

Funded Research Projects for FY 96-97

Title: Evaluation of various materials and practices contributing toward economic crop production under flexible, continuous and other cropping systems in Montana.

Institution: MSU

Department: Montana Ag Research Centers

Researchers: 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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Title: Winter Wheat Breeding/Genetics

Institution: MSU

Department: Plant, Soil and Environmental Sciences Department

Researchers: Phil Bruckner
Jim Berg
Lou Kuifu

Amount Funded: \$60,000

Objectives:

- 1) Develop improved cultivars of winter wheat adapted to montana climatic conditions and cropping systems, which possess superior grain yield potential, winterhardiness, 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 1996 projects; identification and incorporation of new sources of stem solidness and WSMV resistance, population structure of wheat stem sawfly, cultivar variability for cold tolerance, straw color, residue production, and coleoptile length, and critical overwintering plant populations.
- 4) Coordinate Montana statewide winter wheat variety testing program and provide ~~ltd~~ performance data necessary for cultivar release decisions, variety recommendations, and producer management decisions.

Title: Developing Improved Barley Varieties for Montana

Institution: MSU

Department: Plant, Soil and Environmental Sciences

Researchers: Dr. Tom Blake
Pat Hensleigh

Amount Funded: \$60,000

Objective:

Continue development of improved lines of barley to fit defined market needs.

MW & BC Funded Projects
MSU and Other (by title and summary)
FY 1996-1997
Page 3

Title: Spring Wheat Breeding and Genetics

Institution: MSU

Department: Plant, Soil and Environmental Sciences Department

Researchers: Luther Talbert

Amount Funded: \$60,000

Objectives:

- 1) To develop spring wheat varieties for Montana with the following attributes:
 - a) Sawfly resistant varieties with superior agronomic and end-use properties.
 - b) Hard White wheat varieties.
 - c) Russian wheat aphid resistant varieties.
 - d) Varieties with combinations of the above attributes.
 - 2) To manage the varietal testing program for spring wheat in Montana.
 - 3) To provide information and materials to insure the long-term productivity of the spring wheat breeding program.
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Title: Ecology and Management of the Wheat Stem Sawfly

Institution: MSU

Department: Entomology

Researchers: Dr. Wendell Morrill
Dr. Greg Johnson

Amount Funded: \$52,000

Objectives:

- 1) Assess the effectiveness of fall versus spring tillage for increasing overwinter mortality of WSS.
- 2) Compare susceptibility of hollow versus solid stemmed winter wheats relative to levels of infestation, impact on grain quantity and quality.
- 3) Evaluate effectiveness of cultural and chemical control tactics.
- 4) Monitor fall larval infestations to predict spring adult emergence and economic levels of infestation.
- 5) Develop a predictive emergence model for WSS based on intensive sampling of adult WSS.
- 6) Explore the potential role and impact of biocontrol agents as a component of an integrated WSS management program.
- 7) Schedule on-farm field tours of WSS integrated pest management demonstrations.

Title: Purchase of a Plot Combine for Harvesting Small Grain Research Plot Samples

Institution: MSU

Department: Montana Agricultural Experiment Station, Sidney

Researchers: Jerald Bergman, Superintendent
Joyce Eckhoff, Agronomist

Amount Funded: \$35,000

Objective:

To purchase a plot combine for harvesting and cleaning small grain research plot samples.

MW & BC Funded Projects
MSU and Other (by title and summary)
FY 1996-1997
Page 5

Title: Evaluating Control Methods for Wheat Streak Mosaic Virus Management

Institution: MSU

Department: Plant Pathology Department

Researchers: Jack Risselman
Luther Talbert
Phil Bruckner

Amount Funded: \$28,640

Objectives:

- 1) Continue to maintain a WSM nursery at Conrad and Havre for use in evaluating varietal tolerance to the disease or its mite vector.
- 2) Utilize molecular markers for WSM1, resistance gene for wheat streak mosaic virus, to continue developing resistant spring and winter wheat germplasm adapted to Montana environments.
- 3) Document effectiveness and value of WSMV resistant germplasm for control of WSMV in field (nursery) and greenhouse evaluations.
- 4) Determine if a correlation exists between susceptibility and viral numbers within plant tissue.
- 5) Continue evaluation of post harvest tillage practices for promoting early and uniform volunteer development.

Title: Development of Superior Wheat for Montana By Genetic Transformation

Institution: MSU

Department: Plant, Soil and Environmental Sciences

Researchers: Dr. Rongda Qu

MW & BC Funded Projects
MSU and Other (by title and summary)
FY 1996-1997
Page 6

Amount Funded: \$26,000

Objectives:

- 1) To obtain wheat strains resistant to wheat streak mosaic virus (WSMV) by transformation of wheat with the viral coat protein and replicase genes.
 - 2) To transform wheat with available genes for improvement of drought resistance.
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Title: Montana Hard Red and hard White Wheats for the Asian Noodle Market

Institution: MSU

Department: Plant, Soil and Environmental Sciences Department

Researchers: Luther Talbert

Amount Funded: \$25,000

Objectives:

- 1) To determine the relationship between bread-making capability and noodle characteristics for Montana Hard White wheats.
 - 2) To determine the noodle characteristics of selected Hard Red Winter wheats.
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Title: Survey To Show Freedom of Montana Wheat From Karnal Bunt

Institution: MSU

Department: Pathology Department

Researchers: Don Mathre

Amount Funded: \$24,000

Objective:

To conduct a survey of Montana produced durum and bread wheats to verify their freedom from karnal bunt.

Title: Selected Insect Pests of Small Grains

Institution: MSU

Department: Entomology Department

Researchers: Dr. Greg Johnson
Dr. Sue Blodgett

Amount Funded: \$23,000

Objectives:

- 1) Wheat Curl Mite and Wheat Streak Mosaic Virus
 - a) Evaluate the relative importance of grass species as reservoirs for wheat curl mite and wheat streak mosaic virus.
 - b) Evaluate glyphosate and wind speed on wheat curl mite management.
 - c) Evaluate selected acaricides for wheat curl mite management.
- 2) Biology and Management of Grasshopper Species Attacking Small Grains
 - a) Investigate the influence of flexible cropping systems on abundance and species of grasshoppers.
 - b) Determine the relative susceptibility and efficacy of field applications of imidacloprid against selected grasshopper species.
- 3) Validate Treatment Decision Guidelines and Economic Injury of Barley Thrips to Barley

- a) Determine timing and value of foliar applied insecticides for barley thrips management.

Title: Development of Rapid Feed Quality Analysis Technology for Barley

Institution: MSU

Department: Animal Range Sciences Department

Researchers: Janice Bowman

Amount Funded: \$20,000

Objectives:

- 1) To continue the development of near infrared reflectance spectroscopy (NIRS) technology to rapidly select for feed quality in barley.
- 2) To measure the range of feed quality variation available in barley germplasm.

Title: Greenhouse and Field Trials to Evaluate MIF (Mating Inhibiting Factor) as a Seed Treatment to Control Cereal Smuts and Bunts

Institution: MSU

Department: Plant Pathology

Researchers: John Sherwood, Asso. Professor
Shirley Gerhardt, Research Asst.

Amount Funded: \$18,600

Objectives:

The objectives of this proposal are to examine the use of a naturally-occurring compound from *Ustilago hordei*, MIF (for Mating Inhibiting Factor; referred to as “ustilagin” in previous proposals to MW & BC), to control smut and bunt diseases of wheat and barley. The specific aims are to:

- 1) Perform greenhouse trials using MIF as a seed treatment for control of barley covered smut and wheat common bunt.
- 2) Perform field trials using MIF as a seed treatment for control of barley covered smut and dwarf bunt on winter wheat.

Title: Relationship Between Common Root Rot Control and Susceptibility to Wheat Stem Sawfly

Institution: MSU

Department: Plant Pathology Department

Researchers: Don Mathre and Bill Grey (Dept. Of Plant Pathology)
Greg Kushnak, Western Triangle Research Center
Dave Wichman, Central Research Center
Joyce Eckhoff, Eastern Research Center

Amount Funded: \$17,500

Objective:

To determine the effect of using spring wheat isolines developed for resistance and susceptibility to common root rot as related to seed treatment and susceptibility to wheat stem sawfly.

MW & BC Funded Projects
MSU and Other (by title and summary)
FY 1996-1997
Page 10

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

Institution: MSU

Department: Plant, Soil and Environmental Sciences Department

Researchers: Richard Engel
Dan Long
Greg Carlson

Amount Funded: \$14,300

Objectives:

- 1) Map N removal from a dryland spring wheat field with global positioning systems (GPS) and on-the-go yield and protein sensing.
- 2) Determine whether N removal and grain protein at harvest can be used to forecast future N fertility needs and whether such predictions are as accurate as soil testing.
- 3) Contrast wheat quality, yield, and economic return for a variable-rate fertilizer N program based on N removal with a conventional uniform rate fertilizer N program.
- 4) Improve Montana growers wheat grain quality and yield by developing a precision N management program that uses variable rate fertilizer N applications based on estimates of N removal by the crop.

Title: Screening Diverse *Triticum tauschii* To Improve Winter Hardiness and Wheat Stem Sawfly Resistance In Wheat

Institution: MSU
USDA, ARS/Kansas

Department: Entomology Department

MW & BC Funded Projects
MSU and Other (by title and summary)
FY 1996-1997
Page 11

Researchers: Andrew W. Lenssen

Amount Funded: \$10,000

Objectives:

- 1) Determine winter hardiness of 200 populations of the wheat relative, *Triticum tauschii*.
 - 2) Determine if resistance to wheat stem sawfly is present in 250 populations of *T. Taushii*.
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Title: Enhanced Field Selection for Wheat Stem Sawfly Resistance In Wheat

Institution: MSU

Department: Plant, Soil and Environmental Sciences Department

Researchers: Phil Bruckner

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 from the U.S. National Small Grains Collection (NSGC) and other sources for enhanced stem solidness and WSS resistance.
- 4) Provide a field site, representative of sawfly-infested production regions, for demonstration to producers of effective sawfly management strategies including use of resistant cultivars.

Title: Fall Seed Dormancy of Cereal Varieties and Field Techniques to Minimize
Volunteer Cereals

Institution: MSU

Department: Central Ag Research Center

Researchers: David Wichman
Jerry Harris

Amount Funded: \$8,000

Objectives:

- 1) To determine the relative fall seed dormancy of varieties of winter wheat and spring wheat.
- 2) To determine if fall and early spring field germination of shattered cereal seed is enhanced by post harvest harrowing.

Title: Development and Evaluation of Spring Barley, Spring Wheat and Winter Wheat
Cultivars Adapted to Montana

Institution: Western Plant Breeders

Researchers: Dr. Dan Biggerstaff, Manager

Amount Funded: \$7,400

Objectives:

- 1) Continue development of very high yielding, semi-dwarf feed barleys adapted to irrigated and higher rainfall areas of Montana.
- 2) Evaluate and release a performance-competitive, naked, waxy, two-rowed barley adapted to Montana growing conditions.

- 3) Evaluate the yield performance of barleys that are suitable for export malt.
 - 4) Continue development of yield competitive, high quality spring wheat cultivars for Montana growers.
 - 5) Evaluate and release a higher-quality, sawfly resistant spring wheat.
 - 6) Evaluate and release a sawfly resistant winter wheat.
 - 7) Evaluate and release a soft white winter wheat for the high rainfall and irrigated growers in Montana.
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Title: GPS-Based Mapping and Guidance Equipment for Precision Farming Research

Institution: MSU, NARC-Havre

Department: Entomology Department

Researchers: Dan Long
Gregg Carlson
Jerry Nielsen

Amount Funded: \$6,550

Objectives:

- 1) Develop and test a method for mapping soil profile moisture in production fields based on Time Domain Reflectometry and Global Positioning System technology.
 - 2) Incorporate and test GPS-based guidance systems into existing work involving precise application of fertilizer, herbicide, and seed in both experimental and commercial fields.
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MW & BC Funded Projects
MSU and Other (by title and summary)
FY 1996-1997
Page 14

Title: Evaluating Copper Deficiency As the Cause of Abnormal Growth Characteristics in Northern Montana Spring Wheat and Barley

Institution: MSU

Department: Plant Pathology Department

Researchers: Dr. Jack Riesselman, Extension Plant Pathologist
Dr. Jeff Jacobsen, Extension Soil Scientist

Amount Funded: \$6,250

Objectives:

- 1) Determine if abnormal symptomology commonly observed in fields and locations is associated with copper deficiency.
 - 2) Determine if copper applications increase yields, test weight and protein.
 - 3) Determine if copper fertilizer applications reduce diseases.
 - 4) Verify copper response claims currently being made by some Montana crop consultants.
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Title: Compendium of Barley Diseases Revision

Institution: MSU

Department: Plant Pathology Department

Researchers: Don Mathre

Amount Funded: \$3,000

Objective:

MW & BC Funded Projects
MSU and Other (by title and summary)
FY 1996-1997
Page 15

Prepare a revised version of the Compendium of Barley Diseases to be published by the American Phytopathological Society.