"1990-91 Funded MSU Research Projects -- A Synopsis"

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TITLE: Economic comparison of spring wheat and safflower produced using conventional weed control and chemical-free weed control.

INSTITUTION: Montana State University

DEPARTMENT: Eastern Agricultural Research Center/Sidney MT

RESEARCHERS: Gerald W. Bergman (Leader)
Joyce L. Eckhoff (Leader)

FUNDED AMOUNT: $ 4,000

OBJECTIVES:

1) To evaluate the economics of chemical-free spring wheat and safflower production.

2) To compare yield and quality of spring wheat and safflower grown using conventional herbicides with yield and quality of spring wheat and safflower grown under chemical-free conditions.

3) To initiate research at EARC on sustainable agriculture and chemical-free crop production.

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TITLE: Development of a Saturated Barley Linkage Map and Identification of Genes Controlling Quality, Adaptation, Disease and Pest Resistance

INSTITUTION: Montana State University

DEPARTMENT: Plant & Soil Science

RESEARCHERS: Tom Blake (Leader)
Raeann Magyar

FUNDED AMOUNT: $ 25,000

OBJECTIVES:

1) Identify and map enough dna and genomic clones to saturate

the cultivated barley linkage map with genetic markers.

2) Identify the location of genes modifying important agronomic characters including maintenance of high kernel weight under drought, cold tolerance in winter barley, feed quality, enzymatic potential and extract in malting barley, smut resistance and Russian Wheat Aphid tolerance.

3) Survey our 2-rowed and 6-rowed germplasm bases thoroughly enough to permit the development of strategies for marker assisted gene introgression from alien into adapted lines.

4) Develop polymerase chain reaction (PCR) sequence amplification to a level at which it will permit the development of rapid, foolproof, inexpensive techniques to unambiguously characterize the varietal identity of barley samples.

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TITLE: Development of Barley Cultivars Adapted to Montana

INSTITUTION: Montana State University

DEPARTMENT: Plant & Soil Science

RESEARCHER: Tom Blake (Leader)
Patrick Hensleigh

FUNDED AMOUNT: $ 50,000

OBJECTIVES:

1) Develop and release drought tolerant 2-rowed barley varieties with reliable performance, high test weight and when possible, malting potential.

2) Develop and release stiff strawed, scald and net blotch resistant 2-rowed barley varieties with improved yield potential for production in high rainfall and irrigated environments.

3) Improve 6-rowed germplasm to a point at which we may begin developing high test weight, shattering resistant 6-rowed lines with acceptable malting potential and excellent feedlot performance.

4) Introgress resistance to loose smut and the Russian Wheat Aphid into our 2-rowed and 6-rowed germplasm bases.

5) Continue development of barley lines for evaluation and potential use in the human food industry.

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TITLE: Evaluate Different Barley Genotypes for their Possible Resistance to the New Disease (Barley Yellow Streak Mosaic) of Barley

INSTITUTION: Montana State University

DEPARTMENT: Plant & Soil Science/Plant Pathology

RESEARCHER: Tom Carroll (Leader)
Tom Blake

FUNDED AMOUNT: $ 10,000

OBJECTIVE: Evaluate different genotypes of barley for their possible resistance to barley yellow streak mosaic (BYSM). Identify any that show promise as a source of resistance for future development of resistant malting and/or feed barleys to be grown in Montana.

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TITLE: Economic Response of Dryland Spring Wheat to an Application of Nitrogen During the Tillering Stage.

INSTITUTION: Montana State University

DEPARTMENT: Eastern Agricultural Research Center/Sidney, MT

RESEARCHER: Joyce Eckhoff

FUNDED AMOUNT: $ 3,150

OBJECTIVES:
1) To determine the crop response and economics of an application of N during the tillering stage on dryland spring

wheat following summer fallow.

2) To determine optimum nitrogen management practices for spring wheat under dryland crop/fallow production.

3) To observe differences in response among varieties to N applied at different rates during tillering in a crop/fallow system.

==========

TITLE: Selection and breeding for more drought tolerant barley and spring wheat cultivars and more winterhardy winter wheat cultivars.

INSTITUTION: Montana State University

DEPARTMENT: Plant & Soil Science

RESEARCHERS: Hayden Ferguson (Leader)
Gene Hockett
Allen Taylor
Luther Talbert
Jack Martin

FUNDED AMOUNT: $ 13,860

OBJECTIVES:

1) To adapt a "new" method of selection for drought resistant barley and spring wheat cultivars for use by plant breeders.

2) To use the technique in a genetics-breeding study aimed at developing more drought resistant cultivars.

3) To adapt a "new" method of selection for winterhardiness of winter wheat cultivars for use by plant breeders.

4) To use the technique in a genetics-breeding study aimed at developing more winterhardy wheats and a better understanding of the hardening process.

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TITLE: Optimal Nitrogen Fertilization of Cereal Grains in Central Montana

INSTITUTION: Montana State University

DEPARTMENT: Central Montana Research Center/Agricultural Economics

RESEARCHERS: Grant Jackson (Leader)
James B. Johnson
Steve Stauber

FUNDED AMOUNT: $ 10,000

OBJECTIVES:
1) To estimate yield and protein response to nitrogen for cereal grains in central Montana.

2) To estimate the most profitable level of nitrogen, crop-by-crop, under alternative crop and nitrogen prices.

3) To estimate the effect of reduced nitrogen applications on crop returns.

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TITLE: Maps Mailbox -- A Land and Climate Information System

INSTITUTION: Montana State University

DEPARTMENT: Plant & Soil Sciences

RESEARCHERS: Jeff Jacobsen (Leader)
Gerald Nielsen (Leader)

COOPERATORS: Joe Caprio, Bob Pearson, Alma Plantenberg, Bob Snyder, Rick Rocho

FUNDED AMOUNT: $ 5,600

OBJECTIVES:
1) To refine MAPS Mailbox program capabilities for delivery of land and climatic characteristics.

2) To produce a MAPS Mailbox User's Manual and computer software for distribution to all Montana County Extension offices, Research Centers, consultants and interested individuals (see draft flier).

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TITLE: Development and Evaluation of Agronomic Practices for Management of Russian Wheat Aphid in Montana.

INSTITUTION: Montana State University

DEPARTMENT: Plant & Soil Sciences

RESEARCHERS: Greg Johnson
Tom Blake
Jeff Littlefield
Robert Nowierski
David Sands
Al Scharen
Allan Taylor
Eugene Hockett
Luther Talbert

FUNDED AMOUNT: $ 80,000

OBJECTIVES:
1) Cereal Breeding Programs

A. To characterize and transfer genes controlling resistance to the Russian wheat aphid in barley (Blake).

B. To understand the genetics of Russian wheat aphid resistance in wheat and to develop resistant varieties (Talbert and Taylor).

C. To understand the effects of fall RWA infestation on the winterhardiness of winter wheat (Taylor and Storlie).

==========

TITLE: Characterizing variety performance to varying environmental conditions in Montana.

INSTITUTION: Montana State University

DEPARTMENT: Plant & Soil Science

RESEARCHERS: John M Martin

COOPERATORS: Tom Blake
Gene Hockett
Dick Lund
Luther Talbert
Charles McGuire

FUNDED AMOUNT: $ 8,000

OBJECTIVES:
1) Determine the optimum sites for testing wheat and barley varieties for yield and quality, and determine the amount of testing necessary to describe a variety's performance to varying environmental conditions.

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TITLE: Seminar Series for Visiting Agricultural Scientists

INSTITUTION: Montana State University

DEPARTMENT: Plant & Soil Science

RESEARCHERS: Tom McCoy

FUNDED AMOUNT: $ 2,000

OBJECTIVES:
1) To enhance interaction among faculty at Montana State University and agricultural scientists and other institutions.

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TITLE: Cereal Quality Laboratory Equipment Acquisition

INSTITUTION: Montana State University

DEPARTMENT: Plant & Soil Science

RESEARCHERS: Charles McGuire (Leader)
Luther Talbert
Allen Taylor

FUNDED AMOUNT: $ 4,470

OBJECTIVES: Automatic data collection from farinograph in the Cereal Quality Laboratory.

The Cereal Quality Laboratory performs evaluations of bread wheat quality and barley quality. Support of breeding programs in HRS, HRS wheats, malting, and feed barley has resulted in release of cultivars that have enhanced Montana agriculture significantly. Additional cooperative efforts with soils, cropping systems, and special genetic studies have produced significant data useful to the agricultural community.

Improvements have been made in the Cereal Quality Laboratory in faster analytical techniques and in automated data collection. Automation of data collection from the newly purchased Brabender Farino/Resistograph S/N 189520 remains to be done. Since our Cereal Quality Laboratory Equipment Acquisition, continued purchase in 1989, Brabender Inst., Inc. has announced the release of computer software to enable us to electronically collect, analyze, and record physical dough properties during Farino operation. Measured values can be either printed or stored on a floppy disc for incorporation into written reports. The Farinograph has to be equipped with a data output (0-4 v corresponding to 0-1000 F.U.) by mounting a potentiometer. Included in this is conversion and recalibration of the Farino/Resistograph scale head to provide output suitable for computer data acquisition.

Savings in time are anticipated to be one-fourth of the operator's time. Even more important will be the elimination of possibilities of transcribing errors when data are first recorded on farinograph charts and subsequent manual data entry steps.

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TITLE: Wheat Stem Sawfly Resistance in Wheat

INSTITUTION: Montana State University

DEPARTMENT: Entomology

RESEARCHER: Wendell Morrill
Allan Taylor
Luther Talbert

FUNDED AMOUNT: $ 35,120

OBJECTIVES:

1) Evaluate hollow stemmed winter wheat recently identified by Taylor as having resistance to the wheat stem sawfly.

2) Determine current effectiveness of the stem solidness characteristic in spring and winter wheat as source of resistance against wheat stem sawfly.

3) Determine modes of resistance to wheat stem sawfly in several other cereals and grasses; this will suggest looking for that characteristic(s) in wheat.

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TITLE: Impact of New Insect Pests on Wheat and Barley Yields

INSTITUTION: Montana State University

DEPARTMENT: Entomology

RESEARCHER: Wendell Morrill

FUNDED AMOUNT: $ 8,500

OBJECTIVES:

Measure losses caused by various levels of infestations insects to obtain data needed for pest management programs.

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TITLE: Biological Control of the Wheat Stem Sawfly

INSTITUTION: Montana State University

DEPARTMENT: Entomology

RESEARCHERS: Wendell Morrill
Greg Kushnak

FUNDED AMOUNT: $ 8,500

OBJECTIVES: Determine current status of native and introduced sites of the wheat stem sawfly.

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TITLE: Initial Investigations on **Puccinia striiformis hordei**, a Potential Threat to Barley Production in Montana.

INSTITUTION: Montana State University

DEPARTMENT: Plant Pathology

RESEARCHERS: Mareike Reinhold-Johnston
Rebecca McGee (Cooperator)

FUNDED AMOUNT: $ 4,000

OBJECTIVES:

1) Evaluate Barley cultivars and breeding lines currently grown in Montana for resistance to stripe rust in Central American nurseries.

2) Screen material describes as resistant to stripe rust from Europe at Central American location for resistance to the central and South American Pathotypes of the fungus.

3) Determine adaptability of some already obtained foreign material with documented resistance to stripe rust to Montana growing conditions.

4) Evaluate naturally occurring grasses in Montana as possible over wintering hosts for the fungus.

==========

TITLE: Bare Patch of Cereals -- A New Threat To Cereal Production

INSTITUTION: Montana State University

DEPARTMENT: Plant Pathology

RESEARCHERS: Jack Reisselman
Don Mathre

FUNDED AMOUNT: $ 10,000

OBJECTIVES:

1) Determine which organisms are associated with stunted plants in barley and wheat in dryland and irrigated situations in various Montana locations.

2) Determine the effect of cropping practices including tillage, seeding dates, etc., on the incidence of stunted plants and the severity of bare patch.

3) Determine the interaction of Rhizoctonia and other pathogens with various herbicides in relation to timing of seeding and herbicide application.

4) Determine varietal response to these pathogens and practices.

5) Determine the effect of moisture stress on severity of disease caused by these pathogens.

6) Determine the effect of rotation with alternative crops on the pathogens and diseases.

7) Determine the role of grassy weeds in the epidemiology of the disease.

8) Design effective disease management practices for Montana producers.

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TITLE: Spring Wheat Breeding and Genetics

INSTITUTION: Montana State University

DEPARTMENT: Plant & Soil Science

RESEARCHER: Luther Talbert

FUNDED AMOUNT: $ 50,000

OBJECTIVES:

1) To develop superior spring wheat varieties for Montana.

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 breeding and genetics.

==========

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

FUNDED AMOUNT: $ 36,000

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.

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TITLE: The Role and Importance of Multiple Peril Crop Insurance to Montana Producers

INSTITUTION: Montana State University

DEPARTMENT: Agricultural Economics & Economics

RESEARCHERS: Alan E. Banaquet
Vincent H. Smith

FUNDED AMOUNT: $ 15,000

OBJECTIVES:

1) Identify the impact of multiple peril crop insurance on the

level and variability of revenues received by Montana producers.

2) Identify strengths, weaknesses and areas of improvement for multiple peril crop insurance as it applies to Montana producers.

3) Compare the benefits associated with multiple peril crop insurance with benefits associated with crop disaster assistance.

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TITLE: Mapping Malting Barley Production Opportunities in Montana -- Matching environments with cultivars for enhancement of quality.

INSTITUTION: Montana State University

DEPARTMENT: Plant & Soil Sciences

RESEARCHERS: Jerry Nielsen
Joe Caprio

FUNDED AMOUNT: $ 1,000

OBJECTIVES:

1) Identify environmental attributes associated with production of high quality malting barley.

2) Produce maps of Montana showing best areas for production of three types of malting barley; a) 6-row HDT, b) 2-row European, c) 2-row Western.

3) Prepare map products that affectively demonstrate opportunities in Montana for producers and the malting barley industry.

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TITLE: Winter Wheat Breeding/Genetics

INSTITUTION: Montana State University

DEPARTMENT: Plant & Soil Sciences

RESEARCHERS: Gene Hockett
Allan Taylor
Ted Kisha

COOPERATORS: MAES Research Center Facility
Charles McGurie
Luther Talbert
Tom Blake
Jarvis Brown
Jack Martin
Hayden Ferguson
Victor Rayboy
Dick Lund
Wendell Morrill
Greg Johnson
Coop. Extension

FUNDED AMOUNT: $ 50,000

OBJECTIVES:

1) Develop improved winter wheat varieties adapted to Montana's diverse growing conditions which meet domestic and export marketing requirements.

2) Test Montana and introduced winter wheat cultivars to obtain data for variety release and formulation of variety recommendations to growers.

3) Pursue wheat breeding, genetics and other research related to winter wheat variety development.

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TITLE: Farm-Scale Computer Systems for Farming Soils/Not Fields.

INSTITUTION: Montana State University

DEPARTMENT: Plant & Soil Sciences

RESEARCHERS: Gerald Nielsen
Paul McDaniel
Kirk McEachern

FUNDED AMOUNT: $ 5,200

OBJECTIVES:

1) Develop and demonstrate prototype farm-scale Geographic Information Systems (GIS) for Farming Soils/Not Fields.

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TITLE: Value Enhancement and marketing of barley as a food and feed through coordinated nutritional studies and promotional activities.

INSTITUTION: Montana State University

DEPARTMENT: Plant & Soil Sciences

RESEARCHERS: R.K. Newman (Leader)
C.W. Newman (Leader)
Petrea Hofer
Jill Abbott
Kibbie Horsley
Alan Danielson
Qi Xue
Linji Wang

COOPERATORS: C.F. McGuire
L.L. Jackson

FUNDED AMOUNT: $ 80,000

OBJECTIVES:

1) To further identify and clarify the hypocholesterolemic factors in barley, i.e. total dietary fiber, soluble dietary fiber, B-glucans, tocotrienol and unsaturated fatty acids.

2) To develop high-fiber and high oil fractions from select barley cultivars for food products and dietary supplements.

3) To investigate the malting of waxy hull-less and waxy covered barley to produce malt additives for food products.

4) To study the feasibility of using waxy barley as an adjunct to wort in the brewing process.

5) To further investigate the effects and desirability of extrusion processing of select barleys and their respective milling fractions for food products and animal feed.

6) To provide accurate technical information on nutritional

quality, chemical composition, and desirable properties of barley to the cereal food industry.

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TITLE: Cheat Grass Study

INSTITUTION: Roosevelt County Soil Conservation District

RESEARCHERS:

AMOUNT FUNDED: $10,500

OBJECTIVES:

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TITLE: Building Project

INSTITUTION: Northern Montana Research Farm

RESEARCHERS:

AMOUNT FUNDED: $10,000

OBJECTIVES:

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