Wheat Breeding and Genetics
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Research Question

The objectives of this proposal are to i) develop improved varieties and germplasm combining high grain yield, disease resistance, and end-use quality; and ii) provide performance data on wheat varieties adapted to the state of Minnesota.

Results

RB07 (MN99436-6) was released in 2007. RB07 is an early semi-dwarf with moderately strong straw. RB07 is highly resistant to prevalent races of leaf rust, resistant to stem rust, moderately resistant to other leaf diseases, and has moderate resistance to Fusarium head blight, intermediate between the levels of Alsen and Oklee. RB07 has high and consistent grain yields with average test weight and above average protein. An exclusive licensing agreement was reached for the wheat line MN00261-4 (MN95286/MN94155//Verde). MN00261-4 is a late semidwarf with moderately strong straw. MN00261-4 is moderately resistant to prevalent races of leaf rust, resistant to stem rust, moderately resistant to other leaf diseases, and is moderately resistant to Fusarium head blight, similar to Alsen. MN00261-4 has high grain yields and average test weight and protein.

During the 2006/2007 crossing cycle, 261 crosses were made. The Variety Trial, which contained 34 released varieties, 11 University of Minnesota experimental lines, and 3 experimental lines from other programs and was grown at Crookston, Lamberton, Morris, Roseau, St. Paul, Stephen, and Waseca. During the 2007 growing season, 120 advanced experimental lines were evaluated in replicated advanced yield trials at Crookston, Morris, and St. Paul. A total of 370 preliminary yield trial lines were tested in unreplicated plots at Crookston, Morris, and St. Paul. Fusarium-inoculated, misted, replicated nurseries were established at Crookston, Morris, and St. Paul. A tan spot-inoculated, misted, replicated nurseries was established at St. Paul. The disease nurseries involve collaboration with agronomists and pathologists at Crookston and Morris and with personnel from the Plant Pathology Department and the USDA-ARS. Data from the yield and scab nurseries are summarized and published in Prairie Grains and the U of M Extension Service's Minnesota Varietal Trials Results.

One advanced experimental line, MN01311-A-1, underwent seed increase during 2007 and is a candidate for release in 2007. MN01311-A-1 (97T1003/Verde) has medium maturity, height, and straw strength. MN01311-A-1 has shown consistently high grain yields, especially in northern locations, moderate leaf rust resistance, and Fusarium head blight resistance comparable to Alsen. MN01311-A-1 has above average test weight and grain protein.

Application and Use

Experimental lines that show improvement over currently available varieties are recommended for release. Improved germplasm is shared with other breeding programs in the region. Scientific information related to efficiency of breeding for particular criteria is presented at local, regional, national, and international meetings and published.

Materials and Methods

All yield nurseries are grown in small, replicated plots (typically 40-50 sq. ft. harvested area per plot). Fusarium-inoculated nurseries at Crookston, Morris, and St. Paul consist of single 4 to 6 ft. rows, with 1 to 3 replications. Fusarium-infected corn seed or spray-applied macroconidia are used as inoculum. The plot areas are misted periodically to maintain a high humidity environment for at least three weeks after anthesis.

Economic Benefit to a Typical 500 Acre Wheat Enterprise

Choice of variety is one of the most important decisions growers make each year. The development of high-yielding varieties that are resistant to the prevalent diseases and have good end-use quality are necessary to increase grower profit and protect against constantly changing pathogens and pests. As an example, a new variety that yields 4% higher will produce two extra bushels in a field that averages 50 bu/A.
Related Research

These funds provide general support for our breeding/genetics program. Additional monetary support for breeding-related research comes from the Minnesota Agricultural Experiment Station and the U.S. Wheat and Barley Scab Initiative via USDA-ARS.

Our breeding project is a participant in a new USDA-CSREES project whose objectives are to discover DNA markers linked to pre-harvest sprouting resistance and use DNA markers associated with other key genes to increase the efficiency of the breeding project.

Publications


