Plant Pathology (2006) **55**, 726–738 Doi: 10.1111/j.1365-3059.2006.01444.x

Identification of isolate-specific and partial resistance to septoria tritici blotch in 238 European wheat cultivars and breeding lines

L. S. Arraiano* and J. K. M. Brown

Disease and Stress Biology Department, John Innes Centre, Norwich Research Park, Colney, Norwich NR4 7UH, UK

From a total of 238 European cultivars and breeding lines screened for isolate-specific resistance to septoria tritici blotch (STB) with eight *Mycosphaerella graminicola* isolates from five different countries, 142 lines were resistant to Ethiopian isolate IPO88004, and 43 lines were specifically resistant to IPO323, with little or no leaf area bearing pycnidia of *M. graminicola*. These lines probably all have the resistance gene *Stb6*. Specific resistances to isolates CA30JI, IPO001, IPO89011, IPO92006 and ISR398 were less common. Seventy-three per cent of the lines were specifically resistant to at least one isolate and 36 lines were resistant to more than one isolate. The line with the greatest number of specific resistances was the spring cultivar Raffles, with five. The most resistant line in which no specific resistance was identified was the Italian landrace Rieti, an ancestor of many modern European wheat cultivars. There was also a wide range of partial resistance among the lines tested, expressed in detached seedling leaves. Information about the resistance of wheat lines to *M. graminicola* isolates will assist breeders to choose parents of crosses from which progeny with superior resistance to STB may be selected.

Keywords: median polish, *Mycosphaerella graminicola*, resistance genes, septoria tritici blotch, variety × isolate interactions, wheat

Introduction

Septoria tritici blotch (STB) has been the major disease of wheat in the UK for nearly two decades (Hardwick *et al*., 2001; Pillinger *et al*., 2004) and is the principal target for foliar fungicides on wheat. The recent discovery of resistance to strobilurin (QoI) fungicides (Fraaije *et al*., 2005) has increased interest in breeding and growing cultivars resistant to STB as a cost-effective means of controlling the disease. Wheat breeders throughout Europe therefore consider it one of the major targets for resistance breeding.

Broadly speaking, two types of resistance to STB are known. Specific resistance to STB is near-complete, oligogenic, effective against particular pathogen isolates and follows a gene-for-gene relationship (Brading *et al*., 2002). Quantitative or partial resistance is incomplete, polygenic (Jlibene *et al*., 1994; Simon & Cordo, 1998; Zhang *et al*., 2001) and isolate-nonspecific (Chartrain *et al*., 2004a). Twelve major genes for resistance to the fungal pathogen that causes STB, *Mycosphaerella graminicola*, have been identified and mapped (Somasco *et al*., 1996; Arraiano *et al*., 2001b; Brading *et al*., 2002; McCartney *et al*., 2003; Adhikari *et al*., 2003, 2004a,b,c; Chartrain, 2004; Chartrain *et al*., 2005a,b) and some quantitative-trait loci conferring partial resistance have been identified (Eriksen *et al*., 2003; Chartrain *et al*., 2004a). The gene *Stb6*, which follows a gene-for-gene relationship (Brading *et al*., 2002), is widespread in sources of resistance to STB worldwide (Chartrain *et al*., 2004b).

Several isolate-specific resistances have been detected in European wheat cultivars (Kema & van Silfhout, 1997; Brown *et al*., 2001), but it is not known how frequent they are among germplasm currently used by breeders. For many years, European wheat breeders believed they did not have access to adequate genetic variation in resistance to STB. However, little was known about the genetics of resistance, particularly the distribution of resistance genes among different cultivars, which would indicate if different genes could be combined (Chartrain *et al*., 2005c). Indeed, until recently (Brading *et al*., 2002), no STB resistance gene had been identified in any modern European wheat cultivar. It is possible that the resistance of some European wheat cultivars might depend on partially effective isolate-specific resistances, but, if so,

*E-mail: lia.arraiano@bbsrc.ac.uk

Accepted 28 March 2006