

Funded Research Projects for FY 93-94

TITLE: Development of Improved Barley Cultivars for Montana

INSTITUTION: Montana State University

DEPARTMENT: Plant & Soil Sciences

RESEARCHERS: Tom Blake, Pat Hensleigh

AMOUNT FUNDED: \$60,000

OBJECTIVES:

- 1) Selection and Release of a stiff-strawed, 2-rowed feed barley with excellent yield potential.
- 2) Selection and Release of a drought tolerant 2-rowed variety with potential for malting.
- 3) Release of an AMBA approved 2-rowed malting barley to replace Harrington in Montana.
- 4) Development of achievable, rational objectives which will enable the production of improved value barley cultivars adapted to Montana.

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TITLE: Selection of Superior Barley Genotypes for Finishing Beef Cattle in Montana

INSTITUTION: Montana State University

DEPARTMENT: Animal and Range Sciences

RESEARCHERS: Janice Bowman, Roger Brownson

COOPERATORS: Tom Blake, David Bullock, C.Walt Newman, Ken Bryan, Darrin Boss

AMOUNT FUNDED: \$20,000

OBJECTIVES:

- 1) To evaluate feedlot performance and carcass characteristics of cattle consuming high grain diets with barley or corn as the basal ingredients.

2) To make economic comparisons between corn and barley finishing programs for beef cattle in Montana.

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TITLE: Enhanced Field Selection For Economically Important Characteristics In Winter Wheat

INSTITUTION: Montana State University

DEPARTMENT: Plant & Soil Science

RESEARCHERS: Phil Bruckner, Rhoda Burrows, Gregg Carlson, David Wichman, Greg Kushnak

COOPERATORS: Greg Johnson, Wendell Morrill, Charles McGuire, Ron Lockerman, Harold Bockelman

AMOUNT FUNDED: \$10,000

OBJECTIVES:

1) Advance early-generation segregating winter wheat bulk populations at Research Center sites under heavy enhanced and natural selection pressure for winter survival, wheat stem sawfly resistance, and/or Russian wheat aphid (RWA) resistance, with selection of surviving and/or resistant segregating progenies.

2) Evaluate derived lines at Research Center sites under heavy natural selection pressure and select those with adequate cold tolerance, sawfly resistance, and/or RWA resistance.

3) Systematically evaluate selected germplasm from the U.S. National Small Grains Collection (NSGC) and other germplasm collections to identify new sources of enhanced winterhardiness, stem solidness, and/or other forms of sawfly resistance (antibiosis).

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TITLE: Matching Funds for Winter Wheat Low Temperature Growth Room

INSTITUTION: Montana State University

DEPARTMENT: Plant & Soil Sciences

RESEARCHERS: Phil Bruckner, Rhoda Burrows, Ron Lockerman

COOPERATORS: David Baumbauer

AMOUNT FUNDED: \$12,500

OBJECTIVES:

1) Enhance ability to evaluate and select winter wheat germplasm with superior cold tolerance and increase MSU's capability for low temperature-stress research through acquisition of a low temperature-growth room.

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TITLE: Winter Wheat Breeding/Genetics

INSTITUTION: Montana State University

DEPARTMENT: Plant & Soil Sciences

RESEARCHERS: Phil Bruckner, Rhoda Burrows

COOPERATORS: Greg Johnson, Gregg Carlson, David Wichman, Greg Kushnak, Wendell Morrill, Charles McGuire, Gil Stallknecht, Don Mathre, Ron Lockerman, Bob Stougaard, Mareike Rienhold-Johnston, Blair Goates, Joyce Eckhoff, Jack Martin, Howard Bowman

AMOUNT FUNDED: \$50,000

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) Investigate and define environmental and genetic factors, associations, and interactions which influence wheat productivity and end-use quality in Montana.

3) Develop efficient screening, selection, and breeding procedures to maximize efficiency and genetic progress in winter annual breeding programs.

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: Continue the Evaluation of F3 Progeny From Crosses Between Two Barley Genotypes Resistant To Barley Yellow Streak Mosaic and Selected Commercial Barley Cultivars

INSTITUTION: Montana State University

DEPARTMENT: Plant & Soil Sciences

RESEARCHERS: T. W. Carroll, S K. Z Brumfield, J. Skaff, E. Smidansky

COOPERATORS: T. K. Blake, D. M. Wesenberg, R. L. Forster

AMOUNT FUNDED: \$10,000

OBJECTIVES:

1) Continue to evaluate the F3 progeny derived from crosses made between the two resistant (tolerant) genotypes (CIho 734, Haua; CIho 1032, Skinless) of barley and selected commercial barley cultivars and an experimental barley line.

2) If the resistance is determined by genetic analysis to be simple inherited (one to two genes), then use the resistance to develop resistant barley cultivars suitable for commercial production in Montana.

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TITLE: Use of Methanol to Improve Dryland Spring Wheat Yield

INSTITUTION: Montana State University

DEPARTMENT: Eastern Agricultural Research Center

RESEARCHERS: Joyce L. A. Eckhoff, Charles Flynn

AMOUNT FUNDED: \$6,500

OBJECTIVES:

- 1) To determine optimum rates of methanol for spring wheat production.
- 2) To determine optimum timing of application of methanol for spring wheat production.
- 3) To determine varietal response of spring wheat to application of methanol.

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TITLE: Effect of Chloride Fertilization on Spring and Winter Wheat Varieties

INSTITUTION: Montana State University

DEPARTMENT: Southern Agricultural Research Center

RESEARCHERS: Richard Engel, Joyce Eckhoff

AMOUNT FUNDED: \$17,200

OBJECTIVES:

- 1) To determine the effect of CI fertilization on grain yield, kernel weight, rate of kernel growth, and grain-fill duration in several spring and winter wheat varieties under a wide range of environments.
- 2) To provide a CI fertilizer recommendation program to Montana producers by developing a data-base on yield response frequency to CI as affected by soil and plant CI levels.
- 3) To determine the effect of CI on leaf diseases and disease-like symptoms in wheat.

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TITLE: Russian Wheat Aphid: Determination of Economic Injury Levels to Spring Grains and Development of Small Grain Resistant Varieties

INSTITUTION: Montana State University

DEPARTMENT: Entomology

RESEARCHERS: Greg Johnson

AMOUNT FUNDED: \$30,000

OBJECTIVES:

- 1) Cereal Breeding Programs
 - A. Develop resistant spring and winter wheat varieties that are adapted to Montana (Talbert and Bruckner).
 - B. Develop resistant spring barley varieties adapted to Montana and identify markers linked to the genes controlling RWA tolerance (Blake).

- 2) Entomological Investigations
 - A. Ascertain injury and economic impact of RWA on spring grains through simulated immigration and conventional insecticide management (Johnson).
 - B. Participate in field screening for RWA resistance in small grains (Blake, Bruckner, Johnson, and Talbert).
 - C. Provide timely information to producers on the status of this pest in Montana (Johnson).

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TITLE: Control of Cereal Rusts in Montana

INSTITUTION: Montana State University

DEPARTMENT: Plant Pathology

RESEARCHERS: Mareike R. Johnston, Luther Talbert,
Phil Bruckner

AMOUNT FUNDED: \$20,750

OBJECTIVES:

- 1) Stem rust: Maintain and improve levels of stem rust resistance in Montana spring and winter wheat cultivars and breeding lines. Provide barley breeding program with sources of resistance to stem rust. Monitor naturally occurring races of stem rust in Montana.

- 2) Stripe rust: Monitor naturally occurring races of stripe rust in Montana. Maintain levels of stripe rust resistance in all wheat cultivars recommended for the western part of the state. Continue resistance screening for stripe rust of barley in locations where the pathogen occurs naturally. Incorporate

resistance into Montana adapted materials.

3) Collect and preserve large amounts of inoculum for establishment of screening nurseries and greenhouse work for both pathogens.

4) Prepare press release on current developments in pathogen research, with special emphasis on fungal spread, survival and effective resistance in commercial cultivars.

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TITLE: Relation of Mixogram Measurements to Breadbaking Characteristics in Wheat

INSTITUTION: Montana State University

DEPARTMENT: Plant & Soil Sciences

RESEARCHERS: John M. Martin, Charles McGuire, Luther Talbert, Phil Bruckner

AMOUNT FUNDED: \$5,000

OBJECTIVES:

1) Relate numerical values from the mixograph test to bread-baking quality values for hard red winter and spring wheats.

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TITLE: Impact of Plant Disease on the Ability of Producers to Comply With the Residue Compliance Program

INSTITUTION: Montana State University

DEPARTMENT: Plant Pathology

RESEARCHERS: Don Mathre, Bill Grey, Greg Kushnak, Jack Martin, Bob Johnston, Luther Talbert, Phil Bruckner, Tom Blake

AMOUNT FUNDED: \$15,000

OBJECTIVES:

1) Determine the effect of residue conservation on the

development and impact of plant disease on barley production.

2) Determine the susceptibility of currently grown winter wheat, spring wheat, and barley cultivars to residue-borne pathogens.

3) Evaluate the lines of winter wheat, spring wheat, and barley currently under development for their disease reaction to residue-borne pathogens.

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TITLE: Consolidation of the Plant and Soil Science Cereal Quality (CQL) and Nutrition Research (NRL) Laboratories

INSTITUTION: Montana State University

DEPARTMENT: Plant & Soil Sciences

RESEARCHERS: Charles F. McGuire, Rosemary K. Newman, C. Walt Newman, Thomas McCoy

AMOUNT FUNDED: \$70,000

OBJECTIVES:

1) To prepare for and initiate the consolidation of the plant and Soil Science CQL and NRL into a comprehensive cereal quality research unit.

2) To identify and purchase equipment and instruments required for state-of-the-art technology in end-product enhancement, added product value, and product evaluation of Montana cereal crops.

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TITLE: Wheat Stem Sawfly Management

INSTITUTION: Montana State University

DEPARTMENT: Entomology

RESEARCHERS: Wendell Morrill, Gregory Kushnak, Phil Bruckner

AMOUNT FUNDED: \$50,000

OBJECTIVES:

- 1) Assist the winter wheat breeding program by evaluating new lines for sawfly resistance.
- 2) Plant trap strips to reduce damage in crops and reduce sawfly populations on the following year.
- 3) Evaluate properly timed applications of carbofuran for sawfly control.
- 4) Monitor the impact of parasites on sawfly populations.
- 5) Identify the oat toxin which kills sawflies.

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TITLE: Value Enhancement of Wheat and Barley as Food and Feed Grains With the Objective of Meeting Market Demands

INSTITUTION: Montana State University

DEPARTMENT: Home Economics/Animal & Range Science/Plant & Soil Science

RESEARCHERS: R. K. Newman, C. W. Newman, C. F. McGuire, D. R. Clark, R. T. Ramage, B. J. Donnelly, M. A. Belury

AMOUNT FUNDED: \$65,000

OBJECTIVES:

- 1) To continue analyzing barley cultivars which are adapted to the various Montana environments in order to determine the most desirable end usage by the food and feed industries.
- 2) To determine the milling, pearling, flaking and grinding characteristics and composition thereof of the whole grain, products and by-products of selected wheat and barley cultivars.
- 3) To investigate the use of vital wheat gluten as an adjunct in baking bread and preparing other products with barley flour from different cultivars, barley concentrates, and oat concentrates.

4) To investigate health-promoting and/or disease prevention properties of selected Montana grains or grain by-products.

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TITLE: An Analysis of Economic Implications of Expiring Conservation Reserve Program (CRP) Contracts On Montana Wheat and Barley Producers

INSTITUTION: Montana State University

DEPARTMENT: Department of Sociology

RESEARCHERS: John Saltiel, James B. Johnson, Steve Stauber

AMOUNT FUNDED: \$17,000

OBJECTIVES:

1) Analyze the socioeconomic and resource endowment characteristics of CRP contract holders likely to have an impact on the post-contract land use decisions.

2) Identify the acceptability of post-contract uses/compensation for lands currently in CRP beyond those post-contract uses/compensation provided for under existing statute provisions.

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TITLE: Control of Fungal Pathogens Using Natural Compounds from *Ustilago Hordei*

INSTITUTION: Montana State University

DEPARTMENT: Plant Pathology

RESEARCHERS: John Sherwood, Don Mathre

AMOUNT FUNDED: \$15,345

OBJECTIVES:

1) The objectives of this proposal are to examine the use of a naturally-occurring compound from *Ustilago hordei*, ustilagin, to control fungal diseases of wheat and barley. The specific aims are to:

- a. determine the range of pathogens (and plants) affected by ustilagin and the concentrations required to affect these organisms.
- b. determine the effect of adding ustilagin as a seed treatment for control of fungal diseases of wheat and barley.

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TITLE: Spring Wheat Breeding and Genetics

INSTITUTION: Montana State University

DEPARTMENT: Plant & Soil Sciences

RESEARCHERS: Luther Talbert, Susan Lanning, Charles McGuire,
Jack Martin

AMOUNT FUNDED: \$60,000

OBJECTIVES:

- 1) To develop spring wheat varieties for Montana. We are developing varieties with the following attributes:
 - a) Sawfly resistant varieties with superior agronomic and end-use properties.
 - b) Varieties for eastern Montana.
 - c) Hard white wheat varieties for Montana.
 - d) Varieties with combinations of the above attributes.
- 2) To manage the varietal testing program for spring wheat in Montana.
- 3) To improve end-use quality of Montana spring wheat.
- 4) To improve basic knowledge and efficiency of spring wheat breeding and genetics.

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TITLE: The Impact of Group Risk Plan Crop Insurance on
Montana Producers

INSTITUTION: Montana State University

DEPARTMENT: Agricultural Economics & Economics

RESEARCHERS: Myles J. Watts

AMOUNT FUNDED: \$18,000

OBJECTIVES:

1) Identify the impact of an area yield multiple peril crop insurance program on the level and variability of incomes for Montana small grain producers.

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TITLE: Evaluation of Various Materials and Practices
Contributing Toward Economic Crop Production Under
Flexible, Continuous and Other Cropping Systems in
Montana

INSTITUTION: Montana State University

DEPARTMENT: Research Centers

RESEARCHERS: Various

AMOUNT FUNDED: \$42,000

OBJECTIVES:

1) To evaluate the effects of differing systems on crop variety performance under the diverse environments represented across the Montana Research Center network.

2) To evaluate the potential fit of other materials, concepts and techniques with various cropping systems employed.