The Spread of Stem Rust Caused by *Puccinia graminis* f. sp. *tritici,* with Virulence on *Sr31* in Wheat in Eastern Africa. R. Wanyera and M. G. Kinyua, Kenya Agricultural Research Institute, National Plant Breeding Research Center, P.O. Njoro, Kenya; Y. Jin, USDA-ARS Cereal Disease Laboratory, University of Minnesota, St. Paul; and R. P. Singh, CIMMYT, Apdo, Postal 6-641, Mexico D.F., Mexico.

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Stem rust resistance in wheat cultivars with *Sr31* has been effective and durable worldwide for more than 30 years. Isolates of *Puccinia graminis* f. sp. *tritici* with virulence to *Sr31* were detected in Uganda in 1999 (1). During 2003 and 2004, a majority of current Kenyan cultivars and a large portion of CIMMYT wheat germplasm with gene *Sr31* planted in Kenya were susceptible to stem rust. Six isolates collected during 2004 at different locations in Kenya were tested for virulence on the 16 North American stem rust race differentials with the following *Sr* genes: *Sr5*, *6*, *7b*, *8a*, *9a*, *9b*, *9d*, *9e*, *9g*, *10*, *11*, *17*, *21*, *30*, *36*, and *Tmp.* An extended set of designated *Sr* genes (*Sr13*, *19*, *22*, *24*, *25*, *26*, *29*, *31*, *32*, *33*, *35*, *37*, *39*, *40*, *44*, and *Wld-1*) was also tested at the seedling stage. An isolate from Uganda collected in 1999 with virulence on *Sr31* was used for comparison. Urediniospores suspended in a lightweight mineral oil were inoculated onto 7-day-old seedlings. Inoculated plants were placed in a dew chamber for 14 h at 18°C in the dark and then for an additional period of 3 to 4 h placed under fluorescent light. Plants were incubated in a greenhouse at 18 ± 2°C with a photoperiod of 16 h. Infection types (IT), described by Stakman et al. (3), were assessed after 14 days postinoculation. All isolates from Kenya exhibited a low infection type (IT 0) on line W2691SrTt-1 (donor of *Sr36*), a low infection type (IT 2) on cv. Triumph 64 (donor of *SrTmp*), and high infection types (IT 3 or 4) on all other lines in the differential set (2); thus these isolates were keyed to race TTKS. The virulence pattern of the isolate collected in 1999 from Uganda was identical to that from Kenya on the differential set and on the extended set of designated *Sr* genes. In this study, these isolates produced a high infection type (IT 3) on Einkorn and CnSSr21Tm (a derivative of *Triticum monococcum* in Chinese Spring background), two sources of *Sr21* used in our study, whereas the isolate with *Sr31*-virulence from Uganda in 1999 was reported to be avirulent on *Sr21* (1). These isolates produced high infection types on single gene lines with *Sr31* and winter wheat cvs. Custer, Foster, GA-Dozier, Patton, and Pioneer 26R61, which were known to carry the 1BL.1RS translocation with *Sr31*. These isolates were also virulent on *SrWld-1*, a gene used in spring wheat for its resistance to North American stem rust isolates. In addition to *Sr36* and *SrTmp*, other stem rust resistance genes that were effective against TTKS at the seedling stage include *Sr13*, *22*, *24*, *25*, *26*, *27*, *29*, *32*, *33*, *35*, *37*, *39*, *40*, and *44*. Cultivars, breeding germplasm, and single gene lines are currently being evaluated for adult plant reaction in Kenya. Results from this study indicated that stem rust isolates with virulence on *Sr31* are now wide spread in the Eastern Africa highlands and pose a threat to wheat production in the region, as well as in other wheat production areas where *Sr31* resistance is important. A rapid deployment of effective resistance genes to this race in breeding programs throughout Eastern Africa and Asia is needed to reduce this threat.

References: (1) Z. A. Pretorius et al. Plant Dis. 84:203, 2000. (2) A. P. Roelfs and J. W. Martens. Phytopathology 78:526, 1988. (3) E. C. Stakman et al. U.S. Department of Agriculture. ARS E-617, 1962.