

Current Funded Research Projects for FY 2001-2002

Title: Developing and Releasing Improved Barley Varieties for Montana Farmers

Institution: MSU

Department: MSU/Plant Sciences

Principal Investigator: Dr. Tom Blake

Amount Funded: \$60,000.

Objectives:

The Montana State University barley improvement program has as its primary goal the development and release of barley varieties that improve the economic value of barley to Montana farmers. During the past two years, we've had three varieties approved for release of barley varieties approved for release: Valier (now in production), H3860224 (in preparation for release to foundation seed growers this spring) and Haxby, a line in seed increase that will be released to foundation seed growers in the spring of 2002. Valier and H3860224 are high-yielding, high feed quality feed barley varieties. H3860224 is also stripe rust resistant, increasing the likelihood that it might find use in states to the West.

The next group of barley varieties to be released equals or exceeds Baronesse in yield potential. Several of these lines have excellent malting quality, as measured by USDA's Cereal Crops research Unit Malt Laboratory (Madison, WI). Our new variety, "Haxby", is remarkable for test weight, averaging more than 53 lbs/bu, more than three pounds heavier than Harrington and a full pound heavier than Stark.

Title: Integrated Weed Management Diagnostic and Education Lab

Institution: MSU

Department: Dept. Land Resources & Environmental Sciences (LR & ES)

Principal Investigator: Alvin J. Bussan

Amount Funded: \$20,000.

Objectives:

1) Provide an Integrated Weed Management Diagnostic Center for determining herbicide injury, detecting herbicide resistance, and management complaints to Montana farmers, ranchers, and homeowners. Develop best management recommendations for chronic problem weeds encountered through the diagnostic service.

2) Develop an integrated weed management outreach and education program that reaches a high percentage of Montana's farmers and ranchers.

3) Evaluate integrated weed management education programs for their effectiveness in leading to adoption by Montana ranchers and farmers.

Title: Winter Wheat Breeding/Genetics

Institution: MSU

Department: Plant Sciences

Principal Investigator: Phil Bruckner

Amount Funded: \$70,000.

Objectives:

- 1) Develop improved cultivars of winter wheat adapted to Montana climatic conditions and cropping systems, which possess superior on-farm production characteristics (grain yield, winter hardiness, adequate and durable pest resistance, stress tolerance, agronomic characteristics) and superior end-use quality characteristics.
- 2) Isolate, as much as possible, our foreign wheat customers from variations in wheat quality performance by development and release of suitable cultivars and production research to develop strategies to maximize quality consistency for wheat produced in Montana.
- 3) Investigate environmental, genetic, and management factors which influence wheat productivity and end-use in Montana including 2001 project: effects of selection for low polyphenol oxidase (PPO) on disease resistance, agronomic performance, and end-use quality; and molecular markers for wheat stem sawfly tolerance and cold tolerance.
- 4) Coordinate Montana statewide winter wheat variety testing program and provide long-term performance data necessary for cultivar release decisions, variety recommendations, and producer management decisions.

Title: Enhanced Field Selection for Wheat Stem Sawfly Resistance

Institution: MSU

Department: Plant Sciences

Principal Investigator: Phil Bruckner

Amount Funded: \$12,000.

Objectives:

- 1) Subject early-generation segregating winter wheat bulk populations and derived lines to heavy selection pressure for wheat stem sawfly (WSS) resistance and select plant phenotypes resistant to WSS infestation and cutting damage.
- 2) Evaluate spring and winter wheat cultivars and advanced lines for resistance to infestation and cutting damage by WSS and for yield performance under heavy infestation by WSS.
- 3) Systematically evaluate selected germplasm for enhanced stem solidness and alternative sources of WSS resistance.
- 4) Provide field sites, representative of sawfly-infested production regions, for research and demonstration to producers of effective sawfly management strategies including use of resistant cultivars.

Title: Early Generation Durum Selection and Germplasm Improvement

Institution: MSU

Department: Experiment Station

Principal Investigator: Joyce Eckhoff

Amount Funded: \$10,000.

Objective:

To develop improved durum germplasm for Montana.

Title: Development of Higher Yielding Wheat Varieties by Extension of Leaf Duration

Institution: MSU

Department: Plant Sciences and Plant Pathology

Principal Investigator: Andreas Fischer

Amount Funded: \$25,000.

Objectives:

- 1) Test the influence of leaf duration ("stay-green") on yield formation by comparing Reeder, a high-yielding stay-green variety, with several "standard" wheat varieties under field conditions.
- 2) Evaluate easily measurable quantitative parameters associated with extended leaf duration for use in breeding programs.

Title: Selective Tests for Small Grain Quality

Institution: MSU

Department: Plant Sciences

Principal Investigator: Michael Giroux

Amount Funded: \$25,000.

Objectives:

- 1) Increasing seed yield of wheat and/or barley through transformation. Examine agronomic yield under Bozeman field conditions and analysis of end product quality.
- 2) Examine role of large variation in grain hardness on wheat end product quality. Study of isogenic hard/soft wheats in relation to wheat flour end product quality.
- 3) Identify control of barley milling energy and genes controlling endosperm texture in barley. Determine extent to which barley endosperm texture predicts digestibility and malting quality.

Title: Improved Quality of Montana Hard Red and Hard White Wheat

Institution: MSU

Department: Plant Sciences

Principal Investigator: Deb Habernight/Luther Talbert

Amount Funded: \$25,000.

Objectives:

- 1) To determine end-use quality parameters of Montana breeding lines of hard red and hard white wheat for the spring wheat and winter wheat breeding programs.

2) To develop methods of selecting for alternative end-use quality in hard red and hard white spring wheat without sacrificing bread making quality.

3) To evaluate the relationship between hard wheat flours milled using an experimental mill vs. those milled commercially.

4) To cooperate with Research Centers, researchers, producers, general public and industry to educate and explore areas to improve cereal quality.

Title: Influence of Trichome Density on Wheat Stem Sawfly Infestation of Diverse Spring Wheat Lines

Institution: MSU

Department: Entomology

Principal Investigator: Andrew Lenssen

Amount Funded: \$1,169.

Objective:

Compare infestation and survival of wheat stem sawfly in spring wheats that vary for trichome density.

Title: Wheat Stem Sawfly Infestation and Fusarium Crown Rot of Diverse Wheat, Durum and Barley Lines

Institution: MSU

Department: Entomology

Principal Investigator: Andrew Lenssen

Amount Funded: \$13,980.

Objective:

1. Compare infestation and survival of wheat stem sawfly in diverse spring wheat, durum and barley lines.
2. Compare Fusarium Crown Rot infection of diverse spring wheat, durum and barley lines.
3. Compare yield and quality of diverse spring wheat, durum and barley lines.

Title: Impact of Polyphenol Oxidase on Bread, Noodle, and Agronomic Traits in Winter Wheat

Institution: MSU

Department: Plant Sciences

Principal Investigator: Jack Martin

Amount Funded: \$15,600.

Objectives:

1) Examine the effect of selection for high versus low polyphenol oxidase on bread and noodle quality traits in winter wheat crosses.

2) Examine the effect of selection for high versus low polyphenol oxidase on agronomic traits in winter wheat crosses.

Title: Cereal Crop Yield and Quality Benefits From Diversified Cropping Sequences

Institution: MSU

Department: Dept. of Land Resources and Environmental Sciences (LR & ES)

Principal Investigator: Perry Miller

Amount Funded: \$17,700.

Objectives:

1) Compare rotational benefits among cool and warm season cereal, oilseed and pulse crops, related to soil water nitrogen conservation.

2) Compare HRS wheat, durum wheat, winter wheat and barley grain yield and quality response to cereal, oilseed and pulse cropping sequences.

Title: Wheat and Barley Research Equipment Maintenance and Replacement

Institution: MSU

Department: Plant Sciences

Principal Investigator: Phil Bruckner

Amount Funded: \$15,000.

Objective:

Provide faculty working in wheat and barley research areas with resources to maintain and replace equipment.

Title: Ag Appreciation Weekend 2001

Institution: MSU

Department: Dean's office

Principal Investigator: Sharron Quisenberry

Amount Funded: \$1,000.

Objectives:

Provide students in the College of Agriculture at Montana State University the opportunity to participate and represent MSU at judging contests, annual meeting and other important events by raising funds during MSU's Ag Appreciation Weekend, November 2001 through corporate sponsorships and donations. Showcase agriculture in Montana during Ag Appreciation Weekend with a Community Day where the public is invited to view displays highlighting agriculture in Montana.

Title: Continuing as an Underwriter for MONTANA AG LIVE!

Institution: MSU

Department: Plant Sciences

Principle Investigator: Jack Riesselman

Amount Funded: \$2,500.

Objective:

In 1994 with start-up assistance from the US West Foundation, the Montana State University Extension Service and KUSM Montana Public Television initiated a Sunday evening, live, call-in television program. The program was designed to address in a timely and cost-effective manner, the needs of agriculture producers in Montana with special emphases placed on production crops. Three Extension specialists from the following list – Jack Riesselman (plant pathology), A.J. Bussan or Roger Sheley (weeds), Sue Blodgett (insect management), Jeff Jacobsen (soils) or Bob Gough (horticulture) -- are the weekly panelists. Hayden Ferguson, a retired soil scientist is the weekly moderator. Guests addressing specific, relevant issues appear on each program. This year's guests include scientists addressing legislative issues impacting agriculture, genetically modified crops, fertilizer prices and alternatives to traditional fertilizers, mountain snow pack and surface water run-off, and the impact of energy deregulation. The weekly format includes two or three topical demonstrations or presentations interjected between calls from viewers.

Title: Inhibition of Fungal Pathogens of Wheat and Barley by Wheat Puroindoline Proteins

Institution: MSU

Department: Plant Sciences

Principle Investigator: John Sherwood

Amount Funded: \$20,160.

Objective:

The long term goal of this research is to develop transgenic plants expressing the antifungal puroindoline proteins to protect those plants against fungal diseases. This proposal describes experiments designed to determine the diseases that we might expect to be curtailed by the puroindoline proteins, and to continue ongoing research to directly test transgenic wheat for resistance to fungal diseases important in Montana. The specific objectives are to:

1. Continue testing PIN-producing transgenic wheat for susceptibility to fungal diseases. We will include wheat that has both pinA and pinB, which is currently being generated by traditional breeding methods.
2. Determine the sensitivity to the PIN proteins of fungal pathogens causing disease of wheat in Montana with recently developed bioassays. The relative sensitivity of a pathogen to extracted puroindoline should predict the ability of these proteins to control the disease caused by each fungus.
3. Examine the correlation between the amount of puroindoline protein naturally present in different wheat varieties and susceptibility to *Penicillium*, which causes dry seed decay.

Title: Spring Wheat Breeding and Genetics

Institution: MSU

Department: Plant Sciences

Principle Investigator: Luther Talbert

Amount Funded: \$70,000.

Objective:

- 1) To develop spring wheat varieties that provide an economic advantage to Montana farmers.
- 2) To manage the varietal testing program for Montana.
- 3) To make a contribution to the science of wheat breeding and genetics.

Title: Support for Six Research Centers

Institution: MSU

Department: Ag Experiment Stations

Principle Investigator: MAES Research Centers

Amount Funded: \$72,000.

Objectives:

1. To evaluate the effects of differing systems on crop and variety performance under diverse environments represented across the Montana Agricultural Experiment Station – Research Center network.
 2. To evaluate the potential fit of other materials, concepts and techniques with various cropping systems employed.
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