

**MW & BC Funded Projects
MSU
1983-84**

TITLE: Cutworm Biology and Control
INSTITUTION: Montana State University
DEPARTMENT: Plant & Soil Sciences/Plant Pathology
RESEARCHERS: Wendell Morrill
Dave Sands
AMOUNT FUNDED: \$10,200.00

OBJECTIVES:

- 1) Refine pheromone trapping methodology to predict outbreaks.
- 2) Develop new strains of bacteria for biological controls.

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TITLE: Stored-Grain Insects
INSTITUTION: Montana State University
DEPARTMENT: Plant & Soil Sciences
RESEARCHERS: Wendell Morrill
AMOUNT FUNDED: \$1,850.00

OBJECTIVES:

- 1) Gain a better understanding of problems associated with stored grain and select practical management practices for reducing losses from insects.

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TITLE: Spring Wheat Breeding
INSTITUTION: Montana State University
DEPARTMENT: Plant & Soil Sciences
RESEARCHERS: W. Larry Alexander

Michael R. Wilson
Allen F. Cook

AMOUNT FUNDED: \$40,160.00

OBJECTIVES:

- 1) Support for Montana Agricultural Experiment Station Spring Wheat Breeding Project

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TITLE: Improved Winterhardiness for Winter Wheat Production in Montana

INSTITUTION: Montana State University

DEPARTMENT: Plant & Soil Sciences

RESEARCHERS: Jarvis H. Brown, Michael J. Wille, Allan Taylor

AMOUNT FUNDED: \$15,700.00

OBJECTIVES:

- 1) To help develop winter wheat varieties with increased winterhardiness in Montana environments.

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TITLE: Barley Improvement

INSTITUTION: Montana State University

DEPARTMENT: Plant & Soil Sciences

RESEARCHERS: E.A. Hockett, K.M. Gilbertson

AMOUNT FUNDED: \$44,400.00

OBJECTIVES:

- 1) Development of agronomically acceptable barley varieties for Montana for food, feed, malting, processing, export, and special uses is the underlying objective of the barley program. Breeding methods include pedigree, backcrossing, mutation, and male sterile facilitated recurrent selection (MSFRS) populations.

- 2) Evaluate methods of selecting single plants for improved agronomic type from male sterile facilitated recurrent

selection populations (MSFRS). Disease resistant populations developed over the past few years will be the source material. The most advanced of these is RSP5 Rrs + Rpt (a population resistant to scald and net blotch; both are foliar diseases of barley in Montana) selected for day length sensitivity. Disease resistant populations for most diseases found in Montana are available for combining to form multiple disease resistant populations to be followed by agronomic improvement.

3) Mutation, isolation, increase, identification of new seed traits in white aleurone hulless barley that may increase the value of barley for food, feed, or processing purposes. Mode of inheritance and genetic effectiveness of these genes are to be evaluated. Short term major emphasis will be given the development of plump, high yielding, high lysine barley varieties and/or high protein barley varieties.

4) Development of auxitrophs, particularly for non-germinating or rootless, or shootless seedlings to control volunteer barley in winter wheat. A second approach will be to alter the herbicidal tolerance and/or susceptibility to increase selectivity of certain herbicides. An attempt will be made to identify other auxitrophs that may be useful in DNA research.

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TITLE: Duration of Glean Residues in Montana Soils

INSTITUTION: Montana State University

DEPARTMENT: Plant & Soil Sciences

RESEARCHERS: Peter Fay, Dan burkhart, Vern Stewart, Gil Stallknecht, Gregg Carlson, Art Dubbs

AMOUNT FUNDED: \$13,000.00

OBJECTIVES:

1) To measure the rate of degradation of Glen in soil at seven locations in Montana.

2) To measure the rate of Glean residues which crops grown in Montana can tolerate.

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TITLE: Stimulating Dormant Wild Oat Seed Germination With Fusicoccin

INSTITUTION: Montana State University

DEPARTMENT: Plant & Soil Sciences

RESEARCHERS: Michael E. Foley
Susan Johnston

AMOUNT FUNDED: \$10,775.00

OBJECTIVES:

1) To determine under controlled conditions whether fusicoccin, a demonstrated seed germination stimulator, can induce germination in dormant and non-dormant wild oat seeds.

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TITLE: Barley Breeding

INSTITUTION: Montana State University

DEPARTMENT: Plant & Soil Sciences

RESEARCHERS: E.A. Hockett, K.M. Gilbertson

AMOUNT FUNDED: \$11,600.00

OBJECTIVES:

1) To improve the agronomic characteristics and malting and feed quality of barley cultivars for Montana.

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TITLE: Winter Wheat Survival and Production Under Alternate Cropping Systems

INSTITUTION: Montana State University

DEPARTMENT: Western Triangle Research Center/Plant & Soil Sciences

RESEARCHERS: Alice Jones, A Hayden Ferguson, Gregory Kushnak

AMOUNT FUNDED: \$9,400.00

OBJECTIVES:

1) Develop barley - winter wheat cropping systems that maximize survival of non-winterhardy, high yielding winter wheat varieties.

a. Develop barley row spacing, seeding rates, and residue management that will optimize survival of selected winter wheat varieties.

b. Determine winter wheat row spacing and seeding rates required for maximum production of non-winterhardy, high yielding winter wheat varieties for each barley management option in Objective 1a.

2) Develop winterhardiness selection criteria for winter wheat breeding.

a. Select winter wheat varieties that are high yielding and which have varying degrees of winterhardiness.

b. Identify crop and soil physical properties which can be used as measures of winterhardiness.

c. Monitor crop and soil physical properties, identified in Objective 2b using varieties selected in Objective 2a, and relate these properties to winter wheat survival and productivity.

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TITLE: An Economic Analysis of Market Responses to protein Content in Wheat and Barley

INSTITUTION: Montana State University

DEPARTMENT: Agricultural Economics & Economics

RESEARCHERS: Jeffrey LaFrance

AMOUNT FUNDED: \$17,800.00

OBJECTIVES:

1) Develop an economic model of the relationship at the farm level for the market price of wheat and its quality level(s).

- 2) Economically estimate an empirical model based on the theory developed in (1), and test the hypotheses suggested by the theoretical model.
- 3) Analyze the demand for feed grains as a derived demand for the nutrients contained in the feed, and develop an economic model for the market price of barley as a feed grain.
- 4) Utilize the results from (1) - (3) to infer the structural barriers, if any, to the development of a more informed marketing structure for feed barley in Montana.

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TITLE: Equipment Development and Modification of Grain Drills to Improve the Efficiency of Fertilizer Use and to permit the Use of Existing Drills in No-Till Applications

INSTITUTION: Montana State University

DEPARTMENT: Civil & Ag Engineering

RESEARCHERS: W. E. Larsen, J. T. Palmer

AMOUNT FUNDED: \$15,000.00

OBJECTIVES:

1) Continue studies of grain drill opener modifications that were begun in 1981-1982 season. These studies will include field studies to measure the effect of drill modifications on stand establishment and yield. A major variable in addition to the opener design will be fertilizer rate. Openers for an IHC 150 drill are currently under test and openers for a JDL drill have been constructed, but not tested in the field. Openers will be developed for a minimum of four drills and field tests begun with winter wheat and spring grains.

2) Develop equipment modifications to permit use of existing drills over a range of planting conditions including no-till. This will include the development of a device that will mechanically walk straw and other surface residue past a hoe type opener. This will be used to eliminate the need for a rolling coulter in no-till farming. Rolling coulters have been shown to be effective, but they add considerably to the drill cost and require a large amount of weight to obtain the

proper penetration.

3) Develop a fertilizer applicator that can be pulled ahead of a grain drill for applying anhydrous ammonia and liquid fertilizers in no-till at the same time as planting. Moisture conservation during planting is critical for obtaining a good stand. Combining fertilizer application and planting into one operation will reduce the chances for soil drying. If the fertilizer applicator is ahead of the drill then they should both use the same soil slot to minimize soil disturbance and to conserve on power use.

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TITLE: Control of soil-borne disease of wheat and barley

INSTITUTION: Montana State University

DEPARTMENT: Plant Pathology

RESEARCHERS: Don Mathre

AMOUNT FUNDED: \$25,493.00

OBJECTIVES:

- 1) Evaluate the effectiveness of using barley as a rotation crop for irrigated fields where Take-All disease has eliminated spring wheat as the crop of choice.
- 2) Evaluate the role of pathogens in stand establishment problems in wheat stubble and determine if seed treatment with Apron will reduce stand losses.
- 3) Continue development of germplasm of winter wheat with resistance to Cephalosporium stripe and evaluate this disease's effect on water use efficiency in winter wheat.

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TITLE: Purchase of Near Infrared Reflectance Apparatus for the Cereal Quality Laboratory

INSTITUTION: Montana State University

DEPARTMENT: Plant & Soil Sciences

RESEARCHERS: Charles McGuire

AMOUNT FUNDED: \$3,000.00

OBJECTIVES:

1) Near Infrared Reflectance technology allows the rapid measurement of such quality parameters in wheat and barley as protein percentage, moisture percentage, amino acid content, fiber content, plus other traits as need arises.

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TITLE: Potentials of Montana Soils

INSTITUTION: Montana State University

DEPARTMENT: Plant & Soil Sciences

RESEARCHERS: Gerald Nielsen, Clifford Montagne

AMOUNT FUNDED: \$20,000.00

OBJECTIVES:

1) Accelerate and improve soil inventory processes. We will identify soil types developed on representative geologic parent materials, demonstrate how this information can be extrapolated over large areas, and show how to compile information prior to soil-mapping operations conducted by federal, state, and private organizations.

2) Develop and test methods of determining soil performance and potentials for agriculture. We will acquire agronomic data keyed to soil type, in cooperation with groups such as Agricultural Research Centers, Soil Conservation Service, pest management groups, farm organizations, and agricultural consultants. This soil performance and potential information will be extrapolated to areas with similar soils and climates.

3) Initiate soil erosion research appropriate to Montana's conditions. Although extensive work is beyond the scope of this proposal, we are concerned because erosion rates in this state have been estimated, but seldom measured. We will test for the redistribution of radioactive cesium-137 fixed on soil particles following nuclear testing and fall-out in the 1950's.

4) Develop computer-assisted information systems that will deliver useful soil resource data from Federal, State, and University files to individual citizens (farmers, ranchers,

foresters, and others) via telephone, telecommunication networks, magnetic tapes, and diskettes.

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TITLE: Feasibility of utilizing wild emmer for improving disease resistance and other characteristics in cultivated wheat

INSTITUTION: Montana State University

DEPARTMENT: Plant Pathology

RESEARCHERS: Eugene L Sharp (leader), Mareike Reinhold, Charles F. McGuire, Vern Stuart, William L. Alexander

AMOUNT FUNDED: \$14,200.00

OBJECTIVES:

Agronomic improvement of stripe rust resistant wheat hybrids developed from crosses of emmer wheat with cultivated wheat through a backcross program.

- 1) Selection of lines with high thousand kernel weights.
- 2) Improvement of resistance to several other diseases such as powdery mildew, stem rust, leaf rust and others.
- 3) Development of winterhardy lines from progenies of crosses with Turkish emmer lines.
- 4) Selection of lines with high protein content.

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TITLE: Dryland Cereal Production in Montana Based on Cereal-Legume Rotations

INSTITUTION: Montana State University

DEPARTMENT: Plant & Soil Sciences

RESEARCHERS: James R. Sims, Charles F. McGuire, Siadou Koala

AMOUNT FUNDED: \$11,000.00

OBJECTIVES :

- 1) Adapt annual-legume/cereal rotations (Ley Farming) to dryland cereal production to major winter and spring grain production areas in Montana.
- 2) Relate adaptability of annual-legume/cereal rotations to climatic factors and soil properties.
- 3) Determine reduction in N fertilizer requirement for maximum grain yield following annual legumes grown for green manure.
- 4) Compare protein levels, test weights, and baking quality parameters of wheat produced with legume N and wheat produced with fertilizer N.

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TITLE: Winter Wheat Improvement

INSTITUTION: Montana State University

DEPARTMENT: Plant & Soil Sciences

RESEARCHERS: Allan Taylor (leader), Hollis Spitler, Sadiq Chaudhry, Janet Goodell, Mohamed Al-Khawlani, Maher, Noaman, John DeNoma, Phil Becraft

AMOUNT FUNDED: \$44,400.00

OBJECTIVES :

- 1) General support of winter wheat breeding project.
- 2) Breeding for wheat ideotypes which produce the greatest grain protein consistent with high stable yields.
- 3) Equipment purchase.

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TITLE: County Field Crop Variety Demonstrations

INSTITUTION: Montana State University

DEPARTMENT: Montana Cooperative Extension Service

RESEARCHERS: Donald E. Baldrige, Charles H. Rust

AMOUNT FUNDED: \$17,000.00

OBJECTIVES:

1) Demonstration plots on a county level are an extremely useful teaching tool for Extension Specialists and county agents. These plots have provided for the establishment of an educational program with producers and have hastened the transfer of technology and adoption by producers of new crop varieties and practices.

The county agricultural agents with the Montana Cooperative Extension Service have indicated a willingness to make a long-term commitment to participate in field demonstration programs that include the observation of various field crop varieties under different environments.

At the present time, county agents establish small demonstration plots with obsolete equipment. Such equipment cannot control seeding depth, is very time consuming and does not duplicate the conditions of farm equipment. County agents have occasionally used full sized farm equipment for large plot demonstrations in cooperation with producers, with varying degrees of success.

Field crop variety plots established on a county level will enable producers to make frequent observations of recommended and other varieties on a side-by-side basis. Producers will have the opportunity to observe these plots for seedling vigor, tillering, disease reaction, hail tolerance, shattering, lodging and potential yield.

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TITLE: Cereal Grain Production Guide for Montana

INSTITUTION: Montana State University

DEPARTMENT: Cooperative Extension Service, Ag. Exp. Station

RESEARCHERS: Bill Schafer, Alice Jones, Don baldridge, Allan Taylor, Jim Johnson, and over 30 faculty and staff from the Mt. Cooperative Extension Service, Mt. Ag. Experiment Station and USDA-ARS

AMOUNT FUNDED: \$12,825.00

OBJECTIVES:

- 1) Prepare a "cereal grain" production guide for Montana. The publication would be a compilation of research findings and established recommendations on growing, processing, marketing, and utilization of small grains (spring wheat, winter wheat,barley).
- 2) Orient the publication toward production and marketing of small grains in the Northern Great Plains with emphasis on Montana producers and conditions.
- 3) Compile information in the publication that has been developed with the assistance of the Montana Wheat Research and Marketing Committee.
- 4) Charge a minimum fee that would recover initial production costs incurred by the Montana Wheat Research and Marketing Committee (MWRMC) for the publication.

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TITLE: Effect of processing on components of DDG

INSTITUTION: Montana State University

DEPARTMENT: Home Economics & Chemistry

RESEARCHERS: Jacquelyn O'Palka, Larry Jackson

AMOUNT FUNDED: \$11,800.00

OBJECTIVES:

1) It is proposed to investigate the changes in the lipids of barley induced by the processing through to ethanol and DDG. Samples of production runs will be taken at several stages of the process, and analyses of the lipid content made. These will be done using thin layer chromatography for lipid class analyses and by GLC for fatty acid analyses. MSU is well suited to this work, and Dr. Jackson has a high reputation as a lipid chemist.

TITLE: Development of NIR analytical techniques

INSTITUTION: Montana State University

DEPARTMENT: Plant & Soil Sciences

RESEARCHERS: Charles McGuire

AMOUNT FUNDED: \$8,800.00

OBJECTIVES:

1) Near Infrared Reflectance (NIR) has shown considerable power as an analytical tool in cereals. it is proposed to develop conditions to enable the determination of protein, fat and lysine in distillers dried grains by NIR techniques. The techniques for this type of development are well established.