

PROJECT TITLE: Plant and Variety Selection in Spring Wheat, Winter Wheat and Barley for the Control of Foliar Diseases.

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OBJECTIVES:

1. To select germplasm of winter wheat, spring wheat and barley that has improved resistance to foliar fungal and bacterial diseases that presently occur in Montana.
2. To incorporate the resistant germplasm into winter wheat, spring wheat and barley breeding programs so that adapted varieties can be developed for release to commercial small grain growers.

SUMMARY: Foliar diseases are of increasing economic importance to small grain producers in Montana. The most prevalent of these diseases are the fungi Septoria tritici, (Septoria leaf blotch), Septoria nodorum (Septoria glume blotch) and Pyrenophora trichostoma (tan spot), the bacteria Pseudomonas syringae and Xanthomonas translucens, and wheat streak mosaic virus. No reliable estimates are available as to the economic losses caused by these diseases, but due to their widespread occurrence, losses in aggregate are probably substantial.

Most of these foliar diseases are of particular significance under continuous cropping conditions, especially in combination with minimum tillage practices, because the disease inoculum appears to be carried over on crop residues or volunteer grain. Thus, there is an urgent need for identification of germplasm that is resistant to these diseases and development of resistant cultivars if continuous cropping and minimum tillage practices are to be applied successfully in Montana on a sustained basis.

Wheat disease nurseries have been grown at the Eastern Agricultural Research Center in cooperation with the Plant Pathology Department at Montana State University since 1975. Each year, 250-700 spring wheat lines and 150-500 winter wheat lines have been evaluated for disease resistance potential. Materials for the nursery are provided by Dr. A. Scharen of the Pathology Department and come from various environments, including Israel, Lebanon, Tunisia, Kenya, India, Japan, USSR, Yugoslavia, Algeria, Spain, Mexico, Brazil, Chile, Argentina, Australia and other wheat producing countries. All the disease evaluations are made by personnel from the Plant Pathology Department at Montana State University. In addition to disease ratings, other agronomic characteristics of these wheat varieties are rated by the staff of the Eastern Agricultural Research Center. The most promising lines are harvested each year and are used as a source of resistance in the breeding programs at Montana State University.

One hundred seventy-nine winter wheat lines were planted under irrigated conditions during the 1989 growing year. The winter wheat lines were read for disease reaction on June 19 and 20. Winterkill damaged much of the winter wheat. Because Septoria development was poor, lines were rated only on the presence or absence of the disease. There was no tan spot on any of the lines, and one line showed the presence of leaf rust.

Eighty-three spring wheat lines were planted under irrigated conditions in 1989. Cool wet weather in June was conducive to disease and very good Septoria development occurred. Extensive disease notes were made on a double digit scale on July 17 and 18. Although Septoria development was good, no other diseases were noted in the spring wheat.

A barley disease resistant recurrent selection population has been grown at the Eastern Agricultural Research Center since 1979 in cooperation with the Plant Pathology Department at Montana State University. The population was provided by Dr. David Sands. Each year, Dr. Harold Bockelman evaluated disease reaction at Sidney and selected resistant plants. The population was primarily selected for resistance to Xanthomonas translucens (bacterial leaf streak), although selection was for resistance to any disease organism. Each year, several thousand plants were grown and evaluated for disease resistance. Resistant plants were harvested and the seed produced were planted in a winter nursery in Arizona. Plants in Arizona were intercrossed and the resulting seed were planted back in Sidney in the following spring as the disease resistant recurrent selection population.

Lines from the disease resistant population were selected for good agronomic characters by Dr. Mike Bjarko and by Dr. Rebecca McGee. Four hundred rows of plant selections from the barley disease resistant recurrent selection population were planted on the dryland farm in 1989 and harvested for seed increase.

RESULTS: Septoria tritici(leaf blotch) and Septoria nodorum(glume blotch) were observed in the irrigated winter wheat and spring wheat nurseries, and lines were evaluated for resistance to these diseases. Severity of these diseases was high in the spring wheat this year and extensive readings were possible. The winter wheat did not exhibit the severity of the diseases and were rated only as to the presence or absence of the disease. No other diseases were observed.

FUTURE PLANS: Further testing and selection in 1990 is anticipated for those wheat lines selected by Dr. Al Scharen as having foliar disease resistance. Nurseries are planned on the irrigated research site as well as the dryland farm to help assure a satisfactory level of development of foliar diseases to permit worthwhile disease evaluations in 1990.

Barley selections and advanced lines which were selected from the disease resistant recurrent selection population and increased in Sidney last year will be grown in preliminary yield trials in 1990. In addition, recurrent selection will continue in the parent population.