Registration of Rusty Durum Wheat

Rusty (Reg. no. GS-155, PI 639869), a genetic stock of durum wheat (Triticum turgidum L. var. durum) that is a near universally susceptible to stem rust (caused by Puccinia graminis Pers.:Pers. f. sp. tritici Eriks. & Hen.) was selected and released in December 2004 by the USDA-ARS Northern Crops Science Laboratory, Fargo, ND, and North Dakota State University. Rusty was selected from a euploid BC₁F₃ plant having the parentage Langdon 4D(4B)/Line 47–1/Langdon 4D(4B) is a disomic substitution line in which chromosome 4B of the durum wheat ‘Langdon’ (Citr13165) was substituted by chromosome 4D from the hexaploid wheat (T. aestivum L.) Chinese Spring (Citr14108) (Joppa and Williams, 1988). The parentage of Line 47–1 involves PI 192334 and either Langdon or a Langdon aneuploid (L.R. Joppa, personal communication, 1997). PI 192334 is a selection known as Marruecos 9623 (Weeraratne and Williams, 1971), Marrocos 9623 (Williams and Gough, 1968), Marrocos 623 (USDA-ARS Cereal Disease Laboratory, 2004), or simply Marrocos (USDA-ARS National Genetic Resources Program, 2004). PI 192334 is moderately susceptible to stem rust, but it carries a single thermosensitive gene, temporarily designated SrM (USDA-ARS Cereal Disease Laboratory, 2004), that confers an intermediate infection type (IT) of 13 or 31 (Stakman et al., 1962) to pathotype, Pgt-LBBL, at low temperature (19–21°C), but an IT of 34 at temperatures above 21°C. Line 47–1 also carries this gene.

The pathotype Pgt-LBBL is an important pathotype for screening germplasm to identify new stem rust resistance genes since it is avirulent to most host resistance genes. When Pgt-LBBL is used to identify resistant progeny in crosses involving either Marruecos 9623 or Line 47–1, the presence of the SrM gene interferes with selection of resistant progeny and causes susceptible progenies to be misclassified as resistant. Selection of a durum genotype having temperature-insensitive susceptibility to Pgt-LBBL, indicating that the SrM gene has been eliminated, would increase the utility of Pgt-LBBL for selection or genetic analysis of new stem rust resistance genes.

To initiate the selection of Rusty, 13 BC₁F₃ plants that had a susceptible reaction to pathotypes Pgt-JCMN and Pgt-LBBL were selected. The pathotype Pgt-JCMN had been used in the prior study because it was a gray-brown color mutant which allowed for simultaneous testing of two pathotypes of stem rust on a single leaf. We screened for temperature-insensitive susceptibility to Pgt-LBBL in BC₁F₂ families, each derived from one of the 13 BC₁F₁ selected plants using procedures previously described (Williams et al., 1992) except that greenhouse temperatures did not exceed 20°C. Plants were scored for IT, and two families were found to be homogeneous for temperature-insensitive susceptibility to Pgt-LBBL. An additional 25 plants per BC₁F₃ family were screened for temperature-insensitive susceptibility to Pgt-LBBL and also selected for plant fertility and morphological characteristics. A single BC₁F₂ plant, originally tested as 47–1R1, was selected.