Funded Research Projects for FY 1999-2000

Title: Developing Improved Barley Varieties for Montana

Institution: MSU

Principal Investigator/Department: Tom Blake/Plant Sciences

Amount Funded: $60,000

Objectives:
1) Selection, release and definition of barley varieties with better cattle feed quality than corn.
2) Development and release of two-rowed malting barley varieties which will increase contract barley production in Montana.
3) Development and release of six-rowed malting barley varieties which will increase contract barley production in Montana.
4) Development of the germplasm pools needed to maintain our position in barley production.

Title: Optimization of Wheat End-Use Quality for Noodle & Dual Purpose

Institution: MSU

Principal Investigator/Department: Phil Bruckner/Plant Sciences

Amount Funded: $9,600

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

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

Institution: MSU

Principal Investigator/Department: Phil Bruckner/Plant 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 imazamox for control of downy brome and jointed goatgrass in cropping systems and environments representative of Montana wheat production regions.

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

Institution: MSU

Principal Investigator/Department: Phil Bruckner/Plant 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 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: Winter Wheat Breeding/Genetics

Institution: MSU

Principal Investigator/Department: Phil Bruckner/Plant Sciences

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) Isolate, as much as possible, our foreign wheat customers from variations in wheat performance by development and release of suitable cultivars and production research to develop strategies to maximize quality consistency for wheat produced in Montana.
3) Investigated environmental, genetic, and management factors which influence wheat productivity and end-use in Montana including 1999 projects: genotype and management effects on noodle and dual-purpose quality; effects of selection for low PPO on disease resistance and agronomic performance, 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 recommendation, and producer management decisions.

Title: Integrated Weed Management Diagnostic & Education Lab

Institution: MSU

Principal Investigator/Department: Alvin Bussan/Land Resources & Env. Sciences

Amount Funded: $20,000

Objectives:
1) Provide an Integrated Weed Management Diagnostic Center for weed identification, herbicide injury, detecting herbicide resistance, and management complaints to Montana farmers, ranchers, and home owners. 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: Selective Tests for Small Grain Quality

Institution: MSU

Principal Investigator/Department: Michael Giroux/Plant 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) Increasing seed yield of wheat and/or barley through transformation. (Incorporation of an altered SH2 gene that increases seed weight in maize by 15%.)
3) Selective tests for wheat starch quality. Development of selective tests for bread firmness and noodle quality that identify preferred starch properties, particularly amylose content.
4) Identify control of barley milling energy and genes controlling endosperm texture in barley.

Title: Improved Quality of Montana Hard Red & Hard White Wheats

Institution: MSU

Principal Investigator/Department: Debra Habernicht/Plant 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.

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

Institution: MSU

Principal Investigator/Department: Greg Johnson/Entomology

Amount Funded: $80,000

Objectives:
1) Use novel, naturally occurring chemical resources to manage wheat stem sawfly.
   a. Investigate the pheromone system and mating behavior of the wheat stem sawfly.
2) 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. Collect data on field scale parasitism at four sites in Montana.
3) Evaluate selected cultural control tactics.
   a. Evaluate the impact of short duration, high intensity stubble grazing by sheep.
   b. Determine influence of nitrogen and potash fertilization on wheat yield, quality, wheat stem sawfly infestation and lodging.
   c. Document effects of wheat production practices on sawfly damage.
   d. Evaluate sawfly and host plant interactions.
   e. Evaluate spring and fall stubble burning as a sawfly management tactic.
4) Evaluate and promote plant resistance to wheat stem sawfly.
   a. Determine infestation levels of wheat stem sawfly in stems and stubble of durum wheat and barleys grown in Montana. b. Examine the mechanism of resistance of newly identified wheat stem sawfly resistance factors.
5) Conduct on-farm field tours and winter meetings to discuss progress in wheat stem sawfly management tactics.

Title: Cereal Crop Yield & Quality Benefits from Diversified Cropping Sequences

Institution: MSU

Principal Investigator/Department: Perry Miller/Land Resource & Env. Sciences

Amount Funded: $17,700

Objectives:
1) Compare rotational benefits among cool and warm season oilseed and pulse crops, related to soil water and nitrogen conservation.
2) Compare HRS wheat, durum wheat, winter wheat and barley crop response to oilseed and pulse cropping sequences.

Title: Development of Superior Wheat for Montana by Genetic Transformation

Institution: MSU

Principal Investigator/Department: Luther Talbert/Plant Sciences

Amount Funded: $10,000

Objectives:
1) Test drought tolerance of transgenic Hi-Line wheat expressing the barley *Hva1* gene under field conditions in Bozeman and Sidney.
2) Evaluate transgenic wheat engineered with WSMV replicase and/or coat protein genes for WSMV resistance in the field in Bozeman.

Title: Spring Wheat Breeding & Genetics

Institution: MSU

Principal Investigator/Department: Luther Talbert/Plant Sciences

Amount Funded: $70,000

Objectives:
1) To develop spring wheat varieties that provide an economic advantage to Montana growers. In addition to good end-use quality and yield potential, we are developing varieties with the following specific attributes: a) resistance to the wheat stem sawfly, b) resistance to wheat streak mosaic virus, c) hard white spring wheat, and
d) resistance to other pests.
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.

Title: Potassium Fertilization for Stem Solidness and Wheat Stem Sawfly Management.

Principal Investigator: Bob Stougaard, Northwestern Agricultural Research Center.
Amount Funded: $4,800

Objective:
To determine if potassium additions will enhance the expression and degree of stem solidness and reduce sawfly cutting in winter wheat cultivars.

Summary: Potassium had only small effects on stem solidness and does not appear to have much potential as a management tool to reduce damage from wheat stem sawfly.