

Challenge, Progress, and Perspective for the Implementation of Integrated Management of Wheat Stripe (Yellow) Rust Caused by *Puccinia striiformis* f. sp. *tritici* in China

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China is the largest wheat producer and consumer in the world. Wheat stripe (yellow) rust caused by *Puccinia striiformis* f. sp. *tritici* (*Pst*) is the most destructive foliar disease of wheat in all winter wheat regions. Epidemics of the disease have occurred at varying intensity all over the country and are notably endemic in the Northwest and Southwest wheat growing areas since 1950. Annual losses of wheat yields due to stripe rust have averaged about 1 million tons. The most severe epidemics occurred in 1950, 1964, 1990 and 2002, which caused yield losses of wheat approaching 6.0 million tons, 3.2 million tons, 2.65 million tons and 1.4 million tons, respectively. Traditionally, wheat stripe rust is considered a low-temperature disease and frequently occurs in temperate areas with cool and moist conditions. However, recent severe epidemics have occurred in warmer areas where the disease was previously infrequent or absent. This led to the presumption that *Pst* populations have adapted higher temperatures enabling it to inflict damage in previously unfavorable environments. And a noticeably increased frequency of race V26 with a combined virulence for *Yr24/26* and *Yr10* firstly detected in 2010 is the major virulence change recorded in recent years compared with the results on an annual basis. Based on the geographical conditions, wheat plantation, occurrence and dispersal of disease, wheat stripe rust in China can be divided into three major zones, namely the autumn sources of inoculums, the spring sources of inoculums, and spring epidemic areas. A major strategy of headstream management has been put forward, i.e. “integrated management of wheat stripe rust in the sources of inoculums to protect wheat safety plantation in all over the country”. A series of effective measures for the control of disease, including the improving cultivar resistance, changing cultivation crops, regulating sowing date, seed-dressing with fungicides, and spraying fungicides in the initial stage of disease, has been developed. The integrated management systems based on the biodiversity have been set up in the areas of inoculum sources of *Pst*, respectively, which have been widely applying in wheat production resulting in the sustainable control of wheat stripe rust epidemics and remarkably economic efficiency. It is anticipating in an alternative strategy for limiting virulence evolution, and development of early forecast system and the ecological control measures of disease in the areas of inoculum sources of wheat stripe rust in the near future.

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