

## **Funded Research Projects for FY 98-99**

**Title:** Evaluation of various materials and practices

**Institution:** MSU

**Department:** Montana Agricultural Experiment Stations and Research Centers

**Amount Funded:** \$102,000

**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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**Title:** Development and Implementation of Integrated Management Strategies for the Wheat Stem Sawfly

**Institution:** MSU

**Principal Investigator:** Dr. Greg Johnson

**Department:** Entomology Department

**Amount Funded:** \$80,000

**Objectives:**

- 1) Elucidate chemical communication and behavior of the wheat stem sawfly.
  - A. Investigate the pheromone system and mating behavior of the wheat stem sawfly.
  - B. Determine how the behaviors of adult wheat stem sawflies change with micro climatic conditions (i.e., soil temperatures, air temperatures, plant surface temperatures, wind speeds, and humidities).
- 2) Evaluate and promote plant resistance to wheat stem sawfly.
  - A. Determine infestation levels of wheat stem sawfly in stems and stubble of durum wheats and semi-solid hard red spring wheats grown in Montana.
  - B. Examine the mechanism of resistance of newly identified wheat stem sawfly

resistance factors.

C. Determine the influence of blending resistant and susceptible winter wheat varieties on sawfly infestations, grain yield and quality.

- 3) Evaluate selected cultural control tactics.
    - A. Ascertain the ability of a solid stem winter wheat trap strip to protect a hollow stem spring wheat.
    - B. Determine the effect of a rotary harrow on increasing mortality of wheat stem sawfly.
    - C. Determine the effect of swathing on wheat stem sawfly mortality, grain yield and quality.
    - D. Evaluate small plot burning and its affect on sawfly larvae.
    - E. Determine if sawfly losses can be reduced by changing from narrow fields to wide fields.
    - F. Determine if a two week delay of spring wheat planting will reduce damage caused by wheat stem sawflies.
  - 4) Explore the potential role and impact of parasitic wasps on wheat stem sawfly
    - A. Enhance parasitism of wheat stem sawfly using cultural procedures.
    - B. Determine if parasitism is more successful in grasses than in wheat.
    - C. Determine if sawfly and parasitoid populations that occur in different regions are similar.
  - 5) Conduct on-farm field tours and winter meetings to discuss progress in wheat stem sawfly management tactics.
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**Title:** Winter Wheat Breeding/Genetics

**Institution:** MSU

**Principal Investigator:** Dr. Phil Bruckner

**Department:** Plant Science Department

**Amount Funded:** \$70,000

**Objectives:**

- 1) Develop improved cultivars of winter wheat adapted to Montana climatic conditions and cropping systems, which possess superior grain yield potential, winter hardiness, adequate and durable pest resistance, stress tolerance, superior agronomic characteristics, and end-use qualities.

- 2) Advance early-generation segregating bulk populations and evaluate derived lines at Research Center locations under natural and enhanced selection pressure for winter survival and pest resistance and select favorable plant types for further testing.
  - 3) Investigate environmental, genetic, and management factors which influence wheat productivity and end-use in Montana including 1998 projects: wheat doubled haploid production; optimal N fertility for McGuire winter wheat; genotypic variability for noodle and dual-purpose quality; and cultivar variability for Fargo tolerance, residue production, and coleoptile length.
  - 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.
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**Title:** Spring Wheat Breeding and Genetics

**Institution:** MSU

**Principal Investigator:** Dr. Luther Talbert

**Department:** Plant, Soil, and Environmental Sciences

**Amount Funded:** \$70,000

**Objectives:**

- 1) To develop spring wheat varieties for Montana with good yield potential, high protein, and overall agronomic acceptability. In addition, we are breeding for the following specific attributes:
    - A) resistance to the wheat stem sawfly
    - B) resistance to other insects and diseases
    - C) hard white wheat spring wheat
  - 2) To coordinate the varietal testing program for Montana.
  - 3) To develop information, germplasm and procedures to insure the long-term productivity of the Montana spring wheat breeding program.
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**Title:** Breeding Improved Barley Varieties for Montana

**Institution:** MSU

**Principal Investigator:** Dr. Tom Blake

**Department:** Plant, Soil, and Environmental Sciences

**Amount Funded:** \$60,000

**Objectives:**

- 1) Production of a data set sufficient to permit recommendation, release and PVP of 'Valier' barley, a premium two-rowed feed barley.
  - 2) Development, characterization and publication of the genetic underpinnings of feed quality variation in our germplasm base.
  - 3) Further development of a dryland six-rowed malting and feed barley germplasm base.
  - 4) Cooperative development of hullless waxy and starchy barley lines with colleagues at the human nutrition research laboratory.
  - 5) Evaluation of the utility of the *1pa1* mutation in ruminant feed trials.
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**Title:** Selective Tests for Small Grain Quality

**Institution:** MSU

**Principal Investigator:** Dr. Michael J. Giroux

**Department:** Plant, Soil, and Environmental Sciences

**Amount Funded:** \$35,000

**Objectives:**

- 1) Develop selective tests for wheat grain hardness. Identify control of water absorption, milling yield, and varietal uniformity.
- 2) Identify control of barley milling energy and genes controlling endosperm texture in barley.
- 3) Increasing seed yield of wheat and/or barley through transformation. (Incorporation of an altered SH2 gene that increases seed weight in maize by 15%.)

4) Selective tests for wheat starch quality. Development of selective tests for bread firmness and noodle quality that identify preferred starch properties, particularly amylose content.

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**Title:** Development of Superior Wheat for Montana by Genetic Transformation

**Institution:** MSU

**Principal Investigator:** Dr. Elumalai Sivamani

**Department:** Plant, Soil, and Environmental Sciences

**Amount Funded:** \$25,000

**Objectives:**

- 1) Test drought tolerance of transgenic Hi-Line expressing the barley HVA1 gene under field conditions.
  - 2) Characterize and evaluate transgenic wheat engineered with WSMV replicase and/or coat protein genes for WSMV resistance.
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**Title:** Improved Quality of Montana Hard Red and Hard White Wheats

**Institution:** MSU

**Principal Investigator:** Debra Habernicht

**Department:** Plant, Soil, and Environmental Sciences

**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.
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**Title:** A Precision N Management Program to Optimize Wheat Grain Quality and Yield

**Institution:** MSU

**Principal Investigator:** Dr. Dan Long

**Department:** Montana Agricultural Experiment Stations and Research Centers

**Amount Funded:** \$23,360

**Objectives:**

- 1) Identify N deficient sites within fields from measured grain protein and yield acquired with on-the-go sensing technologies, and b) use this information to develop a cost-effective method for making variable rate N fertilizer recommendations.
  - 2) Test effectiveness of this proposed precision N management method for maximizing grain quality and yield in dryland wheat fields.
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**Title:** Effects of Wheat Streak Mosaic Virus on Montana's Wheat Genotypes

**Institution:** MSU

**Principal Investigator:** Dr. Mark Young

**Department:** Plant Pathology

**Amount Funded:** \$18,400

**Objectives:**

- 1) Complete the Bozeman field trials of 18 spring and winter wheat varieties for WSMV titer and yield loss and to expand these trials to other MSU field stations.
  - 2) To access the new germplasm currently being developed in the MSU winter and spring wheat breeding programs for WSMV disease severity and virus levels under greenhouse and field conditions. A total of 75 lines will be analyzed.
  - 3) To assess for the first time durum wheat varieties currently being grown in Montana for disease susceptibility to WSMV and quantitate virus levels under greenhouse and field conditions. A total of eight cultivars will be examined.
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**Title:** Preparation of a Summary of Compositional Data of Montana Grains Generated by the MAES Nutrition Research Program

**Institution:** MSU

**Principal Investigator:** Dr. Rosemary Newman

**Department:** Plant, Soil, and Environmental Sciences

**Amount Funded:** \$10,400

**Objective:**

Organize and tabulate existing data generated by the MAES from 1967 to 1997 illustrating, but not limited to genetic, environmental, storage and year effects on the composition of barley and wheat grown in Montana and other areas of the Pacific Northwest.

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**Title:** Enhanced Field Selection for Wheat Stem Sawfly Resistance

**Institution:** MSU

**Principal Investigator:** Dr. Phil Bruckner

**Department:** Plant, Soil, and Environmental Sciences

**Amount Funded:** \$10,000

**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 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.

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**Title:** Using Molecular Markers to Predict Agronomic Performance in Spring Wheat

**Institution:** MSU

**Principal Investigator:** Dr. John M. (Jack) Martin

**Department:** Plant, Soil, and Environmental Sciences

**Amount Funded:** \$10,000

**Objectives:**

- 1) Identify molecular markers that differentiate among elite spring wheats that are entered into early stages of yield testing.
  - 2) Determine if these molecular markers are associated with agronomic traits.
  - 3) Determine if these marker associations can be used to help predict performance of agronomic traits.
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**Title:** Cultivar Susceptibility to Preharvest Sprouting with Associated Economic and Quality Concerns

**Institution:** MSU

**Principal Investigator:** Dr. Doug Holen

**Department:** Montana Agricultural Experiment Stations and Research Centers

**Amount Funded:** \$8,100

**Objective:**

To identify susceptibility differences among spring and winter wheat cultivars to preharvest sprouting and to document the effects of sprouting on crop marketing and end-use quality.

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**Title:** Optimization of Wheat End-Use Quality for Noodle and Dual-Purpose Markets

**Institution:** MSU

**Principal Investigator:** Dr. Phil Bruckner

**Department:** Plant, Soil, and Environmental Sciences

**Amount Funded:** \$8,000

**Objective:**

Quantify genetic, environmental, and production variables that impact noodle qualities with plot research exploring effects of different production components, individually and in combination.

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**Title:** Herbicide Resistant Winter Wheat for Downy Brome and Jointed Goatgrass Management

**Institution:** MSU

**Principal Investigator:** Dr. Phil Bruckner

**Department:** Plant, Soil, and Environmental Sciences

**Amount Funded:** \$7,940

**Objectives:**

- 1) To incorporate resistance to herbicides capable of controlling downy brome and jointed goatgrass into prominent winter wheat varieties grown in Montana.
  - 2) To evaluate efficacy of AC299263 for control of downy brome and jointed goatgrass in cropping systems and environments representative of Montana wheat production regions.
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**Title:** Market Potential of Indian Ricegrass: A Gluten-Free Perennial Grain Crop

**Institution:** MSU

**Principal Investigator:** Dr. David Sands

**Department:** Plant Pathology

**Amount Funded:** \$5,000

**Objectives:**

- 1) The long term goal of this proposal is to investigate the market potential for commercial products made from Indian Ricegrass (IRG) and, therefore, provide Montana with a new, high-value crop.
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**Title:** Continuation as an Underwriter for MONTANA AG LIVE

**Institution:** MSU

**Principal Investigator:** Dr. Jack Riesselman

**Department:** Plant Pathology

**Amount Funded:** \$2,500

**Objectives:**

- 1) Montana Wheat & Barley Committee will receive significant public exposure at modest cost. Underwriters are listed monthly in the Montana Public Television program guide, which is received by the 5,500 members of Montana Public Television. In addition, underwriters receive on-air credits during each of the 16 weekly programs.
  - 2) Montana Wheat & Barley Committee will be positioned as a service provider to your constituents when Montana Ag Live provides grain producers with timely and relevant answers to their questions in a cost-effective manner.
  - 3) Montana Wheat & Barley Committee will help interpret the day-to-day issues facing ag producers to non-ag audiences. Given the growing tensions in some sectors of Montana between producers and non-producers, a forum such as MONTANA AG LIVE!, where needs of farmers are clarified and addressed, offers a rational atmosphere for increased public awareness.
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