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

PROJECT LEADERS

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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.

RESULTS:

Winter wheat and barley lines that were previously selected for resistance or tolerance to Septoria tritici(leaf blotch) and Septoria nodorum(glume blotch) were observed under irrigated and dryland conditions and evaluated for winter hardiness. Agronomic characters of spring barley lines that were selected for disease resistance or tolerance were evaluated under dryland conditions.

SUMMARY:

Foliar diseases of small grains are of 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 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 a great need to identify germplasm that is resistant to or tolerant of these diseases and to develop 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 have been 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. Additionally, 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 forty-six winter wheat lines and fifty-seven winter and facultative barley lines that were identified as having disease resistance or tolerance were planted under irrigated and dryland conditions during the 1991-92 growing year. The winter wheat and barley lines were evaluated for winter survival and height.

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, the population was evaluated for disease reaction at Sidney and resistant plants were selected. 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.

Twenty spring barley lines were evaluated in a replicated yield trial under dryland conditions in 1992. Lines that were evaluated included some that were selected for good agronomic characters by Dr. Mike Bjarko and by Dr. Rebecca McGee from the disease resistant population.

FUTURE PLANS:

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 1993. Additionally, recurrent selection will continue in the parent population for disease resistance and good agronomic characteristics.