Hidase, and Danda'a. This race was reported in Kenya for the first time in 2014 and belongs to the TTKSK (Ug99) race group ([Patpour et al. 2016](#)). TTKTT has the most complex virulence combination of all known Ug99 races, and range expansion out of Kenya is highly significant. This first confirmation of TTKTT in Ethiopia is important because of its striking virulence combinations for *SrTmp*, *Sr24*, and *Sr31*, indicating the increase in virulence and variability in the Ethiopian *Pgt* population. Among these three genes, *Sr24* is a valuable source of resistance that has remained effective in Ethiopia. Detection of TTKTT in Ethiopia is of great concern because a high frequency of widely grown commercial cultivars and advanced breeding lines in Ethiopia are known to possess the *Sr24* resistance gene ([Hundie et al. 2019](#)). According to [Jin et al. \(2008\)](#), commercial cultivars with resistance based on *Sr24*, particularly in the East African region, must be viewed with caution in terms of potential stem rust epidemics. The current result also emphasizes the importance of regular monitoring to timely identify new races and utilize this information in screening and identification of effective sources of resistance. Moreover, the result highlighted the need for developing cultivars with combinations of effective resistance genes to enhance their longevity. Alternatively, cultivars with multiple minor genes to achieve durable resistance could be developed. Further spread of race TTKTT is considered likely and requires close monitoring.

The author(s) declare no conflict of interest.



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### The American Phytopathological Society

(APS)

📍 3340 Pilot Knob Road, St. Paul, MN 55121 USA

☎ +1.651.454.7250

**FAX** +1.651.454.0766

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