Hettinger Research Extension Center

NORTH DAKOTA STATE UNIVERSITY

Annual Progress Report of Agricultural Research and Extension
January 1, 2008 through December 31, 2008

NDSU
HETTINGER
Research Extension Center

Contents

Weather Summary

2008 Growing Conditions
Hettinger Research Extension Center

Southwestern North Dakota continued to suffer from drought in 2008. The winter of 2007-08 was generally mild with very little snowfall. These conditions caused some winter kill in winter wheat. Spring temperatures were cool, causing delays in crop and weed emergence. Very little pre-plant burndown herbicide treatments were applied. These cool temperatures also delayed maturity in warm season crops. The number of frost free growing season days was 10 fewer than normal. Very little of the area=s corn was harvested for grain.

The North Dakota / South Dakota state line was the dividing line for spring and summer precipitation with more rainfall to the south and less to the north. Hettinger received above normal precipitation in May (4") and June (4") while some areas to the north received very little of these rainfall events. Hay land and pastures remained green throughout the year in most of NW South Dakota, but were too short and thin to form a windrow in much of SW North Dakota. With rain, often comes hail, which was the case for several large areas causing severe crop losses. Hot and dry weather in July and August caused small grain crops to deteriorate, resulting in relatively low yields and very light test weight.

White sterile wheat heads caused by wheat stem maggot were again prevalent throughout the Western Dakota=s. Wheat stem sawfly also continues to increase in both intensity and area and has quickly becoming a major production problem in wheat. A late season explosion of grasshoppers were reported in some areas. Foliar diseases were almost absent this year.

Most trials at the Hettinger Research Center were grown under a no-till system. Broadleaf crop trials were typically planted into wheat stubble and small grain trials were typically planted into field pea stubble. Residual soil fertility levels were determined and fertilizer was applied according to specific yield goals for each crop. Urea (46-0-0) was the primary nitrogen fertilizer source and was applied with a no-till drill prior to planting. Monoammonium phosphate (11-52-0) was typically applied directly with the seed during planting. All legume crops were treated with granular *rhizobia* innoculant during seeding.

HRSW, durum and barley trials were treated post-emergence for both wild oats and for broadleaf weeds (kochia, Russian thistle and wild buckwheat). Most broadleaf crops were treated with a pre-emergence burn down, and with either a pre-emergence or a post-emergence herbicide for grassy weeds and broadleaf weeds when possible.

Weather Data Summary – Hettinger

Frost Free Days

	28 F	32 F	Normal 32 F
Date of last frost	April 25	May 11	May 18
Date of first frost	Oct 7	Sept 3	Sept 20
Frost free days	165	115	125

Precipitation

Precipitation (inches)	2004-2005	2005-2006	2006-2007	2007-2008	53 Year Average
Sept. –Dec.	4.41	3.68	3.15	1.26	3.26
Jan.-March	0.98	2.34	2.18	0.87	1.44
April	0.75	2.12	1.09	0.98	1.63
May	2.30	0.97	5.97	4.01	2.61
June	5.10	2.53	3.04	4.08	3.32
July	1.31	0.58	1.62	1.23	2.02
August	1.38	1.75	3.65	1.75	1.67
Total	16.23	13.97	20.70	14.18	15.95

Air Temperature

Average Temperature F	2004	2005	2006	2007	2008	53 Year Average
April	45.4	45.5	47.8	40.2	40.1	42.8
May	51.3	50.7	55.6	56.2	52.0	53.9
June	59.5	64.0	65.2	62.7	59.7	63.3
July	69.2	71.9	77.3	75.4	71.1	70.2
August	63.4	68.0	71.3	68.8	70.0	68.9
September	60.2	60.4	56.4	60.9	56.6	57.7

Growing Degree Units- Corn

Growing Degree Units (50-86)	2004	2005	2006	2007	2008	36 Year Average
May	242	226	323	272	207	264
June	371	430	465	452	346	422
July	558	607	678	672	606	588
August	441	388	276	533	579	539
September	335	388	276	353	340	313
Total	1947	2166	2335	2282	2078	2126

Agronomy Research Trials

Agronomy Department
Hettinger Research Extension Center
Eric Eriksmoen – Agronomist
Rick Olson – Technician
Caitlin Pearson & Gwen Kristy - Summer Labors

Summary of 2008 Field Research Projects

Drill Strips, HRSW - 45 cultivars, Durum - 45 cultivars, Barley - 25 cultivars, Oat - 33 cultivars. Drill strips are grown to increase seed for future use at the research center and harvested seed is sent to the NDSU Dept. of Cereal Science for grain quality analysis. These strips are also used for demonstration during the annual summer field tours. Status: **Ongoing.**

Hard Red Winter Wheat Variety Trial. 25 cultivars.
This trial was composed of established and experimental varieties and was used to determine agronomic and quality parameters of individual varieties. The information is used by growers to assist them with variety selection and by plant breeders to determine adaptation of elite experimental lines for release to the general public. This is a cooperative project with the NDSU Dept. Plant Science. Status: **Ongoing**.

Hard Red Winter Wheat Northern Regional Performance Nursery. 31 cultivars.
This trial was composed of experimental cultivars developed by plant breeders located throughout the great plain states. The information is used to assist plant breeders in determining cultivar adaptation and performance of agronomic traits (plant height, insect resistance, etc.) used in variety development. This is a cooperative project with the USDA - ARS at Lincoln, NE. Status: **Ongoing**.

Winter Rye Variety Trial. 4 cultivars.
This trial was composed of established and experimental varieties and was used to determine agronomic and quality parameters of individual varieties. The information is used by growers to assist them with variety selection and by plant breeders to determine adaptation of elite experimental lines for release to the general public. This is a cooperative project with the NDSU Carrington Research Extension Center. Status: **Ongoing**.

Hard Red Spring Wheat Variety Trial. 49 cultivars.
This trial was composed of established and experimental varieties and was used to determine agronomic and quality parameters of individual varieties. The information is used by growers to assist them with variety selection and by plant breeders to determine adaptation of elite experimental lines for release to the general public. NDSU's first Clearfield line was released to the public - ND901CL. This is a cooperative project with the NDSU Dept. Plant Science and private seed companies. Status: **Ongoing**.

Hard Red Spring Wheat Uniform Regional Nursery. 42 cultivars.
This trial was composed of experimental cultivars developed by plant breeders located throughout the United States and Canada. The information is used to assist plant breeders in determining cultivar adaptation and performance of agronomic traits (plant height, insect resistance, etc.) used in variety development. This is a cooperative project with the USDA - ARS at St. Paul, MN. Status: **Ongoing**.

Western Hard Red Spring Wheat Elite Yield Trial. 75 cultivars.
This trial was composed of elite experimental cultivars developed by the HRS wheat plant breeder at NDSU. The information is used to assist in the development of spring wheat varieties for Western North Dakota. Status: **Ongoing**.

IMI Tolerant Hard Red Spring Wheat Elite Yield Trial. 40 cultivars.
This trial was composed of experimental cultivars that are being developed to tolerate imazamox (Beyond) herbicide. Cultivars are being developed by the HRS wheat plant breeder at NDSU. The information is used to assist in the development of IMI tolerant spring wheat varieties for North Dakota. Status: **Ongoing**.

Commercial White Spring Wheat Nursery. 21 cultivars.
This trial was composed of commercial and experimental cultivars developed by plant breeders located throughout the United States and Canada. The information is used by growers to assist them with variety selection and by plant breeders to determine adaptation of elite experimental lines for release to the general public. This is a cooperative project with the NDSU Williston Research Extension Center. Status: **Ongoing**.

WestBred Hard Red Spring Wheat Variety Trial. 6 varieties.
This trial was composed of established varieties developed by WestBred, Inc. and was used to determine agronomic and quality parameters of individual varieties. The information is used by growers to assist them with variety selection and by WestBred to determine the area of adaptation. This trial was funded by WestBred. Status: **Completed**.

HRSW Sawfly Yield Trial. 15 cultivars at 2 locations.
This trial was composed of commercial and experimental cultivars developed to resist sawfly infestations. The trial was seeded at the HREC and into a natural sawfly infested area near Hettinger. Sawfly infestations have become a major problem in western North Dakota where no-till spring wheat is the predominant crop. The information is used to assist in the development of sawfly resistant varieties for western North Dakota. This is a cooperative project with the NDSU Dept. of Plant Sci. Status: **Unknown??**

Optimizing the Identification and Development of High-yielding Spring Wheats with Resistance to Wheat Stem Sawfly. 18 cultivars at 5 locations.
This trial was composed of commercial and experimental cultivars developed to resist sawfly infestations. The objectives of the trial were to expand the knowledge base of sawfly, variety and environmental interactions relating to stem solidity, stem infestation and timing of infestations. The trials were seeded into a natural sawfly infested areas near Hettinger, Scranton,

Regent and New Leipzig. The information is used to assist in the development of integrated pest management strategies for western North Dakota. This is a cooperative project with the NDSU Dept. of Plant Sciences and the NDSU Dept. of Entomology and was funded by SBARE. Status: **Ongoing.**

Specialty Wheat Advanced Yield Trial. 20 cultivars.
This trial was composed of experimental cultivars developed by the specialty wheat plant breeder at NDSU. The information is used to assist in the development of cultivars with specific characteristics such as unique starch or protein composition. Status: **Ongoing**.

HRSW Seed Inoculation Trials. 3 trials.
These trials were composed of spring wheat seed that was treated with various types of proprietary micro organisms (Curvularia and Azospirillium), polymers and enzymes to enhance root, plant growth and other agronomic characteristics. The information will be used in the further development of these inoculants. These trials were conducted for a fee and were a cooperative project with the NDSU Dept. Plant Science. Status: **Completed**.

Durum Variety Trial. 45 cultivars.
This trial was composed of established and experimental varieties and is used to determine agronomic and quality parameters of individual varieties. The information is used by growers to assist them with variety selection and by plant breeders to determine adaptation of elite experimental lines for release to the general public. This is a cooperative project with the NDSU Dept. Plant Science. Status: **Ongoing**.

Barley Variety Trial. 25 cultivars.
This trial was composed of established and experimental varieties and was used to determine agronomic and quality parameters of individual varieties. The information is used by growers to assist them with variety selection and by plant breeders to determine adaptation of elite experimental lines for release to the general public. Of these cultivars, 14 were two row types and the remaining were 6-row types. This is a cooperative project with the NDSU Dept. Plant Science. Status: **Ongoing**.

Western Regional Dryland Spring Barley Nursery. 21 cultivars.
This trial was composed of experimental cultivars developed by plant breeders located throughout the western United States and Canada. The information is used to assist plant breeders in determining cultivar adaptation and performance of agronomic traits (plant height, insect resistance, etc.) used in variety development. This is a cooperative project with the USDA - ARS at Aberdeen, ID. Status: **Ongoing**.

Oat Variety Trial. 33 cultivars.
This trial was composed of established and experimental varieties and was used to determine agronomic and quality parameters of individual varieties. The information is used by growers to assist them with variety selection and by plant breeders to determine adaptation of elite experimental lines for release to the general public. This is a cooperative project with the NDSU Dept. Plant Science. Status: **Ongoing**.

Naked Oat Nursery. 28 cultivars.
This trial was composed of experimental cultivars that have been developed throughout the United Stated and Canada and that produce a naked or hulless kernel. The information is used to assist the NDSU oat breeding program in the development of varieties adapted to North Dakota. This is a cooperative project with the NDSU Dept. Plant Science. Status: **Ongoing**.

Oat Kernel Quality Trial. 10 cultivars.
This trial was conducted to identify and better understand specific kernel quality characteristics of selected commercial and experimental cultivars. The information is used to assist the NDSU Dept. of Cereal Sciences in the identification and development of specific oat kernel quality characteristics. This is a cooperative project with the NDSU Dept. Plant Science. Status: **Completed**.

Spring Triticale Variety Trial. 6 varieties.
This trial was composed of established varieties and was used to determine adaptation and agronomic parameters of individual varieties. The information is used by growers to assist them with variety selection and by plant breeders to determine adaptation. This is a cooperative project with the NDSU North Central Research Extension Center. Status: **Ongoing**.

Spring Emmer Variety Trial. 7 cultivars.
This trial was composed of established and experimental cultivars and was used to determine adaptation and agronomic parameters of individual varieties. The information is used by growers to assist them with variety selection and by plant breeders to determine adaptation. This was a cooperative project with the NDSU Carrington Research Extension Center. Status: **Ongoing**.

Winter Spelt Variety Trial. 4 cultivars.
This trial was composed of established and experimental cultivars and was used to determine adaptation and agronomic parameters of individual varieties. The information is used by growers to assist them with variety selection and by plant breeders to determine adaptation. This was a cooperative project with the NDSU Carrington Research Extension Center. Status: **Ongoing**.

Winter Triticale Variety Trial. 4 cultivars.
This trial was composed of established and experimental cultivars and was used to determine adaptation and agronomic parameters of individual varieties. The information is used by growers to assist them with variety selection and by plant breeders to determine adaptation. This was a cooperative project with the NDSU Carrington Research Extension Center. Status: **Ongoing**.

Flax Variety Trial, 18 cultivars.
This trial was composed of established and experimental varieties and was used to determine agronomic and quality parameters of individual varieties. The information is used by growers to assist them with variety selection and by plant breeders to determine adaptation of elite

experimental lines for release to the general public. This is a cooperative project with the NDSU Dept. Plant Science. Status: **Ongoing**.

Spring Camelina Variety Trial, 10 cultivars.
This trial was composed of established and experimental varieties and was used to determine agronomic and quality parameters of individual varieties. Camelina is an industrial oil seed that currently has no established market in North Dakota but is being looked at as a possible bio-diesel crop. The information is used to determine adapted varieties and to assist in the development of this crop. This is a cooperative project with the NDSU Dept. Plant Sciences and MT State Univ. Status: **Ongoing**.

Spring Camelina Seeding Rate Trial, 5 seeding rates.
This trial was conducted to determine optimum agronomic and quality characteristics of this crop based on seeding rates. Camelina is an industrial oil seed that currently being looked at as a possible bio-diesel crop. There is currently no established market in North Dakota but there is in MT. The information is used to determine optimum production practices for this growing region. Status: **Ongoing**.

Spring Camelina Nitrogen Fertility Trial, 3 nitrogen rates.
This trial was conducted to determine optimum agronomic and quality characteristics of this crop based on nitrogen fertility rates. All plant species require nitrogen for structural and metabolic processes. This crop has been touted as a low nitrogen fertilizer user and therefore this trial was established to investigate this claim. The information is used to establish optimum nitrogen fertilization practices for this growing region. Status: **Ongoing**.

Safflower Variety Trial, 12 cultivars.
This trial was composed of established and experimental varieties and was used to determine agronomic and quality parameters of individual varieties. The information is used by growers to assist them with variety selection and by plant breeders to determine adaptation of elite experimental lines for release to the general public. This is a cooperative project with the NDSU Williston Research Extension Center. Status: **Ongoing**.

Dormant Seeded Safflower Trial, 4 varieties.
This trial was composed of four safflower varieties and was seeded in late Fall prior to soil freeze up. Trials conducted in the past have shown positive results to this seeding practice. Benefits of this practice include more efficient utilization of time, equipment and labor resources. The information will be used to determine agronomic practices and risk factors associated with the potential implementation of this practice. This is a cooperative project with the NDSU Williston Research Extension Center. Status: **Ongoing**.

Dormant Seeded Canola Trial, 3 types.
This trial was composed of 3 types of canola (winter, spring and winter x spring hybrid) which were seeded in late Fall prior to soil freeze up. Winter types tend to be higher yielding than spring types but are not adapted to ND and winter x spring hybrid types are just now being commercialized. The impotence behind this trial is to have these crops in the ground and ready

to grow as early as possible in order to beat yield robbing hot temperatures during flowering and pod fill. Spring types are susceptible to frost injury and it is thought that the winter and spring x winter hybrids may have a higher frost tolerance. The information will be used to investigate the potential of Fall seeded canola. Status: **Ongoing**.

Canola Varity Trial. 25 varieties.
This trial was composed of established and experimental varieties submitted by seed companies and tested for a fee. The information is used by growers to assist them with variety selection and by seed companies to assist them in determining adaptation. Status: **Ongoing**.

Canola Elite Yield Nursery. 40 cultivars.
This trial was composed of experimental cultivars being developed for adaptation to this growing region. The information is used by Dr. Mukhlesur, NDSU canola breeder, in the development of adapted varieties. Status: **Ongoing**.

Spring Canola Herbicide Systems and Hybrids Comparison Trial. 15 varieties.
This trial was composed elite varieties submitted by canola companies and tested for a fee. The information is used by growers to assist them with variety selection and by seed companies to assist them in determining adaptation. Status: **Ongoing**.

SWP Juncea Nursery. 24 cultivars.
This trial was composed of experimental cultivars being developed by Saskatchewan Wheat Pool and was tested for a fee. This crop is being developed as an alternative to canola for areas that are more prone to heat and moisture stress. The information is used by plant breeders to assist them with variety development. This is a cooperative project with Saskatchewan Wheat Pool. Status: **Ongoing**.

Winter Crops Trial, 12 varieties from 5 different crops.
This trial was composed of experimental and established varieties of winter lentil, camelina, field pennycress, pepperweed and winter canola and was used to determine adaptation and agronomic parameters of individual varieties. There are currently no commercially available winter hardy varieties available for our region and camelina, pepperweed and field pennycress have no commercial markets. The information is used by plant breeders to determine adaptation and to further develop elite experimental lines for release to the general public. All of the cultivars had 100% winter kill. Status: **Ongoing**.

Mustard Variety Trial, 7 varieties.
This trial was composed of established varieties and is used to determine adaptation and agronomic parameters of individual varieties. The information is used by growers to assist them with variety selection. Four of the varieties were yellow types, one was an oriental type and two were brown types. This is a cooperative project with the NDSU Langdon Research Extension Center. Status: **Ongoing**.

Crambe Variety Trial, 9 cultivars.
This trial is composed of established and experimental varieties and was used to determine agronomic and quality parameters of individual varieties. The information is used by growers to assist them with variety selection and by plant breeders to determine adaptation of elite experimental lines for release to the general public. This is a cooperative project with the NDSU Dept. Plant Sciences. Status: **Ongoing**.

Pennycress Evaluation.
This evaluation was composed of seed collected from locally growing field pennycress plants. Field pennycress is a winter annual (or spring annual) weed species in the mustard family which grows readily throughout ND. It has been reported to have a seed oil content of up to 40%. To my knowledge, it has never been tested as a potential oilseed crop in ND. Status: **Ongoing**.

Buckwheat Variety Trial, 3 varieties.
This trial was composed of established varieties and was used to determine adaptation and agronomic parameters of individual varieties. The information is used by growers to assist them with variety. This is a cooperative project with the NDSU Langdon Research Extension Center. Status: **Ongoing**.

Proso Millet Variety Trial, 4 varieties.
This trial was composed of established varieties and was used to determine adaptation and agronomic parameters of individual varieties. The information is used by growers to assist them with variety selection. The Hettinger Research Extension Center coordinates the statewide proso millet trials. Status: **Ongoing**.

Field Pea Variety Trial. 14 cultivars.
This trial was composed of established varieties and was used to determine adaptation and agronomic parameters of individual varieties. The information is used by growers to assist them with variety selection and by seed companies to assist them in determining adaptation. Green and yellow types were represented in this trial. This was a cooperative project with the NDSU Carrington Research Extension Center. Status: **Ongoing**.

Western Regional Dry Pea Nursery. 12 cultivars.
This trial was composed of experimental cultivars developed by Dr. Kevin McPhee, USDA plant breeder located at Washington State University. The information is used in cultivar development. This is a cooperative project with the USDA - ARS at Pullman, WA. Status: **Ongoing**.

USDA / ND Dry Pea Nursery. 20 cultivars.
This trial was composed of experimental cultivars being developed for North Dakota by Dr. Kevin McPhee, USDA plant breeder located at Washington State University. The information is

used in cultivar development. This is a cooperative project with the USDA - ARS at Pullman, WA. Status: **Ongoing**.

Winter Dry Pea Nursery. 9 cultivars.
This trial was composed of two established and 7 experimental cultivars being developed by the USDA-ARS station at Pullman, WA. There are no winter peas currently being grown in ND. The information is used to assist plant breeders in determining cultivar adaptation and performance of agronomic traits (plant height, insect resistance, etc.) used in variety development. This was a statewide project being coordinated by the Hettinger Research Center. None of the cultivars survived. This trial was partly funded by the ND Dry Pea and Lentil Association. Status: **Ongoing**

Lentil Variety Trial. 23 varieties.
This trial was composed of established varieties and was used to determine adaptation and agronomic parameters of individual varieties. The information is used by growers to assist them with variety selection. All market classes were represented in this trial. This is a cooperative project with the NDSU North Central Research Extension Center. Status: **Ongoing**.

Winter Lentil Nursery. 10 cultivars.
This trial was composed of experimental cultivars developed by the USDA-ARS station at Pullman, WA. There are no winter lentils currently being grown in ND. The information is used to assist plant breeders in determining cultivar adaptation and performance of agronomic traits (plant height, insect resistance, etc.) used in variety development. This was a statewide project being coordinated by the Hettinger Research Center. None of the cultivars survived. This trial was partially funded by the ND Dry Pea and Lentil Association. Status: **Ongoing**

Lentil Seeding Rate Trial. 6 treatments.
This trial was designed to establish optimal seeding rates of lentils in ND. Current seeding rate information was developed in Canada and may not be applicable to our growing region. The information is used to assist farmers in managing this crop. This was a statewide project being coordinated by the Williston Research Center. Status: **Completed.**

Chickpea Variety Trial. 10 varieties.
This trial was composed of established and experimental varieties and was used to determine adaptation and agronomic parameters of individual varieties. The information is used by plant breeders to assist them with variety development and by growers to assist them with variety selection. Kaboli and Desi types were represented in this trial. This is a cooperative project with the NDSU North Central Research Extension Center. Status: **Ongoing**.

Western Regional Chickpea Nursery. 12 cultivars.
This trial was composed of experimental cultivars being developed for the northern great plains by Dr. Kevin McPhee, USDA plant breeder located at Washington State University. The information is used in cultivar development. This is a cooperative project with the USDA - ARS at Pullman, WA. Status: **Ongoing**.

__**Soybean Variety Trial**__, 20 varieties.
This trial was composed of experimental, private and public varieties and was used to determine adaptation and agronomic parameters of individual varieties. The information is used by growers to assist them with variety selection and by seed companies to establish parameters of adaptation. Both conventional and Roundup Ready types were represented in this trial. This is a cooperative project with the NDSU Dept. Plant Science and private seed companies. Status: **Ongoing**.

__**Faba Bean Variety Trial**__. 3 cultivars.
This trial was composed of established and experimental cultivars and was used to determine adaptation and agronomic parameters of individual varieties. The information is used by plant breeders to assist them with variety development and by growers to assist them with variety selection. This is a cooperative project with the NDSU Carrington Research Extension Center. Status: **Ongoing**.

__**Dry Edible Bean Variety Trials**__, 20 varieties.
This trial was composed of established and experimental varieties and was used to determine agronomic and quality parameters of individual varieties. The information is used by growers to assist them with variety selection and by plant breeders to determine adaptation of elite experimental lines for release to the general public. The trial included pinto, navy, great northern, red, pink and black types. “Avalanche” navy bean was released to the public this year. This is a cooperative project with the NDSU Dept. Plant Science. Status: **Ongoing**.

__**Hybrid Sunflower Trial**__, 60 oil type hybrids.
This trial was composed of established and experimental varieties submitted by seed companies and tested for a fee. The information is used by growers to assist them with variety selection and by seed companies to assist them in determining adaptation. Status: **Ongoing**.

__**Hybrid Corn Trial**__, 13 hybrids.
This trial is composed of established varieties submitted by seed companies and tested for a fee. The information is used by growers to assist them with variety selection and by seed companies to assist them in determining adaptation. Status: **Ongoing**.

__**Corn Breeder Nurseries**__, 170 lines at 2 locations.
These trials were established to determine agronomic and yield factors of corn varieties being developed by NDSU. The trials were planted at Hettinger and at Richardton. The information will assist the NDSU plant breeder in the development of this crop. The Richardton site was affected by severe drought and was not harvested. Status: **Ongoing**.

__**Skip Row Corn Demonstration**__, 3 treatments.
This field scale demonstration was established to determine agronomic and grain quality factors of corn planted in a Askip row@ configurations. Previous work has established a baseline of production practices to enhance grain production in SW ND. Skip row configurations in this demo showed a 67% increase in grain production over conventional row spacing. The

information will assist growers in limiting risk and enhance production. The trial was partially funded by Monsanto. Status: **Completed**.

Hay Barley Trial, 7 varieties.
This trial was composed of commercial and experimental varieties that were developed specifically for the production of livestock feed. The information is used to assist plant breeders in determining cultivar adaptation and feed values used in variety development. The trial is partially funded by WestBred LLC. Status: **Ongoing**

Off Station Variety Trials, Scranton, Regent, New Leipzig, Selfridge and Mandan.
Twelve hard red spring wheat varieties, six durum varieties, six barley varieties and seven oat varieties were tested for yield, agronomic and quality factors at five southwestern North Dakota locations. A field pea variety trial was also located at Wilton, HRWW at Mandan and grain corn at Regent. The trials are used for demonstration purposes during the annual field tours and to enhance the data base on variety adaptation. The information is used by growers to assist them with variety selection. These trials are located in farmer fields with cooperation from the NDSU Extension Service, the ARS Northern Great Plains Research Lab, Ducks Unlimited and Legume Logic. The Selfridge site was destroyed by hail and the Scranton and Regent sites were severely affected by drought. Status: **Ongoing**.

National Phenology Network, cloned Syringa chinensis lilac.
This study involves the observation and collection of biological information such as bud formation, flowering and leaf senescence based on a standard phenological clock (lilac). This is a cooperative project with the Dept. of Geography, Univ. of WI - Milwaukee. Status: **Ongoing.**

Foliar Disease Evaluations in HRSW and Durum, 45 HRSW and 45 durum varieties.
These evaluations were conducted to document varietal tolerance/sensitivity to foliar diseases. The information will assist growers in determining varietal susceptibility to several commonly occurring diseases. Status: **Ongoing**.

Control of Wheat Stem Maggot in Wheat, 7 treatments.
This trial was conducted to document the efficacy of various insecticide treatments on wheat stem maggot. Insecticide treatments included seed treatments, foliar treatments and combinations of seed and foliar treatments. The information will be used to gain a better understanding of control methods of this insect. Status: **?**

Evaluation of ET Herbicide for In-Crop Applications in Wheat, 7 treatments.
This trial was conducted to document the efficacy and crop safety of POST applied ET Herbicide to wheat. ET Herbicide is relatively new and is being evaluated as a post-applied herbicide to control certain broadleaf weeds in wheat. The information will be used by the manufacturer to gain a better understanding of potential herbicide use, weed efficacy and crop tolerance. This trial was funded by Nichino Corp. Status: **Completed.**

Evaluation of PrePare Herbicide on Light Soils in Spring Wheat, 14 treatments.
This trial was conducted to document the efficacy and crop safety of Everest Herbicide applied to light textured soils and in split applications and in combination with other herbicides for the control of grassy weeds (wild oat, Persian darnel, Japanese brome and downy brome). Everest Herbicide is used in wheat to control wild oat, foxtail and brome species. The information will be used by the manufacturer to establish guidelines for herbicide compatibility and use. This trial was funded by Arysta. Status: **Completed.**

Evaluation of Everest Herbicide for Grassy Weed Control in HRSW, 7 treatments.
This trial was conducted to document the efficacy and crop safety of Everest Herbicide applied in split applications and in combination with other herbicides for the control of grassy weeds (wild oat, Persian darnel, Japanese brome and downy brome). Everest Herbicide is used in wheat to control wild oat, foxtail and some brome species but does not control Persian darnel. The information will be used by the manufacturer to establish guidelines for herbicide compatibility and use. This trial was funded by Arysta. Status: **Completed.**

Evaluation of Fall and Spring Applications of Everest Herbicide for Grassy Weed Control in HRWW, 15 treatments.
This trial was conducted to document the efficacy and crop safety of Everest Herbicide applied in split applications and in combination with other herbicides for the control of grassy weeds (wild oat, Persian darnel, Japanese brome and downy brome) in winter wheat. Everest Herbicide is used in spring wheat to control wild oat, foxtail and some brome species but does not control Persian darnel. The information will be used by the manufacturer to establish guidelines for herbicide compatibility and use. This trial was funded by Arysta. Status: **Ongoing.**

Evaluation of Clearfield Wheat Varieties, 10 varieties x 2 herbicide treatments.
NDSU is developing HRSW varieties with genetic tolerance to imazimox and this trial is designed to demonstrate that tolerance. The information will be used by the plant breeder during submission of documentation for variety approval. This is a cooperative trial with the NDSU Dept. Plant Science and BASF. Status: **Ongoing.**

Evaluation of Field Bindweed Control, 8 treatments.
This trial was conducted to determine the effectiveness of various herbicides and herbicide combinations in controlling field bindweed. Field bindweed is a deep rooted perennial noxious weed and has few effective control options. The information will be used by producers for herbicide tank mix selection and application timing. Status: **Completed**.

Evaluation of Kixor Herbicide Applied Pre-Plant to Lentil, 5 treatments.
This trial was conducted to determine the effectiveness and crop safety of Kixor Herbicide applied to lentil. Kixor is a new herbicide being developed for the control of broadleaf weeds in several crops including lentil. The information will be used by the manufacturer to establish guidelines for herbicide compatibility and use. This trial was funded by BASF. Status: **Completed.**

Evaluation of Kixor Herbicide Applied Pre-Plant to HRSW, 4 treatments.
This trial was conducted to determine the effectiveness and crop safety of Kixor Herbicide applied to HRSW. Kixor is a new herbicide being developed for the control of broadleaf weeds in several crops including HRSW. The information will be used by the manufacturer to establish guidelines for herbicide compatibility and use. This trial was funded by BASF. Status: **Completed.**

Evaluation of Kixor Herbicide Applied to Summer Fallow, 4 treatments x 2 appl. timings.
This trial was conducted to determine the effectiveness Kixor Herbicide applied as an aid to chemical fallow. Kixor is a new herbicide being developed for the control of broadleaf weeds in several crops. The information will be used by the manufacturer to establish guidelines for herbicide compatibility and use. This trial was funded by BASF. Status: **Completed.**

Evaluation of Fall and Spring Applications of PowerFlex Herbicide for Grassy Weed Control in HRWW, 9 treatments.
This trial was conducted to document the efficacy and crop safety of PowerFlex Herbicide applied in split applications and in combination with other herbicides for the control of grassy weeds (wild oat, Persian darnel, Japanese brome and downy brome) in winter wheat. PowerFlex is a new herbicide for use in controlling tough grassy weeds in winter wheat. The information will be used by farmers and by the manufacturer to establish guidelines for herbicide compatibility and use. This trial was funded by Dow AgroSciencs. Status: **Ongoing.**

Evaluation of GoldSky Herbicide for Grassy Weed Control in HRSW, 17 treatments.
This trial was conducted to document the efficacy and crop safety of GoldSky Herbicide for the control of grassy weeds (wild oat, Persian darnel, Japanese brome and downy brome) in spring wheat. GoldSky is a new herbicide for use in controlling tough grassy weeds in spring wheat. The information will be used by farmers and by the manufacturer to establish guidelines for herbicide use. This trial was funded by Dow AgroSciencs. Status: **Completed.**

Evaluation of Orion Herbicide for Broadleaf Weed Control in HRSW, 11 treatments.
This trial was conducted to document the efficacy, crop safety and tank mix compatibility of Orion Herbicide for the control of broadleaf weeds in spring wheat. Orion is a new contact herbicide for use in small grains. The information will be used by farmers and by the manufacturer to establish guidelines for herbicide use. This trial was funded by Syngenta. Status: **Completed.**

Evaluation of Pinoxaden + Broadleaf Herbicide Combinations in HRSW, 12 treatments.
This trial was conducted to document the efficacy and crop safety of a new formulation of pinoxaden (Axial) used in combination with broadleaf herbicides in spring wheat. Pinoxaden is a popular herbicide that is very effective on most common grassy weeds found in small grains. The information will be used by the manufacturer to establish guidelines for herbicide compatibility and use. This trial was funded by Syngenta. Status: **Completed.**

Broadleaf Weed Control in Wheat, 14 treatments.
This trial was conducted to determine the effectiveness of various herbicides and herbicide combinations at controlling various broadleaf weeds in wheat. There are many different broadleaf weed herbicides on the market and many different herbicide combinations being used by producers. The trial looked at various herbicides and herbicide combinations for injury to the crop and for herbicide effectiveness at controlling weeds. The information will be used by producers for herbicide tank mix selection and by manufacturers for tank mix and application guidelines. Status: **Ongoing**.

Grassy Weed Control in Wheat, 14 treatments.
This trial was conducted to determine the effectiveness of various herbicides and herbicide combinations at controlling various grassy weeds in wheat. There are many different grassy weed herbicides on the market and many different herbicide combinations being used by producers. The trial looked at various herbicides and herbicide combinations for injury to the crop and for herbicide effectiveness at controlling weeds. The information will be used by producers for herbicide tank mix selection and by manufacturers for tank mix and application guidelines. Status: **Ongoing**.

Evaluation of Audit Herbicide for Broadleaf Weed Control in HRSW, 11 treatments.
This trial was conducted to document the efficacy, crop safety and tank mix compatibility of Audit Herbicide for the control of broadleaf weeds in spring wheat. Audit is a new broad spectrum herbicide for use in small grains. The information will be used by farmers and by the manufacturer to establish guidelines for herbicide use. This trial was funded by Arysta. Status: **Completed.**

Evaluation of Valor Herbicide as a Pre-harvest Desiccant in Lentil, 5 treatments.
This trial was conducted to document the efficacy of Valor Herbicide for pre-harvest use on lentil. The lack of good weed control methods in lentil often results in many green weeds at harvest time making harvest difficult and causing quality issues with the crop. The information will be used by researchers and manufacturers to gain a better understanding of potential herbicide use and weed efficacy. This trial was funded by Valent. Status: **Completed.**

Evaluation of Valor Herbicide as a Pre-harvest Desiccant in Safflower, 5 treatments.
This trial was conducted to document the efficacy of Valor Herbicide for pre-harvest use on safflower. The lack of good weed control methods in safflower often results in many green weeds at harvest time making harvest difficult and causing quality issues with the crop. The information will be used by researchers and manufacturers to gain a better understanding of potential herbicide use and weed efficacy. This trial was funded by Valent. Status: **Completed.**

Evaluation of glyphosate Efficacy on Tough Weeds in Summer Fallow, 7 treatments.
This trial was conducted to document the efficacy of various glyphosate and adjuvant formulations on tough weeds (large volunteer hrsw, downy brome, Japanese brome, wild oat, Persian darnel, wild buckwheat, kochia, Russian thistle, dandelion and field bindweed) in summer fallow. The information will be used by farmers, researchers and manufacturers to gain

a better understanding of potential herbicide/adjuvant use and weed efficacy. Status: **Completed.**

NDAWN and NOAA Weather Monitoring.

The Hettinger REC agronomy dept. is responsible for daily collection and transmission of weather data to the National Oceanic and Atmospheric Administration and for the maintenance of the North Dakota Ag. Weather Network weather station. Status: **Ongoing.**

Evaluation of Perennial Herbaceous Biomass Crops (Switchgrass).

This trial was established to document the appropriate grass species, harvest methods, production practices and economics in the production of perennial biomass stands. The trial was reseeded this year after very poor stand establishment in past years caused by drought. The information will assist in the feasibility of biomass production for conversion to bio-energy. This trial is being coordinated by the NDSU Central Grasslands REC, Streeter and is being funded by the ND Natural Resources Trust. Status: **Ongoing.**

2008 Barley Variety Trial - Continuously Cropped - No-till — New Leipzig, ND

Cooperator: Daryl Birdsall, New Leipzig

Variety	Plant Height	Test Weight	% Plump	Grain Protein	---- Grain Yield ---- 2006	2007	2008	Average Yield 2 yr	3 yr
	inches	lbs/bu	>6/64	%	----------- Bushels per acre -----------				
2 Row Types									
Rawson	27	46.4	92	12.2	30.3	59.0	30.4	44.7	39.9
Pinnacle	27	45.3	86	12.9	26.4	63.9	28.6	46.2	39.6
Conlon	28	46.9	93	13.5	25.7	45.9	25.6	35.8	32.4
2ND21867	25	46.2	88	13.6			33.1		
6 Row Types									
Stellar-ND	26	42.4	70	13.3	24.7	66.8	33.3	50.0	41.6
Robust	28	45.4	74	14.2	24.9	58.0	28.8	43.4	37.2
Trial Mean	27	45.5	84	13.3	28.2	64.4	30.0	--	--
C.V. %	2.6	4.4	7.4	1.8	9.8	4.7	9.8	--	--
LSD .05	1	NS	9	0.4	4.0	4.4	4.4	--	--
LSD .01	1	NS	13	0.5	5.5	6.0	6.1	--	--

NS = no statistical difference between varieties.

Planting Date: April 23, 2008
Harvest Date: August 8, 2008
Seeding Rate: 750,000 live seeds / acre (approx. 1.4 bu/A).
Previous Crop: 2005 & 2006 = hrww, 2007 = hrsw.
Note: The 2006 & 2008 trials sustained severe moisture stress.

2008 Hay Barley Variety Trial - Continuously Cropped – No-till Hettinger, ND

Variety	Days to Head	Plant Height	Harvest Moisture	Crude Protein	ADF	NDF	TDN	RFV	------------------ Yield ------------------ 2006	2007	2008	2 yr	3yr
	*	inches	%	%	%	%	%		------------ Tons / acre** -------------				
Stockford	72	38	40	14.8	31	50	68	122	2.33	1.86	5.15	3.50	3.11
Haybet	72	38	46	13.1	30	50	69	122	2.33	1.60	4.01	2.80	2.65
Drummond	68	39	47	14.2	26	46	73	138	1.93	1.67	4.12	2.90	2.57
Westford	74	37	53	15.3	30	50	69	123	2.21	1.65	3.30	2.48	2.39
Rawson	67	41	45	12.9	28	46	71	137		1.74	4.71	3.22	
BZ504-141	72	36	45	12.8	30	41	68	149		1.68	4.82	3.25	
BZ504-187	74	36	48	14.0	30	50	68	121			4.45		
Trial Mean	71	38	46	13.9	29	48	69	130	2.17	1.67	4.36	--	--
C.V. %	0.6	4.2	13.5	--	--	--	--	--	7.8	13.5	12.2	--	--
LSD .05	1	2	NS	--	--	--	--	--	0.26	0.33	0.79	--	--
LSD .01	1	3	NS	--	--	--	--	--	NS	0.44	1.08	--	--

* Days to Head = the number of days from planting to head emergence from the boot.
** Forage yields reported on a dry matter (DM) basis.
ADF = Acid Detergent Fiber
NDF = Neutral Detergent Fiber
TDN = Total Digestible nutrients
RFV = Relative Feed Value using NFTA guidelines
NS = no statistical difference between varieties

Planting Date: April 15, 2008
Harvest Date: July 15, 2008 (soft dough)
Seeding Rate: 750,000 live seeds/acre.
Previous Crop: 2005 = soybean, 2006 = hrsw, 2007 = barley.

2008 Barley Variety Trial - Continuously Cropped - No-till   Regent, ND

Cooperators: August and Perry Kirschmann, Regent

Variety	Plant Height	Test Weight	% Plump	Grain Protein	---- Grain Yield ---- 2006	2007	2008	Average Yield 2 yr	3 yr
	inches	lbs/bu	>6/64	%	----------- Bushels per acre -----------				
2 Row Types									
Rawson	26	40.7	72	12.3	61.0	86.0	23.8	54.9	56.9
Pinnacle	24	39.0	53	13.1	54.3	84.8	20.5	52.6	53.2
Conlon	28	44.4	77	13.4	57.5	84.2	12.3	48.2	51.3
2ND21867	25	43.2	37	14.4			16.2		
6 Row Types									
Stellar-ND	23	40.0	34	12.6	53.8	69.0	13.9	41.4	45.6
Robust	26	33.7	29	13.0	48.3	64.5	9.6	37.0	40.8
Trial Mean	25	40.5	50	13.1	57.4	80.0	16.1	--	--
C.V. %	9.8	--	14.3	7.1	5.5	4.5	27.4	--	--
LSD .05	NS	--	11	NS	4.6	5.3	6.6	--	--
LSD .01	NS	--	15	NS	6.2	7.2	9.2	--	--

NS = no statistical difference between varieties.

Planting Date: April 21, 2008
Harvest Date: August 8, 2008
Seeding Rate: 750,000 live seeds / acre (approx. 1.4 bu/A).
Previous Crop: 2005 = hrww, 2006 & 2007 = hrsw.
Note: The 2008 trial sustained severe heat and moisture stress.

2008 Barley Variety Trial - Continuously Cropped - No-till Scranton, ND

Cooperators: Neal and Justin Freitag, Scranton

Variety	Plant Height	Test Weight	% Plump	Grain Protein	---- Grain Yield ---- 2006	2007	2008	Average Yield 2 yr	3 yr
	inches	Lbs/bu	>6/64	%	----------- Bushels per acre -----------				
2 Row Types									
Rawson	27	42.2	28	15.1	90.5	65.4	22.1	43.8	59.3
Pinnacle	24	43.8	51	16.8	85.5	59.6	20.6	40.1	55.2
Conlon	28	--	46	17.1	82.0	42.1	4.3	23.2	42.8
2ND21867	26	42.8	40	17.6			24.7		
6 Row Types									
Stellar-ND	24	39.2	35	15.9	77.3	68.7	15.6	42.2	53.9
Robust	27	40.5	35	16.6	77.9	43.1	15.8	29.4	45.6
Trial Mean	26	41.7	39	16.5	85.2	61.1	17.2	--	--
C.V. %	4.1	3.0	52	3.8	6.0	5.4	28.5	--	--
LSD .05	2	1.9	NS	0.9	7.4	4.9	7.4	--	--
LSD .01	2	2.7	NS	1.3	10.1	6.6	10.2	--	--

NS = no statistical difference between varieties.

Planting Date: April 14, 2008
Harvest Date: August 5, 2008
Seeding Rate: 750,000 live seeds / acre (approx. 1.4 bu/A).
Previous Crop: 2005 & 2006 = hrww, 2007 = hrsw.
Note: The 2008 trial sustained severe heat and moisture stress.

2008 Barley Variety Trial – Continuously Cropped - No-till Hettinger, ND

Variety	Days to Head	Plant Height	Lodging	Test Weight	% Plump	Grain Protein	----- Grain Yield ----- 2006	2007	2008	Avg. Yield 2 yr	3 yr
	*	Inches	**	lbs/bu	>6/64	%	---------- Bushels per acre ----------				
2 Row Types											
Haxby	77	39	4.0	46.0	88	16.5	84.6	97.6	91.1	94.4	91.1
Bowman	73	41	4.5	47.8	86	14.6	80.3	95.1	88.1	91.6	87.8
Conlon	73	42	1.0	47.7	94	14.9	78.3	78.0	102.7	90.4	86.3
Eslick	78	39	3.8	45.6	77	14.0	77.4	90.7	86.3	88.5	84.8
Pinnacle	76	38	1.2	47.2	91	13.5	82.2	75.6	94.0	84.8	83.9
Rawson	74	42	3.0	45.7	87	13.8	75.5	90.9	80.6	85.8	82.3
AC Metcalfe	78	44	4.2	42.5	62	16.6	74.7	75.9	67.4	71.6	72.7
Harrington	80	41	4.0	40.2	31	16.9	59.7	74.3	58.7	66.5	64.2
Conrad	79	38	2.5	44.7	81	15.9		89.8	78.3	84.0	
Scarlett	81	35	3.0	44.6	81	14.5		76.0	89.5	82.8	
Hockett	78	38	4.2	43.2	58	16.2		82.8	75.1	79.0	
Geraldine	79	38	3.2	43.9	70	14.3		85.7	70.4	78.0	
CDC Copeland	80	42	2.8	42.4	69	15.3		76.1	73.9	75.0	
2ND21867	74	40	3.0	46.4	87	15.0			77.1		
6 Row Types											
Tradition	76	40	4.8	45.7	82	14.6	73.9	87.1	88.0	87.6	83.0
Lacey	76	40	6.0	43.5	64	14.2	79.3	88.9	76.7	82.8	81.6
Legacy	78	42	7.8	40.5	50	14.8	77.1	78.0	69.0	73.5	74.7
Stellar-ND	75	40	8.5	40.0	60	14.9	74.0	86.4	60.4	73.4	73.6
Drummond	75	41	6.5	44.1	75	14.8	72.1	81.7	66.2	74.0	73.3
Robust	77	44	6.5	46.6	59	14.8	70.8	79.5	64.2	71.8	71.5
Rasmusson	76	39	6.8	43.5	41	15.0		86.9	63.7	75.3	
ND20448	76	41	7.0	44.0	66	14.9			67.7		
ND20299	74	42	5.0	44.9	86	13.8			85.5		
M122	74	43	6.2	44.0	53	15.4			79.9		
6B01-2218	74	40	7.8	40.7	54	15.9			58.4		
Trial Mean	76	40	4.7	44.2	70	15.0	76.0	81.8	76.5	--	--
C.V. %	0.9	3.5	47.1	2.5	12.8	4.6	9.7	7.6	8.4	--	--
LSD .05	1	2	3.1	1.5	13	1.0	10.4	8.8	9.0	--	--
LSD .01	1	3	4.1	2.0	17	1.3	13.8	11.7	12.0	--	--

* Days to Head = the number of days from planting to head emergence from the boot.
** Lodging: 0 = none, 9 = lying flat on ground.

Planting Date: April 14
Harvest Date: August 6
Seeding Rate: 750,000 live seeds / acre (approx. 1.4 bu/A).
Previous Crop: 2007 = hrsw, 2006 = field pea, 2005 = fallow.
Note: Hot and dry weather conditions in July caused low test weights.

Date/Feeks Growth Stage When Scored				10.1	11	25-Jul		
ENTRY NO.	CULTIVAR/ DESIGNATION	YIELD	TEST WT.	HEADING DATE	HEIGHT	LODGING	PLUMP >2.4mm 2r	Protein
		bu/A	lbs/bu	Julian	cm	0-9*	>2.2mm 6r	%
1	Steptoe	52.57	30.71	177	103.3	5.7	25.8	12.8
2	Baronesse	68.54	40.60	184	88.3	1.3	15.3	18.3
3	Morex	44.11	35.97	176	103.7	8.7	10.6	16.8
4	Harrington	55.94	36.07	182	95.0	1.7	38.3	15.4
5	Legacy	51.68	32.91	181	99.3	8.3	8.7	15.5
6	Conlon	81.56	39.24	175	103.0	5.3	64.6	14.9
7	2B02-2925	53.23	35.15	178	84.7	1.3	18.5	15.3
8	2B03-3719	63.73	37.23	181	90.7	0.3	29.4	17.1
9	01Ab7163	54.67	36.10	182	87.0	1.3	12.3	15.9
10	02Ab17060	61.47	36.62	177	88.0	4.7	15.9	16.5
11	MT010158	55.93	37.92	183	93.3	1.3	26.6	17.2
12	MT010160	55.62	38.70	183	94.3	2.7	20.2	19.1
13	MT020155	57.99	34.76	177	92.7	2.7	6.6	18.1
14	MT020204	58.05	38.78	178	93.7	2.0	7.4	20.7
15	MT030042	65.24	39.00	178	96.0	3.7	5.7	18.9
16	MT040073	61.28	39.52	183	85.7	2.7	10.0	18.6
17	2ND21867	51.29	38.87	176	91.0	5.7	22.6	17.3
18	2ND22182	59.08	38.89	175	97.0	3.0	20.5	16.2
19	2ND22927	55.68	38.31	177	93.0	5.3	32.2	17.8
20	UT03B1960-483	37.39	31.28	175	99.3	8.7	6.5	15.6
21	UT04B2041-42	52.20	33.88	177	89.7	7.3	5.0	16.9

No. of Reps: 3
Harvest Plot Area (sq.ft.): 55.5
Fertilizer: 103-52-0 (N-P-K)

Seed Date: April 15
Harvest Date: July 25

2008 Buckwheat Variety Trial – Continuously Cropped No-till — Hettinger, ND

Variety	Days to Bloom	Test Weight	1000 Seed Weight	---- Grain Yield ---- 2005	2006	2008	Average Yield 2 yr	3 yr
	*	lbs/bu	grams	----------- Pounds per acre -----------				
Manor	36	31.0	24.6	666	588	762	675	672
Mancan	36	28.6	24.2	776	560	649	604	662
Koma	38	27.8	26.2		775	765	770	
Trial Mean	37	29.1	25.0	587	613	726	--	--
C.V. %	0.0	6.3	5.1	30.2	17.3	15.3	--	--
LSD .05	1	NS	NS	NS	160	NS	--	--

* Days to Bloom = the number of days from planting to 10% bloom.

Planting Date: June 9, 2008
Harvest Date: September 19, 2008
Seeding Rate: 700,000 live seeds / acre.
Previous Crop: 2004 & 2005 = barley, 2007 = hrsw.
NS = no statistical difference between varieties.

2008 Spring Camelina Nitrogen Fertility Trial - No-till — Hettinger, ND

Nitrogen Fertility	Plant Stand	Days to Bloom	Duration of Flowering	Days to Mature	Plant Height	Test Weight	Oil Content	Seed Yield
lbs/A*	# / sq ft	**	Days	**	inches	lbs/bu	%	lbs/A
60	6.6	60	15	90	26	48.2	32.7	1018
100	5.6	60	15	90	27	49.7	34.6	974
150	6.1	59	16	90	27	49.9	34.5	907
Trial Mean	6.1	60	15	90	27	49.2	33.9	966
C.V. %	31.1	0.6	5.9	0.6	11.6	1.9	4.8	7.3
LSD .05	NS	NS	NS	NS	NS	NS	NS	NS

*Nitrogen Fertility = pounds per acre of actual N from residual soil N (0 – 24”) + N fertilizer (46-0-0).
** Days to Bloom and Days to Mature = the number of days from planting to 10% bloom or maturity.
NS = no statistical difference between nitrogen rates.

Variety = Suneson
Planting Date: April 23
Harvest Date: July 28
Previous Crop: hrsw
Note: The 2008 trial sustained severe late season heat and moisture stress.

2008 Spring Camelina Seeding Rate Trial - No-till — Hettinger, ND

Seeding Rate	Plant Stand	Days to Bloom	Duration of Flowering	Days to Mature	Plant Height	Test Weight	Oil Content	Seed Yield
lbs/A	# / sq ft	*	Days	*	inches	lbs/bu	%	lbs/A
2	7.0	60	16	87	30	46.8	34.2	687
4	7.6	60	16	88	32	49.8	34.2	850
6	13.0	60	16	84	29	47.6	33.9	662
8	12.4	60	14	83	30	45.7	33.6	783
10	12.9	60	14	82	31	47.9	33.3	799
Trial Mean	10.6	60	15	85	30	47.6	33.8	756
C.V. %	27.3	0.8	6.8	2.9	5.1	3.9	3.0	17.4
LSD .05	4.4	NS	NS	4	NS	NS	NS	NS
LSD .01	NS	NS	NS	NS	NS	NS	NS	NS

* Days to Bloom and Days to Mature = the number of days from planting to 10% bloom or maturity.
NS = no statistical difference between seeding rates.

Variety = Suneson
Planting Date: April 23
Harvest Date: July 28
Previous Crop: hrsw
Note: The 2008 trial sustained severe late season heat and moisture stress.

2008 Spring Camelina Variety Trial - Continuously Cropped - No-till Hettinger, ND

Variety	Days to Bloom	Duration of Flowering	Days to Mature	Plant Height	Test Weight	Oil Content	----- Grain Yield ----- 2007	2008	Avg.
	*	Days	*	inches	lbs/bu	%	- pounds per acre -		
Robinson	60	16	84	29	50.1	32.7	1707	832	1270
Ligera	60	14	85	31	48.8	34.8	1360	1136	1248
Galina	60	15	83	29	51.3	33.3	1387	899	1143
Celine	62	14	86	31	46.3	33.9	1173	899	1036
Suneson	60	15	84	29	49.7	33.5	1173	828	1000
Gold of Pleasure	60	15	84	31	46.3	34.4	800	1018	909
Blaine Creek	60	17	84	30	48.3	31.7	1013	733	873
Calena	60	14	83	28	47.1	33.3		930	
CO54-97	59	15	84	29	49.9	33.9		745	
CO46	58	16	83	29	47.3	34.4		837	
Trial Mean	60	15	84	30	48.5	33.6	--	886	--
C.V. %	0.8	5.8	0.9	6.5	4.2	2.8	--	13.0	--
LSD .05	1	1	1	NS	2.9	1.4	--	168	--
LSD .01	1	2	1	NS	4.0	1.9	--	226	--

* Days to Bloom and Days to Mature = the number of days from planting to 10% bloom or maturity.
NS = no statistical difference between varieties.

Planting Date: April 23, 2008.
Harvest Date: July 28, 2008.
Seeding Rate: 6 lbs / acre.
Previous Crop: 2006 = barley, 2007 = hrsw.
Note: The 2008 trial sustained severe late season heat and moisture stress.

2008 Dormant Seeded Canola Trial - No-till | Hettinger, ND

Type	Variety	Date of First Bloom	Date of Last Bloom	Test Weight	Oil Content	Seed Yield
Fall Seeded: Nov. 16				lbs/bu	%	lbs/A
Winter	HyCLASS 107w	June 29	July 22	--	--	0
Spring	IS 357 Mag	June 9	July 4	50.7	39.0	1337
Winter	Visby		Poor spring emergence			0
Spring Seeded: April 9						
Winter	HyCLASS 107w	July 10	July 22	--	--	0
Spring	IS 357 Mag	June 14	July 4	50.8	38.6	1562
W. x Spg	Sprinter	June 18	July 11	49.7	38.6	792
C.V. %		0.5	0.5	3.5	2.8	10.2
LSD .05		1 day	1 day	NS	NS	216

NS = no statistical difference between varieties or seeding dates.

Seeding Rate: 500,000 live seeds/A
Harvest Date: August 4
Note: The trial sustained severe late season heat and moisture stress.

2008 Spring Canola Herbicide Systems and Hybrids Comparison Trial — Hettinger, ND

Variety	Seedling Vigor	Harvest Population	Days to 10% Bloom	Days to 90% Bloom	Duration of Bloom	Days to Mature	Plant Height	Lodging	Test Weight	Seed Yield
	1 - 9*	# / sq ft	**	**	days	**	cm	1 - 9***	lbs/bu	lbs/a
RR1	2.5	8.2	58	72	14	90	104	1	50.0	889
RR2	1.0	10.7	57	70	13	87	103	1	49.7	1091
RR3	1.0	12.6	56	70	14	86	101	1	50.8	1000
RR4	1.0	12.8	57	70	14	88	107	1	52.5	897
RR5	1.0	10.4	57	70	13	88	108	1	50.6	1147
RR6	1.0	14.1	57	71	14	89	102	1	51.1	1201
RR7	1.5	11.9	58	73	14	89	113	1	50.7	1166
RR8	2.8	8.4	56	73	17	87	106	1	47.9	699
RR9	1.2	13.7	57	70	14	88	102	1	50.5	880
RR13	1.8	14.9	55	72	16	86	108	1	51.3	727
RR14	1.0	13.2	58	72	14	89	103	1	51.2	921
LL1	1.0	13.1	56	70	14	86	100	1	53.5	820
LL2	1.0	15.4	58	71	13	88	107	1	53.2	823
RR untrt	1.0	9.4	56	70	14	87	101	1	50.1	878
LL untrt	1.0	13.7	56	70	14	85	96	1	49.7	889
Trial Mean	1.3	12.2	57	71	14	88	104	1	50.8	935
C.V. %	28.9	30.9	0.5	1.1	5.7	0.8	7.2	0	4.5	9.3
LSD 5%	0.5	NS	1	1	1	1	NS	NS	NS	124
LSD 1%	0.7	NS	1	2	2	1	NS	NS	NS	166

* Seedling Vigor: 1 = excellent, 9 = poor.
** Days after planting.
*** Lodging: 1 = none, 9 = lying flat on ground.
NS = No statistical difference between varieties.

Planting Date: April 28
Date of Emergence: May 11
Harvest Date: July 31
May 20: 11 oz/A R'up Weather Max applied to 1 leaf canola.
June 1: 32 oz/A Liberty Herbicide applied to 4 leaf canola.
June 3: 11 oz/A R'up Weather Max applied to 5 leaf canola.
Trial was planted into a continuously cropped no-till system.
Previous Crop = field pea.
The trial sustained late season heat and moisture stress resulting in low test weights and reduced yields.

2008 Canola Variety Trial – Continuously Cropped – No-till Hettinger, ND

Brand	Variety	Days to Bloom	Duration of Flowering	Days to Mature	Plant Height	Test Weight	Oil Content	Seed Yield 2007	Seed Yield 2008
			days		inches	lbs/bu	%	--- lbs/A ---	
Roundup Ready Varieties									
Brett Young	4362RR	56	14	88	46	48.2	34.3		818
	6051RR	56	15	90	43	49.8	37.4		1104
	6235RR	58	14	90	44	48.9	37.1		1085
Croplan	HyCLASS 924	55	16	86	43	51.0	36.4	1643	1202
Genetics	HyCLASS 940	55	14	87	38	51.3	37.0	1725	1162
	HyCLASS 410	57	14	88	45	53.0	37.1	1314	1259
Dekalb	DKL 71-55	56	14	90	42	50.1	39.1		1429
	DKL 52-41	56	14	88	41	51.7	37.2	1314	1169
	DKL 3042	55	14	88	40	50.8	37.3		1303
Interstate	IS3057RR	53	16	84	40	50.1	37.8	1725	1197
Seed	IS7145RR	57	15	90	45	49.2	37.5	1602	1104
Monsanto	Z4409	56	14	88	43	50.9	37.2		1202
	G7003	56	14	87	42	50.4	37.0		1070
	G72061	57	14	90	41	49.8	38.0		1059
	G64034	57	14	89	42	52.9	37.4		1406
	G75011	56	14	88	43	50.6	37.3		1282
	G75449	56	15	88	44	49.9	36.0		1248
	G67012	56	14	89	42	49.8	37.3		1242
	G72021	55	15	88	40	51.9	39.1		1548
Pioneer	45H21	57	13	89	42	50.4	37.4		1219
Hi-Bred	06N530R	56	13	88	46	50.8	37.8		1288
Proseed	50 Calibre	55	16	90	41	49.5	37.4	1396	1620
	30 Calibre	58	14	91	43	49.0	37.5	1232	1410
	2066	56	14	86	43	50.0	37.6	1150	1210
	2030	55	16	90	41	49.7	38.0		1564
Liberty Link Varieties									
Croplan Gen.	Freedom 84S01	56	14	87	40	49.0	38.6	2054	1192
Trial Mean		56	14	88	42	50.3	37.4	1539	1246
C.V. %		0.7	4.7	1.2	9.0	4.0	1.9	15.2	11.2
LSD .05		1	1	1	NS	NS	1.0	333	197
LSD .01		1	1	2	NS	NS	1.3	443	262

NS = no statistical difference between varieties.
Planting Date: April 23 Harvest Date: July 31 Previous Crop: Field pea

2008 Chickpea Variety Trial – Continuously Cropped – No-till Hettinger, ND

Variety	Days to Bloom	Duration of Bloom	Days to Mature	Plant Height	1000 Seed wt.	Test Weight	Seed Size (mm) >9	8-9	<8	Seed Yield 2006	2007	2008	2 yr	3 yr
	*	days	*	inches	grams	lbs/bu	--------- % --------			----------- pounds per acre ------------				
Large Kaboli Types														
Sierra	62	12	94	17	509	45.1	32	42	26	1550	1726	1933	1830	1736
Dylan	58	16	95	14	527	47.0	40	42	18	1634	1576	1933	1754	1714
Troy	63	12	96	14	556	44.5	58	27	15	980	1874	1468	1671	1441
Small Kaboli Type														
CDC Frontier	62	14	95	17	402	50.1	--	--	--		2599	2112	2356	
B-90	62	14	94	16	298	49.0	--	--	--	2138	--	2314		
Desi Type														
CDC Anna	61	16	92	18	237	41.2	--	--	--		2569	2311	2440	
Experimental														
HB 14	61	14	94	17	504	47.9	41	40	19			1747		
HB 19	59	15	93	13	521	49.0	33	43	24			2174		
CA9890233W	62	12	96	16	523	46.1	43	35	22		1444	1434		
CA0090B347C	62	12	93	15	470	50.8	19	39	42		2115	1774		
Trial Mean	61	14	94	16	455	47.1	38	38	24	1652	1984	1920	--	--
C.V. %	0.7	5.1	0.9	6.7	3.9	1.7	18.1	13.3	21.6	6.8	9.7	8.8	--	--
LSD .05	1	1	1	2	26	1.2	10	8	8	168	283	245	--	--
LSD .01	1	1	2	2	35	1.6	14	10	10	233	385	331	--	--

* Days to Bloom and Days to Mature = the number of days from planting to 10% bloom and to maturity.

Planting Date: April 28, 2008
Harvest Date: August 15, 2008
Seeding Rate: 175,000 live seeds / acre.
Previous Crop: 2005 = barley, 2006 & 2007 = hrsw.

2008 Western Regional Chickpea Nursery – 0899 - No-till Hettinger, ND

Cultivar	Days to Bloom	Duration of Bloom	Days to Mature	Plant Height	Dis.*	1000 Seed wt.	Test Weight	Seed Size >9mm	Seed Size 8-9mm	Seed Size <8mm	Seed Yield
		days		cm	0-9	grams	lbs/bu	%	%	%	lbs/Ac
Dwelley	69	13	105	42	9	424	51.3	25	30	45	1125
Sierra	68	11	103	43	5	464	51.6	46	34	20	1313
Troy	68	13	105	45	2	517	47.9	55	22	23	1193
CA0090B347C	65	15	101	43	1	466	51.8	24	31	45	1428
CA0390B007C	67	15	104	38	1	477	51.5	30	64	6	1220
CA0469C020C	63	19	101	38	1	388	50.8	7	48	45	1371
CA0469C025C	66	16	101	35	1	364	49.7	12	40	47	1679
CA04900443C	68	13	103	41	2	513	49.2	38	37	25	1260
CA04900612C	68	12	105	40	1	516	49.8	50	31	19	1107
CA04900716C	69	11	103	46	6	509	50.2	42	36	21	1137
CA04900851C	69	12	103	46	2	503	50.5	38	38	24	1305
CA04900509C	63	18	103	47	4	470	50.1	28	34	38	1065
Trial Mean	67	14	103	42	3	465	50.4	33	36	31	1267
C.V. %	0.7	5.0	0.6	8.9	--	9.1	2.7	--	--	--	10.9
LSD .05	1	1	1	6	--	72	NS	--	--	--	234
LSD .01	1	2	1	NS	--	98	NS	--	--	--	306

* Ascochyta: 0 = none, 9 = completely infected (dead). 1 rep only.
NS = no statistical difference between cultivars.

Planting Date: April 23, 2008
Harvest Date: August 15, 2008
Previous Crop: hrsw
Note: The trial sustained severe late season heat and moisture stress.

Corn Row Spacing

Eric Eriksmoen*, Research Agronomist

Research on corn production conducted at the Hettinger Research Extension Center in 1998 – 2001 showed maximum grain yields were achieved when corn was seeded in wide rows (28" or greater) and at higher plant populations (24,000 vs. 18,000 plants per acre). It is believed that wider row spacing provide corn plants with more area from which to draw soil moisture during dry periods and higher plant populations allow for increased yield potential.

Row Spacing 1998 – 2001 Combined Means*

Row Spacing	Test Weight	Grain Yield
inches	Lbs/bu	Bu/Ac
14	56.1	49.7
28	56.7	55.2
42	56.2	55.7
LSD .05	NS	3.9

*Combined means of 3 hybrids and 4 plant populations over 3 years.

In 2003, research was conducted on "twin row" configurations, a concept where two rows are seeded relatively close together with a wider row spacing between twin rows. This type of row configuration provided for wider in-row spacing between plants while maintaining a wide between-row spacing. The 2003 growing season was marred by a severe drought resulting in very poor yields, however, the twin row configuration out yielded the conventional row spacing by 16%. Area growers expressed interest in the concept, however could not justify the cost of the specially designed planter.

2003 Twin Row Configurations Combined Means*

Row Spacing	Test Weight	Grain Yield
inches	Lbs/bu	Bu/Ac
7" twin rows	54.6	24.8
14" twin rows	54.2	21.0
Conventional 28" rows	53.8	21.4
LSD .05	NS	2.2

*Combined means of 2 hybrids and 2 plant populations.

In 2004, research was initiated on a "skip row" configuration, where rows are seeded at a conventional row spacing but every third row is left blank. This configuration gives each planted row an adjacent wide row spacing (56") and is achieved with the use of existing conventional corn seeding equipment. The 2004 growing season was marred by a hard frost on June 18 and relatively cool and dry conditions throughout the rest of the shortened season. Grain maturity was not achieved, resulting in very poor yields and light test weights. Despite the adverse growing conditions, grain yields were almost 60% higher for corn grown with the skip row configuration compared to the conventional row configuration.

2004 Skip Row Configurations	Combined Means*	
Row Configuration	Test Weight	Grain Yield
	Lbs/bu	Bu/Ac
Skip Row	41.5	16.1
Conventional 28" rows	42.6	10.2
LSD .05	NS	1.3

*Combined means of 2 hybrids and 2 plant populations.

In 2005 and 2007, research was expanded on this concept to include four different row configurations: two planted rows with one skipped row (2 x 1), one planted row with one skipped row (1 x 1), two planted rows with two skipped rows (2 x 2) and a conventional 28" row configuration. The trial was seeded with one hybrid at a population of 24,000 plants per acre. The 2005 growing season was generally warm and dry, and grain maturity was achieved. The 2007 growing season was generally warm and moist with a hot and dry period during pollen shed and silking. On average, the 1x1 and 2x1 row configurations out yielded the conventional row configuration by 69% and 76% respectively. The 2x2 row configuration yielded considerably less than the other row configurations in 2005. This may be due to detrimental in-row plant competition caused by corn plants being spaced too close together (as row spacing increases, in-row spacing between plants narrows).

2005 & 2007 Skip Row Configurations						Means
Row Configuration	Test Weight - lbs/bu			Grain Yield - bu/A		
	2005	2007	Avg	2005	2007	Avg.
Conventional 28" rows	53.5	55.7	54.6	32.2	34.3	33.2
2 planted x 1 skipped	53.3	57.4	55.4	44.9	72.2	56.1
1 planted x 1 skipped	54.2	56.8	55.5	40.6	72.0	58.4
2 planted x 2 skipped	52.6	55.5	54.0	22.8	66.9	44.8
LSD .05	NS	NS	--	10.9	21.3	--

In 2008 the skip row concept was applied on an 80 acre unreplicated field with strips planted in 1 x 1 and 2 x 1 row configurations and compared to conventionally planted 30" rows. The field was a fine sandy loam soil. The growing season started with almost no stored soil moisture but with good spring precipitation. The late summer was very typical with hot and dry growing conditions. Despite relatively low grain yields, the 1 x 1 and 2 x 1 skip row configurations out yielded the conventional row spacing by 41 and 42 percent respectively.

2008 Skip Row Configurations	
Row Configuration	Grain Yield - bu/A
Conventional 30" rows	24.1
2 planted x 1 skipped	34.2
1 planted x 1 skipped	33.9

In conclusion, the use of skip row spacing should be utilized as an important management tool for optimizing grain yields in the Western Dakota's where late season moisture stress is typical. During years of optimum growing conditions, where precipitation is not a limiting factor, the use of skip rows does not hinder grain yields over conventional row spacing. Relatively high plant populations (18,000 - 20,000 plants/acre) also need to be maintained, regardless of row spacing, to optimize grain yield potential.

Acknowledgements: Thank you Monsanto for providing all of the seed and chemicals on the 2008 farm scale trial.

Related Info: http://cropwatch.unl.edu/Input$/skip-row.htm

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Skip Row Corn - No-till Hettinger, ND

Row Configuration	---- Grain Yield ---- 2005	2007	2008	Mean Yield
	------ bushels per acre ------			
Conventional 28” rows	32.2	34.3	24.1	30.2
1 planted x 1 skipped	40.6	72.2	33.9	48.9
2 planted x 1 skipped	44.9	72.0	34.2	50.4
2 planted x 2 skipped	22.8	66.9	--	--
Trial Mean	35.1	61.4	--	--
C.V. %	16.3	10.9	--	--
LSD 5%	10.9	21.3	--	--

Planting Date: May 3, 2005, May 3, 2007, May 15, 2008
Harvest Date: October 3, 2005, October 3, 2007, October 7, 2008
Hybrid: 2005 & 2007 =Mycogen 2P174, 2008 = DKC35-19
Plant Population: 18,000 plants / acre.
Note: Yields are adjusted to 13.5% moisture. The 2005 and 2008 trials sustained severe late season moisture stress.
All seed and chemicals for the 2008 trial were provided by Monsanto.

2008 Roundup Ready Corn Trial - Continuously Cropped - No-till Hettinger, ND

Brand	Hybrid	GDU's	Relative Maturity	Days to Silk	Test Weight	----- Grain Yield ---- 2007	2008	Avg.
		*	days		lbs/bu	- bushels per acre -		
IntegraSeed	6385 R	2060	85	88	50.6	78.8	27.7	53.2
	6385 VT3	2060	85	88	50.4		29.3	
	9361 VT3	2185	86	88	51.5		26.7	
	6780 R	1930	80	84	49.2	82.4	25.5	54.0
Mycogen	2P174	2220	85	88	48.6		26.5	
	2J272	2250	87	90	53.2	78.5	27.0	52.8
	2D326	2370	92	90	48.6	68.6	34.7	51.6
	2T220	2240	87	90	50.3		32.1	
Peterson	54M83	2030	83	88	53.3		35.3	
Farms Seed	27L84	2035	84	88	48.6		26.8	
Proseed	581RRBtCRW	1970	83	89	50.2	59.8	21.0	40.4
	884 VT3	2150	92	88	57.3		34.0	
	787 VT3	2030	87	88	50.0		21.0	
Trial Mean				88	50.9	74.4	28.3	--
C.V. %				0.9	3.1	7.5	8.2	--
LSD 5%				1	2.3	8.3	3.3	--
LSD 1%				2	3.1	11.4	4.5	--

*Growing Degree Units to Black Layer.

Planting Date: May 14, 2008
Harvest Date: October 8, 2008
Seeding Rate: 26,500 seeds / acre, thinned to 24,000 plants / acre.
Row Spacing: 28"
Soil Type: Sandy Loam
Previous Crop: HRSW

Note: Yields are adjusted to 13.5% moisture. The 2008 trial sustained severe moisture stress.

2008 Crambe Variety Trial - Continuously Cropped - No-till Hettinger, ND

Variety	Days to Bloom	Days to Mature	Plant Height	Test Weight	Oil Content	-------- Yield -------- 2006	2007	2008	Avg. Yield 2 yr	3 yr
	*	*	inches	lbs/bu	%	-------------- lbs / ac --------------				
BelAnn	54	84	33	26.3	27.0	933	1837	1513	1675	1428
Meyer	51	82	31	24.8	27.3	1176	1111	1367	1239	1218
1030	51	81	32	25.0	27.6			1600		
1411	51	82	31	25.7	28.2			1630		
2006-22	49	80	33	25.8	29.8			1757		
2006-51	52	81	33	25.4	28.0			1482		
2006-80	51	82	32	25.4	28.1			1755		
N2006-81	51	82	35	25.5	29.1			1760		
N2006-90	54	83	33	26.7	27.8			1539		
Trial Mean	52	82	33	25.6	28.1	1089	1459	1600	--	--
C.V. %	0.9	1.2	7.3	4.7	5.6	14.6	13.7	8.4	--	--
LSD .05	1	1	NS	NS	NS	230	286	197	--	--
LSD .01	1	2	NS	NS	NS	NS	382	266	--	--

* Days to Bloom and Days to Mature = the number of days from planting to 10% flowering and maturity.
NS = no statistical difference between varieties.

Planting Date: Mat 5, 2008
Harvest Date: August 4, 2008
Seeding rate: 25 lbs/A
Previous Crop: 2005 = soybean, 2006 = barley, 2007 = hrsw.

Amanda Schoch & Kayla Hutzenbiler, IPM Crops Scout, Dickinson Res. Ext. Center

Variety	Wheat Stem Maggot	------ Tan Spot ------ Incidence	Severity	---- Septoria ---- Incidence	Severity
	%	%	%	%	%
Mountrail	0	60	2	0	0
Ben	20	40	2	0	0
Lebsock	30	20	1	0	0
Grenora	20	40	2	0	0
Divide	10	30	1	0	0
Alkabo	10	60	3	0	0
Maier	20	60	2	0	0
Pierce	0	60	4	0	0
Dilse	20	50	4	0	0
Alzada	20	90	3	80	2
AC Navigator	20	60	2	40	2
Ac Napoleon	20	50	5	30	1
AC Commander	0	60	2	30	1
Rugby	40	70	3	50	2
DG Star	20	60	3	50	2
Wales	30	90	4	20	1
Grande Doro	10	60	3	30	1
D00095	20	30	1	10	1
D00752	10	40	1	10	1
D021110	10	40	1	20	1
D021657	20	30	2	30	1
D021667	20	10	1	30	1
D03004	10	20	2	10	2
D03028	20	30	3	30	2
D03708	30	0	0	20	1
D031350	10	10	1	0	0
D031527	40	30	1	0	0
D031606	50	10	1	20	1
D031607	20	20	1	20	1
D031671	30	0	0	30	1
D04008	10	0	0	30	1
D04102	40	30	2	0	0
D04573	30	50	1	20	1
D04581	10	30	2	20	1
D04586	10	30	1	0	0
D04630	20	30	1	10	1

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D041603	60	0	0	20	2
D041642	10	40	2	0	0
D041708	30	0	0	30	1
D041733	20	60	2	0	0
D041734	20	40	2	30	2
D041735	30	30	1	0	0
DH05047	20	20	1	60	2
DG2166	70	60	1	20	1
Strongfield	10	30	1	30	2

Amanda Schoch & Kayla Hutzenbiler, IPM Crops Scout, Dickinson Res. Ext. Center

Variety	Wheat Stem Maggot	------ Leaf Rust ----- Incidence	Severity	------ Tan Spot ------ Incidence	Severity	---- Septoria ---- Incidence	Severity
	%	%	%	%	%	%	%
Glenn	10	0	0	40	2	20	1
Steele-ND	0	0	0	20	1	40	1
Howard	20	0	0	40	1	10	1
Faller	10	0	0	30	1	0	0
ND901CL	0	0	0	10	1	40	2
Granger	0	0	0	10	1	30	10
Kelby	0	0	0	40	2	20	3
Kuntz	10	20	1	40	7	10	1
Choteau	0	0	0	30	1	10	1
NDSW0449	30	40	1	30	3	0	0
ND806	10	0	0	50	5	30	1
ND809	20	10	1	40	6	20	1
Alsen	30	0	0	40	1	0	0
Reeder	0	0	0	50	3	20	6
Parshall	0	0	0	0	0	50	4
Briggs	10	0	0	40	1	20	1
Fryer	40	0	0	20	1	30	2
Knudson	40	0	0	30	1	50	3
Granite	10	0	0	50	1	30	1
RB07	10	0	0	0	0	10	1
AP604CL	20	40	1	0	0	30	1
Rush	20	0	0	40	6	20	2
Traverse	0	0	0	40	1	30	6
Samson	40	10	1	40	2	20	1
Vantage	20	0	0	30	1	60	4
Breaker	10	0	0	40	3	10	1
Blade	20	0	0	10	1	40	3
ND807	30	0	0	20	1	0	0
ND808	0	0	0	10	1	40	1
ND810	0	0	0	30	1	10	1
ND811	0	0	0	0	0	10	1
ND812	0	0	0	20	2	30	3
ND813	20	0	0	40	5	30	1
ND814	0	0	0	20	4	0	0
ND815	40	0	0	10	1	20	2
ND816	10	0	0	20	5	40	7

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ND817	50	0	0	0	0	50	10
ND904	0	0	0	40	1	20	1
ND905	10	0	0	0	0	60	12
ND906	20	0	0	30	1	0	0
NDSW0481	10	0	0	30	1	40	2
NDSW0601	10	0	0	10	1	10	1
SD3851	0	0	0	40	1	0	0
Cromwell	10	0	0	40	1	30	1
Diamond	20	0	0	0	0	30	2
MN03358-4	20	0	0	0	0	20	1
SD3948	0	0	0	0	0	20	1
00S0291	30	0	0	0	0	30	1
01S0042-10	10	0	0	0	0	10	1

Wheat Stem Maggot = percent of stems infected with maggot (white heads).
Disease Incidence = percent of plants infected with disease.
Disease Severity = percent of flag leaf area infected by disease.

Date of observations: July 16 – soft dough stage
Planting Date: April 14
Previous Crop: hrsw

Variety	Type	Seed Yield
		lbs/A
Buster	Pinto	515
GTS 900	Pinto	539
Maverick	Pinto	552
Othello	Pinto	696
Topaz R	Pinto	595
La paz	Pinto	628
Stampede	Pinto	626
Lariat	Pinto	568
Navigator	Navy	428
Norstar	Navy	544
Seahawk	Navy	453
Vista	Navy	544
Avalanche	Navy	447
Ensign	Navy	504
Eclipse	Black	449
Jaguar	Black	377
T-39	Black	391
Matterhorn	Great Northern	548
Merlot	Red	525
Sedona	Pink	391
Trial Mean		516
C.V. %		22.7
LSD .05		165
LSD .01		NS

NS = no statistical difference between varieties.

Planting Date: June 9
Harvest Date: September 30
Previous Crop: HRSW
Note: The trial sustained severe heat and moisture stress.

2008 Durum Variety Trial - Continuously Cropped - No-till — Mandan, ND

Cooperator: USDA-ARS, Mandan

Variety	Plant Height	Test Weight	Grain Protein	Grain Yield 2006	Grain Yield 2007	Grain Yield 2008	Average Yield 2 yr	Average Yield 3 yr
	inches	lbs/bu	%	Bushels per acre				
Ben	42	55.3	15.5	28.6	61.6	55.1	58.4	48.4
Alkabo	39	55.5	14.7	28.1	56.1	60.2	58.2	48.1
Mountrail	40	54.1	15.7	27.3	59.6	56.9	58.2	47.9
Grenora	37	54.5	15.0	25.7	57.3	57.7	57.5	46.9
Divide	40	54.9	15.6	26.7	54.2	55.8	55.0	45.6
Lebsock	40	56.0	15.5	27.5	--	57.0		
Trial Mean	40	55.0	15.3	27.3	57.8	57.1	--	--
C.V. %	2.7	1.2	2.7	7.6	4.5	6.0	--	--
LSD .05	2	1.0	0.6	NS	4.9	NS	--	--
LSD .01	2	1.4	NS	NS	NS	NS	--	--

NS = no statistical difference between varieties.

Planting Date: April 22, 2008
Harvest Date: August 12, 2008
Seeding Rate: 1.25 million live seeds / acre (approx. 2.2 bu/A).
Previous Crop: 2005 & 2006 = hrww, 2007 = hrsw.

2008 Durum Variety Trial - Continuously Cropped - No-till — Regent, ND

Cooperators: August and Perry Kirschmann, Regent

Variety	Plant Height	Test Weight	Grain Protein	---- Grain Yield ---- 2006	2007	2008	Average Yield 2 yr	3 yr
	inches	lbs/bu	%	----------- Bushels per acre -----------				
Grenora	21	57.8	15.6	35.1	55.6	10.5	33.0	33.7
Alkabo	24	--	15.6	29.8	52.2	8.9	30.6	30.3
Mountrail	23	51.7	16.4	29.7	47.2	10.0	28.6	30.0
Divide	24	56.6	15.5	31.1	46.7	10.0	28.4	29.3
Ben	27	58.3	17.2	29.7	45.2	11.5	28.4	28.8
Lebsock	23	--	15.8	31.6	--	7.1		
Trial Mean	24	56.1	16.1	31.2	49.4	9.7	--	--
C.V. %	5.0	--	14.1	5.3	4.7	50.6	--	--
LSD .05	2	--	NS	2.5	3.6	NS	--	--
LSD .01	2	--	NS	3.5	5.0	NS	--	--

NS = no statistical difference between varieties.

Planting Date: April 21, 2008
Harvest Date: August 8, 2008
Seeding Rate: 1.25 million live seeds / acre (approx. 2.2 bu/A).
Previous Crop: 2005, 2006 & 2007 = hrsw.
Note: The 2008 trial sustained severe heat and moisture stress.

2008 Durum Variety Trial - Continuously Cropped - No-till — Scranton, ND

Cooperators: Neal and Justin Freitag, Scranton

Variety	Plant Height	Test Weight	Grain Protein	---- Grain Yield ---- 2006	2007	2008	Average Yield 2 yr	3 yr
	inches	lbs/bu	%	----------- Bushels per acre				-----------
Alkabo	25	57.4	19.1	54.3	26.7	17.9	22.3	33.0
Divide	25	57.0	19.2	52.1	28.4	17.8	23.1	32.8
Mountrail	23	56.1	19.7	55.2	21.0	16.6	18.8	30.9
Grenora	23	55.0	19.3	55.8	18.2	18.3	18.2	30.8
Ben	28	54.9	19.8	53.1	21.9	15.2	18.6	30.1
Lebsock	25	57.9	19.0	52.3	--	20.2		
Trial Mean	25	56.4	19.4	53.8	23.3	17.6	--	--
C.V. %	3.8	3.6	1.9	3.9	9.1	16.2	--	--
LSD .05	1	NS	0.6	NS	3.3	NS	--	--
LSD .01	2	NS	NS	NS	4.6	NS	--	--

NS = no statistical difference between varieties.

Planting Date: April 14, 2008
Harvest Date: August 5, 2008
Seeding Rate: 1.25 million live seeds / acre (approx. 2.2 bu/A).
Previous Crop: 2005 & 2006 = hrww, 2007 = hrsw.
Note: The 2008 trial sustained heat and moisture stress.

Variety	Days to Head	Plant Height	Lodging	Test Weight	Grain Protein	------ Grain Yield ------ 2006	2007	2008	Average Yield 2 year	3 year
	*	inches	0 - 9**	lbs/bu	%	------------- Bushels per acre -------------				
Alzada	77	38	2.0	55.7	17.1	35.6	40.7	39.1	39.9	38.5
Grenora	80	38	1.2	54.4	17.5	35.3	36.9	33.3	35.1	35.2
Ben	80	40	2.5	53.7	17.8	34.9	40.1	28.2	34.2	34.4
Alkabo	81	39	1.2	54.2	17.5	30.5	37.5	30.3	33.9	32.8
Dilse	81	42	2.2	55.2	17.7	30.9	37.7	28.4	33.0	32.3
Pierce	80	40	2.2	54.0	17.4	32.2	36.3	27.5	31.9	32.0
Mountrail	82	40	1.5	51.9	17.9	34.5	38.4	23.2	30.8	32.0
Divide	82	39	2.2	54.2	17.2	34.2	30.7	30.3	30.5	31.7
Rugby	82	40	1.8	55.6	16.7	31.1	30.1	27.3	28.7	29.5
AC Commander	81	37	1.0	56.0	15.6		43.3	45.1	44.2	
DG Star	78	40	1.5	55.8	17.2		37.6	37.1	37.4	
AC Navigator	80	39	2.0	55.8	16.9		37.1	37.5	37.3	
Maier	81	39	1.8	55.7	16.4		40.6	31.0	35.8	
Lebsock	79	40	1.0	53.4	16.8	33.4		33.8	33.6	
Grande D'oro	80	40	1.2	55.4	17.6	36.8		28.1	32.4	
Strongfield	82	42	1.8	54.1	17.4	30.2		32.2	31.2	
AC Napoleon	81	40	1.2	54.2	17.5		33.7	25.9	29.8	
Wales	80	40	1.5	55.5	17.9			25.9		
D00095	80	43	1.5	55.8	18.1			31.6		
D00752	83	42	1.2	54.1	17.7			25.7		
D021110	81	41	1.0	54.7	18.2			31.2		
D021657	81	42	1.0	58.6	16.4			42.3		
D021667	82	41	2.2	54.6	16.9			30.3		
D03004	80	41	1.8	54.6	17.8			30.2		
D03028	84	39	1.2	54.2	16.6			31.2		
D03708	81	41	2.5	54.4	17.4			27.3		
D031350	80	40	1.0	57.4	16.4			38.2		
D031527	82	38	1.8	57.0	16.4			37.6		
D031606	80	40	1.0	57.7	16.7			35.9		
D031607	80	41	1.0	57.7	15.9			38.6		
D031671	81	42	1.0	57.4	16.3			42.3		
D04008	80	41	1.5	54.3	17.9			26.2		
D04102	80	41	1.5	52.7	17.8			31.0		
D04573	82	41	1.8	55.5	17.4			33.3		
D04581	81	39	1.5	54.8	17.2			28.0		
D04586	82	38	1.5	54.5	15.8			33.6		
D04630	80	41	1.8	54.5	16.9			32.5		
D041603	79	41	2.2	56.3	17.8			36.7		
D041642	82	41	2.2	56.7	16.4			27.4		
D041708	81	40	1.5	54.9	17.4			32.1		
D041733	80	40	1.2	52.4	17.4			29.8		

Table continued on next page.

D041734	79	37	2.2	52.2	17.0			27.0		
D041735	80	39	2.0	52.9	17.6			29.5		
DH05047	80	42	2.5	53.4	17.4			29.2		
DG2166	80	42	2.2	54.6	17.9			26.5		
Trial Mean	81	40	1.6	54.9	17.2	31.6	36.6	31.8	--	--
C.V. %	0.8	4.0	33.9	2.0	1.9	8.4	13.0	11.6	--	--
LSD .05	1	2	0.8	1.6	0.4	3.7	6.6	5.1	--	--
LSD .01	1	3	1.0	2.1	0.6	4.9	8.8	6.8	--	--

* Days to Head = the number of days from planting to head emergence from the boot.
** Lodging: 0 = none, 9 = lying flat on ground.

Planting Date: April 14
Harvest Date: August 13
Seeding Rate: 1.25 million live seeds / acre (approx. 2.2 bu/A).
Previous Crop: 2007 & 2006 = HRSW, 2005 = soybean.
Note: The 2008 trial sustained late season heat and moisture stress.

2008 Spring Emmer Variety Trial — Hettinger, ND

Variety	Days to Head	Plant Height	Lodging	Test Weight	Grain Yield
	*	inches	0-9**	lbs/bu	lbs/A
Common H	89	41	5.2	38.6	2552
Lucille	91	44	3.0	30.2	2465
Bowman	88	42	3.0	31.9	2398
Common	89	43	3.2	31.8	2362
Red Vernal	90	42	3.0	30.3	2216
Common M	89	41	3.5	31.5	1837
Common R	88	40	4.2	32.5	1678
Trial Mean	89	42	3.6	32.4	2215
C.V. %	0.3	6.0	38.4	3.8	12.2
LSD .05	1	NS	NS	1.8	402
LSD .01	1	NS	NS	2.5	551

* Days to Head = the number of days from planting until head emergence from the boot.
** Lodging: 0 = none, 9 = lying flat on ground.
NS = no statistical difference between varieties.

Planting Date: April 14
Harvest Date: August 13
Previous Crop: HRSW
Note: The trial sustained severe late season heat and moisture stress.

Variety	Days to Bloom	Plant Height	1000 Seed wt.	Test Weight	Grain Yield
	*	inches	grams	lbs/bu	lbs/A
Flaxen	56	24	294	45.4	1245
NPZ 4-7540	58	22	262	51.4	805
NPZ 5-7680	58	27	299	52.9	1143
Trial Mean	57	25	285	49.9	1064
C.V. %	1.1	4.8	3.4	2.8	11.3
LSD .05	NS	2	17	2.4	207
LSD .01	NS	3	25	3.7	314

* Days to Bloom = the number of days from planting until 10% bloom.
NS = no statistical difference between varieties.

Planting Date: April 28
Harvest Date: August 15
Previous Crop: HRSW
Note: The trial sustained severe late season heat and moisture stress.

2008 Flax Variety Trial - Continuously Cropped - No-till Hettinger, ND

Variety	Days to Bloom	Plant Height	----- Grain Yield ----- 2006	2007	2008	Average Yield 2 yr	3 yr
	**	inches	----------- Bushels per acre -----------				
CDC Arras	58	20	14.8	20.4	12.4	16.4	15.9
Nekoma	59	20	14.4	18.1	11.2	14.6	14.6
York	60	21	12.5	17.3	13.4	15.4	14.4
Webster	62	23	12.3	18.7	11.1	14.9	14.0
Neche	62	25	14.4	19.5	6.9	13.2	13.6
Rahab 94	61	22	12.9	17.0	10.3	13.6	13.4
Prairie Blue	62	23	11.3	18.6	9.5	14.0	13.1
Pembina	58	22	11.3	15.8	11.6	13.7	12.9
CDC Bethume	61	21	11.4	16.6	10.1	13.4	12.7
Hanley	57	21	12.0	15.8	9.6	12.7	12.5
Carter*	60	21	9.9	14.6	11.3	13.0	11.9
Omega*	63	20	6.2	9.7	4.7	7.2	6.9
Prairie Thunder	59	22		17.5	8.2	12.8	
Lightning	57	21			12.3		
Prairie Grande	57	22			11.6		
CDC Sorrel	61	24			10.4		
FP2188	60	22			10.7		
FP2214	59	22			12.3		
Trial Mean	60	22	12.1	16.5	10.5	--	--
C.V. %	1.5	3.6	11.2	10.9	11.8	--	--
LSD .05	1	1	2.0	2.6	1.8	--	--
LSD .01	2	2	2.6	3.4	2.4	--	--

*Yellow seed type
** Days to Bloom = the number of days from planting until 10% of the plants are flowering.

Planting Date: May 5
Harvest Date: August 13
Seeding Rate: 40 lbs / acre.
Previous Crop: 2007 & 2006 = hrsw, 2005 = soybean.
Note: The 2008 trial had a poor stand and sustained late season heat and moisture stress.

A15351A Herbicide on Grassy Weeds in Wheat — Hettinger, ND

Eric Eriksmoen

'Howard' HRSW was seeded on April 30. Treatments were applied on June 1 to 4 leaf wheat and to heading downy brome (dobr), tillering Japanese brome (jabr), 3 ½ leaf wild oat (wiot) and 2 leaf Persian darnel (peda) with 56° F, 74% RH, clear sky and NW wind at 4 mph. Treatments were applied with a tractor mounted CO_2 propelled plot sprayer delivering 10 gpa at 30 psi through PK-01E80 nozzles to a 5 foot wide area the length of 10 by 28 foot plots. The trial was a randomized complete block design with four replications. HRSW, downy brome, Japanese brome, wild oat and Persian darnel populations were 8, 3, 7, 5 and 3 plants per square foot, respectively. The trial was sprayed with 10 oz/A Starane on June 16 to control broadleaf weeds. Plots were evaluated for crop injury on June 17 and July 2, and for weed control on June 17, July 2 and July 30. The trial was over-run with brome grasses and therefore was not harvested.

		Product	--------- June 17 ---------				------ July 2 ------			-- July 30 --	
	Treatment	Rate	inj	dobr	jabr	wiot	inj	wiot	peda	wiot	peda
		oz/A	----------------------------- % control							-----------------------------	
1	A15351A + Adigor	8.85 + 9.6	0	0	0	99	0	99	99	99	99
2	A15351A + Adigor + MCPA	8.85 + 9.6 + 5.3	0	0	0	99	0	99	99	99	99
3	A15351A + Adigor + Starane	8.85 + 9.6 + 5.3	0	0	0	99	0	99	99	99	99
4	A15351A + Adigor + Starane & Sward	8.85 + 9.6 + 12	0	0	0	99	0	99	99	99	99
5	A15351A + Adigor + Starane NXT	8.85 + 9.6 + 14	0	0	0	99	0	99	99	99	99
6	A15351A + Adigor + Bronate Adv.	8.85 + 9.6 + 12.8	0	0	0	99	0	99	99	99	99
7	A15351A + Adigor + Bromox & MCPA	8.85 + 9.6 + 16	0	0	0	99	0	99	99	99	99
8	A15351A + Adigor + WideMatch	8.85 + 9.6 + 10	0	0	0	99	0	99	99	99	99
9	Puma + Huskie + UAN	8 + 11 + 32	0	0	0	99	0	99	0	99	0
10	Puma + Bronate Adv.	8 + 12.8	0	0	0	99	0	99	0	99	0
11	Puma + WideMatch + MCPA	8 + 16 + 12	0	0	0	99	0	99	0	99	0
12	Untreated	--	0	0	0	0	0	0	0	0	0
	C.V.%		0	0	0	0	0	0	0	0	0
	LSD .05		NS	NS	NS	1	NS	1	1	1	1

Summary

Crop injury was not observed. None of the herbicide treatments had any efficacy on downy brome or Japanese brome. All herbicide treatments provided excellent season long control of wild oats. All A15351A treatments provided excellent season long control of Persian darnel. Puma treatments had no efficacy on Persian darnel.

2008 Broadleaf Weed Control with Baseline Herbicide in Spring Wheat

Eric Eriksmoen

'Howard' HRSW was seeded on April 30. Treatments were applied on May 31 to 4 ½ leaf wheat and to 1" kochia (kocz), 2" Russian thistle (ruth), 4" field bindweed (fibw), 2 leaf volunteer soybean (vosb) and to 2 leaf wild buckwheat (wibw) with 63^{o} F, 60% RH, clear sky and west wind at 2 mph. Treatments were applied with a tractor mounted CO_2 propelled plot sprayer delivering 10 gpa at 30 psi through PK-01E80 nozzles to a 5 foot wide area the length of 10 by 28 foot plots. The trial was a randomized complete block design with three replications. Kochia, Russian thistle, field bindweed, wild buckwheat and soybean populations were 11, 0.25, 0.5, 0.5 and 0.5 plants per square foot, respectively. The trial was located on a clay loam soil with 24% sand, 42% silt and 34% clay. Plots were evaluated for crop injury and weed control on June 13, June 24 and on August 1. The trial was harvested on August 8.

Summary

Crop injury was initially quite low with the exception of Baseline A + Baseline B + Sahara + NIS (trt 3) which exhibited significant injury (stunting). Crop injury diminished quickly and was not observed on any treatment by June 24. All treatments provided excellent season long kochia control. All treatments provided good to excellent control of Russian thistle and wild buckwheat with the exception of Sahara alone (trt 8) which was weak on these weeds. All treatments showed some activity on field bindweed, however, Widematch + MCPA (trt 6) was the only treatment to provide good season long control. All treatments provided excellent control of volunteer soybeans except for the Sahara treatments (trts 3 & 8). Test weights were poor due to late season heat and moisture stress and were not significantly different between treatments. Treatments 3, 4, 6 and 8 had significantly higher grain yields than the untreated check.

	Treatment	Product rate	June 13 inj	June 13 kocz	June 13 ruth	June 13 fibw	June 13 wibw	June 13 vosb	June 24 inj	June 24 kocz	June 24 ruth	June 24 fibw	June 24 wibw	June 24 vosb	Aug. 1 kocz	Aug. 1 fibw	Test weight	Grain yield
		oz/A	% control														lbs/bu	bu/A
1	Untreated		0	0	0	0	0	0	0	0	0	0	0	0	0	0	48.0	15.9
2	Baseline A + Baseline B + Starane	0.3 + 0.1 + 7.7	2	92	93	80	93	57	0	93	98	40	90	92	98	37	51.9	20.3
3	Baseline A + Baseline B + Sahara + NIS	0.3 + 0.1 + 3.6 + 0.25%	10	92	92	77	96	50	0	83	99	60	98	35	96	51	50.7	24.9
4	Baseline A + Baseline B + Widematch	0.3 + 0.1 + 8	5	92	92	45	95	77	0	92	98	7	99	98	95	0	50.6	22.9
5	Baseline A + Baseline B + Widematch	0.3 + 0.033 + 8	2	93	60	35	93	92	0	90	87	20	96	96	98	17	49.7	16.8
6	Widematch + MCPA ester	16 + 8	2	90	5	60	93	87	0	92	91	83	95	98	99	88	50.1	26.6
7	Huskie	11	0	50	93	60	0	92	0	90	99	7	93	88	96	0	50.0	17.7
8	Sahara + NIS	3.75 + 0.25%	1	90	0	22	65	8	0	87	27	3	33	30	98	17	49.9	21.1
9	Starane	8	0	93	0	20	73	88	0	93	90	60	88	95	99	17	50.2	15.0
	C.V. %		135	3	13	52	14	16	0	4	12	44	14	9	3	77	2.5	13.5
	LSD 5%		6	4	11	40	16	17	NS	6	15	24	18	12	5	35	NS	4.7

NS = no statistical difference between treatments.

Eric Eriksmoen

Herbicide treatments were applied on September 11, 2007 to fully mature field bindweed (fibw) which had been cut to a 4 to 6 inch height during small grain harvest (post harvest) with 54^{o} F, 56% RH, partly cloudy sky and east wind at 6 mph. 'Howard' HRSW was seeded on April 30. Treatments were applied with a tractor mounted CO_2 propelled plot sprayer delivering 10 gpa at 30 psi through PK-01E80 nozzles to a 10 foot wide area the length of 15 by 28 foot plots. The trial was a randomized complete block design with three replications. Plots were evaluated for crop injury and weed control on May 27 and on June 18. The trial was harvested on August 8.

		Product	Approx.	- May 27 -		- June 18 -		Test	Grain
	Treatment	Rate	trt cost	inj	fibw	inj	fibw	Weight	Yield
		oz/A	$/A	-------- % control --------				lbs/bu	bu/A
1	Untreated	--	0	0	0	0	0	52.2	13.8
2	Roundup (RT3)	96	21.00	0	98	0	99	53.4	22.1
3	Roundup + AMS	44 + 1%	13.12	0	99	0	99	52.8	18.3
4	R'up + 2,4-D ester + AMS	11 + 24 + 1%	8.72	0	99	0	99	54.4	22.5
5	2,4-D amine (4 lb/gal)	48	4.50	0	96	0	99	53.4	16.1
6	2,4-D ester (4 lb/gal)	48	5.62	0	96	0	98	55.9	21.1
7	Banvel + NIS	32 + 0.5%	23.50	0	99	2	99	54.9	16.5
8	Paramount + MSO + UAN	5.28 + 32 + 128	25.40	0	99	0	99	56.8	19.2
	C.V.%			0	3.1	490	0.9	4.0	7.8
	LSD .05			NS	5	NS	1	NS	2.5

Summary

Crop injury was very minor when observed. The trial sustained severe late season heat and moisture stress causing light test weights and lower yields. All herbicide treatments provided excellent season long control of field bindweed. All herbicide treatments except for 2,4-D amine alone (trt 5) had significantly higher grain yields than the untreated check.

ET Herbicide for In-Crop Applications in Wheat — Hettinger, ND

Eric Eriksmoen

'Howard' HRSW was seeded on April 30. Treatments were applied on June 1 to 4 ½ leaf wheat and to 2" kochia (kocz), 2" Russian thistle (ruth) and to 2 leaf wild buckwheat (wibw) with 69^{o} F, 58% RH, clear sky and NW wind at 3 mph. Treatments were applied with a tractor mounted CO_2 propelled plot sprayer delivering 10 gpa at 30 psi through PK-01E80 nozzles to a 5 foot wide area the length of 10 by 28 foot plots. The trial was a randomized complete block design with three replications. HRSW, kochia, Russian thistle and wild buckwheat populations were 8, 29, 3 and 0.7 plants per square foot, respectively. Plots were evaluated for crop injury on June 10 and June 18 and for weed control on June 10, June 18 and on August 1. The trial was harvested on August 8.

			---------- June 10 ----------				---------- June 18 ----------				8/1	Test	Crop
	Treatment*	Rate	inj	kocz	ruth	wibw	inj	kocz	ruth	wibw	kocz	Weight	Yield
		oz/A	--------------------------------- % Control ---------------------------------									lbs/bu	bu/a
1	ET + MCPA ester	0.75 + 16	13	87	98	95	0	91	93	95	93	46.2	31.8
2	ET + Buctril	0.75 + 24	10	93	96	95	0	92	96	96	98	47.9	29.7
3	ET + 2,4-D ester	0.75 + 16	17	90	92	55	0	90	95	96	90	47.7	20.3
4	ET + Ally Extra	0.75 + 0.1	3	80	98	90	0	76	96	99	91	45.6	24.3
5	ET + Ally Extra	0.75 + 0.2	2	60	93	92	0	80	96	85	82	49.1	26.7
6	MCPA ester	16	0	30	37	0	0	91	90	7	77	45.3	26.3
7	Untreated	--	0	0	0	0	0	0	0	0	0	43.3	22.5
	C.V.%		49	17	15	24	337	14	8	9	13	7.4	19.8
	LSD .05		6	19	20	26	NS	19	11	11	18	NS	NS

Summary

Crop injury (leaf spotting) was quite evident initially but diminished quickly. All herbicide treatments except for ET + 0.2 oz/A Ally Extra (trt 5) and MCPA alone (trt 6) provided excellent season long kochia control. MCPA alone (trt 6) was not effective on wild buckwheat but when combined with ET herbicide (trt 1), control was excellent. All herbicide treatments provided excellent Russian thistle control. Test weights were very light due to late season heat and moisture stress. Although there were no statistical differences for grain yield between treatments, all herbicide treatments with the exception on ET + 2,4-D (trt 3) had higher yields than the untreated check.

Eric Eriksmoen

Fall pre-plant treatments (PP) were applied on September 6, 2007 to 2 leaf mixed bromus species (downy brome (dobr) and Japanese brome (jabr)) with 68° F, 44% RH, cloudy sky and east wind at 6 mph. 'Jerry' HRWW was seeded on September 14, 2007. Fall pre-emergence treatments (PRE) were applied on September 24 to 4 leaf mixed bromus species with 45° F, 82% RH, clear sky and northwest wind at 12 mph. Fall post emergence treatments (FPOST) were applied on October 4 to 2 leaf winter wheat and to 2" tall mixed bromus species with 51° F, 49% RH, cloudy sky and north wind at 7 mph. Winter crop survival was very poor (<15%). Spring dormancy break treatments (SPOST1) were applied on May 4 to 3 ½ leaf winter wheat and to tillering downy brome, 3 leaf Japanese brome (jabr) and to one leaf wild oat (wiot) with 50° F, 48% RH, clear sky and northeast wind at 2 mph. The trial was re-seeded no-till with 'Dapps' HRSW on May 28. This re-seeding did not take due to weed competition and droughty growing conditions. Spring tiller initiation treatments (SPOST2) were applied on June 16 to 3 leaf spring wheat and to flowering downy brome, Japanese brome in the late boot stage, 5 leaf wild oat and to 4 leaf Persian darnel (peda) with 46° F, 92% RH, clear sky and calm wind. Treatments were applied with a tractor mounted CO_2 propelled plot sprayer delivering 10 gpa at 30 psi through PK-01E80 nozzles to a 5 foot wide area the length of 10 by 28 foot plots. The trial was a randomized complete block design with four replications. Downy brome, Japanese brome, wild oat and Persian darnel populations averaged 22, 6, 0.1 and 2 plants per square foot, respectively. The trial was located on a clay loam soil with 24% sand, 42% silt and 34% clay. Plots were evaluated for crop injury on October 11 and for weed control on June 18 and on July 31. The trial was not harvested.

Summary

Crop injury was not observed. Although control was marginal, it appears that Everest has some activity on Russian thistle in this trial and little activity on kochia or wild buckwheat. Field bindweed control was excellent with most treatments. This control may be attributed to fall applied glyphosate uptake, although, there may also be some synergism with Everest. All treatments provided excellent season long control of downy brome and Japanese brome regardless of application timing. All herbicide treatments had very little activity on Persian darnel. Fall applications (trts 2, 3, 4, 6, 7, 8 and 10) did not provide adequate carryover to control wild oats, with the exception of fall applied Olympus (trt 14).

	Treatment	Product rate	App. timing	10/11 inj	June 18 kocz	ruth	fibw	wibw	dobr	jabr	peda	Plant height	July 31 dobr	jabr	wiot	peda
		oz/A		% control								cm	% control			
1	Untreated			0	0	0	0	0	0	0	0	60	0	0	0	0
2	Glyphosate + NIS + AMS	24 + 0.5% + 1.5 lb	PP	0	0	52	96	2	99	99	0	71	99	99	0	0
3	Glyphosate + NIS + AMS + Everest	24 + 0.5% + 1.5 lb + 0.61	PP	0	0	81	99	0	99	99	0	66	99	99	10	0
4	Glyphosate + NIS + AMS + Everest / Everest + Basic Blend	24 + 0.5% + 1.5 lb + 0.306 / 0.306 + 1%	PP / FPOST	0	20	84	94	0	99	99	0	65	99	99	5	2
5	Glyphosate + NIS + AMS + Everest / Everest + 28% N + Basic Blend	24 + 0.5% + 1.5 lb + 0.306 / 0.306 + 50% + 1%	PP / SPOST1	0	0	85	96	18	99	99	0	64	97	99	88	0
6	Glyphosate + NIS + AMS	24 + 0.5% + 1.5 lb	PRE	0	0	12	72	0	99	99	0	65	99	97	0	0
7	Glyphosate + NIS + AMS + Everest	24 + 0.5% + 1.5 lb + 0.61	PRE	0	0	21	84	1	99	99	0	64	99	99	5	0
8	Glyphosate + NIS + AMS + Everest / Everest + Basic Blend	24 + 0.5% + 1.5 lb + 0.306 / 0.306 + 1%	PRE / FPOST	0	0	45	97	0	99	99	0	64	97	99	25	0

continued	Treatment	Product rate	App. timing	10/11 inj	----------------------- June 18 kocz	------------------------ ruth	fibw	wibw	dobr	jabr	peda	Plant height	----------- July 31 dobr	----------- jabr	wiot	peda
9	Glyphosate + NIS + AMS + Everest / Everest + 28% N + Basic Blend	24 + 0.5% + 1.5 lb + 0.306 / 0.306 + 50% + 1%	PRE / SPOST1	0	0	69	66	0	99	99	0	64	99	99	94	12
10	Glyphosate + NIS + AMS / Everest + Basic Blend	24 + 0.5% + 1.5 lb / 0.61 + 1%	PP / FPOST	0	12	71	99	0	99	99	0	63	99	99	30	0
		oz/A		--------------------------- % control							---------------------------	cm	--------- % control			---------
11	Glyphosate + NIS + AMS / Everest + 28% N + Basic Blend	24 + 0.5% + 1.5 lb / 0.61 + 50% + 1%	PP / SPOST1	0	5	85	94	42	99	99	0	66	97	99	96	25
12	Glyphosate + NIS + AMS / Everest + Basic Blend / Everest + 28% N + Basic Blend	24 + 0.5% + 1.5 lb / 0.306 + 1% / 0.61 + 50% + 1%	PP / FPOST / SPOST1	0	0	84	98	12	99	99	0	66	97	99	97	2
13	Glyphosate + NIS + AMS / Everest + Basic Blend / Everest + Basic Blend	24 + 0.5% + 1.5 lb / 0.306 + 1% / 0.306 + 1%	PP / FPOST / SPOST2	0	22	84	94	15	99	99	0	61	94	99	99	25
14	Glyphosate / Olympus + NIS	24 / 0.92 + 0.5%	PP / FPOST	0	0	84	94	0	99	99	0	64	99	99	87	0
15	Glyphosate / Rimefire + Basic Blend	24 / 1.75 + 1%	PP / SPOST2	0	42	58	93	1	99	99	0	63	99	99	99	25
	C.V. %			0	303	33	20	231	0	0	0	6	4	1	23	239
	LSD 5%			NS	NS	29	25	22	1	1	NS	NS	5	2	11	21

NS = no statistical difference between treatments.

Glyphosate Efficacy on Tough Weeds in Summer Fallow — Hettinger, ND

Eric Eriksmoen

Treatments were applied on June 16 to 6 leaf hard red spring wheat (hrsw), flowering downy brome (dobr), Japanese brome (jabr) in the boot, 5 leaf wild oat (wiot), 4 leaf Persian darnel (peda), 6” long wild buckwheat (wibw), 3” tall kochia (kocz), 4” tall Russian thistle (ruth), post seed set dandelion (dali) and 10” long field bindweed (fibw) with 50^{o} F, 87% RH, clear sky and south wind at 2 mph. Treatments were applied with a tractor mounted CO_2 propelled plot sprayer delivering 10 gpa at 30 psi through PK-01E80 nozzles to a 5 foot wide area the length of 10 by 28 foot plots. The trial was a randomized complete block design with four replications. Plots were evaluated for weed control on July 2 and on July 30.

		Product	July 2										7/30
	Treatment	Rate	hrsw	dobr	jabr	wiot	peda	wibw	kocz	ruth	dali	fibw	fibw
		oz/A	% control										
1	Durango	4	71	97	85	99	58	8	65	68	33	29	28
2	Duramax	4	72	99	87	93	42	2	25	40	7	16	6
3	Roundup Weather Max	4	79	99	92	97	58	2	52	61	13	12	15
4	Roundup Original Max	4	70	99	98	94	52	25	86	75	21	12	22
5	R’up Orig Max + NIS	4 + 0.25%	68	99	89	99	42	45	55	48	16	15	22
6	R’up Orig Max + AMS	4 + 1%	95	99	96	99	58	0	70	62	22	32	8
7	R’up Orig Max + NIS + AMS	4 + 0.25%+1%	91	99	95	99	72	28	72	92	38	30	28
	C.V.%		20	1.8	6.4	4.7	44	187	31	46	107	65	123
	LSD .05		21	NS	8	NS	NS	NS	25	37	NS	18	NS

Summary

The objective of this trial was to observe differences between various glyphosate treatments under adverse conditions including: low rate of glyphosate (4 oz product/A), use of high (9.3) pH water, application to older weeds, and hot and dry weather conditions.

There were no significant differences between treatments for control of downy brome, wild oat, Persian darnel, wild buckwheat, dandelion or field bindweed control. The addition of AMS to Roundup Original Max (trts 6 & 7) tended to enhance hrsw control over Roundup Original Max alone (trt 4). Durango (trt 1) and Duramax (trt 2) tended to be slightly less effective on Japanese brome than the other treatments. Duramax (trt 1) provided significantly less kochia control than the other treatments and Roundup Original Max treatments tended to provide higher levels of kochia control than other treatments. Roundup Original Max + NIS + AMS (trt 7) was the only treatment that provided excellent control of Russian thistle.

Eric Eriksmoen

'Howard' HRSW was seeded on April 30. Treatments were applied on May 31 to 3 1/2 leaf wheat and to heading downy brome (dobr), tillering Japanese brome (jabr), 2 leaf Persian darnel (peda) and 3 leaf wild oat (wiot) with 73^o F, 34% RH, clear sky and northwest wind at 8 mph. Treatments were applied with a tractor mounted CO_2 propelled plot sprayer delivering 10 gpa at 30 psi through PK-01E80 nozzles to a 5 foot wide area the length of 10 by 28 foot plots. The trial was sprayed with 10 oz/A Starane to control broadleaf weeds on June 16. The trial was a randomized complete block design with three replications. Downy brome, Japanese brome, Persian darnel and wild oat populations averaged 2.6, 4, 1.2 and 0.8 plants per square foot, respectively. Plots were evaluated for crop injury on June 10, June 17, July 2 and on July 29 and for grassy weed control on June 17, July 2 and on July 29. The trial was harvested on August 9.

Summary

Crop injury was initially observed on all treatments but diminished quickly. Treatments were applied to large downy brome plants resulting in relatively poor overall control with the exception of treatments 2, 8, 9, 15 and 16 which provided good control of this weed. All treatments except for Axial XL alone (trt 14) provided excellent control of Japanese brome. All treatments provided excellent control of Persian darnel except for GF-1847 (trt 7), Olympus (trt 10), Everest (trt 11) and Rimfire (trt 12). All treatments provided excellent season long control of wild oats. Although there were some significant differences between treatments for yield, there did not appear to be any trends. Yields were poor due to late season drought.

	Treatment	Product rate	6/10 inj	----- June 17 ---- inj.	dobr	jabr	--------------- July 2 --------------- inj	dobr	jabr	wiot	peda	-------------- July 29 -------------- inj	dobr	jabr	peda	wiot	twt	yield
		oz/A	% control														lbs/bu	bu/A
1	GoldSky +	16 +																
	Agral 90	0.5%	8	0	75	75	0	50	98	99	99	0	50	96	99	99	55.7	15.1
2	GoldSky +	16 +																
	Agral 90 +	0.5% +																
	AMS	1.5 lbs	5	0	65	68	0	73	86	92	99	0	90	99	99	99	58.0	16.6
3	GoldSky +	16 +																
	Agral 90 +	0.5% +																
	AMS	3.0 lbs	4	0	67	82	0	60	95	99	99	0	50	99	99	99	56.7	14.5
4	GoldSky +	16 +																
	mineral oil	0.8%	9	0	60	78	0.3	60	93	99	99	0.3	50	99	95	98	56.0	11.3
5	GoldSky +	16 +																
	MSO	0.8%	5	1.7	70	78	0	63	77	96	99	0	60	99	96	99	56.0	15.2
6	PowerFlex +	4.56 +																
	Agral 90	0.5%	10	0	62	68	0	62	75	98	99	0	80	98	99	96	53.9	13.5
7	PowerFlex +	4.56 +																
	Agral 90 +	0.5% +																
	AMS	1.5 lbs	2	0	82	68	0	68	88	99	99	0	87	98	99	96	54.9	16.3
8	PowerFlex +	4.56 +																
	Agral 90 +	0.5% +																
	AMS	3.0 lbs	4	0	57	63	0	67	83	81	99	0	85	99	73	98	53.8	13.5
9	PowerFlex +	5.47 +																
	Agral 90 +	0.5% +																
	AMS	1.5 lbs	9	0	78	83	0	80	80	98	99	0	73	98	99	99	56.0	13.3
10	Olympus +	0.9 +																
	Agril 90	0.5%	2	0	73	83	0	47	83	0	99	0	50	99	0	99	55.2	18.5

Continued next page

11	Everest +	0.61 +																
	Agral 90 +	0.25% +																
	AMS	1.5 lbs	5	0	50	77	0	33	93	0	99	0	3	99	0	98	56.3	13.3
12	Rimfire +	1.75 +																
	Agral 90 +	0.25% +																
	AMS	1.5 lbs	5	0	67	73	0.3	50	60	80	99	0	40	98	80	96	56.3	15.3
13	Silverado +	2.25 +																
	Scoil	24	2	0	53	60	0	40	93	91	99	0	23	96	93	99	57.2	14.2
14	Axial XL	16.4	4	0	0	0	0	0	0	98	99	0	0	0	99	98	53.8	11.6
15	GoldSky +	12 +																
	Axial XL	8.2	10	3.3	57	82	0.3	77	93	99	99	0	93	96	98	99	54.8	11.9
16	PowerFlex +	4.56 +																
	Axial XL	8.2	8	0	80	82	0.3	80	93	99	99	0	91	99	99	99	54.2	19.2
17	Untreated	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	52.7	11.8
	C.V. %		112	519	17	15	357	28	10	9	0	714	23	3	16	2	3.1	15.8
	LSD 5%		NS	NS	17	17	NS	25	13	12	1	NS	21	4	21	3	2.9	3.8

NDSU Broadleaf Herbicide Trial — Hettinger, ND

Eric Eriksmoen

'Howard' HRSW was seeded on April 30. Treatments were applied on May 31 to 4 leaf wheat and to 2" kochia (kocz) and 2" Russian thistle (ruth) with 65° F, 55% RH, clear sky and west wind at 2 mph. Treatments were applied with a tractor mounted CO_2 propelled plot sprayer delivering 10 gpa at 30 psi through PK-01E80 nozzles to a 5 foot wide area the length of 10 by 28 foot plots. The trial was a randomized complete block design with three replications. HRSW, kochia and Russian thistle populations were 8, 17 and 3 plants per square foot, respectively. The trial was sprayed with 16 oz/A Axial XL on June 16 to control wild oats. Plots were evaluated for crop injury on June 18 and for weed control on July 2 and August 1. The trial was harvested on August 8.

	Treatment	Product Rate	6/18 inj	7/2 kocz	-- Aug. 1-- kocz	ruth	Test Weight	Grain Yield
		oz/A	--------- % control			----------	lbs/bu	bu/A
1	Starane + Sward	18	0	98	99	99	52.1	20.5
2	Widematch	16	0	95	98	93	51.8	23.9
3	Widematch + Harmony SG + Express SG	10.7+ 0.32 + 0.08	0	27	50	99	48.8	15.9
4	Harmony SG + Express SG + Sword + NIS	0.32 + 0.08 + 6.15 + 0.25%	0	57	40	99	55.0	26.3
5	Harmony SG + Express SG + Salvo + NIS	0.2 + 0.2 + 6.4 + 0.25%	2	90	92	99	51.6	21.9
6	Rage D-Tech + NIS	8 + 0.25%	0	95	93	99	50.8	18.1
7	ET + Salvo + NIS	0.52 + 6.4 + 0.25%	0	70	83	99	51.6	17.1
8	Bronate Advance	12.8	0	98	93	99	51.5	19.1
9	Bromoxynil & 2,4-D	18	0	98	93	99	49.8	16.1
10	Huskie	9.5	0	99	99	99	49.5	16.5
11	Huskie + AMS	9.5 + 8	0	97	98	99	51.6	18.5
12	Starane NXT	13.8	0	96	96	95	53.9	21.5
13	Florasulam & MCPA	17.1	2	82	47	96	51.5	16.7
14	Untreated		0	0	0	0	48.6	13.9
	C.V.%		369	11.8	11.6	3.0	2.0	13.3
	LSD .05		NS	16	15	5	1.4	8.8

Summary

Crop injury was very minor when observed. All herbicide treatments provided excellent season long Kochia control with the exception of Widematch + Harmony SG + Express SG (trt 3), Harmony SG + Express SG + Sword + NIS (trt 4), ET + Salvo + NIS (trt 7) and Florasulam & MCPA (trt 13) which were all quite weak on kochia. Despite poor kochia control, treatment 4 had the highest test weight and grain yield. All herbicide treatments provided excellent season long Russian thistle control. All herbicide treatments had grain yields higher than the untreated check, however, only the Widematch alone (trt 2) and Harmony SG + Express SG + Sword + NIS (trt 4) had statistically higher yields.

Eric Eriksmoen

'Howard' HRSW was seeded on April 30. Treatments were applied on May 31 to 3 1/2 leaf wheat and to heading downy brome (dobr), tillering Japanese brome (jabr), 3 leaf wild oat (wiot) and 2 leaf Persian darnel (peda) with 72^{o} F, 35% RH, clear sky and NW wind at 9 mph. Treatments were applied with a tractor mounted CO_2 propelled plot sprayer delivering 10 gpa at 30 psi through PK-01E80 nozzles to a 5 foot wide area the length of 10 by 28 foot plots. The trial was a randomized complete block design with four replications. HRSW, downy brome, Japanese brome, wild oat and Persian darnel populations were 8, 6, 3, 0.3 and 5 plants per square foot, respectively. The trial was sprayed with 10 oz/A Starane on June 16 to control broadleaf weeds. Plots were evaluated for crop injury on June 17 and July 2, and for weed control on June 17, July 2 and July 30. The trial was not harvested.

		Product	-- June 17 --		--------------- July 2 ---------------					----------- July 30 -----------			
	Treatment	Rate	inj	brome*	inj	wiot	dobr	jabr	peda	wiot	dobr	jabr	peda
		oz/A	-- % control --										
1	Silverado + Bronate Adv. + MSO	1.8 + 12.8 + 1% v/v	0	51	0	97	21	82	94	98	18	87	35
2	Everest + Bronate Adv. + Basic Blend	0.457 + 12.8 + 1% v/v	0	58	0	99	32	97	0	99	46	89	0
3	Rimfire + Bronate Adv. + Basic Blend	1.76 + 12.8 + 1% v/v	0	61	0	99	29	94	25	99	19	89	0
4	Assert + Bronate Adv. + Basic Blend	16 + 12.8 + 1% v/v	0	2	0	99	0	4	0	99	0	2	0
5	Olympus + Bronate Adv. + Basic Blend	0.475 + 12.8 + 1% v/v	1	72	0	99	42	94	0	99	48	99	0
6	GF-1848 + Bronate Adv. + NIS	4.54 + 12.8 + 0.25%	2	81	0	99	60	99	99	99	45	99	90

7	GoldSky + NIS	15.8+0.25 %	0	60	0	99	40	90	97	99	25	97	94
8	Achieve + Bronate Adv. + Supercharge + AMS	7 + 12.8 + 0.5% v/v + 9.5	0	12	0	94	0	0	99	99	0	0	99
9	Puma + Bronate Adv.	6.4 + 12.8	0	0	0	99	0	0	0	99	0	0	0
10	Puma + Bronate Adv.	10.6 + 12.8	1	0	0	99	0	0	0	99	0	0	0
11	Discover NG + Bronate Adv.	12.8 + 12.8	0	0	0	99	0	0	99	99	0	0	99
12	Axial XL + Bronate Adv.	16.4 + 12.8	2	20	0	99	0	0	99	99	0	0	99
13	Avenge + Bronate Adv.	64 + 12.8	0	0	0	99	0	0	0	99	0	0	0
14	Untreated	--	0	0	0	0	0	0	0	0	0	0	0
	C.V.%		339	46	0	3	58	17	18	1	87	24	8
	LSD .05		NS	20	NS	4	13	10	11	1	18	14	4

* Combination of downy brome and Japanese brome.

Summary

Crop injury was relatively minor when observed and diminished quickly. All herbicide treatments provided excellent season long control of wild oats. Silverado, Everest, Rimfire, Olympus, GF-1848 and GoldSky showed some activity on large downy brome but only Everest, Olympus and GF-1848 provided significantly higher levels of control than the other active herbicides. Silverado, Everest, Rimfire, Olympus, GF-1848 and GoldSky all provided good to excellent season long control of Japanese brome. GF-1848, GoldSky, Achieve, Discover NG and Axial XL provided excellent season long control of Persian darnel. Silverado and Rimfire also provided some activity on Persian darnel.

Tank Mixes with Orion Herbicide in Wheat — Hettinger, ND

Eric Eriksmoen

'Howard' HRSW was seeded on April 30. Treatments were applied on May 31 to 4 leaf wheat and to 2" kochia (kocz) and 2" Russian thistle (ruth) with 65° F, 55% RH, clear sky and west wind at 2 mph. Treatments were applied with a tractor mounted CO_2 propelled plot sprayer delivering 10 gpa at 30 psi through PK-01E80 nozzles to a 5 foot wide area the length of 10 by 28 foot plots. The trial was a randomized complete block design with three replications. HRSW, kochia and Russian thistle populations were 8, 17 and 3 plants per square foot, respectively. The trial was sprayed with 16 oz/A Axial XL on June 16 to control wild oats. Plots were evaluated for crop injury on June 18 and for weed control on August 1. The trial was harvested on August 8.

	Treatment	Product Rate	6/18 inj	-- Aug. 1-- kocz	ruth	Test Weight	Grain Yield
		oz/A	---- % Control -----			lbs/bu	bu/A
1	A15351A + Adigor	8.85 + 9.6	0	60	99	52.6	12.3
2	Orion	17	0	73	99	53.0	18.5
3	Orion + Starane	17 + 5.33	0	99	98	55.9	16.9
4	Orion + Buctril	17 + 16	0	90	99	51.7	15.9
5	Orion + Stinger	17 + 5.33	0	73	99	54.3	17.2
6	Orion + Axial XL	17 + 16.4	0	72	99	54.1	16.7
7	Bronate Adv.	12.8	0	73	94	53.3	15.3
8	Huskie	11	0	88	96	52.6	18.6
9	WideMatch + MCPA	16 + 8	0	99	99	58.3	17.0
10	Affinity TM + MCPA	0.6 + 8	0	72	99	54.9	18.5
11	Untreated	--	0	0	0	52.0	15.0
	C.V.%		0	19	3	4.9	11.6
	LSD .05		NS	24	20	NS	3.3

Summary

Crop injury was not observed. A15351A, Orion alone, Orion + Stinger, Orion + Axial XL, Bronate Advance and Affinity treatments only provided partial control of kochia. Orion + Starane, Orion + Buctril and WideMatch treatments provided excellent season long kochia control. All herbicide treatments provided excellent Russian thistle control. The trial sustained late season heat and moisture stress which significantly impacted test weights and grain yields. Orion alone, Huskie and Affinity treatments had significantly higher yields than the untreated check.

Evaluation of Fall and Spring Applications of PowerFlex Herbicide for Tough Grassy Weed Control in Winter Wheat

Hettinger, ND

Eric Eriksmoen

'Jerry' HRWW was seeded on September 14, 2007. Fall treatments were applied on October 4 to two leaf winter wheat and to one leaf downy brome (dobr) with 51° F, 49% RH, cloudy sky and north wind at 7 mph. Winter crop survival was very poor (<15%). Spring treatments were applied on May 4 to 3 ½ leaf winter wheat and to tillering downy brome, 3 leaf Japanese brome (jabr) and to one leaf wild oat (wiot) with 54° F, 51% RH, clear sky and west wind at 9 mph. Treatments were applied with a tractor mounted CO_2 propelled plot sprayer delivering 10 gpa at 30 psi through PK-01E80 nozzles to a 5 foot wide area the length of 10 by 28 foot plots. The trial was sprayed with 10 oz/A Starane to control broadleaf weeds on June 16. The trial was a randomized complete block design with four replications. Downy brome, Japanese brome, wild oat and Persian darnel populations averaged 22, 6, 0.1 and 2 plants per square foot, respectively. Plots were evaluated for crop injury on October 11, May 12, June 10 and on July 2, and for grassy weed control on June 10, July 2 and on July 31. The trial was not harvested.

Summary

Crop injury was not observed. Initial observations showed excellent downy brome control from all treatments except for the fall applied Olympus Flex treatment (trt 3), however, later observations of this treatment also showed excellent control. All treatments provided excellent season long control of Japanese brome. All treatments provided excellent wild oat control except for the fall applied PowerFlex treatment (trt 1). Fall applied Maverick (trt 4) and spring applied PowerFlex (trt 5) were the only treatments that had significant activity on Persian darnel.

Evaluation of Fall and Spring Applications of PowerFlex Herbicide for Tough Grassy Weed Control in Winter Wheat

Hettinger, ND

	Treatment	Product rate	App. timing	10/11 inj	5/12 inj.	---- June 10 ----- inj	dobr	jabr	--------------- July 2 --------------- inj	dobr	jabr	wiot	peda	------- July 31 ------ dobr	jabr	peda
		oz/A		-- % control										--		
1	PowerFlex+Agral 90+AMS	3.5+0.5%+1.7kg	Fall	0	0	0	97	99	0	97	99	77	0	94	99	0
2	Olympus + Agral 90	0.9 + 0.5%	Fall	0	0	0	98	99	0	82	99	96	0	94	99	0
3	Olympus Flex+Agral 90+AMS	3.17+0.5%+1.7kg	Fall	0	0	0	74	99	0	74	97	93	0	97	99	0
4	Maverick + Agral 90	0.67 + 0.5%	Fall	0	0	0	94	99	0	99	99	90	60	97	99	88
5	PowerFlex + Agral 90 + AMS	3.5+0.5%+1.7kg	Spg	0	0	0	99	99	0	94	99	94	72	94	99	58
6	Olympus + Agral 90	0.9 + 0.5%	Spg	0	0	0	97	99	0	94	97	99	8	92	99	0
7	Olympus Flex+Agral 90+AMS	3.17+0.5%+1.7kg	Spg	0	0	0	97	99	0	90	99	97	12	94	99	5
8	Maverick + Agral 90	0.67 + 0.5%	Spg	0	0	0	99	99	0	62	99	92	5	84	87	0
9	Untreated	0		0	0	0	0	0	0	0	0	0	0	0	0	0
	C.V. %			0	0	0	12	0	0	15	2	11	61	10	9	38
	LSD 5%			NS	NS	NS	15	1	NS	17	3	13	16	12	12	9

NS = no statistical difference between treatments.

PrePare Herbicide in Spring Wheat

Eric Eriksmoen

Pre-plant treatments (PP) were applied on May 4 to 2” tall mixed bromus species (downy brome and Japanese brome) with 46^o F, 66% RH, clear sky and northwest wind at 5 mph. ‘Dapps’ HRSW was seeded on May 28. Post-emergence treatments (POST) were applied on June 16 to 3 leaf wheat and to flowering downy brome (dobr), Japanese brome (jabr) in the late boot, 4 ½ leaf wild oat (wiot) and to 4 leaf Persian darnel (peda) with 48^o F, 90% RH, clear sky and south wind at 2 mph. Treatments were applied with a tractor mounted CO_2 propelled plot sprayer delivering 10 gpa at 30 psi through PK-01E80 nozzles to a 5 foot wide area the length of 10 by 28 foot plots. The trial was a randomized complete block design with four replications. Downy brome, Japanese brome, wild oat and Persian darnel populations averaged 22, 6, 0.1 and 2 plants per square foot, respectively. The trial was located on a clay loam soil with 24% sand, 42% silt and 34% clay. Plots were evaluated for crop injury and weed control on June 10, June 26 and on August 1, and for plant height on July 18. The trial was not harvested due to poor crop development caused by drought.

Summary

Crop injury was not observed on any treatment (data not shown). Glyphosate alone (trt 1) provided excellent season long control of both bromus species but did not control either wild oat or Persian darnel which had not emerged prior to the pre-plant application. The addition of PrePare + Banvel with glyphosate (trt 2) did not enhance grassy weed control above the glyphosate alone treatment. POST applied Everest treatments (trt 3 & 4) provided some activity on Persian darnel with the higher rate (trt 4) providing comparable control to Discover NG (trt 6) but not as good as the Axial XL treatment (trt 7). All POST application treatments provided excellent wild oat control. There were no significant differences for plant height between treatments.

	Treatment	Product rate	App. timing	- June 10 - dobr	jabr	------ June 26 ------ dobr	jabr	peda	Plant height	---------- August 1 ---------- dobr	jabr	peda	wiot
		oz/A		-------------- % control				--------------	cm	--------- % control			----------
1	Glyphosate + AMS	11.4 + 1lb	PP	99	99	99	99	0	48	99	99	0	0
2	Glyph + AMS + PrePare + Banvel	11.4 + 1lb + 0.306 + 2.0	PP	99	99	99	99	0	49	99	99	0	0
3	Glyph + AMS + PrePare + Banvel /	11.4 + 1lb + 0.306 + 2.0 /	PP /										
	Everest + Basic Blend	0.204 + 1%	POST	99	99	99	99	20	48	99	99	0	96
4	Glyph + AMS + PrePare + Banvel /	11.4 + 1lb + 0.306 + 2.0 /	PP /										
	Everest + Basic Blend	0.306 + 1%	POST	99	99	99	99	48	46	99	99	42	94
5	Glyph + AMS + PrePare + Banvel /	11.4 + 1lb + 0.306 + 2.0 /	PP /										
	Olympus + Basic Blend	0.2 + 1%	POST	99	99	99	99	0	48	99	99	0	94
6	Glyph + AMS + PrePare + Banvel /	11.4 + 1lb + 0.306 + 2.0 /	PP /										
	Discover NG	6.4	POST	99	99	99	99	45	44	97	99	42	97
7	Glyphosate + AMS /	11.4 + 1lb /	PP /										
	Axial XL	16.4	POST	99	99	99	99	82	46	94	94	98	98
	C.V. %			0	0	0	0	74	6.9	2.5	2.0	50	4.4
	LSD 5%			NS	NS	NS	NS	30	NS	NS	3	20	5

NS = no statistical difference between treatments.

PrePare Herbicide on Light Soils in Spring Wheat

Eric Eriksmoen

Howard' HRSW was seeded on April 30. Pre-emergence treatments (PRE) were applied on May 5 to 2" tall mixed bromus species (downy brome and Japanese brome) with 71^o F, 22% RH, partly cloudy sky and west wind at 8 mph. Post-emergence treatments (POST) were applied on June 1 to 4 leaf wheat and to heading downy brome (dobr), tillering Japanese brome (jabr), 2 leaf wild buckwheat (wibw) and to 3 leaf volunteer canola (cano) with 61^o F, 64% RH, clear sky and northwest wind at 4 mph. Treatments were applied with a tractor mounted CO_2 propelled plot sprayer delivering 10 gpa at 30 psi through PK-01E80 nozzles to a 5 foot wide area the length of 10 by 28 foot plots. The trial was a randomized complete block design with four replications. Bromus species, wild buckwheat and volunteer canola populations averaged 10, 2.75 and 2 plants per square foot, respectively. The trial was located on a loamy soil with 41% sand, 35% silt and 24% clay. Plots were evaluated for crop injury on June 12, for plant height on July 18 and for weed control on June 12 and August 1. The trial was harvested on August 9.

Summary

Crop injury was initially observed on all treatments but at very low levels. There were significant differences between treatments for plant height, however, there did not appear to be any trends associated with these differences. There were no significant differences for weed control between herbicide treatments. Test weights from the herbicide treatments were all significantly higher than the untreated check, with the exception of treatment 12. All herbicide treatments were significantly higher in grain yield than the untreated check. There were also significant differences between herbicide treatments, however, there did not appear to be any clear trends associated with these differences.

	Treatment	Product rate	App. timing	June 12 inj.	June 12 brom	June 12 cano	June 12 wibw	Plant height	August 1 jabr	August 1 dobr	August 1 wibw	Test weight	Grain yield
		oz/A		% control				cm	% control			lbs/bu	bu/A
1	Untreated	--	--	0	0	0	0	64	0	0	0	52.9	8.2
2	Glyphosate + AMS / Widematch + MCPA	11.4 + 1lb / 16 + 8	PRE / POST	2	94	91	94	67	98	97	95	56.4	16.6
3	Glyph + AMS + PrePare / Widematch + MCPA	11.4 + 1lb + 0.204 / 16 + 8	PRE / POST	3	96	92	94	69	99	95	92	57.6	19.1
4	Glyph + AMS + PrePare / Widematch + MCPA	11.4 + 1lb + 0.306 / 16 + 8	PRE / POST	2	92	92	97	72	96	94	95	57.9	20.9
5	Glyph + AMS + PrePare + Banvel / Widematch + MCPA	11.4 + 1lb + 0.204 + 2.0 / 16 + 8	PRE / POST	2	91	91	92	68	97	93	92	57.9	19.0
6	Glyph + AMS + PrePare + Banvel / Widematch + MCPA	11.4 + 1lb + 0.306 + 2.0 / 16 + 8	PRE / POST	4	96	94	95	71	99	96	95	56.2	17.4
7	Glyph + AMS + PrePare + ET / Widematch + MCPA	11.4 + 1lb + 0.204 + 1.0 / 16 + 8	PRE / POST	1	94	94	95	72	99	94	96	59.6	18.4
8	Glyph + AMS + PrePare + ET / Widematch + MCPA	11.4 + 1lb + 0.306 + 1.0 / 16 + 8	PRE / POST	2	92	92	95	71	99	94	96	58.7	15.7
9	Glyph + AMS + PrePare / Everest + Widematch + MCPA	11.4 + 1lb + 0.204 / 0.204 + 16 + 8	PRE / POST	2	95	94	95	69	99	94	95	57.4	18.3
10	Glyph + AMS + PrePare / Everest + Widematch + MCPA	11.4 + 1lb + 0.306 / 0.204 + 16 + 8	PRE / POST	2	94	95	96	71	98	96	96	57.6	16.6
11	Glyph + AMS + PrePare / Discover NG + Widematch + MCPA	11.4 + 1lb + 0.204 / 6.4 + 16 + 8	PRE / POST	3	92	91	94	71	99	98	95	58.0	17.6
12	Glyph + AMS + PrePare / Discover NG + Widematch + MCPA	11.4 + 1lb + 0.306 / 6.4 + 16 + 8	PRE / POST	2	92	92	96	72	99	92	95	56.0	17.5
13	Glyph + AMS / Everest + Widematch + MCPA	11.4 + 1lb / 0.408 + 16 + 8	PRE / POST	6	95	95	95	67	99	96	92	58.3	16.3
14	Glyph + AMS / Discover NG + Widematch + MCPA	11.4 + 1lb / 12.8 + 16 + 8	PRE / POST	4	89	92	95	69	97	94	95	58.7	16.5
	C.V. %			125	3.7	3.0	2.5	4.7	2.7	4.9	2.3	3.9	12.1
	LSD 5%			NS	5	4	3	5	3	6	3	3.2	2.9

NS = no statistical difference between treatments.

Grassy Weed Control with Pyroxsulam in Spring Wheat

Eric Eriksmoen

'Howard' HRSW was seeded on April 30. Treatments were applied on May 31 to 3 1/2 leaf wheat and to heading downy brome (dobr), tillering Japanese brome (jabr), 2 leaf Persian darnel (peda) and 3 leaf wild oat (wiot) with 73^{o} F, 34% RH, clear sky and northwest wind at 8 mph. Treatments were applied with a tractor mounted CO_2 propelled plot sprayer delivering 10 gpa at 30 psi through PK-01E80 nozzles to a 5 foot wide area the length of 10 by 28 foot plots. The trial was sprayed with 10 oz/A Starane to control broadleaf weeds on June 16. The trial was a randomized complete block design with three replications. Downy brome, Japanese brome, Persian darnel and wild oat populations averaged 2.6, 4, 1.2 and 0.8 plants per square foot, respectively. Plots were evaluated for crop injury on June 10, June 17, July 2 and on July 29 and for grassy weed control on June 17, July 2 and on July 29. The trial was harvested on August 9.

Summary

Crop injury was initially observed on all treatments but diminished quickly. Treatments were applied to large downy brome plants resulting in relatively poor overall control with the exception of treatments 2, 8, 9, 15 and 16 which provided good control of this weed. All treatments except for Axial XL alone (trt 14) provided excellent control of Japanese brome. All treatments provided excellent control of Persian darnel except for GF-1847 (trt 7), Olympus (trt 10), Everest (trt 11) and Rimfire (trt 12). All treatments provided excellent season long control of wild oats. Although there were some significant differences between treatments for yield, there did not appear to be any trends. Yields were poor due to late season drought.

	Treatment	Product rate	6/10	----- June 17 ----			--------------- July 2 ---------------					-------------- July 29 --------------						
			inj	inj.	dobr	jabr	inj	dobr	jabr	wiot	peda	inj	dobr	jabr	peda	wiot	twt	yield
		oz/A	% control														lbs/bu	bu/A
1	GF-1848 +	16 +																
	Agral 90	0.5%	8	0	75	75	0	50	98	99	99	0	50	96	99	99	55.7	15.1
2	GF-1848 +	16 +																
	Agral 90 +	0.5% +																
	AMS	1.5 lbs	5	0	65	68	0	73	86	92	99	0	90	99	99	99	58.0	16.6
3	GF-1848 +	16 +																
	Agral 90 +	0.5% +																
	AMS	3.0 lbs	4	0	67	82	0	60	95	99	99	0	50	99	99	99	56.7	14.5
4	GF-1848 +	16 +																
	mineral oil	0.8%	9	0	60	78	0.3	60	93	99	99	0.3	50	99	95	98	56.0	11.3
5	GF-1848 +	16 +																
	MSO	0.8%	5	1.7	70	78	0	63	77	96	99	0	60	99	96	99	56.0	15.2
6	GF-1847 +	4.56 +																
	Agral 90	0.5%	10	0	62	68	0	62	75	98	99	0	80	98	99	96	53.9	13.5
7	GF-1847 +	4.56 +																
	Agral 90 +	0.5% +																
	AMS	1.5 lbs	2	0	82	68	0	68	88	99	99	0	87	98	99	96	54.9	16.3
8	GF-1847 +	4.56 +																
	Agral 90 +	0.5% +																
	AMS	3.0 lbs	4	0	57	63	0	67	83	81	99	0	85	99	73	98	53.8	13.5
9	GF-1847 +	5.47 +																
	Agral 90 +	0.5% +																
	AMS	1.5 lbs	9	0	78	83	0	80	80	98	99	0	73	98	99	99	56.0	13.3
10	Olympus +	0.9 +																
	Agril 90	0.5%	2	0	73	83	0	47	83	0	99	0	50	99	0	99	55.2	18.5

Continued next page

Grassy Weed Control with Pyroxsulam in Spring Wheat

Hettinger, ND

11	Everest +	0.61 +																
	Agral 90 +	0.25% +																
	AMS	1.5 lbs	5	0	50	77	0	33	93	0	99	0	3	99	0	98	56.3	13.3
12	Rimfire +	1.75 +																
	Agral 90 +	0.25% +																
	AMS	1.5 lbs	5	0	67	73	0.3	50	60	80	99	0	40	98	80	96	56.3	15.3
13	Silverado +	2.25 +																
	Scoil	24	2	0	53	60	0	40	93	91	99	0	23	96	93	99	57.2	14.2
14	Axial XL	16.4	4	0	0	0	0	0	0	98	99	0	0	0	99	98	53.8	11.6
15	GF-1848 +	12 +																
	Axial XL	8.2	10	3.3	57	82	0.3	77	93	99	99	0	93	96	98	99	54.8	11.9
16	GF-1847+	4.56 +																
	Axial XL	8.2	8	0	80	82	0.3	80	93	99	99	0	91	99	99	99	54.2	19.2
17	Untreated	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	52.7	11.8
	C.V. %		112	519	17	15	357	28	10	9	0	714	23	3	16	2	3.1	15.8
	LSD 5%		NS	NS	17	17	NS	25	13	12	1	NS	21	4	21	3	2.9	3.8

Desiccation of Lentil with Valor Herbicide — Hettinger, ND

Eric Eriksmoen

'CDC Richlea' lentil was seeded on May 14 and treated with 2 pt/A Prowl H_2O + 1 pt/A Roundup Weather Max on May 18. Desiccation treatments were applied on August 3 to lentils that were at physiologic maturity with 83^o F, 34% RH, clear sky and NW wind at 6 mph. Treatments were applied with a tractor mounted CO_2 propelled plot sprayer delivering 20 gpa at 30 psi through PK-01E80 nozzles to the length of 5 by 28 foot plots. Treatments were harvested at 4, 10 and 15 days after desiccation.

Treatment	Product Rate	Seed Moisture	Test Weight	Grain Yield
	oz/A	%	lbs/bu	lbs/A
Harvest = August 7 (4 DAT)				
Untreated		17.2	56.0	576
Valor + Superb + AMS	2.0 + 32 + 2.5 lbs	15.3	57.2	603
Gramoxone + NIS	20.8 + 0.25%	13.6	59.9	592
Valor + glyphosate + Superb + AMS	2.0 + 22 + 32 + 2.5 lbs	14.8	57.4	496
Glyphosate + Superb + AMS	22 + 32 + 2.5 lbs	15.6	57.1	395
Harvest = August 13 (10 DAT)				
Untreated		9.1	58.6	345
Valor + Superb + AMS	2.0 + 32 + 2.5 lbs	7.2	58.2	315
Gramoxone + NIS	20.8 + 0.25%	4.8	58.9	203
Valor + glyphosate + Superb + AMS	2.0 + 22 + 32 + 2.5 lbs	9.0	58.4	395
Glyphosate + Superb + AMS	22 + 32 + 2.5 lbs	8.8	59.1	336
Harvest = August 18 (15 DAT)				
Untreated		--	--	139
Valor + Superb + AMS	2.0 + 32 + 2.5 lbs	--	--	139
Gramoxone + NIS	20.8 + 0.25%	--	--	96
Valor + glyphosate + Superb + AMS	2.0 + 22 + 32 + 2.5 lbs	--	--	171
Glyphosate + Superb + AMS	22 + 32 + 2.5 lbs	--	--	53

Summary

Due to the unreplicated nature of this trial, specific conclusions should not be drawn from this data, however, a few general trends were observed. The Gramoxone treatment tended to provide a higher level of seed dry-down than the other treatments. Seed moisture tended to be correlated with grain yields with lower seed moistures tending to correspond with lower grain yields. This is probably due to more seed shattering as pods dry down. There did not appear to be any obvious trends related to test weight. Seed moistures and test weights were not obtained for the August 18 harvest date due to very low seed yields.

Desiccation of Safflower with Valor Herbicide — Hettinger, ND

Eric Eriksmoen

'Finch' Safflower was seeded on June 9. Desiccation treatments were applied on September 11 to safflower that was at physiologic maturity (39% seed moisture) with 69^o F, 45% RH, cloudy sky and N wind at 6 mph. Treatments were applied with a tractor mounted CO_2 propelled plot sprayer delivering 20 gpa at 30 psi through PK-01E80 nozzles to the length of 5 by 28 foot plots. Treatments were harvested at 6, 12 and 18 days after desiccation.

Treatment	Product Rate	Seed Moisture	Test Weight	Grain Yield*
	oz/A	%	lbs/bu	lbs/A
Harvest = September 17 (6 DAT)				
Untreated		29.6	34.1	1309
Valor + Superb + AMS	2.0 + 32 + 2.5 lbs	29.4	33.3	1107
Gramoxone + NIS	20.8 + 0.25%	26.5	39.2	1308
Valor + glyphosate + Superb + AMS	2.0 + 22 + 32 + 2.5 lbs	31.5	35.2	1153
Glyphosate + Superb + AMS	22 + 32 + 2.5 lbs	33.3	35.6	1411
Harvest = September 23 (12 DAT)				
Untreated		23.7	33.7	780
Valor + Superb + AMS	2.0 + 32 + 2.5 lbs	28.0	35.6	932
Gramoxone + NIS	20.8 + 0.25%	17.3	36.7	670
Valor + glyphosate + Superb + AMS	2.0 + 22 + 32 + 2.5 lbs	23.4	36.9	843
Glyphosate + Superb + AMS	22 + 32 + 2.5 lbs	25.3	35.0	728
Harvest = September 29 (18 DAT)				
Untreated		19.9	39.8	784
Valor + Superb + AMS	2.0 + 32 + 2.5 lbs	12.1	35.9	771
Gramoxone + NIS	20.8 + 0.25%	-	-	451
Valor + glyphosate + Superb + AMS	2.0 + 22 + 32 + 2.5 lbs	15.5	35.7	667
Glyphosate + Superb + AMS	22 + 32 + 2.5 lbs	14.7	33.1	608

* Grain yields have been adjusted to 0% seed moisture.

Summary

Due to the unreplicated nature of this trial, specific conclusions should not be drawn from this data. Chemical desiccation appears to be much less effective on this crop possibly due to the waxy plant surface coating and relatively large and tight seed bolls, however, desiccation appeared to be a little more effective with Gramoxone than with the other treatments. There does not appear to be any clear trends between treatments and harvest dates other than what would normally be expected such as decreasing seed moistures and yields over time.

Line	Days to Head	Plant Height	Test Weight	Grain Yield
		cm	lbs/bu	bu/ac
NDSW0449	77	86	53.3	32.2
NDSW0481	76	91	42.1	19.2
NDSW0501	75	101	50.8	25.2
NDSW0601	77	80	50.3	24.8
NDSW0607	77	90	49.7	22.4
NDSW0609	74	88	50.4	27.1
NDSW0612	78	82	44.0	22.9
NDSW0701	74	83	48.8	33.9
NDSW0702	76	90	44.6	26.6
NDSW0703	76	91	48.3	25.0
NDSW0705	75	95	49.8	25.1
NDSW0706	74	92	46.6	19.6
NDSW0711	74	99	48.4	23.6
AC Lillian	78	92	50.6	30.5
Choteau	74	83	45.9	19.4
Glenn	72	96	52.6	20.3
Steele-ND	76	90	45.7	23.5
AC Snowbird	75	98	51.5	21.4
Alpine	75	91	48.0	26.3
Lolo	77	82	46.1	25.5
Trial Mean	75	90	48.4	24.7
C.V. %	0.9	3.4	4.1	12.6
LSD .05	1	5	3.3	5.1
LSD .01	1	7	4.4	6.9

Planting Date: April 15, 2008
Harvest Date: August 1, 2008
Previous Crop: HRSW
Note: The trial sustained severe late season heat and moisture stress.

2008 Clearfield Wheat Cultivar Evaluation — Hettinger, ND

Eric Eriksmoen

The trial was seeded on April 15 into no-till durum stubble. Beyond Herbicide was applied at 8.0 oz/A + 32 oz/A AMS + 0.25% NIS on June 3 to 5 leaf wheat with 69^{o} F, 42% RH, clear sky and 4 mph West wind. The treated block was applied with a pickup mounted sprayer delivering 10 gpa at 40 psi through 8004 EVS nozzles to the length of 5 by 18 foot plots. The trial was a split block design with three replications. Blocks were either treated or untreated and varieties were sub-plots within each block. Plots were evaluated for crop injury on June 17 and on June 25, for days to head emergence, for plant height, for test weight and for grain yield. The trial sustained severe late season heat and moisture stress. The trial was harvested on August 1.

Cultivar	Herbicide Treatment	6/9 Inj	6/25 Inj	Days to Head	Plant Height	Test Weight	Grain Yield
		%	%	*	cm	lbs/bu	bu/A
AP603CL	trt	0	0	78	82	49.2	22.0
	untrt	0	0	77	82	43.8	16.2
AP604CL	trt	0	0	74	94	51.8	24.8
	untrt	0	0	74	92	48.8	17.1
ND901CL	trt	0	0	76	93	51.8	20.9
	untrt	0	0	75	91	44.4	19.2
ND904	trt	0	0	77	85	51.7	23.7
	untrt	0	0	75	80	42.3	19.4
ND905	trt	0	0	75	82	48.2	21.3
	untrt	0	0	74	75	48.6	16.2
ND906	trt	0	0	78	91	47.7	23.4
	untrt	0	0	74	83	41.0	20.1
Glenn	trt	95	99	--	--	--	0.0
	untrt	0	0	76	84	43.2	19.0
Steele-ND	trt	95	99	--	--	--	0.0
	untrt	0	0	74	84	--	18.1
Reeder	trt	95	99	--	--	--	0.0
	untrt	0	0	74	62	47.0	24.0
Alsen	trt	95	99	--	--	--	0.0
	untrt	0	0	66	54	45.8	19.1
C.V. %		2.7	0	1.2	5.0	5.6	14.0
LSD .05		1	1	2	7	NS	4.7

* Days to head = the number of days from seeding until head emergence from the boot.
NS = no statistical difference between cultivars.

2008 "Seed Prod+" and "Crop Prod" on HRSW Continuously Cropped, No-till Hettinger, ND

Treatment	Heading Date	Plant Height	Test Weight	Grain Protein	Grain Yield
	July	inches	lbs/bu	%	bu/Ac
Seed Prod +	5	36	50.8	17.4	27.9
Crop Prod	4	35	55.3	17.1	38.6
Seed Prod +/ Crop Prod	5	35	54.4	16.3	38.2
Untreated	5	35	55.3	16.7	39.0
Trial Mean	5	35	54.0	16.9	35.9
C.V. %	0.1	0.8	1.4	5.0	11.6
LSD .05	NS	1	1.6	NS	NS

Application Info: Seed Prod + applied to seed at 1.6 oz / 100 lbs of seed
Crop Prod applied on June 16 at 10 oz/A with 10 gal water/A
Planting Date: May 5
Harvest Date: August 13
Variety: Howard
Seeding Rate: 1.1 million live seeds / acre.
Previous Crop: hrsw
Note: Trial sustained late season heat and moisture stress.
NS = No Statistical difference between treatments.

Wheat Stem Maggot Evaluations — Hettinger, ND

Eric Eriksmoen

'Steele-ND' HRSW was seeded on May 5 into field pea stubble. Foliar treatments were applied on June 16 (early foliar) to 5 ½ leaf wheat and on June 26 (late foliar) to wheat just after flag leaf emergence. Foliar treatments (trts 3, 4 & 7) were with 2.56 fl. oz. per acre of Warrior Insecticide. The low seed treatment (trts 5 and 7) was with 1.00 oz. Cruiser + Dividend and the high seed treatment (trt 6) was with 1.33 oz. Cruiser + Dividend. Treatments were applied with a tractor mounted CO_2 propelled plot sprayer delivering 20 gpa at 30 psi through PK-01E80 nozzles to an area the length of 10 by 24 foot plots. The trial was a randomized complete block design with four replications. The trial was harvested on August 13. The trial sustained severe late season heat and moisture stress causing low test weights and relatively poor grain yields.

	Treatment	Test Weight	Grain Protein	Grain Yield
		lbs/bu	%	bu/A
1	Untreated	50.7	18.2	16.7
2	Dividend Seed Trt	51.3	18.2	19.1
3	Early Foliar	49.6	18.3	18.0
4	Late Foliar	51.5	18.0	19.7
5	Low Seed Trt	50.9	18.1	19.5
6	High Seed Trt	49.0	18.2	17.1
7	Low Seed Trt + Early Foliar	50.0	18.1	20.2
	C.V.%	2.8	1.4	6.5
	LSD .05	NS	NS	1.8
	LSD .01	NS	NS	2.5

NS = no statistical difference between treatments.

2008 HRSW Variety Trial - Continuously Cropped - No-till   Mandan, ND

Cooperator: USDA-ARS, Mandan

Variety	Plant Height	Test Weight	Grain Protein	---- Grain Yield ---- 2006	2007	2008	Average Yield 2 yr	3 yr
	inches	lbs/bu	%	----------- Bushels per acre -----------				
Granger	41	56.3	14.5	30.4	58.8	64.2	61.5	51.1
Glenn	39	57.8	15.0	30.2	64.6	56.2	60.4	50.3
Steele-ND	37	54.6	14.8	29.6	58.2	59.5	58.8	49.1
Howard	36	55.2	14.6	30.4	59.3	57.6	58.4	49.1
Faller	35	54.3	14.4	20.5	60.4	58.5	59.4	46.5
Kelby	30	56.9	14.7		61.1	67.6	64.4	
Kuntz	32	56.4	14.0		60.1	67.7	63.9	
Choteau	32	54.3	15.0			60.5		
ND901CL	38	55.9	15.4			58.9		
NDSW0449	38	55.1	15.1			59.1		
ND806	39	54.4	14.8			64.1		
ND809	38	55.4	14.9			66.2		
Trial Mean	36	55.5	14.8	29.7	59.0	61.7	--	--
C.V. %	2.3	1.5	3.4	9.3	5.3	6.0	--	--
LSD .05	1	1.2	NS	4.7	5.3	5.4	--	--
LSD .01	2	1.7	NS	6.3	7.3	7.2	--	--

NS = no statistical difference between varieties.

Planting Date: April 22, 2008
Harvest Date: August 12, 2008
Seeding Rate: 1.1 million live seeds / acre (approx. 1.6 bu/A).
Previous Crop: 2005 & 2006 = hrww, 2007 = hrsw.

2008 Soil Restoration, LLC on HRSW Continuously Cropped, No-till — Hettinger, ND

Treatment	Rate	Heading Date	Plant Height	Lodging	Test Weight	Grain Protein	Grain Yield
	oz/A	July	inches	0 – 9*	lbs/bu	%	bu/Ac
Arbor T&O + Ocean Trace	32 + 10	4	32	1	58.7	15.2	41.6
Microbalancer + Ocean Trace	32 + 10	4	32	1	58.1	14.8	36.3
Untreated	0	4	31	1	58.6	14.8	39.3
Trial Mean		4	36	1	58.5	14.9	39.1
C.V. %		0.1	3.0	0	1.4	3.7	5.0
LSD .05		NS	NS	NS	NS	NS	3.4

* 0 = none, 9 = lying flat on ground.

Application Info: May 5, pre-plant, 10 gal water/A
Planting Date: May 5
Harvest Date: August 13
Variety: Howard
Seeding Rate: 1.1 million live seeds / acre.
Previous Crop: barley

NS = No Statistical difference between treatments

2008 HRSW Variety Trial - Continuously Cropped - No-till New Leipzig, ND

Cooperator: Daryl Birdsall, New Leipzig

Variety	Plant Height	Test Weight	Grain Protein	---- Grain Yield ---- 2006	2007	2008	Average Yield 2 yr	3 yr
	inches	lbs/bu	%	----------- Bushels per acre -----------				
Steele-ND	30	56.5	15.0	15.3	31.9	17.7	24.8	21.6
Glenn	32	58.4	15.1	15.0	32.0	17.5	24.8	21.5
Howard	30	56.4	15.2	15.9	29.7	16.9	23.3	20.8
Faller	27	55.2	14.8	12.1	32.6	15.3	24.0	20.0
Granger	31	58.0	14.4	10.1	28.2	17.9	23.0	18.7
Kelby	25	56.3	16.2		28.6	18.5	23.6	
Kuntz	25	55.4	15.2		28.5	16.2	22.4	
Choteau	25	55.4	15.5			22.3		
ND901CL	30	60.4	16.2			19.0		
NDSW0449	27	59.4	15.6			22.7		
ND806	31	55.6	15.4			19.4		
ND809	31	55.4	15.0			19.0		
Trial Mean	29	56.9	15.3	13.9	30.8	18.5	--	--
C.V. %	3.1	4.0	3.9	13.0	14.9	7.4	--	--
LSD .05	1	3.3	0.9	2.6	NS	2.0	--	--
LSD .01	2	NS	1.2	4.8	NS	2.7	--	--

Planting Date: April 23, 2008
Harvest Date: August 8, 2008
Seeding Rate: 1.1 million live seeds / acre (approx. 1.6 bu/A).
Previous Crop: 2005 & 2006 = hrww, 2007 = hrsw.
NS = no statistical difference between varieties.
Note: The 2006 & 2008 trials sustained severe heat and moisture stress.

2008 “Plant Health Care 501” on HRSW and Barley Continuously Cropped, No-till Hettinger, ND

Crop	Treatment	Heading Date	Plant Height	Lodging	Test Weight	Grain Protein	Grain Yield
			inches	0 – 9*	lbs/bu	%	bu/Ac
HRSW	untreated	July 2	34	1.1	52.9	17.0	37.0
HRSW	PHC 501	July 2	33	1.1	53.1	16.9	43.5
Barley	untreated	June 30	36	8.0	38.8	15.1	53.8
Barley	PHC 501	June 29	35	8.0	37.8	15.4	61.4
C.V. %		0.3	3.6	5.6	2.7	3.6	8.7
LSD .05		0.6	1	0.2	1.3	0.6	4.4

* Lodging: 0 = none, 9 = lying flat on ground.

Planting Date: April 28
Harvest Date: August 5
Variety: Howard HRSW and Tradition Barley
Previous Crop: barley
Note: Trial sustained late season heat and moisture stress.

2008 HRSW Variety Trial - Continuously Cropped - No-till — Regent, ND

Cooperators: August and Perry Kirschmann, Regent

Variety	Plant Height	Test Weight	Grain Protein	---- Grain Yield ---- 2006	2007	2008	Average Yield 2 yr	3 yr
	inches	lbs/bu	%	----------- Bushels per acre -----------				
Howard	26	52.9	17.3	39.6	54.8	13.5	34.2	36.0
Glenn	26	54.8	17.4	38.0	48.0	14.6	31.3	33.5
Steele-ND	27	53.1	17.0	43.2	43.0	13.6	28.3	33.3
Faller	23	52.2	17.4	35.8	49.6	12.1	30.8	32.5
Granger	26	53.5	17.0	36.4	44.7	14.0	29.4	31.7
Kelby	24	58.0	16.8		58.5	19.6	39.0	
Kuntz	23	54.4	16.4		46.3	12.6	29.4	
Choteau	22	55.9	17.4			16.2		
ND901CL	26	57.2	17.4			14.9		
NDSW0449	23	59.1	18.3			17.7		
ND806	30	51.3	17.7			15.1		
ND809	27	58.2	17.4			16.1		
Trial Mean	25	55.6	17.3	38.4	49.4	15.0	--	--
C.V. %	10.3	3.5	2.2	7.3	9.7	20.9	--	--
LSD .05	4	2.8	0.6	5.1	1.4	NS	--	--
LSD .01	5	2.8	0.8	5.5	1.9	NS	--	--

Planting Date: April 21, 2008
Harvest Date: August 8, 2008
Seeding Rate: 1.1 million live seeds / acre (approx. 1.6 bu/A).
Previous Crop: 2005, 2006 & 2007 = hrsw.
NS = no statistical difference between varieties.
Note: The 2008 trial sustained severe heat and moisture stress.

2008 HRSW Variety Trial - Continuously Cropped - No-till — Scranton, ND

Cooperators: Neal and Justin Freitag, Scranton

Variety	Plant Height	Test Weight	Grain Protein	---- Grain Yield ---- 2006	2007	2008	Average Yield 2 yr	3 yr
	inches	lbs/bu	%	----------- Bushels per acre -----------				
Steele-ND	28	54.6	17.4	57.3	36.1	24.0	30.0	39.1
Howard	29	54.9	17.3	52.8	42.1	18.6	30.4	37.8
Granger	27	56.5	17.6	49.9	41.9	18.5	30.2	36.8
Glenn	29	58.4	17.6	52.9	38.2	18.2	28.2	36.4
Faller	23	55.1	17.1	44.1	36.2	18.7	27.4	33.0
Kelby	25	56.1	17.6		32.6	26.7	29.6	
Kuntz	23	57.1	17.1		30.4	24.8	27.6	
Choteau	23	57.9	17.5			22.0		
ND901CL	29	58.8	17.4			19.5		
NDSW0449	24	61.1	18.2			24.3		
ND806	30	53.8	17.5			21.9		
ND809	29	57.4	17.4			19.5		
Trial Mean	27	56.8	17.5	53.5	37.0	21.4	--	--
C.V. %	3.5	3.3	1.3	5.7	8.6	7.1	--	--
LSD .05	1	2.7	0.3	4.4	4.6	2.2	--	--
LSD .01	2	3.7	0.4	5.9	6.2	2.9	--	--

Planting Date: April 14, 2008
Harvest Date: August 5, 2008
Seeding Rate: 1.1 million live seeds / acre (approx. 1.6 bu/A).
Previous Crop: 2005 & 2006 = hrww, 2007 = hrsw.
Note: The 2008 trial sustained heat and moisture stress.

Entry	Line	Heading Date	Plant Height	Lodging	Test Weight	Grain Yield
		Julian	cm	0 – 9*	lbs/bu	bu/ac
1	Marquis	187	107	2.3	48.0	25.9
2	Chris	184	113	1.3	49.2	29.5
3	2375	182	97	2.0	46.5	34.3
4	Verde	182	78	1.3	44.2	34.2
5	Keene	183	92	5.3	46.1	29.1
6	SD3948	178	93	1.0	50.7	34.8
7	SD4024	182	80	1.0	49.5	33.3
8	SD4027	176	98	1.3	51.2	39.0
9	SD4036	180	87	1.0	43.4	36.1
10	SD4073	183	97	1.0	43.4	30.5
11	ND04/3-20	182	113	3.0	43.2	31.3
12	ND04/3-21	180	96	1.3	45.4	37.4
13	ND05/1-1	181	99	1.7	48.3	27.9
14	ND05/1-2	181	96	3.3	49.0	34.8
15	ND05/1-3	182	104	1.7	46.8	32.7
16	NDSW0449	184	79	1.3	48.6	30.7
17	NDSW0501	181	96	6.3	48.8	30.9
18	NDSW0601	185	81	3.3	48.6	35.2
19	MN03196	182	83	1.7	47.9	33.6
20	MN03308-4	183	91	1.3	48.5	33.8
21	MN03169-2-062	183	94	3.3	43.3	34.2
22	MN05141-2	181	86	3.0	48.8	30.7
23	MT0415	182	85	1.7	48.7	30.2
24	MT0713	182	90	1.3	51.1	34.3
25	WA007954	182	92	1.3	48.5	34.6
26	BW897	180	92	2.7	48.4	25.8
27	ES101	182	87	1.3	45.1	26.1
28	BW365	183	83	1.7	49.9	29.6
29	BW396	180	93	5.7	45.2	26.9
30	BW415	181	97	6.3	50.0	30.4
31	BW430	182	114	3.0	50.4	25.9
32	00S0211-29-4	182	96	3.3	47.5	37.6
33	00S0292-14	183	77	2.3	49.7	37.5
34	01S0377-6	179	71	1.0	48.5	32.8
35	01S0263-28	182	77	1.7	47.3	41.5
36	01S0263-29	181	86	1.3	44.6	35.2
37	CA-905-780	182	87	2.3	47.6	29.8

38	CA-907-824	183	79	0.7	48.9	31.1
39	CA-907-835	182	89	1.3	47.4	26.8
40	CA-907-834	182	78	2.7	48.1	28.5
41	BZ901-717	178	86	1.7	46.7	36.7
42	06MSP18	173	84	6.0	40.6	46.5
	C.V. %	0.4	3.6	56.6	2.4	8.8
	LSD .05	1	5	2.2	1.8	4.7

Planting Date: April 14, 2008
Harvest Date: August 4, 2008
*Lodging: 0 = none, 9 = lying flat on ground.
Plot Size: Planted = 74 ft^2
Harvested = 56 ft^2
Previous Crop: HRSW
Note: The trial sustained severe late season heat and moisture stress.

Variety	Days to Head	Plant Height	Lodg.	Test Weight	Grain Protein	---- Grain Yield ---- 2006	2007	2008	Average Yield 2 yr	3 yr
	*	inches	0-9**	lbs/bu	%	----------- Bushels per acre -----------				
Briggs	76	37	2.0	56.2	16.5	39.2	47.1	43.9	45.5	43.4
Kelby	76	32	2.0	57.4	15.9	38.6	38.2	50.9	44.6	42.6
Steele-ND	78	38	0.8	54.3	16.0	38.1	41.2	48.1	44.6	42.5
RB07	76	34	1.5	57.0	15.8	35.8	39.0	51.6	45.3	42.1
Alsen	78	37	0.2	53.1	16.6	38.1	37.8	48.2	43.0	41.4
Freyr	78	39	0.0	51.8	16.1	38.0	35.7	47.9	41.8	40.5
Knudson	79	34	0.2	53.0	16.0	36.9	36.0	47.2	41.6	40.0
Granger	77	39	0.2	55.3	16.4	40.0	37.9	41.8	39.8	39.9
Reeder	77	37	1.0	52.6	16.8	40.8	38.5	38.3	38.4	39.2
Rush	77	35	0.5	56.8	16.2	31.0	35.4	50.8	43.1	39.1
Glenn	76	38	1.2	55.3	17.0	35.8	39.4	41.7	40.6	39.0
Parshall	77	40	0.5	53.9	16.8	37.3	37.4	41.7	39.6	38.8
Granite	82	34	0.0	51.5	17.8	33.6	37.2	42.8	40.0	37.9
Howard	78	38	1.0	54.1	16.2	36.3	37.2	39.3	38.2	37.6
Faller	79	37	0.2	51.2	16.7	33.2	42.3	37.0	39.6	37.5
ND901CL	78	38	0.8	54.8	16.5	33.1	35.9	43.1	39.5	37.4
Choteau	79	33	0.8	52.6	16.4	33.8	38.0	40.5	39.2	37.4
Traverse	77	39	0.8	51.2	15.9	38.6	36.4	36.0	36.2	37.0
Kuntz	78	34	1.5	54.7	15.6		37.4	44.4	40.9	
AP604CL	77	38	1.8	54.6	16.8		41.2	38.3	39.8	
Samson	79	34	0.5	54.0	16.3			48.7		
Breaker	79	36	0.0	53.2	16.4			47.8		
Cromwell	79	35	0.8	54.5	17.3			42.2		
Vantage	82	35	0.0	51.3	17.4			41.9		
Blade	78	37	0.5	52.6	16.9			39.4		
Diamond	78	38	1.8	54.9	16.1			33.7		
ND806	78	40	2.2	50.5	16.5			35.6		
ND807	76	37	0.8	53.5	16.5			46.4		
ND808	80	37	0.0	52.3	16.2			42.9		
ND809	77	39	1.5	52.4	16.7			43.1		
ND810	77	42	1.2	54.1	16.5			43.7		
ND811	78	36	0.5	50.7	16.5			43.4		
ND812	77	39	1.5	55.6	16.8			33.6		
ND813	77	38	1.0	55.0	16.2			40.4		
ND814	76	39	1.2	56.6	16.1			45.1		
ND815	77	39	0.8	52.3	16.8			36.0		
ND816	77	39	0.0	53.6	16.4			46.7		

ND817	79	39	1.5	52.0	16.8			45.0		
ND904	79	40	1.0	52.0	16.1			35.2		
ND905	78	39	0.8	53.5	16.8			38.9		
ND906	82	36	0.2	49.3	16.5			38.7		
NDSW0449	81	36	0.2	52.6	17.0			34.1		
NDSW0481	80	39	1.8	51.2	17.0			41.4		
NDSW0601	79	35	0.0	52.4	16.6			44.7		
SD3851	73	38	1.2	56.0	16.4			39.8		
SD3948	74	38	0.2	56.4	15.5			51.1		
MN03358-4	77	38	0.2	55.8	16.4			47.0		
00S0291	81	35	0.5	52.5	16.8			42.8		
01S0042-10	77	32	1.8	56.4	15.9			50.2		
Trial Mean	78	37	0.8	53.7	16.5	35.9	37.3	42.7	--	--
C.V. %	0.8	3.8	79	1.7	2.2	7.3	7.4	8.7	--	--
LSD .05	1	2	0.9	1.2	0.5	3.6	3.8	5.2	--	--
LSD .01	1	3	1.2	1.6	0.7	4.8	5.1	6.8	--	--

* Days to Head = the number of days from planting to head emergence from the boot.
** Lodging: 0 = none, 9 = lying flat on ground.

Planting Date: April 14
Harvest Date: August 6
Seeding Rate: 1.1 million live seeds / acre (approx. 1.6 bu/A).
Previous Crop: 2007 = hrsw, 2006 = field pea, 2005 = soybean.
Note: The trial sustained late season heat and moisture stress.

2008 WestBred Spring Wheat Variety Trial Continuously Cropped, No-till Hettinger, ND

Variety	Heading Date	Plant Height	Test Weight	Grain Protein	Grain Yield
		inches	lbs/bu	%	bu/Ac
Conan	6/30	30	51.6	17.3	43.2
Triangle II	6/30	31	51.8	16.7	43.8
Volt	7/2	30	53.5	17.0	42.5
BZ901-543W	6/30	33	50.3	16.4	38.1
BZ904-336WP	6/29	28	50.3	17.2	44.2
BZ903-464W	6/28	31	51.5	16.7	42.0
Trial Mean	6/30	30	51.5	16.9	42.3
C.V. %	0.1	6.6	2.5	1.6	10.5
LSD .05	1	NS	1.9	0.4	NS
LSD .01	1	NS	NS	0.6	NS

Planting Date: April 14
Harvest Date: August 5
Previous Crop: barley
NS = No Statistical difference between varieties.
The trial sustained late season heat and moisture stress.

2008 Hard White Spring Wheat – Continuously Cropped - No-till — Hettinger, ND

Variety	Days to Head	Plant Height	Test Weight	Grain Protein	---- Grain Yield ---- 2006	2007	2008	Average Yield 2 yr	3 yr
	*	inches	lbs/bu	%	----------- Bushels per acre -----------				
AC Vista	77	34	46.7	16.0	40.9	58.5	36.4	47.4	45.3
Peerless	81	33	41.9	17.0	41.7	45.6	30.7	38.2	39.3
Otis	78	35	43.6	17.0	38.3	45.1	32.0	38.6	38.5
Pennewawa	78	30	45.2	16.6	35.4	42.8	32.7	37.8	37.0
Diamond	77	33	46.2	16.7	42.7	36.6	30.5	33.6	36.6
Lolo	78	29	43.9	16.4	36.7	39.9	31.4	35.6	36.0
Explorer	75	30	48.7	17.2	30.4	37.2	32.4	34.8	33.3
Golden 86	76	30	47.8	16.5	28.6	40.2	29.2	34.7	32.7
AC Snowbird	77	37	48.8	16.6	32.0	35.6	29.9	32.8	32.5
Snow Crest	74	27	42.4	17.1		47.0	33.7	40.4	
Agawam	74	31	46.5	16.1		42.0	37.7	39.8	
AC Karma	76	29	45.1	16.5		43.6	36.1	39.8	
Waikea	76	33	41.4	16.2		42.9	33.2	38.0	
Lochsa	77	32	45.0	16.0		43.5	31.3	37.4	
Kanata	78	36	47.3	16.4		38.8	33.9	36.4	
Alpine	77	35	33.8	16.6			43.6		
AC Snowstar	76	34	49.2	16.5			30.9		
IDO377S	76	34	45.2	16.9			30.7		
Hard Red Spring Wheat									
Glenn	75	37	49.3	15.8	42.1	48.7	35.9	42.3	42.2
Reeder	76	34	46.8	17.0	36.9	49.0	34.3	41.6	40.1
Steele-ND	78	35	46.4	16.3		39.3	34.8	37.0	
Trial Mean	77	33	45.3	16.5	36.0	42.6	33.4	--	--
C.V. %	0.9	4.5	9.0	4.8	8.3	10.5	11.0	--	--
LSD .05	1	2	5.8	NS	4.9	7.4	5.2	--	--
LSD .01	1	3	7.7	NS	6.6	9.9	6.9	--	--

* Days to Head = the number of days from planting to head emergence from the boot.
NS = no statistical difference between varieties.

Planting Date: April 14, 2008
Harvest Date: August 1, 2008
Seeding Rate: 1.1 million live seeds / acre (approx. 1.6 bu/A).
Previous Crop: 2007 = barley, 2006 & 2005 = hrsw.
Note: The trial sustained late season heat and moisture stress.

2008 HRWW NRPN - Continuously Cropped No-till Hettinger, ND

Entry	Line	Winter Surv.	Heading Date	Plant Height	Lodging	Test Weight	Grain Protein	Grain Yield
		%	Julian	cm	0 – 9*	lbs/bu	%	bu/ac
1	Kharkof	88	173	118	0.7	50.0	16.5	32.2
2	Antelope	23	171	91	0.0	51.4	14.3	45.9
3	Wesley	85	169	89	0.0	50.4	14.4	34.0
4	Jerry	80	175	99	0.0	47.2	15.3	41.9
5	SD06W117	92	174	100	0.0	47.1	15.5	40.0
6	SD06069	77	173	91	0.0	47.1	15.5	38.9
7	SD06163	93	168	93	0.0	50.6	15.5	44.8
8	SD06165	80	169	101	0.0	47.9	15.4	45.9
9	SD06173	82	172	101	0.0	48.6	15.4	37.1
10	SD03164-1	83	170	94	0.0	49.8	16.1	36.5
11	SD03164-2	37	169	93	0.0	51.4	15.7	43.5
12	SD05118	82	172	91	0.3	47.2	16.3	44.6
13	SD05210	86	171	93	0.0	50.2	15.7	36.3
14	SD05W030	73	172	94	0.0	48.2	15.3	41.5
15	N98L20040-44	93	169	88	0.0	46.6	14.0	48.5
16	NX03Y2489	67	172	99	0.3	47.1	14.8	47.7
17	NX04Y2107	80	169	91	0.0	48.8	14.4	45.4
18	NW04Y2188	78	171	91	0.0	50.4	15.5	50.8
19	HV9W03-1379R	14	174	83	0.0	50.5	16.1	23.6
20	NE02533	37	173	96	0.0	45.8	15.7	41.2
21	NE02558	37	173	91	0.0	46.1	15.4	40.6
22	NW03666	68	171	96	0.7	49.5	16.1	42.6
23	NE04490	33	173	92	0.0	46.5	16.2	37.7
24	NI04420	47	172	96	0.3	48.0	15.7	38.8
25	NI04427	60	170	86	0.0	50.0	16.0	42.5
26	NE05548	80	171	99	0.3	46.2	16.5	38.9
27	NE05549	80	171	94	0.0	46.4	16.0	40.6
28	NE05569	78	169	84	0.0	48.5	15.2	41.1
29	MT0495	95	175	92	0.7	43.8	16.3	41.2
30	MTS0531	72	174	87	0.0	47.2	16.2	46.6
31	MT0552	93	171	92	0.3	47.6	16.5	40.9
Trial Mean		70	171	94	0.1	48.3	15.6	41.0
C.V. %		20.1	0.8	4.9	331	5.2	4.7	14.3
LSD .05		23	2	7	NS	4.1	1.2	9.6
LSD .01		31	3	10	NS	NS	1.6	12.8

* Lodging: 0 = none, 9 = lying flat on ground.
Planting Date: September 11, 2007 Harvest Date: July 29, 2008
Previous Crop: hrsw
Note: Trial sustained late season heat and moisture stress.

Cultivar	Days to Bloom	Duration of Flowering	Days to Mature	Plant Height	Lodging	Test Weight	Oil Content	Seed Yield
		days		cm	0 - 9*	lbs/bu	%	lbs/A
45P70	57	14	90	110	0.8	48.3	36.4	1223
J05Z-08376	55	18	88	117	3.5	47.2	35.9	1000
J05Z-07784	55	18	89	98	1.2	49.0	37.0	831
J05Z-08920	51	20	84	103	0.5	49.2	37.8	938
J05Z-05005	53	20	86	103	0.2	46.9	36.7	915
J05Z-07994	52	20	84	97	0.2	49.8	36.5	1127
J05Z-08018	54	18	86	98	0.5	48.5	36.5	921
J05Z-07146	52	18	84	102	1.0	51.0	36.8	1173
J05Z-01484	55	17	89	109	0.0	45.5	36.7	1076
J05Z-09618	55	18	88	102	2.0	48.4	37.0	865
J05Z-10849	55	18	90	108	0.8	46.8	37.0	830
J05Z-10903	53	19	86	98	0.5	46.0	36.2	979
J05Z-14345	55	18	88	100	1.0	47.0	38.0	950
J05Z-14556	54	18	86	110	0.8	46.0	37.0	1099
J05Z-13743	52	20	84	102	0.5	47.4	37.0	1014
J05Z-14662	55	18	88	116	0.5	48.0	36.6	1020
J05Z-10367	53	19	86	97	0.5	51.2	37.2	901
J06Z-05160	53	20	88	99	1.0	47.9	37.2	997
J06Z-05189	53	19	84	102	1.2	47.4	37.0	880
J06Z-06739	52	20	84	112	0.0	48.1	38.6	1117
J06Z-06921	52	21	84	111	0.5	46.9	37.8	931
J06Z-04470	52	20	84	105	1.0	48.7	38.0	1077
J05Z-09677	51	20	85	103	0.0	49.5	37.6	1180
J06Z-02993	51	18	82	109	0.8	51.8	35.2	1037
Trial Mean	53	19	86	105	0.8	48.2	37.0	1003
C.V. %	0.9	3.5	1	5.1	78.2	2.1	1.2	9.7
LSD .05	1	1	1	8	0.9	1.4	0.6	137
LSD .01	1	1	2	10	1.2	1.9	0.8	182

* Lodging: 0 = none, 9 = lying flat on ground.

Planting Date: April 23
Harvest Date: July 30
Previous Crop: HRSW
Note: The trial sustained late season heat and moisture stress.

Kixor Herbicide on Tough Broadleaf Weeds in Summer Fallow	Hettinger, ND

Eric Eriksmoen

Treatments were applied on June 25 to flowering field bindweed (fibw), flowering wild buckwheat (wibw) and to flowering dandelion (dali) with 74^o F, 40% RH, clear sky and west wind at 5 mph. Treatments were applied with a tractor mounted CO_2 propelled plot sprayer delivering 10 gpa at 30 psi through PK-01E80 nozzles to a 5 foot wide area the length of 10 by 28 foot plots. The trial was a randomized complete block design with four replications. Plots were evaluated for weed control on July 2 and on July 30.

		Product	------- July 2 -------			-- July 30 --	
	Treatment	Rate	wibw	fibw	dali	wibw	fibw
		oz/A	-------------- % control --------------				
1	Untreated	0	0	0	0	0	0
2	Glyphosate + NIS + AMS	32 + 0.25% + 17 lbs	0	18	1	2	5
3	2,4-D + glyphosate + NIS + AMS	16 + 32 + 0.25% + 20 lbs	18	6	19	21	8
4	Kixor + glyphosate + COC + AMS	1.0 + 32 + 1% + 17 lbs	85	97	80	85	78
5	Kixor + glyphosate + COC + AMS	1.5 + 32 + 1% + 17 lbs	92	99	94	97	91
6	Kixor + glyphosate + COC + AMS	2.0 + 32 + 1% + 17 lbs	91	99	93	94	97
	C.V.%		9	14	21	19	9
	LSD .05		7	14	16	15	8

Summary

Treatments were applied to large and 'older' weeds. Glyphosate alone (trt 2) and 2,4-D + glyphosate (trt 3) had very poor activity on these weeds. The 1 oz/A rate of Kixor (trt4) provided relatively good initial weed control but this control tended to diminished over time. The 1.5 and 2.0 oz/A rates of Kixor (trts 5 & 6) provided excellent season long control of these tough broadleaf weeds.

2008 Lentil Seeding Rate Trial – Continuously Cropped - No-till Hettinger

Seeding Rate	Plant Stand	Days to Bloom	Duration of Bloom	Days to Mature	Plant Height	1000 Seed wt.	Test Weight	Seed Yield 2003	2004	2005	2006	2008	Avg.
seeds/ft^2	plants/ft^2	*	Days	*	inches	grams	lbs/bu	pounds per acre					
28	22	54	16	85	11	55.2	58.3	--	--	--	--	1103	--
24	23	54	15	86	11	54.6	57.7	--	--	2660	2240	1192	2031
20	22	54	16	86	13	55.4	58.2	--	--	2623	2194	1249	2022
16	18	55	15	86	13	53.8	58.3	--	--	2464	2063	1308	1945
12	13	55	15	86	12	54.8	58.5	1307	2233	2352	2110	1241	1849
8	12	55	16	86	12	54.2	58.3	999	1960	1979	1895	965	1560
4	--	--	--	--	--	--	--	719	1591	--	--	--	1155
C.V. %	20.8	0.7	3.9	0.5	14.2	2.2	1.5	8.2	6.2	7.3	10.0	11.7	--
LSD .05	6	NS	NS	NS	NS	NS	NS	134	184	270	NS	207	--
LSD .01	8	NS	NS	NS	NS	NS	NS	188	258	378	NS	286	--

* Days to Bloom and Days to Mature = the number of days from planting to 10% bloom and to maturity.
NS = no statistical difference between seeding rates.

Planting Date: May 5, 2008
Harvest Date: August 11, 2008
Variety = 2003, 04, 05 & 08 = CDC Richlea (medium green type), 2006 = CDC Blaze (small red type).

2008 Lentil Variety Trial – Continuously Cropped - No-till   Hettinger, ND

Variety	Days to Bloom	Days to Mature	Plant Ht.	1000 Seed wt.	---- Seed Yield ---- 2006	2007	2008	Average Yield 2 yr	3 yr
	*	*	inches	grams	----------- pounds per acre -----------				
Large Green Types									
Pennell	63	91	10	66.6	1453	1494	1095	1294	1347
CDC Plato	63	94	12	69.8	1737	1070	1063	1066	1290
Riveland	60	93	14	74.4	1258	1095	1098	1096	1150
CDC Improve-CL	62	93	14	72.7		1469	985	1227	
CDC Greenland	62	92	11	68.4			1315		
Medium Green Types									
CDC Richlea	62	93	10	55.4	2135	1742	1355	1548	1744
CDC Meteor	62	93	11	49.8	2054	1394	1205	1300	1551
CDC Impress-CL	62	92	11	55.0			1364		
Small Green Types									
CDC Viceroy	63	91	10	39.4	1972	1693	1295	1494	1653
Small Red Types									
Crimson	62	90	10	39.6	1989	1046	939	992	1325
CDC Rouleau	61	92	9	45.2	1526	1195	1247	1221	1323
CDC Impact-CL	60	92	10	43.4		1120	537	828	
CDC Maxim-CL	60	92	10	46.2			1227		
Extra Small Red Type									
CDC Imperial-CL	62	92	10	39.3		647	758	702	
CDC Rosetown	62	91	9	37.8			851		
CDC Impala-CL	62	94	10	38.8			729		
French Green Type									
CDC Lemay	62	92	12	48.0	1591	1319	1294	1306	1401
Experimental Lines									
LC7601114YZ	59	94	12	65.0		1021	906	964	
LC00600917RZ	59	93	11	55.2		1145	816	980	
LC860359L	62	94	12	69.8		996	1009	1002	
LC99600747L	62	94	13	71.0		971	1270	1120	
LC1602062T	60	92	10	52.0		996	865	930	
Trial Mean	62	92	11	54.7	1727	1130	1056	--	--
C.V. %	1.8	1.0	13.6	4.1	6.2	12.5	13.2	--	--
LSD .05	1	1	2	2.1	151	232	197	--	--
LSD .01	2	2	3	2.8	200	309	262	--	--

* Days to Bloom and Days to Mature = the number of days from planting to 10% flowering and maturity.

Planting Date: April 28, 2008
Harvest Date: August 11, 2008
Seeding Rate: 550,000 live seeds / acre.
Previous Crop: 2005 = barley, 2006 & 2007 = hrsw.

Proso Millet Variety Trials, 2008

Grain Yield - pounds per acre

Variety	Hettinger	Carrington	Williston	Prosper	Avg
Horizon	1347	1085	1001	2039	1368
Sunrise	1377	331	406	1820	984
Sunup	1401	882	575	2119	1244
Red Waxy	477	589	207	--	424
C.V. %	11	39	7	13	--
LSD 5%	199	491	58	NS	--

Test Weight - pounds per bushel

Variety	Hettinger	Carrington	Williston	Prosper	Avg
Horizon	50.5	55.0	52.2	52.9	52.6
Sunrise	50.5	53.7	52.8	51.7	52.2
Sunup	52.1	54.0	51.5	52.8	52.6
Red Waxy	45.7	47.0	38.7	--	43.8
C.V. %	2.4	1.1	1.2	1.3	--
LSD 5%	1.9	0.9	1.9	NS	--

Plant Height - inches

Variety	Carrington	Williston	Prosper	Avg
Horizon	39	15	49	34
Sunrise	39	17	48	35
Sunup	44	20	51	38
Red Waxy	54	25	--	40
C.V. %	6.7	5	3	--
LSD 5%	5	2	NS	--

Variety	--------------- Days to Head* ---------------				----- Lodging** -----	
	Hettinger	Carrington	Williston	Prosper	Carrington	Prosper
Horizon	68	64	66	47	0	3.3
Sunrise	67	64	64	47	0	3.3
Sunup	69	62	64	47	0	3.5
Red Waxy	77	75	75	--	0	--
C.V. %	0.5	0.9	1	0	0	13.2
LSD 5%	1	1	1	NS	NS	NS

* Days to Head = the number of days from planting to head emergence from the boot.
** Lodging: 0 = none, 9 = laying flat on ground.

	Hettinger	Carrington	Williston	Prosper
Planting Date	June 9	June 5	June 5	June 25
Harvest Date	Sept. 29	Sept. 17	Oct. 10	Oct. 9

2008 Proso Millet Variety Trial - Continuously Cropped - No-till — Hettinger, ND

Variety	Days to Head	Test Weight	----- Seed Yield ----- 2007	2008	Avg.
	*	lbs/bu	-------- lbs/Ac --------		
Horizon	68	50.5	2530	1347	1938
Sunrise	67	50.5	2280	1377	1828
Sunup	69	52.1	2032	1401	1716
Red Waxy	77	45.7		477	
Trial Mean	70	49.7	2281	1150	--
C.V. %	0.5	2.4	10.5	10.8	--
LSD 5%	1	1.9	415	199	--
LSD 1%	1	2.8	NS	286	--

* Days to Head = the number of days from planting to head emergence from the boot.

Planting Date: June 9, 2008
Harvest Date: September 29, 2008
Previous Crop: 2006 & 2007 = hrsw.
NS = no statistical difference between varieties.

2008 Tame Mustard Variety Trial - Continuously Cropped - No-till — Hettinger, ND

Variety	Days to Bloom	Duration of Bloom	Days to Mature	Plant Height	Lodg	Test Weight	-------- Yield -------- 2006	2007	2008	Avg. Yield 2 yr	3 yr
		days		inches	0-9*	lbs/bu	-------------- lbs / ac --------------				
Yellow Types											
Tilney	54	21	83	40	6.2	--	625	1027	619	823	757
Andante	53	21	83	42	3.5	54.4	927	616	681	648	741
AC Pennant	55	20	84	41	1.8	--	570	821	510	666	634
Ace	54	20	84	37	5.2	--	722	534	452	493	569
Oriental Types											
Forge	60	18	90	46	5.8	49.8	404	863	1137	1000	801
Brown Types											
Duchess	60	18	90	47	1.0	51.4		1109	1168	1138	
Common Brown	59	18	89	46	1.0	51.7		945	1208	1076	
Trial Mean	56	19	86	43	3.5	51.3	650	845	825	--	--
C.V. %	1.0	5.1	1.0	12.7	44	2.8	10.7	20.6	21.8	--	--
LSD .05	1	1	1	NS	2.3	NS	107	259	267	--	--
LSD .01	1	2	2	NS	3.1	NS	150	354	365	--	--

* Lodging: 0 = none, 9 = lying flat on ground.
NS = no statistical difference between varieties.

Planting Date: April 23, 2008
Harvest Date: July 30, 2008
Seeding rate: 610,000 pls/A (approx. Yellow = 12 lbs/A, Oriental & Brown = 6 lbs/A)
Previous Crop: 2005 & 2007 = hrsw, 2006 = soybean
Note: The 2006 and 2008 trials sustained severe moisture stress.

2008 Oat Variety Trial - Continuously Cropped - No-till — Mandan, ND

Cooperator: USDA-ARS NGP Research Center, Mandan

Variety	Plant Height	Test Weight	------ Grain Yield ------ 2006	2007	2008	Average Yield 2 yr	3 yr
	inches	lbs/bu	------------- Bushels per acre -------------				
Souris	37	32.5	50.4	141.5	137.0	139.2	109.6
Killdeer	36	29.6	53.3	124.5	142.1	133.3	106.6
Maida	40	29.1	51.1	136.8	119.0	127.9	102.3
Beach	43	33.3	44.4	126.1	130.5	128.3	100.3
Jerry	41	32.0	54.8	111.5	127.2	119.4	97.8
Morton	43	32.4	47.0	119.9	124.6	122.2	97.2
Stark*	41	32.6		87.7	102.7	95.2	
Trial Mean	40	31.6	50.2	121.9	126.2	--	--
C.V. %	3.1	4.6	11.3	6.5	6.0	--	--
LSD .05	2	2.2	NS	13.9	11.3	--	--
LSD .01	3	3.0	NS	19.3	15.5	--	--

*Stark is a naked (hulless) type.

NS = no statistical difference between varieties.

Planting Date: April 22, 2008
Harvest Date: August 12, 2008
Seeding Rate: 750,000 live seeds / acre (approx. 1.7 bu/A).
Previous Crop: 2005 & 2006 = hrww, 2007 = hrsw.
Note: The 2006 trial sustained moderate heat and moisture stress.

Exp. 43

Entry	Cultivar	Days to Head	Plant Height	Lodging	Test Weight	Grain Yield
			cm	0-9*	lbs/bu	bu/Ac
1	00Ab5023	75	86	0.3	33.4	57.5
2	02Ab6763	81	75	0.3	32.8	36.4
3	02Ab6861	81	76	0.7	30.8	38.0
4	95Ab13050	79	77	0.0	29.2	38.5
5	Buff	72	81	2.3	36.7	46.1
6	IL02-10836	71	94	2.0	37.6	50.5
7	IL03-7936	73	85	3.3	31.5	42.8
8	Lamont	81	81	0.0	30.4	39.6
9	Monico	76	79	5.3	27.0	54.4
10	ND031314	79	98	8.3	35.6	34.2
11	ND040226	77	92	6.7	26.6	35.4
12	ND040341	78	91	1.0	36.8	32.9
13	ND040443	78	91	3.3	36.5	44.7
14	ND041390	75	99	3.7	--	29.5
15	ND050208	78	89	1.0	35.9	35.2
16	ND050699	75	100	1.0	39.6	41.3
17	ND050904	76	84	6.0	38.0	36.0
18	ND051764	76	92	3.7	29.9	43.0
19	Paul	77	91	7.3	35.1	27.2
20	Provena	80	92	0.0	34.2	51.3
21	SD020301-20	72	94	8.0	38.5	40.0
22	SD051502	75	88	9.0	36.9	34.7
23	SD061552	75	95	0.7	40.7	38.5
24	SD061560	70	92	4.7	35.3	44.0
25	SD061593	70	91	3.3	37.0	46.1
26	SD061605	73	98	1.3	41.4	48.3
27	SD061654	71	96	0.3	34.5	57.4
28	SD061656	73	95	1.3	40.5	46.6
Trial Mean		76	89	3.0	34.9	41.8
C.V. %		1.0	3.7	41.7	6.6	11.6
LSD .05		1	5	2.1	3.8	8.0
LSD .01		2	7	2.8	5.0	10.6

* Lodging: 0 = none, 9 = lying flat on ground.
Planting Date: April 15, 2008 Harvest Date: July 29, 2008
Previous Crop: Field Pea
Note: The trial sustained severe late season heat and moisture stress.

2008 Oat Variety Trial - Continuously Cropped - No-till — New Leipzig, ND

Cooperator: Daryl Birdsall, New Leipzig

Variety	Plant Height	Test Weight	------ Grain Yield ------ 2006	2007	2008	Average Yield 2 yr	3 yr
	inches	lbs/bu	------------- Bushels per acre -------------				
Maida	29	34.6	24.2	80.4	43.9	62.2	49.5
Morton	28	35.6	22.3	63.9	48.6	56.2	44.9
Beach	28	37.8	23.1	59.5	47.5	53.5	43.4
Killdeer	27	34.6	25.8	65.1	37.4	51.2	42.8
Jerry	29	37.8	25.0	71.4	36.1	53.8	44.2
Souris	24	36.5	15.2	66.8	37.1	52.0	39.7
Stark*	27	40.2		33.7	30.9	32.3	
Trial Mean	28	36.7	22.6	63.0	40.2	--	--
C.V. %	9.0	3.6	13.8	11.9	9.7	--	--
LSD .05	NS	2.0	4.7	11.1	5.8	--	--
LSD .01	NS	2.7	6.5	15.2	8.0	--	--

* Naked (hulless) type
NS = no statistical difference between varieties.

Planting Date: April 23, 2008
Harvest Date: August 8, 2008
Seeding Rate: 750,000 live seeds / acre (approx. 1.7 bu/A).
Previous Crop: 2005 & 2006 = hrww, 2007 = hrsw.
Note: The 2006 & 2008 trials sustained severe moisture stress.

Exp. 87

Entry	Cultivar	Test Weight	Grain Yield
		lbs/bu	bu/Ac
1	HiFi	31.0	46.0
2	SolFi	31.3	72.9
3	ND030287	32.1	68.0
4	Youngs	29.0	88.6
5	Dancer	32.2	59.7
6	Goslin	32.9	74.5
7	Souris	29.7	48.4
8	Beach	28.1	73.8
9	ND051236	34.6	59.7
10	Killdeer	28.9	91.5
Trial Mean		31.0	68.3
C.V. %		4.9	11.8
LSD .05		2.6	13.9
LSD .01		3.5	19.0

Planting Date: April 15, 2008
Harvest Date: July 29, 2008
Previous Crop: Field Pea
Note: The trial sustained severe late season heat and moisture stress.

2008 Oat Variety Trial – No-till Hettinger, ND

Variety	Days to Head	Plant Height	Lodging	Test Weight	---- Grain Yield ---- 2006	2007	2008	Average Yield 2 yr	3 yr
	*	inches	0 – 9**	lbs/bu	----------- Bushels per acre -----------				
Stallion	78	40	4.8	34.8	109.8	77.1	111.1	94.1	99.3
AC Pinnacle	82	40	3.5	33.5	103.4	72.9	115.3	94.1	97.2
Killdeer	77	34	1.8	34.2	104.7	78.0	101.7	89.8	94.8
Monida	81	37	7.0	29.7	100.0	67.6	112.8	90.2	93.5
Maida	77	41	4.0	34.5	90.0	68.9	108.6	88.8	89.2
HiFi	79	37	4.8	34.0	88.6	69.0	108.8	88.9	88.8
Souris	78	36	5.5	34.4	82.3	74.7	108.2	91.4	88.4
Jerry	76	40	4.2	36.2	92.4	70.4	101.4	85.9	88.1
Beach	77	40	4.0	37.0	87.9	65.9	108.7	87.3	87.5
Youngs	80	42	5.5	31.6	87.5	64.9	106.7	85.8	86.4
Hytest	76	38	3.8	37.6	88.2	70.5	96.5	83.5	85.1
CDC Dancer	79	39	3.8	34.4	77.4	64.7	110.7	87.7	84.3
Morton	78	37	2.0	33.9	79.0	74.3	98.1	86.2	83.8
Otana	80	40	3.8	33.3	84.6	47.4	90.7	69.0	74.2
Buff***	74	38	2.0	39.9	67.2	52.2	82.0	67.1	67.1
Stark***	81	38	4.0	33.0	63.6	47.8	75.8	61.8	62.4
Paul***	82	36	2.5	35.5	40.6	29.2	62.3	45.8	44.0
Furlong	82	36	1.8	34.1			115.4		
CDC Minstrel	78	38	4.2	33.2			112.0		
ND970651	78	40	1.0	36.2			116.6		
ND991151	78	40	1.2	34.9			102.0		
ND991293	77	36	6.2	34.0			120.3		
ND000244	77	42	4.2	35.5			108.8		
ND000824	78	38	1.8	35.1			124.4		
ND030349	81	37	6.5	30.0			116.8		
ND030365	77	38	3.2	32.8			107.4		
ND020971	83	39	4.2	33.9			98.0		
ND021052	77	36	6.5	37.3			113.5		
ND021612	78	38	6.0	34.3			111.7		
ND020965	82	36	4.5	34.9			112.5		
ND040196	80	35	6.0	33.7			104.9		
ND040250	78	38	7.2	36.6			114.2		
ND040492	76	38	6.5	36.4			117.8		
Trial Mean	79	38	4.2	34.6	87.3	65.6	105.9	--	--
C.V. %	0.9	4.0	37.1	2.2	7.6	10.3	5.3	--	--
LSD .05	1	2	2.2	1.1	9.3	9.5	7.8	--	--
LSD .01	1	3	2.9	1.4	12.3	12.6	10.4	--	--

*Days to Head = the number of days from planting to emergence of panicle.
** Lodging: 0 = none, 9 = laying flat on ground.
*** Naked (hulless) type.

Planting Date: April 14 Harvest Date: August 6
Seeding Rate: 750,000 live seeds / acre (approx. 1.7 bu/A).
Previous Crop: 2007 = fallow, 2006 = HRSW, 2005 = fallow.

2008 Preliminary Pea Yield Trial – 0806 - No-till Hettinger, ND

Entry	Cultivar	Days to Bloom	Days to Mature	Plant Height*	Lodg.	1000 Seed wt.	Test Weight	Seed Yield
				cm	0-9**	grams	lbs/bu	bu/Ac
1	PS05100522	65	87	53	5.3	238	57.7	47.1
2	PS05100632	61	86	48	3.3	231	58.0	46.9
3	PS05100727	69	93	53	5.3	216	56.9	40.4
4	PS05100728	67	90	42	8.0	252	55.2	44.5
5	PS05100735	69	93	58	7.3	265	57.0	45.8
6	PS05101139	65	87	48	5.0	248	58.0	47.1
7	PS05100120	66	91	44	7.7	227	57.3	43.6
8	PS05101240	68	88	52	8.0	220	58.7	45.7
9	Cruiser	66	90	51	3.3	225	58.5	42.6
10	DS Admiral	67	88	61	2.0	237	58.6	50.2
11	Eclipse	68	91	53	3.0	265	60.1	44.0
12	Medora	70	94	64	1.3	216	60.6	28.5
13	Majoret	68	90	64	3.0	225	58.4	41.1
14	PS03100116	68	92	45	8.0	207	59.6	39.4
15	PS03101349	64	87	41	5.3	246	58.7	43.9
16	PS03101445	67	91	59	4.7	236	59.2	40.1
17	PS03690293	66	90	56	5.7	235	58.8	40.1
18	PS04100453	67	92	62	4.3	218	58.7	41.2
19	PS04100543	67	89	45	6.7	251	58.8	47.1
20	PS04100722	67	88	50	3.7	258	57.8	40.8
Trial Mean		67	90	52	5.0	236	58.3	43.0
C.V. %		0.8	1.1	6.1	17.0	12.5	3.1	9.9
LSD .05		1	1	5	1.4	NS	NS	7.0
LSD .01		1	2	7	1.9	NS	NS	9.4

* Plant height at maturity. ** Lodging: 0 = none, 9 = lying flat on ground.

Planting Date: April 23
Harvest Date: July 31
Previous Crop: hrsw

2008 Preliminary Pea Yield Trial – 0897 - No-till Hettinger, ND

Entry	Cultivar	Days to Bloom	Days to Mature	Plant Height*	Lodg.	1000 Seed wt.	Test Weight	Seed Yield
				cm	0-9**	grams	lbs/bu	bu/A
1	PS02100026	66	91	45	7.7	138	58.4	36.4
2	Stirling	63	90	58	7.7	227	58.7	49.0
3	PS03101445	67	90	56	5.7	232	58.9	43.3
4	PS04100328	68	93	50	4.7	295	55.9	39.1
5	PS04100462	69	92	53	7.7	260	58.3	45.1
6	PS04100505	65	91	43	7.7	247	59.3	46.7
7	PS01102958	67	90	63	6.0	270	58.1	43.2
8	PS03101822	67	86	57	6.7	251	58.6	49.4
9	PS04100710	67	86	59	7.3	269	58.8	46.4
10	PS04100910	67	93	58	6.7	279	58.0	34.0
11	PS04100922	70	91	55	5.0	270	57.7	43.2
12	DS Admiral	68	89	43	2.0	264	59.9	44.2
Trial Mean		67	90	53	6.2	250	58.4	43.3
C.V. %		0.8	1.2	6.0	11.7	3.4	1.1	7.1
LSD .05		1	2	5	1.2	14	1.0	5.2
LSD .01		1	3	7	1.7	20	1.4	7.1

* Plant height at maturity. ** Lodging: 0 = none, 9 = lying flat on ground.

Planting Date: April 23
Harvest Date: July 31
Previous Crop: hrsw

Variety	1000 KWT	TWT	Yield
	grams	lbs/bu	bu/A
PRL 7105	221	61.2	36.1
Pro 051-7025	226	60.8	35.8
PRL 07-3	238	--	41.0
PRL 07-5	256	60.8	42.2
Pro 051-7080	215	60.4	33.9
PRL 07-4	247	60.0	39.1
DS Admiral	242	60.8	36.1
Pro 031-7024/7014	217	61.2	36.3
PRL 07-2	189	61.6	38.9
Pro 043-7169	267	60.8	37.2
PRL 414	267	60.4	37.2
Pro 031-7014	167	60.8	34.6
PRL 07-6	210	61.2	30.5
Cruiser	205	61.2	31.2
Aragorn	211	62.0	34.6
AP-18	210	61.2	35.9
Pro 051-7030	206	61.2	42.1
Pro 051-7065	228	60.4	40.6
Pro 041-7129	216	60.8	35.8
Pro 061-7121	236	61.6	37.9
SSX99006-R-16-1	260	61.6	42.3
SSX01028-7	236	62.0	40.1
SSX01028-5	230	61.6	38.1
SSX99026-F-2-1	258	62.4	42.9
Pro 041-7104	240	62.0	36.7
Trial Mean	228	61.2	37.5
C.V. %	3.5	.	10.4
LSD 5%	13	.	6.5
LSD 1%	18	.	NS

Planting Date: April 22
Harvest Date: August 12

2008 Field Pea Variety Trial – Continuously Cropped - No-till   Hettinger, ND

Brand	Variety	Days to Bloom	Days to Mature	Lodg.	1000 Seed wt.	Test Weight	--- Seed Yield ---- 2006	2007	2008	Avg. Yield 2 yr	3 yr
				0-9*	grams	lbs/bu	--------- bushels per acre ---------				
Yellow Cotyledon Types											
Crop Dev. Ctr.	CDC Mozart	67	89	1	197	61.4	56.8	47.4	46.6	47.0	50.3
Pulse USA	DS Admiral	67	89	1	197	59.8	59.0	50.5	41.6	46.0	50.4
Pulse USA	Eclipse	68	92	2	188	55.9	53.7	50.1	37.5	43.8	47.1
Meridian Seeds	SW Capri	68	89	0	184	58.9		46.3	40.9	43.6	
Meridian Seeds	Fusion	67	94	2	203	57.6		42.4	31.1	36.8	
Meridian Seeds	Agassiz	66	89	1	157	58.5			45.7		
Limagrain Adv.	Alezon	66	89	4	197	60.1			43.4		
Meridian Seeds	Thunderbird	73	93	0	197	57.5			41.6		
Limagrain Adv.	Spider	67	91	1	224	59.0			38.6		
Green Cotyledon Types											
Pulse USA	Majoret	68	92	2	167	58.6	50.7	48.6	41.3	45.0	46.9
Alt. Seed Strat.	CDC Striker	68	92	1	205	59.3	50.9	48.3	38.1	43.2	45.8
Pulse USA	Cruiser	66	90	2	197	59.4	48.8	49.4	36.4	42.9	44.9
Meridian Seeds	Cooper	71	96	1	241	57.9		49.2	39.7	44.4	
Limagrain Adv.	Matrix	70	93	0	215	58.3			38.5		
Trial Mean		68	91	1	198	58.7	51.1	46.4	40.1	--	--
C.V. %		0.5	0.6	55.3	7.8	2.0	6.0	9.3	6.1	--	--
LSD .05		1	1	1	22	1.7	4.4	6.1	3.5	--	--
LSD .01		1	1	1	29	2.2	5.8	8.0	4.6	--	--

* Lodging: 0 = none, 9 = lying flat on ground.

Planting Date: April 23, 2008
Harvest Date: July 31, 2008
Seeding Rate: 250,000 live seeds / acre.
Previous Crop: HRSW

2008 Field Pea Variety Trial – Continuously Cropped - No-till   Wilton, ND

Cooperator: Legume Logic

Variety	1000 KWT	Test Weight	---- Seed Yield ---- 2006	2007	2008	Average Yield 2 yr	3 yr
	g	lbs/bu	----------- bushels per acre -----------				
Yellow Cotyledon Types							
CDC Mozart	228	61.2	64.9	75.0	42.3	58.6	60.4
Eclipse	265	61.2	56.6	74.5	45.8	60.2	59.0
Spider	246	62.0	56.9	75.6	40.8	58.2	57.8
SW Marquee	207	61.2	50.7	79.2	40.1	59.6	56.7
DS Admiral	254	60.4	56.5	70.4	42.3	56.4	56.4
SW Midas	213	61.2	52.7	73.5	42.8	58.2	56.3
APCM 07602	229	61.6			39.9		
APCM 25430	261	59.2			44.2		
AP 4-1330.005	220	60.8			33.0		
AP 4-1393.012	219	60.4			29.8		
SWE 5053	310	62.8			41.3		
SWE 5083	281	60.4			44.2		
APCM 01507	227	60.8			40.0		
APCM 13506	316	60.8			38.7		
APCM 14107	261	62.4			34.0		
LAN 4194	274	63.2			37.6		
LAN 4190	256	62.4			40.5		
LAN 4188	263	62.0			43.9		
LAN 4193	259	61.2			40.4		
Green Cotyledon Types							
Matrix	267	60.8	51.0	82.1	43.9	63.0	59.0
Cruiser	233	61.2	51.0	72.2	41.4	56.8	54.9
Aragorn	199	62.0	51.5	73.6	38.0	55.8	54.4
Majoret	255	62.0	52.3	72.7	36.3	54.5	53.8
K2	225	62.0	48.2	72.5	39.5	56.0	53.4
Arcadia	211	61.2		75.1	39.8	57.4	
CDC Striker	220	62.0			43.5		
SW Sargent	219	61.2			42.8		
APCM 97107	250	62.0			36.1		
APCM 17019G	261	62.0			46.3		
SWC 6185	260	60.4			37.3		
Marrowfat							
Orka	335	59.2	50.1	71.3	37.0	54.2	52.8
Trial Mean	249	61.3	54.1	72.1	40.1	--	--
C.V. %	3.5	--	11.1	6.5	10.1	--	--
LSD .05	14	--	8.4	6.6	6.6	--	--
LSD .01	19	--	11.1	8.6	8.8	--	--

Planting Date: April 22, 2008   Harvest Date: August 12, 2008
Seeding Rate: 300,000 live seeds / acre.   Previous Crop: hrsw.

2008 Dormant Seeded Safflower Trial — Hettinger, ND

Variety	Flowering Date	Plant Height	Test Weight	Oil Content	Seed Yield 2005	Seed Yield 2006	Seed Yield 2008	Seed Yield Avg.
	July	inches	lbs/bu	%	pounds per acre			
Fall Seeded								
Finch	21	25	42.3	35.6	2036	1547	1388	1657
Montola 2003	24	21	39.0	37.3	2240	1545	1082	1622
MonDak	23	26	39.8	36.3	--	--	1684	--
Cardinal	24	26	43.1	34.8	--	--	1379	--
S-541	--	--	--	--	1893	1113	--	1503
Mean	23	24	41.0	36.0	2056	1402	1383	1614
Spring Seeded								
Finch	28	28	41.2	36.1	1627	2333	1364	1775
Montola 2003	30	28	36.9	38.0	1907	1513	939	1453
MonDak	29	28	37.4	36.0	--	--	1322	--
Cardinal	29	30	40.9	33.9	--	--	1354	--
S-541	--	--	--	--	1567	2167	--	1867
Mean	29	28	39.1	36.0	1700	2004	1245	1650
C.V. %	2.1	3.9	1.8	1.6	13.3	8.2	7.0	--
LSD .05	1	2	1.1	0.9	381	212	136	--
LSD .01	1	2	1.5	1.2	532	293	184	--

Planting date	Fall	Spring	Harvest date	Previous Crop
2005	Nov 9	Apr. 6	Sept. 20	Barley
2006	Nov 14	Apr. 12	Aug. 29	Barley
2008	Nov 16	May 7	Sept. 5	HRSW

Seeding Rate: 400,000 live seeds / acre.

Safflower Variety Trial – Continuously Cropped - No-till — Hettinger, ND

Variety	Days to Bloom	Plant Height	Test Weight	Oil Content	---- Seed Yield ---- 2006	2007	2008	Average Yield 2 yr	3 yr
	*	inches	lbs/bu	%	----------- pounds per acre -----------				
Linoleic Types									
Cardinal	91	31	43.0	34.6	1387	2270	1377	1824	1678
S-541	92	28	37.1	41.2	967	2279	1071	1675	1439
Finch	89	29	41.6	35.6	847	1958	1357	1658	1387
NutraSaff	89	30	32.5	42.7	127	1400	612	1006	713
97B1296	89	28	37.6	37.7			1484		
Oleic Types									
MonDak	90	28	38.3	37.6	978	1801	1386	1594	1388
Montola 2000	88	25	36.1	40.2	860	1500	1474	1487	1278
Montola 2003	91	27	38.6	38.0	622	1994	1141	1568	1252
Hybrid 9049	87	27	42.8	32.3			1665		
Hybrid 1601	88	28	40.4	37.4			1637		
02B6081	89	26	38.3	38.6			1314		
01B7113	90	24	32.1	41.8			1307		
Trial Mean	89	28	38.2	38.1	870	1815	1319	--	--
C.V. %	0.7	3.8	2.0	1.8	13.6	9.7	7.7	--	--
LSD .05	1	2	1.1	1.0	171	253	147	--	--
LSD .01	1	2	1.5	1.4	230	342	198	--	--

* Days to Bloom = the number of days from planting to 10% bloom.

Planting Date: April 28, 2008
Harvest Date: September 5, 2008
Seeding Rate: 300,000 live seeds / acre (approx. 22 lbs/A).
Previous Crop: 2005 = barley, 2006 & 2007 = hrsw.
Notes: The 2006 trial sustained moderate moisture stress.

Line	Days to Head	Plant Height	Lodging	Test Weight	Grain Protein	Grain Yield
		cm	0 – 9*	lbs/bu	%	bu/ac
NDSW0449	80	102	1.0	55.3	17.3	34.2
NDSW0450	80	94	1.0	56.1	17.1	37.5
NDSW0816	77	102	1.5	57.8	17.4	41.5
NDSW0817	73	102	1.5	58.1	16.8	47.0
NDSW0818	75	90	1.0	53.5	16.8	53.4
NDSW0819	75	104	3.0	54.3	16.5	44.2
NDSW0820	77	102	1.0	55.3	18.4	36.3
NDSW0821	76	101	1.0	54.3	16.2	48.4
AC Lillian	82	95	2.5	57.3	17.4	47.0
Agawam	74	98	1.0	56.9	14.7	57.8
Choteau	77	89	1.0	55.3	16.1	46.4
Ernest	78	104	2.5	54.9	17.1	32.9
Reeder	76	99	1.0	56.4	16.9	52.2
Steele-ND	77	99	1.0	56.2	16.6	46.0
Vida	78	92	1.2	55.3	15.7	47.9
Trial Mean	77	98	1.4	55.8	16.7	44.8
C.V. %	0.9	4.3	0.7	1.9	2.2	6.8
LSD .05	1	6	0.7	1.5	0.5	4.3
LSD .01	1	8	1.0	2.1	0.7	5.8

*Lodging: 0 = none, 9 = lying flat on ground.

Planting Date: April 14, 2008
Harvest Date: August 13, 2008
Previous Crop: HRSW
Note: The trial sustained severe late season heat and moisture stress.

Rose Farm

Line	Plant Height	Test Weight	Grain Protein	Grain Yield
	cm	lbs/bu	%	bu/ac
NDSW0449	62	57.3	16.9	33.5
NDSW0450	69	55.5	17.3	26.2
NDSW0816	74	58.0	17.7	22.0
NDSW0817	74	55.4	17.4	28.4
NDSW0818	60	52.6	16.6	25.4
NDSW0819	64	52.8	17.4	22.5
NDSW0820	66	52.9	17.6	26.7
NDSW0821	68	54.1	16.3	30.1
AC Lillian	69	51.5	18.1	21.8
Agawam	65	55.2	15.3	26.4
Choteau	59	55.3	16.3	30.1
Ernest	67	54.5	17.1	23.9
Reeder	66	53.8	16.9	23.5
Steele-ND	67	54.2	16.8	24.4
Vida	63	53.9	16.0	29.1
Trial Mean	66	54.5	16.9	26.3
C.V. %	6.3	1.9	2.4	11.1
LSD .05	6	1.5	0.6	4.2
LSD .01	8	2.0	0.8	5.6

Planting Date: April 21, 2008
Harvest Date: August 18, 2008
Previous Crop: HRSW
Note: The trial sustained severe late season heat and moisture stress.

2008 SBARE Sawfly Trails — SW North Dakota*

Variety	Days to Head	Plant Height	Test Weight	Grain Protein	Grain Yield
	**	cm	lbs/bu	%	bu/ac
Hard Red Spring Wheat					
AC Lillian	75	72	52.5	17.7	17.5
Agawam	65	65	54.2	16.0	20.2
Choteau	70	64	52.4	17.0	16.0
Conan	69	64	51.3	17.0	16.0
Ernest	69	70	52.3	17.3	14.6
NDSW0449	72	68	51.4	17.9	18.7
Vida	70	65	50.0	16.8	19.7
Glenn	66	74	55.0	17.3	16.3
Howard	70	69	51.3	17.1	14.9
Reeder	69	69	53.0	17.2	17.1
Steele-ND	68	68	51.2	17.3	18.3
Durum Wheat					
Plaza	70	61	53.0	17.9	15.6
Strongfield	73	68	50.7	18.2	15.4
Divide	73	72	50.9	17.2	15.5
Mountrail	73	65	50.1	17.4	16.0
Alkabo	72	64	52.0	17.4	13.6
MT01695	70	62	53.4	16.0	17.4
MT02525	69	62	52.1	17.1	15.6

*Hettinger REC, Hettinger – Rose Farm, Scranton, Regent, New Leipzig.
**Days to Head = the # of days from planting to head emergence from the boot.
Note: All trials sustained severe heat and moisture stress.

Variety	Days to Head	Plant Height	Test Weight	Grain Protein	Grain Yield
	*	cm	lbs/bu	%	bu/ac
Hard Red Spring Wheat					
AC Lillian	75	85	50.4	17.5	25.4
Agawam	65	79	49.3	16.4	36.6
Choteau	70	91	48.2	17.2	20.9
Conan	69	85	47.2	17.5	27.8
Ernest	69	100	48.8	17.3	20.3
NDSW0449	72	94	45.5	18.3	26.9
Vida	70	93	45.0	16.9	35.7
Glenn	66	93	51.0	18.2	25.6
Howard	70	93	45.6	17.6	21.4
Reeder	69	91	48.3	17.4	25.3
Steele-ND	68	89	46.6	18.2	24.2
Durum Wheat					
Plaza	70	75	47.3	19.9	22.4
Strongfield	73	98	45.0	20.2	19.4
Divide	73	97	45.7	18.7	18.9
Mountrail	73	93	42.7	18.6	23.9
Alkabo	72	86	48.4	18.6	23.2
MT01695	70	75	49.5	17.9	22.2
MT02525	69	85	49.6	18.5	24.4
Trial Mean	70	89	47.5	18.1	24.7
C.V. %	1.3	4.0	3.2	2.9	10.7
LSD .05	2	6	2.6	0.9	4.4
LSD .01	2	8	3.4	1.1	5.9

*Days to Head = the # of days from planting to head emergence from the boot.

Planting Date: April 15, 2008
Harvest Date: August 1, 2008
Previous Crop: HRSW
Note: The trial sustained severe late season heat and moisture stress.

Variety	Plant Height	Grain Protein	Grain Yield
	cm	%	bu/ac
Hard Red Spring Wheat			
AC Lillian	83	16.7	14.8
Agawam	67	15.2	11.0
Choteau	64	16.3	13.5
Conan	66	16.0	10.1
Ernest	75	16.5	14.7
NDSW0449	73	18.1	15.1
Vida	74	15.9	14.6
Glenn	76	16.0	10.2
Howard	75	15.7	8.9
Reeder	72	16.4	14.4
Steele-ND	75	16.2	12.5
Durum Wheat			
Plaza	56	16.7	8.5
Strongfield	64	17.1	11.1
Divide	69	16.1	10.7
Mountrail	70	17.2	9.6
Alkabo	64	17.4	10.1
MT01695	61	15.2	15.8
MT02525	59	15.8	9.9
Trial Mean	69	16.4	12.0
C.V. %	4.0	3.7	21.2
LSD .05	5	1.0	4.2
LSD .01	6	1.4	5.7

Planting Date: April 23, 2008
Harvest Date: August 8, 2008
Previous Crop: HRSW
Note: The trial sustained severe heat and moisture stress.

Variety	Plant Height	Grain Protein	Grain Yield
	cm	%	bu/ac
Hard Red Spring Wheat			
AC Lillian	72	17.6	10.6
Agawam	66	15.8	11.2
Choteau	65	16.9	8.11
Conan	57	17.1	13.4
Ernest	59	17.4	10.2
NDSW0449	54	17.8	7.0
Vida	51	16.7	11.6
Glenn	67	16.5	17.0
Howard	53	17.2	13.3
Reeder	60	17.3	8.2
Steele-ND	54	17.4	14.4
Durum Wheat			
Plaza	60	17.6	11.8
Strongfield	64	18.2	10.9
Divide	69	17.0	11.4
Mountrail	59	16.4	6.9
Alkabo	61	17.2	4.2
MT01695	70	15.3	9.8
MT02525	62	16.5	9.3
Trial Mean	61	17.0	10.5
C.V. %	10.7	3.2	19.2
LSD .05	11	0.9	3.4
LSD .01	15	1.2	4.5

Planting Date: April 21, 2008
Harvest Date: August 8, 2008
Previous Crop: HRSW
Note: The trial sustained severe heat and moisture stress.

Variety	Plant Height	Test Weight	Grain Protein	Grain Yield
	cm	lbs/bu	%	bu/ac
Hard Red Spring Wheat				
AC Lillian	65	54.1	17.8	23.1
Agawam	62	57.9	15.4	26.8
Choteau	56	55.5	16.6	25.7
Conan	59	54.4	16.5	17.4
Ernest	66	54.9	17.0	16.2
NDSW0449	60	55.8	17.4	21.1
Vida	55	53.8	16.3	23.9
Glenn	70	57.9	17.1	20.5
Howard	66	55.5	17.0	22.5
Reeder	66	56.5	16.4	23.9
Steele-ND	66	54.7	16.7	27.4
Durum Wheat				
Plaza	60	57.3	15.9	25.0
Strongfield	62	55.0	16.4	23.2
Divide	68	54.9	16.0	24.8
Mountrail	59	55.7	16.0	26.5
Alkabo	58	54.6	15.8	19.6
MT01695	62	57.4	14.2	29.0
MT02525	55	54.6	15.0	22.4
Trial Mean	62	55.6	16.3	23.2
C.V. %	5.1	1.8	2.0	10.9
LSD .05	5	1.5	0.5	3.6
LSD .01	6	1.9	0.6	4.8

Planting Date: April 21, 2008
Harvest Date: August 18, 2008
Previous Crop: HRSW
Note: The trial sustained severe late season heat and moisture stress.

Variety	Plant Height	Grain Protein	Grain Yield
	cm	%	bu/ac
Hard Red Spring Wheat			
AC Lillian	57	19.0	11.7
Agawam	51	17.2	13.5
Choteau	50	18.0	8.3
Conan	53	18.0	10.7
Ernest	54	18.3	11.0
NDSW0449	59	18.1	18.3
Vida	56	18.2	11.4
Glenn	62	18.8	6.8
Howard	57	17.9	5.8
Reeder	56	18.5	11.6
Steele-ND	57	18.2	10.0
Durum Wheat			
Plaza	53	20.2	7.5
Strongfield	57	19.7	9.6
Divide	61	18.3	8.8
Mountrail	45	19.6	9.6
Alkabo	55	18.4	8.9
MT01695	43	17.3	10.0
MT02525	50	19.6	12.2
Trial Mean	54	18.5	10.3
C.V. %	6.4	3.2	27.7
LSD .05	6	1.0	4.7
LSD .01	8	1.3	6.4

Planting Date: April 21, 2008
Harvest Date: August 8, 2008
Previous Crop: HRSW
Note: The trial sustained severe heat and moisture stress.

Conventional Soybean Variety Trial – Continuously Cropped, No-till — Hettinger, ND

Brand	Variety	Maturity Group	Test Weight	Oil Content	Protein Content	Seed Yield
			lbs/bu	%	%	bu/A
NDSU	Cavalier	00.7	52.5	16.9	38.2	15.5
	ND02-2367	0.3	56.4	17.4	39.2	21.9
	Walsh	0.3	54.1	17.0	40.6	18.1
	Barnes	0.3	54.8	17.3	39.1	20.5
	Sheyenne	0.8	55.3	17.2	37.4	24.1
Pioneer	P9071	0.7	54.9	16.7	37.7	24.6
Trial Mean			54.6	17.1	38.7	20.8
C.V. %			1.6	2.0	1.0	7.8
LSD .05			1.3	NS	0.6	0.6
LSD .01			1.8	NS	0.8	0.8

NS = no statistical difference between varieties.

Planting Date: May 14
Harvest Date: September 19
Seeding Rate: 250,000 pls/A (approx. 1.5 bu/A)
Row Spacing: 7”
Previous Crop: HRSW

2008 Roundup Ready Soybean Variety Trial – Continuously Cropped, No-till   Hettinger, ND

Brand	Variety	Maturity Group	Test Weight	Oil Content	Protein Content	Seed Yield
			lbs/bu	%	%	bu/A
Croplan	RT0383	0.3	57.4	17.5	39.0	16.8
	RT0669	0.6	53.0	18.0	38.7	10.8
Proseed	70-30	0.3	56.7	17.0	40.9	15.6
	60-40	0.4	54.4	18.4	40.8	14.6
Integra	97009R	0.09	--	18.4	37.0	6.5
	79031	0.4	56.4	18.2	40.9	14.4
Monsanto	AG0301	0.3	54.1	18.4	38.0	13.1
NDSU	ND03-8313	00.7	--	17.6	38.2	7.4
	RG7008RR	00.7	--	17.7	38.7	7.8
	RG6008RR	00.8	--	18.4	39.6	5.7
	RG600RR	00.0	--	18.6	37.7	11.7
	RG601NRR	0.1	--	18.8	40.2	12.7
	RG603RR	0.3	--	17.5	39.6	7.0
Trial Mean			55.3	18.0	39.2	11.1
C.V. %			0.9	2.3	1.2	9.8
LSD .05			0.7	0.6	0.7	1.6
LSD .01			1.0	0.9	1.0	2.3

Planting Date: May 14
Harvest Date: September 19
Seeding Rate: 250,000 pls/A (approx. 1.5 bu/A)
Row Spacing: 7”
Previous Crop: field pea

2008 Spring Triticale Variety Trial – Continuously Cropped No-till Hettinger, ND

Variety	Days to Head	Plant Height	Lodging	Test Weight	---- Grain Yield ---- 2006	2007	2008	Average Yield 2 yr	3 yr
	*	inches	0-9**	lbs/bu	----------- bushels per acre -----------				
RSI 310	74	46	0.8	45.4	40.6	62.4	58.5	60.4	53.8
Companion	74	46	1.2	40.6	36.7	48.8	46.6	47.7	44.0
Laser	76	48	1.2	44.0	31.7	51.8	44.9	48.4	42.8
Wapiti	75	49	1.5	40.8	39.9	39.7	45.1	42.4	41.6
Trical 2700	79	45	1.8	37.8	32.2	51.9	39.6	45.8	41.2
Marvel	77	48	2.2	37.2	28.1	41.2	46.5	43.8	38.6
Trial Mean	76	47	1.5	41.0	34.9	49.3	46.9	--	--
C.V. %	1.2	5.3	55.9	5.3	9.9	5.9	8.7	--	--
LSD .05	1	NS	NS	3.3	5.2	4.4	6.2	--	--
LSD .01	2	NS	NS	4.5	7.2	6.0	8.5	--	--

* Days to Head = the number of days from planting to head emergence from the boot.
** Lodging: 0 = none, 9 = lying flat on ground.
NS = no statistical difference between varieties.

Planting Date: April 14, 2008
Harvest Date: August 1, 2008
Seeding Rate: 1 million live seeds / acre.
Previous Crop: 2005 = soybean, 2006 = field pea, 2007 = durum.
Note: The 2008 trial sustained severe late season heat and moisture stress.

2008 Oil Type Sunflower Variety Trial – Continuously Cropped, No-till

Hettinger, ND

Brand	Hybrid	Oil Type & Traits	Days to Bloom	Days to Mature	Test Weight	Oil Content	----- Seed Yield ----- 2007	2008	Avg.
		*	**	**	lbs/bu	%	--- pounds / acre ---		
DynaGro	92N53	NS	82	131	29.0	45.2		1094	
	91H44	HO	81	134	31.5	42.6		804	
	93H11	HO	80	126	30.0	42.7		998	
	94C38	NS, CL	88	133	27.8	41.7		1225	
	94N82	NS	88	137	27.2	43.5		1295	
Croplan	528CL	NS, CL	83	126	28.5	44.0	1545	710	1128
Genetics	325DMR	NS, DMR	83	128	26.9	43.2		994	
	369DMR	NS, DMR	83	132	25.8	41.5		1259	
	551CL	NS, CL	83	130	28.5	42.4		1115	
	3080DMR	NS, DMR	80	127	29.4	40.1	1319	1066	1192
	564CL	NS, CL	87	135	28.9	42.9	940	998	969
	803DMR	NS, DMR	78	124	25.1	43.6	1172	779	976
	356	NS	87	134	29.4	41.7	1701	1172	1436
	306DMR	NS, DMR	82	132	28.2	42.3		1157	
Integra	536NSDM	NS, DMR	81	132	27.9	42.8	1138	1000	1069
Seed	IX0834NSDM	NS, DMR	84	132	33.3	43.4		858	
	735NSCLDM	NS, CL, DMR	83	128	29.2	45.0	1014	897	956
	737NSCLDM	NS, CL, DMR	86	137	27.3	45.6	1392	1186	1289
Seeds 2000	Blazer	NS, CL	89	135	27.0	42.9	2021	1207	1614
	Barracuda	NS, CL	86	133	31.0	42.2	1485	1203	1344
	Sierra	HO	88	135	26.4	42.0	1929	1577	1753
	Firebird	NS, SU	88	136	28.4	40.7	1647	1580	1614
Triumph	s678	NS, SS	89	138	28.4	45.9	1839	1448	1644
Seed	s878	HO, SS	88	137	28.4	41.5		1220	
	s671	NS, SS	88	133	29.3	43.6		1683	
	s7322	NS, SS, DMR	88	132	28.7	41.0		1403	
	s672	NS,SS	84	132	29.3	42.2		1309	
Mycogen	8H449DM	HO, DMR	86	136	29.0	42.2	1904	1636	1770
Seed	8H350DM	HO, DMR	82	128	28.8	43.4		1255	
	8N453DM	NS, DMR	84	133	29.9	43.4	1374	1639	1506
	8N337DM	NS DMR	77	126	28.7	43.8	1232	900	1066
	8N358CLDM	NS, CL, DMR	83	127	30.4	42.1	1447	1494	1470
	8D481	NS	83	132	28.3	42.7		1655	
Pioneer	63M91	NS	78	132	29.9	42.9		1210	
Hi-Bred	63N82	NS, SU	82	134	29.2	43.4		1408	
Monsanto	MH7633	NS, DMR	86	131	29.6	41.8		1075	
	MH7632	NS, DMR	87	133	29.1	43.5		1061	
	MH6640	NS, DMR	84	127	29.9	42.2		1092	
	MH6643	NS, DMR	78	128	29.1	42.0	1712	843	1278

Continued

Brand	Hybrid	Oil Type & Traits	Days to Bloom	Days to Mature	Test Weight	Oil Content	----- Seed Yield ----- 2007	2008	Avg.
		*	**	**	lbs/bu	%	--- pounds / acre ---		
Dekalb	DFF29-30	NS, DMR	77	124	27.0	43.2	997	726	862
	DKF34-33	NS, DMR	88	129	30.5	41.1	1381	980	1180
	IS6131	NS, DMR	80	124	26.1	42.8	1012	644	828
	IS7120	HO, DMR	79	124	26.1	42.8	1171	825	998
	DKF39-80CL	NS, CL	86	134	30.3	40.0		1127	
	DKF34-80CL	NS, CL, DMR	82	129	31.9	45.2	1262	1070	1166
	DKF37-31	NS	83	133	29.8	43.0	1141	1010	1078
	DKF38-45	NS	83	128	30.2	44.7	1637	1393	1515
Proseed	6007	NS, CL	89	135	30.4	41.4		1038	
	6008	NS, CL	88	133	28.2	41.3		1160	
	6481	NS	84	128	29.5	41.8	1380	871	1126
	7016	NS, CL	90	136	28.5	45.2		939	
	7025	NS, CL	89	132	28.6	44.0		822	
	7052	NS, CL	88	132	30.1	40.6		1223	
	7069	NS, CL	88	134	29.9	44.3		885	
	7207	NS, CL	88	132	28.6	43.6		903	
E. mat. check	Hysun 311		78	121	28.6	42.7		627	
M. mat. check	Carg. 270		82	126	29.8	43.0		975	
L. mat. check	P6451		89	138	27.1	43.6		968	
Oil check	USDA 894		83	132	28.7	43.6		834	
Trial Mean			84	131	28.9	42.8	1333	1106	--
CV %			1.3	1.3	3.4	4.4	13.3	8.5	--
LSD .05			1	2	1.4	2.6	248	131	--
LSD .01			2	3	1.9	3.4	328	173	--

* Oil Type: NS = NuSun, HO = high oleic
* Traits: CL = Clearfield, DMR = downy mildew resistant, SU = Express herbicide tolerant, SS = short stature.
** Days to Bloom and Days to Mature = the number of days from planting to 10% Bloom and seed maturity.

Planting Date: May 14, 2008
Harvest Date: October 8, 2008
Seeding Rate: 21,000 seeds / acre, thinned to 18,650 plants / acre.
Row Spacing: 28” Previous Crop: HRSW
Soil Type: Sandy Loam
Notes: Oil content and seed yields are based on 10% moisture.
The 2008 trial sustained moderate late season moisture stress.

2008 Winter Rye Variety Trial - Continuously Cropped - No-till Hettinger, ND

Variety	Winter Surv.	Heading Date	Plant Height	Lodg.	Test Weight	---- Grain Yield ---- 2006	2007	2008	Average Yield 2 yr	3 yr
	%	June	inches	0 – 9*	lbs/bu	----------- Bushels per acre -----------				
Remington	55	10	49	1	50.8	47.6	52.1	36.2	44.2	45.3
DR02	87	8	53	1	51.3	52.0	60.4	35.0	47.7	49.1
DR0207	89	8	54	1	50.7			37.7		
Rymin	99	8	50	1	50.7			31.4		
Trial Mean	81	9	52	1	50.9	41.0	46.1	35.1	--	--
C.V. %	10.2	0.1	4.6	40	1.1	7.5	7.7	9.5	--	--
LSD .05	13	1	4	NS	NS	4.5	5.2	NS	--	--
LSD .01	19	1	NS	NS	NS	NS	7.2	NS	--	--

* Lodging: 0 = none, 9 = lying flat on ground.
NS = No Statistical difference between varieties.

Planting Date: September 24, 2007 Harvest Date: July 30, 2008
Seeding Rate: 1 million live seeds / acre (approx. 1.4 bu/A).
Previous Crop: 2005 = soybean, 2006 = field pea, 2007 = durum.
Notes: The 2008 trial sustained late season heat and moisture stress.

2008 Winter Spelt Variety Trial — Hettinger, ND

Variety	Winter Survival	Heading Date	Plant Height	Test Weight	Grain Yield
	%		inches	lbs/bu	lbs/A
Frank	85	6/30	43	46.6	2620
PI348145	75	7/01	43	42.8	2264
PI348159	88	6/30	46	46.8	2782
PI348377	42	6/30	43	48.4	2659
Trial Mean	72	6/30	43	46.1	2582
C.V. %	17.1	1.7	3.0	3.7	5.5
LSD .05	20	NS	2	2.7	228
LSD .01	29	NS	NS	3.9	328

NS = no statistical difference between varieties.

Planting Date: September 24
Harvest Date: August 1
Previous Crop: Durum
Note: The trial sustained severe late season heat and moisture stress.

Variety	Winter Survival	Heading Date	Plant Height	Test Weight	Grain Yield
	%	June	inches	lbs/bu	bu/A
Windrift	87	18	53	48.7	44.1
Boreal	85	19	55	43.4	36.6
HR003	98	14	43	48.8	51.3
NE426GT	99	11	42	48.0	63.3
Trial Mean	92	16	48	47.2	48.8
C.V. %	12.8	14.1	5.4	7.2	8.3
LSD .05	NS	4	4	NS	6.5
LSD .01	NS	5	6	NS	9.3

NS = no statistical difference between varieties.

Planting Date: September 24
Harvest Date: July 30
Previous Crop: Durum
Note: The trial sustained severe late season heat and moisture stress.
Grain yields are based on a bushel weight of 50 lbs/bu.

2008 Winter Wheat Variety Trial - Continuously Cropped - No-till — Mandan, ND

Cooperator: USDA-ARS, Northern Great Plains Research Lab., Mandan
This Trial was funded by Ducks Unlimited, Bismarck

Variety	Winter Surv.	Plant Height	WSMV*	Test Weight	Grain Protein	---- Grain Yield ---- 2006	2007	2008	Average Yield 2 yr	3 yr
	%	inches	%	lbs/bu	%	----------- Bushels per acre -----------				
Millennium	99	32	12	53.9	12.8	36.9	84.2	55.5	69.8	58.9
Jagalene	96	29	2	55.4	12.7	42.0	60.1	56.7	58.4	52.9
CDC Buteo	99	32	4	56.2	12.6	38.3	70.7	49.2	60.0	52.7
Harding	99	31	3	52.5	12.2	36.5	69.1	52.3	60.7	52.6
Jerry	97	33	0	53.0	13.2	39.1	60.5	57.7	59.1	52.4
Wesley	91	25	20	51.3	13.7	41.1	73.1	38.0	55.6	50.7
Radiant	97	34	0	53.8	11.9	36.5	55.7	57.3	56.5	49.8
Alice**	81	26	10	52.1	12.4	43.5	61.6	42.1	51.8	49.1
CDC Falcon	98	27	9	53.3	11.7	37.4	54.1	52.6	53.4	48.0
Roughrider	98	37	0	52.1	13.2	37.2	66.0	38.6	52.3	47.3
Expedition	98	29	13	53.5	12.2	36.9	55.7	47.9	51.8	46.8
Yellowstone	91	31	2	52.9	12.6	34.5	50.6	53.6	52.1	46.2
Darrell	97	30	0	53.8	12.8		73.5	60.1	66.8	
Hawken	71	25	2	54.0	13.4		74.3	39.1	56.7	
NuDakota**	82	25	2	51.7	12.8		67.2	45.4	56.3	
Overland	98	30	0	54.3	12.1			58.9		
Accipiter	99	29	16	54.1	12.0			55.0		
Peregrine	98	37	20	53.4	12.4			52.3		
AP503CL2	70	27	2	54.0	12.7			44.1		
Lyman	94	30	18	52.2	12.8			43.5		
Norris	77	31	0	51.8	12.9			36.9		
DH99-39-121	98	37	8	54.1	13.0			54.9		
SD01273	89	30	6	53.4	12.5			42.3		
MT0495	93	29	11	50.8	12.8			47.2		
MT0552	98	27	9	54.1	13.4			49.4		
Trial Mean	93	30	7	53.3	12.7	37.5	62.7	49.2	--	--
C.V. %	12.4	4.5	242	3.3	3.9	16.5	14.3	14.0	--	--
LSD .05	16	2	NS	2.5	0.7	NS	14.7	9.7	--	--
LSD .01	21	3	NS	3.3	0.9	NS	19.6	12.9	--	--

* % of plants infested with Wheat Streak Mosaic Virus
** Hard white winter wheat.
NS = No Statistical difference between varieties.

Planting Date: September 12, 2007 Harvest Date: August 12, 2008
Seeding Rate: 1 million live seeds / acre (approx. 1.4 bu/A).
Previous Crop: 2005 & 2006 = HRWW, 2007 = soybean.

2008 Winter Wheat Variety Trial - Continuously Cropped - No-till   Hettinger, ND

Variety	Winter Surv.	Heading Date	Plant Height	Test Weight	Grain Protein	---- Grain Yield ---- 2006	2007	2008	Average Yield 2 yr	3 yr
	%	June	inches	lbs/bu	%	----------- Bushels per acre -----------				
Radiant	96	17	37	53.9	11.7	41.7	59.5	48.1	53.8	49.8
CDC Buteo	99	17	34	58.8	12.1	36.9	60.1	43.8	52.0	46.9
Harding	98	14	36	56.4	11.1	27.0	59.5	50.6	55.0	45.7
Jerry	91	18	39	55.2	11.2	24.8	59.3	49.0	54.2	44.4
Yellowstone	97	18	36	53.3	13.1	20.4	59.3	51.5	55.4	43.7
CDC Falcon	97	16	33	58.2	11.4	8.7	65.9	53.2	59.6	42.6
Jagalene	87	17	35	57.8	11.4	20.9	60.5	46.1	53.3	42.5
Wesley	98	9	30	56.8	12.2	19.1	57.8	50.5	54.2	42.5
Expedition	97	11	34	56.1	11.6	19.4	60.5	47.2	53.8	42.4
Millennium	99	12	37	58.6	11.0	8.7	63.0	49.4	56.2	40.4
Alice*	96	15	33	59.1	10.8	14.7	54.3	49.7	52.0	39.6
Roughrider	93	17	38	55.3	12.3	28.3	49.5	35.6	42.6	37.8
Hawken	98	10	32	57.8	10.9		63.0	48.4	55.7	
NuDakota*	97	14	29	56.1	10.8		55.5	52.6	54.0	
Darrell	95	12	36	57.6	11.6		57.0	50.3	53.6	
Overland	99	12	33	58.3	9.4			50.0		
Accipiter	96	19	34	54.9	11.4			49.8		
AP503CL2	98	14	31	59.5	10.5			49.1		
Norris	98	12	36	58.6	9.2			48.8		
Peregrine	99	16	41	56.2	10.8			45.1		
Lyman	94	12	34	58.7	11.1			42.8		
SD01273	98	11	36	58.4	11.2			46.1		
MT0495	97	18	34	54.4	11.1			51.2		
MT0552	99	14	34	57.8	12.3			51.0		
DH99-39-121	99	18	44	53.6	11.4			46.8		
Trial Mean	97	15	35	56.9	11.3	22.1	58.1	48.3	--	--
C.V. %	5.1	14.0	6.0	2.5	9.8	46.1	6.7	6.8	--	--
LSD .05	NS	3	3	2.0	1.5	17.0	5.5	4.6	--	--
LSD .01	NS	4	4	2.6	2.1	NS	7.2	6.1	--	--

* Hard white winter wheat.
NS = No Statistical difference between varieties.

Planting Date: September 11, 2007   Harvest Date: July 28, 2008
Seeding Rate: 1 million live seeds / acre (approx. 1.4 bu/A).
Previous Crop: 2005 = soybean, 2006 = field pea, 2007 = durum.
Notes: The 2006 trial sustained severe heat and moisture stress.

2008 Evaluation of Winter Pea and Winter Lentil Cultivars for Adaptation to North Dakota

E. Eriksmoen[1], K. McPhee[2], N. Riveland[3], B. Johnson[4], M. Halvorson[5] and S. Zwinger[6]

Summary

Winter pulse crops (dry pea and lentil) are currently being developed by USDA-ARS personnel at Pullman, Washington. Nine winter pea, ten winter lentil and selected 'surviving' cultivars (seed collected from previous year's surviving plants) were planted in the fall of 2007 at five locations in an effort to identify winter hardy cultivars that are adapted to North Dakota. All locations, except for the Prosper site, had little or no winter survival.

Introduction

Winter pea and winter lentil are relatively new crops to the United States and there is currently no commercial production in North Dakota. Seed yields of 50 to 75% higher than spring seeded types have been reported. Fall seeded legumes could provide growers in North Dakota with additional crops that are readily marketable, require no nitrogen fertilizer inputs, are seeded during a time of the year when farmers face fewer time, labor and weather constraints, and provides growers with many crop rotational benefits. Winter pea and winter lentil cultivars were initially tested at Hettinger, Williston, Minot, Carrington and Prosper (winter pea only) in 2004. None of those cultivars were harvested due to poor winter survival, although a small percentage of plants did survive. It was suggested that these few surviving plants may possess a higher level of genetic winter hardiness. From these initial and subsequent trials, surviving seed have been collected and replanted with winter hardiness being the sole selection criteria.

Materials and Methods

Nine winter pea and ten winter lentil cultivars were seeded in the fall of 2007 at the NDSU Hettinger, Williston, Minot and Carrington Research Extension Centers and at the NDSU main station site at Prosper (winter pea only). In addition, trials containing 'surviving' winter pea seed were seeded at the Prosper and Carrington sites. Each crop was arranged in a randomized complete block design. Data was collected on fall establishment, winter survival and on agronomic, yield and seed quality characteristics of surviving cultivars. Seed from all surviving plants was to be harvested and re-seeded in the fall of 2008.

Results and Discussion

All trials were seeded no-till into standing wheat stubble. Fall plant establishment and growth prior to freeze up was excellent at Williston, Carrington and Prosper and relatively poor at Hettinger and Minot. All sites except Prosper had a relatively open winter with little snow cover resulting in bitterly cold soil temperatures and little winter survival. Minimum soil temperatures were 17^{o} F at Hettinger, 15^{o} F at Williston, 11^{o} F at Minot and 10^{o} F at Carrington resulting in less than 5% winter pea survival at these sites. Two winter lentil cultivars had 14% winter survival at the Williston site. The Prosper site had a minimum soil temperature of 25^{o} F and had an estimated winter pea survival rate of 40 to 50%. Winter pea seed yields at this site averaged 3384 lbs/acre with a range of 2349 to 4354 lbs/acre. Agronomic, yield and seed quality data from the Prosper site is shown in Table 1.

Conclusions

None of the winter pea or winter lentil cultivars tested so far have had enough winter hardiness to consistently survive the harsh winter conditions of North Dakota. Seed from surviving plants have been collected at Hettinger, Williston, Carrington and Prosper and will continue to be screened for winter hardiness. We believe enhanced genetic winter hardiness does exist and that it's just a matter of time, effort and resources to discover it. Winter peas appear to have a tremendous seed yielding ability even under conditions of relatively modest winter survival. A good layer of soil insulating snow is essential for winter survival.

Acknowledgements

This study was partially funded by the Northern Pulse Growers Association, Bismarck, ND. Cultivars in this study were developed and provided by the USDA-ARS, Pullman, WA.

Table 1. 2007-2008 Winter Pea Nursery at Prosper, ND.

Variety	Fall stand†	Survival‡	Days to first flower	1000 seed weight	Yield
		%	*	g	lb/acre
Specter	9.1	50	77	148	3357
Windham	8.8	40	76	167	3484
PS0230F092	9.0	43	82	170	2821
PS03100635	9.3	47	79	132	2349
PS03101160	9.1	57	79	179	4354
PS0017018	9.0	40	85	167	4197
PS0230F063	8.8	45	79	149	4146
PS0230F210	8.9	33	77	174	2400
PS03100848	8.9	43	80	175	3258

* Days from April 1 to 10% bloom.
† Visual rating based on 0.0 to 10.0 scale, where 10.0 is best.
‡ Visual estimate of the percent of established plants that survived the winter.
Planted: September 27, 2007
Harvested: August 29, 2008

1. Eric Eriksmoen, Research Agronomist, NDSU Hettinger Research Extension Center
2. Dr. Kevin McPhee, Research Geneticist, USDA-ARS, Pullman, WA
3. Neil Riveland, Research Agronomist, NDSU Williston Research Extension Center
4. Dr. Burton Johnson, Associate Professor, NDSU, Fargo
5. Mark Halvorson, Research Agronomist, NDSU North Central Research Extension Center
6. Steve Zwinger, Research Specialist, NDSU Carrington Research Extension Center

Efficacy of Insecticidal Seed Treatments and Foliar Spray Timing for Control of Wheat Stem Sawfly and Wheat Stem Maggot in Hard Red Spring Wheat, 2008

Hard Red Spring Wheat: Triticum aestivum L., 'Steel ND'

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Wheat stem sawfly (WSS): *Cephus cinctus* Norton

Wheat stem maggot (WSM): *Meromyza americana* Fitch

Combinations of insecticide seed treatments and foliar insecticide applications were evaluated for control of WSS and WSM at the Hettinger Research and Extension Center (REC) in Hettinger, ND, at the North Central REC in Minot, ND, at a cooperator site near Makoti, ND and at the North Dakota State University (NDSU) agronomy research farm in Fargo, ND. WSS infestations occured at Hettinger REC and Makoti, while WSM infestations occured at all four locations. A fifth location near Willow City, ND was discarded due to extremely low WSM numbers. Trials were arranged in a RCB design with four replications. The hollow-stemmed hard red spring wheat variety ‘Steele ND’ was used for all treatments at all locations. Plots at Hettinger, Minot and Makoti were 4.1 ft wide by 23 ft long with seven rows. At NDSU, plots were 4.1 ft wide by 20 ft long with seven rows. Planting date was 5 May at Hettinger, 15 May at Makoti, 19 May at Minot and 12 May at Fargo. Seeding rate was 1.2 million live seeds per acre at Hettinger, Makoti and Minot, and 1.6 million live seeds per acre at Fargo. The following treatments were evaluated: 1) untreated check, 2) foliar insecticide at the 4-6 leaf stage, 3) foliar insecticide at flag leaf stage, 4) low rate of insecticide seed treatment, 5) high rate of insecticide seed treatment, and 6) low rate of insecticide seed treatment + foliar spray at the 4-6 leaf stage. Dividend Extreme fungicide was applied to seed for all treatments at a rate of 15 g AI/100 kg. Cruiser 5FS was used as the insecticide seed treatment and Warrior II with Zeon Technology was used for all foliar insecticide applications. All seed treatments were applied commercially. All foliar applications were made with a CO_2 pressurized backpack sprayer at 40 psi at a rate of 20 gal/acre using T-Jet 80015 nozzles. At Hettinger, the 4-6 leaf stage applications were made on 16 Jun and the flag leaf application was made on 25 Jun. At Makoti, the 4-6 leaf stage applications were made on 25 Jun and the flag leaf application was made on 3 Jul. At Minot, the 4-6 leaf stage applications were made on 29 Jun and the flag leaf application was made on 9 Jul. At Fargo, the 4-6 leaf stage applications were made on 18 Jun, and the flag leaf application was made on 1 Jul. An assessment of WSM injury was made by counting the number of white heads per plot. White head counts were conducted on 8 Jul (Zadok’s stage 69) at Hettinger, on 15 Jul (Zadok’s stage XX) at Makoti, on 21 Jul (Zadok’s stage XX) at Minot and on 14 Jul (Zadok’s stage 70) at Fargo. For WSS, infestation was assessed by splitting 25 stems per plot and counting the number of larvae in the lower four internodes of each stem. A stem was considered infested if one larva was found in any of the lower four internodes. Because WSS larvae are cannibalistic, no stem was given a count greater than one. Stems were collected on 23 Jul and brought back to NDSU and stored in a walk-in cooler until WSS counts could be made. The total number of WSS larvae per plot was determined. All plots were harvested with small-plot combines and grain yield in bushels per acre was determined. Plots were harvested at Hettinger on 13 Aug, at Makoti on 17 Sep, at Minot on 18 Sep and at Fargo on 18 Aug. Grain yield data, white head count data for WSM and infestation count data for WSS were subjected to ANOVA using the GLM procedure in SAS (2008 SAS Institute, Inc., Cary, NC). Treatment means were tested using Fisher's Protected LSD at $P \leq 0.05$. At Hettinger, yield and WSS infestation were subjected to linear regression using the REG procedure in SAS. Count data were transformed using log(X+1) prior to all analyses to satisfy the assumption of homogeneity of variance. Actual means are presented in the tables.

Results for WSM white head counts at all four locations are presented in Table 1. At Hettinger, Warrior II at the 4-6 leaf stage and the low rate of Cruiser 5FS + Warrior II at the 4-6 leaf stage had significantly fewer white heads than all other treatments. Warrior II at the flag leaf stage had significantly fewer white heads than the untreated check, the high rate of Cruiser 5FS and the low rate of Cruiser 5FS. The untreated check, the high rate of Cruiser 5FS and the low rate of Cruiser 5FS were not significantly different for white head counts. At Makoti, Minot and Fargo, Warrior II at the 4-6 leaf stage, the low rate of Cruiser 5FS + Warrior II at the 4-6 leaf stage and Warrior II at the flag leaf stage all had significantly fewer white heads than all other treatments. Also at Makoti and Fargo, the high rate of Cruiser 5FS had significantly fewer white heads compared to the untreated check, but significantly more white heads than the foliar insecticide treatments. These results indicate that that Warrior II applied at the 4-6 leaf stage and as late as the flag leaf stage gives the best control for WSM.

Results for WSS infestation at Hettinger and Makoti are presented in Table 2. At Hettinger, the high rate of Cruiser 5FS had the lowest number of infested stems, but was not significantly different from the untreated check or from any other treatment except the low rate of Cruiser 5FS. There were no significant differences between the untreated check, the low rate of Cruiser 5FS, the low rate of Cruiser 5FS + Warrior II at the 4-6 leaf stage, Warrior II at the 4-6 leaf stage and Warrior II at the flag leaf stage. At Makoti, there were no significant differences among treatments for WSS infestation. These results indicate that insecticides are ineffective at controlling WSS.

Yield results for Hettinger, Makoti, Minot and Fargo are presented in Table 3. WSM infestation at all locations was too low to cause measurable yield differences. There was no significant difference for yield among treatments at Makoti and Fargo. At Minot, the low rate of Cruiser 5FS had significantly lower yield than the high rate of Cruiser 5FS, Warrior II at the flag leaf stage and the untreated check. Yield differences at Minot were likely due to some other factor and not to WSM damage. At Hettinger, the high rate of Cruiser 5FS had a significantly lower yield than any other treatment except the low rate of Cruiser 5FS + Warrior II at the 4-6 leaf stage, even though the high rate of Cruiser 5FS had the lowest number of infested stems. Warrior II at the 4-6 leaf stage was not significantly different from any other treatment except the low rate of Cruiser 5FS + Warrior II at the 4-6 leaf stage. Linear regression of yield against WSS infestation showed a poor relationship ($Y = 17.283 + 1.0137X$, $R^2 = 0.13$, $P>0.05$). Therefore, differences between treatments for yield are impossible to attribute to WSS infestation. Severe drought and heat stress occurred at Hettinger during the growing season and yield differences between treatments may be indicative of heat stress and available soil moisture.

Table 1.

Treatment	Rate	Hettinger REC WSM White Head Count[a]	NDSU, Fargo WSM White Head Count[a]	Makoti WSM White Head Count[a]	Minot WSM White Head Count[a]
Cruiser 5FS (high rate)	50 g AI/100 kg	15.0 a	14.3 a	10.5 a	16.8 b
Check	---	13.8 a	22.0 a	9.8 a	24.5 a
Cruiser 5FS (low rate)	39 g AI/100 kg	9.3 a	20.8 a	7.3 a	20.8 ab
Warrior II (flag leaf stage)	1.28 fl oz/acre	3.4 b	4.3 b	1.0 b	5.3 c
Warrior II (4-6 leaf stage)	1.28 fl oz/acre	0.3 c	3.3 b	0.5 b	4.5 c
Cruiser 5FS (low rate) + Warrior II (4-6 leaf stage)	39 g AI/100 kg 1.28 fl oz/acre	0.3 c	0.3 c	0.5 b	2.8 c

Means followed by the same letter are not significantly different (Fisher's LSD, $P \leq 0.05$).

[a]Data transformed using log(X+1) prior to analysis. Actual means are presented in the table.

Table 2.

Treatment	Rate	Hettinger REC WSS Mean No. Infested Stems/Treatment[a]	Makoti WSS Mean No. Infested Stems/Treatment[a]
Cruiser 5FS (low rate)	39 g AI/100 kg	8.0 a	18.5 a
Check	---	6.5 ab	16.8 a
Warrior II (4-6 leaf stage)	1.28 fl oz/acre	6.3 ab	17.3 a
Cruiser 5FS (low rate) + Warrior II (4-6 leaf stage)	39 g AI/100 kg 1.28 fl oz/acre	6.0 ab	16.0 a
Warrior II (flag leaf stage)	1.28 fl oz/acre	5.0 ab	17.0 a
Cruiser 5FS (high rate)	50 g AI/100 kg	3.5 b	15.8 a

Means followed by the same letter are not significantly different (Fisher's LSD, $P \leq 0.05$).

[a]Data transformed using log(X+1) prior to analysis. Actual means are presented in the table.

Table 3.

Treatment	Rate	Hettinger REC Yield (bu/acre)	NDSU, Fargo Yield (bu/acre)	Makoti Yield (bu/acre)	Minot Yield (bu/acre)
Cruiser 5FS (low rate) + Warrior II (4-6 leaf stage)	39 g AI/100 kg 1.28 fl oz/acre	20.2 a	75.5 a	26.3 a	55.0 ab
Warrior II (flag leaf stage)	1.28 fl oz/acre	19.7 ab	82.4 a	26.5 a	60.7 a
Cruiser 5FS (low rate)	39 g AI/100 kg	19.5 ab	74.8 a	26.9 a	47.9 b
Check	---	19.1 ab	80.5 a	25.2 a	60.6 a
Warrior II (4-6 leaf stage)	1.28 fl oz/acre	18.0 bc	78.9 a	26.3 a	55.1 ab
Cruiser 5FS (high rate)	50 g AI/100 kg	17.1 c	74.1 a	26.4 a	58.9 a

Means followed by the same letter are not significantly different (Fisher's LSD, $P \leq 0.05$).

Part II. Materials Tested for Arthropod Management

F

HARD RED SPRING WHEAT: *Triticum aestivum* L., 'Steele ND'

EFFICACY OF INSECTICIDAL SEED TREATMENTS AND FOLIAR SPRAY TIMING FOR CONTROL OF WHEAT STEM SAWFLY AND WHEAT STEM MAGGOT IN HARD RED SPRING WHEAT, 2008

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Brand Name	Form-ulation	Common Name	Composition	Manufacturer
Cruiser 5FS	5FS	Thiamethoxam	3-[(2-chloro-5-thiazolyl)methyl]tetrahydro-5-	Syngenta Crop

			methyl-*N*-nitro-4*H*-1,3,5-oxadiazin-4-imine	Protection, Inc., Greensboro, NC
Warrior II with Zeon Technology	2.08CS	Lambda-cyhalothrin	(*R*)-cyano(3-phenoxyphenyl)methyl (1*S*,3*S*)-*rel*-3-[(1*Z*)-2-chloro-3,3,3-trifluoro-1-propenyl]-2,2-dimethylcyclopropanecarboxylate	Syngenta Crop Protection, Inc., Greensboro, NC

Progress Report- January 20, 2009
Optimizing the Identification and Development of High-yielding Spring Wheats with Resistance to Wheat Stem Sawfly

Janet J. Knodel, William A. Berzonsky, Patrick B. Beauzay, Eric Eriksmoen, Neil Riveland, and Denise Markle

Wheat stem sawfly, *Cephus cinctus* Norton (Hymenoptera: Cephidae), is a major pest of spring and winter wheat in the Northern Great Plains of the United States (Weiss and Morrill 1992). Wheat stem sawfly larvae feed inside the stem reducing grain yield (Holmes 1977). As the crop matures, larvae move to the bases of the stems and girdle the stem to construct pupation chambers. The weakened stems break and the plants lodge resulting in yield loss and reduced grain protein. Harvest of lodged plants is difficult or impossible. Perhaps because of its persistence in wheat stubble, wheat stem sawfly populations have been increasing in western North Dakota. Sixty to 70% spring wheat yield loss due to wheat stem sawfly cutting were reported in the New Salem, ND area in 2007. Annual losses due to wheat stem sawfly have been estimated to exceed $60 million in the northern Great Plains.

Choteau, a solid-stemmed sawfly resistant variety developed and released by Montana State University, is a top-selling variety in that state. Canadian companies are also looking to supply seed of new sawfly resistant varieties to their growers as well as to growers in North Dakota. The solid-stem characteristic provides resistance to the sawfly, but this trait is also associated with reduced grain yield even when there is no sawfly damage. There is evidence that other factors, such as attractants produced by the plant, could be involved in resistance to sawfly (Berzonsky, pers. comm.). The NDSU effort to develop host plant resistance is currently limited to utilizing two locations to evaluate and identify breeding lines with solid stems. Depending on the season, wheat stem sawfly populations might be adequate or inadequate for useful evaluations. Therefore, our objectives are to:

1) Expand testing for host plant resistance in North Dakota to more locations where high sawfly populations exist to maximize selection for all possible resistance mechanisms.

2) To quantify the degree of stem solidity necessary to supply effective resistance against wheat stem sawfly. This will enable breeders and growers alike to make a more informed decision on what level of stem-solidity is necessary to provide resistance and yet also maximize grain yield.

The main goals in addressing these objectives are to hasten the development and release of high-yielding resistant varieties for North Dakota wheat growers.

Material and Methods

Experimental wheat plots were planted at Hettinger (Adams Co.), Scranton (Bowman Co.), Regent (Hettinger Co.), New Leipzig (Grant Co.) and Williston (Williams Co.), North Dakota in 2008. To establish a range of host plant damage scenarios and to evaluate germplasm with a range of stem-solidness, the following eleven spring wheat varieties/breeding lines were evaluated: 1) Hollow-stemmed varieties (sawfly susceptible) – Glenn, Howard, Reeder, and Steele-ND, and 2) Solid-stemmed varieties/experimental lines (sawfly resistant) – AC Lillian, Agawam, Choteau, Conan, Ernest, NDSW0449, and Vida. The selection of hollow-stemmed varieties was based on acreage figures supplied by ND

Agricultural Statistics (2007) and past stem-solidity evaluations (Berzonsky, pers. comm.). Treatments were arranged in a randomized complete block design with four replications. Cropping practices and previous crop history were recorded. Standard growing practices were used regarding fertility, herbicides and fungicides for spring wheat production.

Wheat stem sawfly populations were monitored biweekly using sticky trap and sweep net samples. Traps were placed in the susceptible hollow-stemmed wheat variety plots from June through early August. Six sticky traps were placed in a line-transect in the field at 30-50 ft intervals and 30-50 ft in from the field edge (total of 6 trap sites per field). Traps were attached to 4 ft stakes using binder clips at the same height as the wheat plant. LAT/LON coordinates were recorded at each location using a GPS unit. Traps were monitored biweekly and trap number, date, and crop stage were recorded during field visits. Traps were carefully placed into separate clear plastic bags and labeled with location, trap number, date and Zadok's wheat growth stage. Bags were placed in a -20C laboratory freezer to preserve insects until counting. Sweep net sampling was also conducted from early June to early August. Twenty sweeps from 10 different sites were conducted for a total of 200 sweeps per field biweekly. All collected insects were placed into plastic bags (one sample per bag). Bags were labeled with location, field number, date and crop stage and then placed into the laboratory freezer to preserve insects until counting. Adult wheat stem sawfly were counted and sex was determined.

The following response variables were measured: percent stems with sawfly larvae, grain protein concentration, grain yield and test weight.

Objective Two: A total of 25 plants per plot were visually rated for stem solidity after harvest using the scale in Fig. 1. Stem solidity rating scales and indices often vary from breeding program to breeding program, but the scale in Figure 1 represents a typical scale. Stem solidity measurements were measured from three locations on the plant: first internode, second internode, and third internode above the soil surface. McNeal and Wallace (1967) found that the solidness of the lower internodes is considered the most important measurement that correlates with resistance to wheat stem sawfly. Sampled stems were split and the number of sawfly present was recorded for each internode. Developing a standardized index by combining the amount of stem solidness at the internode rated with actual sawfly infestation levels will help determine the 'cost' of resistance to grain yield relative to stem solidity and infestation levels.

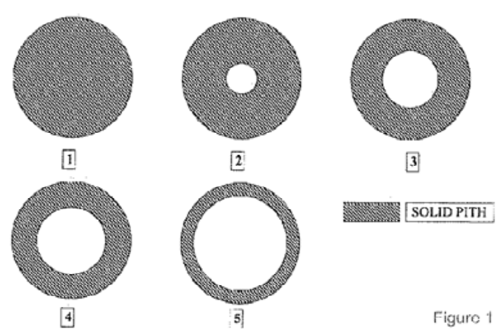

Figure 1

Normality of data and homogeneity of variances were tested to verify that data meets assumptions of parametric tests. Data were analyzed using ANOVA (SAS Institute) and means were tested using Fisher's Protected LSD at P = 0.05 (SAS Institute).

Results

Pest Monitoring:

Wheat stem sawfly was first detected in sweep net samples on 19 June at Hettinger Rose, Scranton and Regent, on 23 June at New Leipzig, and on 30 June at Hettinger REC. Peak emergence was on 26 June at Regent, 30 June at Hettinger Rose and Scranton, 3 July at Hettinger REC and New Leipzig. There were two emergence peaks at Hettinger Rose on 23 and 30 June, and two peaks at Scranton on 30 June and 7 July. Adult wheat stem sawfly count data are summarized in Table 1. Ranking locations from the highest wheat stem sawfly populations to the lowest includes: Scranton, Regent, Hettinger Rose, New Leipzig and Hettinger REC. Wheat stem sawfly was not monitoring at Williston due to labor and time constraints.

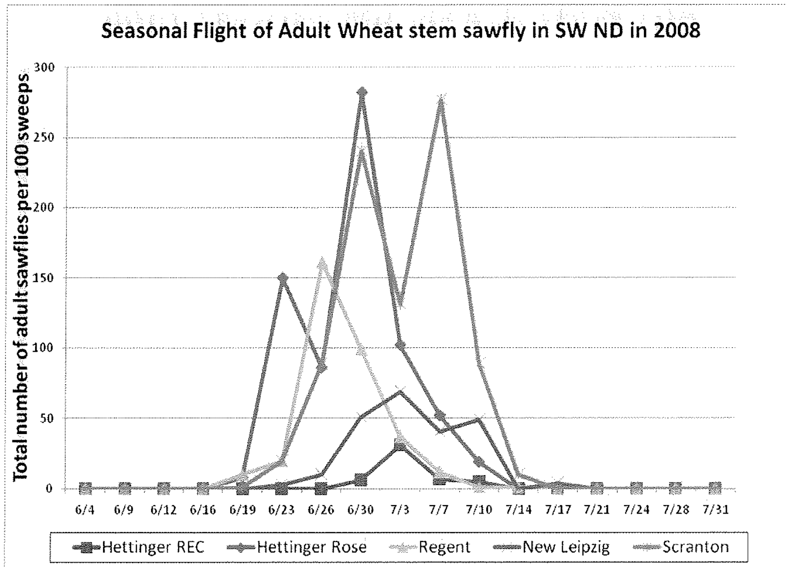

Table 1. Adult wheat stem sawfly counts from yellow sticky traps and sweep net samples 2008.

		Postive Trap Days		Sticky Trap Counts			Sweep Net Counts			Combined Counts		
Location	Crop Stage[1]	Sticky Traps	Sweeps	M	F	Total	M	F	Total	M	F	Total
Hettinger REC	45-71	18	11	2	10	12	8	41	49	10	51	61
Hettinger Rose	32-72	22	22	121	66	187	459	240	699	580	306	886
New Leipzig	21-59	22	18	28	73	101	23	200	223	51	273	324
Regent	32-70	19	22	497	156	653	239	101	340	736	257	993
Scranton	52-70	15	26	96	87	183	478	379	857	574	466	1,040

[1]Zadok's wheat growth stage.

HRSW Variety Results

At Hettinger REC (Table 2), the top five yielding varieties were Agawam, Vida, Conan, NDSW0449 and Glenn. All but Glenn are solid-stemmed varieties. The five varieties with the lowest percentage of infested stems were Conan, Choteau, NDSW0449, Reeder and Ernest. All are solid-stemmed varieties except for Reeder. The five varieties with the most stem solidity were Choteau, Agawam, Ernest, NDSW0449 and Vida.

Table 2. Mean yield, % WSSF infestation and stem solidity in lower two internodes for hard red spring wheat variety trials at Hettinger REC 2008.

Treatment	Type	Yield (bu/acre)[1]	% Infested Stems[1]	Stem Solidity[1,2]
Agawam	Resistant	36.6 a	7.0 abc	2.7 d
Vida	Resistant	35.7 a	14.7 a	4.6 a
Conan	Resistant	27.8 b	1.3 c	4.7 a
NDSW0449	Resistant	26.9 b	2.7 bc	3.8 b
Glenn	Susceptible	25.6 bc	5.3 abc	5.0 a
AC Lillian	Resistant	25.4 bc	12.0 ab	4.7 a
Reeder	Susceptible	25.3 bc	4.0 bc	4.8 a
Steele-ND	Susceptible	24.2 bcd	7.0 abc	4.9 a
Howard	Susceptible	21.4 cd	7.0 abc	4.9 a
Choteau	Resistant	20.9 cd	2.7 bc	2.5 d
Ernest	Resistant	20.3 d	5.3 abc	3.3 c

[1]Means followed by the same letter are not significantly different (Fisher's LSD, P = 0.05).
[2]Stem solidity ratings: 1 = 100% solid stem, 2 = <75% solid stem, 3 = <50% solid stem, 4 = <25% solid stem, and 5 = hollow stem (or 0% solid stem).

At Hettinger Rose (Table 3), the top five yielding varieties were Steele-ND, Agawam, Choteau, Reeder and Vida. The five varieties with the lowest percentage of infested stems were NDSW0449, Agawam, Choteau, Vida and Conan. The five varieties with most stem solidity were NDSW0449, Choteau, Agawam, Ernest and Conan.

Table 3. Mean yield, % WSSF infestation and stem solidity in lower two internodes for hard red spring wheat variety trials at Hettinger Rose 2008.

Treatment	Type	Yield (bu/acre)[1]	% Infested Stems[1]	Stem Solidity[1,2]
Steele-ND	Susceptible	27.4 a	73.0 ab	3.7 a
Agawam	Resistant	26.7 ab	27.0 de	1.5 de
Choteau	Resistant	25.7 abc	35.0 cde	1.4 e
Reeder	Susceptible	23.9 a-d	58.0 abc	3.6 ab
Vida	Resistant	23.9 a-d	40.0 cde	2.4 c
AC Lillian	Resistant	23.1 bcd	58.0 abc	2.6 c
Howard	Susceptible	22.5 cd	52.0 bcd	3.2 b
NDSW0449	Resistant	21.1 de	19.0 e	1.3 e
Glenn	Susceptible	20.5 de	83.0 a	3.7 a
Conan	Resistant	17.4 ef	41.0 cde	1.8 d
Ernest	Resistant	16.2 f	57.0 abc	1.6 de

[1]Means followed by the same letter are not significantly different (Fisher's LSD, P = 0.05).
[2]Stem solidity ratings: 1 = 100% solid stem, 2 = <75% solid stem, 3 = <50% solid stem, 4 = <25% solid stem, and 5 = hollow stem (or 0% solid stem).

At New Leipzig (Table 4), the five highest yielding varieties were NDSW0449, AC Lillian, Ernest, Vida and Reeder. The five varieties with the lowest percentage of infested stems were Ernest, Agawam, Choteau, Reeder and NDSW0449. The five varieties with the most stem solidity were Ernest, Choteau, Agawam, NDSW0449 and Conan.

Table 4. Mean yield, % WSSF infestation and stem solidity in lower two internodes for hard red spring wheat variety trials at New Leipzig 2008.

Treatment	Type	Yield (bu/acre)[1]	% Infested Stems[1]	Stem Solidity[1,2]
NDSW0449	Resistant	15.1 a	18.7 c	1.7 d
AC Lillian	Resistant	14.8 a	36.0 abc	2.5 bc
Ernest	Resistant	14.7 a	18.7 c	1.2 e
Vida	Resistant	14.6 a	28.0 bc	2.7 bc
Reeder	Susceptible	14.4 ab	36.0 abc	2.6 bc
Choteau	Resistant	13.5 abc	30.7 bc	1.3 de
Steele-ND	Susceptible	12.5 a-d	34.7 bc	2.9 b
Agawam	Resistant	11.0 a-d	30.7 bc	1.4 de
Glenn	Susceptible	10.2 bcd	56.0 a	4.1 a
Conan	Resistant	10.1 cd	41.3 ab	2.3 c
Howard	Susceptible	8.9 d	56.0 a	3.6 a

[1]Means followed by the same letter are not significantly different (Fisher's LSD, P = 0.05).
[2]Stem solidity ratings: 1 = 100% solid stem, 2 = <75% solid stem, 3 = <50% solid stem, 4 = <25% solid stem, and 5 = hollow stem (or 0% solid stem).

At Regent (Table 5), the five highest yielding varieties were Glenn, Steele-ND, Conan, Howard and Vida. The five varieties with the lowest percentage of infested stems were Agawam, Conan, Ernest, NDSW0449 and AC Lillian. The five varieties with the most stem solidity were Agawam, Ernest, NDSW0449, Choteau and AC Lillian.

Table 5. Mean yield, % WSSF infestation and stem solidity in lower two internodes for hard red spring wheat variety trials at Regent 2008.

Treatment	Type	Yield (bu/acre)[1]	% Infested Stems[1]	Stem Solidity[1,2]
Glenn	Susceptible	17.0 a	20.0 a	4.7 a
Steele-ND	Susceptible	14.4 ab	13.3 a	4.1 b
Conan	Resistant	13.4 bc	6.7 a	3.2 c
Howard	Susceptible	13.3 bc	16.0 a	4.7 a
Vida	Resistant	11.6 bc	18.7 a	3.4 c
Agawam	Resistant	11.2 bcd	6.7 a	1.6 d
AC Lillian	Resistant	10.6 cd	12.0 a	3.1 c
Ernest	Resistant	10.2 cde	6.7 a	1.6 d
Reeder	Susceptible	8.2 de	18.7 a	4.3 b
Choteau	Resistant	8.1 de	13.3 a	1.9 d

NDSW0449	Resistant	7.0 e	8.0 a	1.8 d

[1]Means followed by the same letter are not significantly different (Fisher's LSD, P = 0.05).
[2]Stem solidity ratings: 1 = 100% solid stem, 2 = <75% solid stem, 3 = <50% solid stem, 4 = <25% solid stem, and 5 = hollow stem (or 0% solid stem).

At Scranton (Table 6), the five highest yielding varieties were NDSW0449, Agawam, AC Lillian, Reeder and Vida. Interestingly, the five varieties with the lowest percentage of infested stems were Glenn, Howard, Steele-ND, Conan and Agawam. Glenn, Howard and Steele-ND are hollow-stemmed varieties. Our conjecture is that the severe drought at Scranton caused early senescence of the hollow-stemmed varieties. The solid-stemmed varieties may have held more moisture in the stems and were therefore more attractive for oviposition than the senesced hollow-stemmed varieties. The five varieties with the most stem solidity were Agawam, Ernest, NDSW0449, Choteau and Conan.

Table 6. Mean yield, % WSSF infestation and stem in lower two internodes for hard red spring wheat variety trials at Scranton 2008.

Treatment	Type	Yield (bu/acre)[1]	% Infested Stems[1]	Stem Solidity[1,2]
NDSW0449	Resistant	22.6 a	37.3 a	2.3 g
Agawam	Resistant	13.5 b	22.7 ab	1.8 g
AC Lillian	Resistant	11.7 bc	24.0 ab	3.4 def
Reeder	Susceptible	11.6 bc	25.3 ab	4.3 ab
Vida	Resistant	11.4 bc	34.7 ab	3.7 cde
Ernest	Resistant	11.0 bc	22.7 ab	2.0 g
Conan	Resistant	10.7 bcd	21.3 ab	3.2 ef
Steele-ND	Susceptible	10.0 bcd	21.3 ab	4.4 a
Choteau	Resistant	8.3 cd	34.7 ab	3.0 f
Glenn	Susceptible	6.8 cd	9.3 b	4.2 abc
Howard	Susceptible	5.8 d	10.7 ab	3.8 bcd

[1]Means followed by the same letter are not significantly different (Fisher's LSD, P = 0.05).
[2]Stem solidity ratings: 1 = 100% solid stem, 2 = <75% solid stem, 3 = <50% solid stem, 4 = <25% solid stem, and 5 = hollow stem (or 0% solid stem).

At Williston (Table 7), the five highest yielding varieties were Vida, Howard, Corbin, Reeder and Agawam. Corbin was tested only at Williston. The five varieties with the lowest percentage of infested stems were Ernest, NDSW0449, Choteau, Conan and Agawam. The five varieties with the most stem solidity were Ernest, NDSW0449, Choteau, Agawam and AC Lillian.

Table 7. Mean yield, % WSSF infestation and stem solidity in lower two internodes for hard red spring wheat variety trials at Williston 2008.

Treatment	Type	Yield (bu/acre)[1]	% Infested Stems[1]	Stem Solidity[1,2]
Vida	Resistant	25.8 a	24.0 a	3.9 c
Howard	Susceptible	24.2 ab	10.0 b	4.5 a
Reeder	Susceptible	23.5 abc	8.0 b	4.4 ab
Corbin	Resistant	23.5 abc	12.0 b	3.1 d
Agawam	Resistant	22.7 bcd	7.0 b	1.7 e
Conan	Resistant	21.8 b-e	6.0 b	2.9 d

Steele-ND	Susceptible	20.6 c-f	11.0 b	4.1 bc
Choteau	Resistant	20.6 c-f	5.0 b	1.7 e
AC Lillian	Resistant	20.0 def	8.0 b	2.8 d
Ernest	Resistant	19.4 ef	2.0 b	1.3 e
NDSW0449	Resistant	19.3 ef	3.0 b	1.5 e
Glenn	Susceptible	18.5 f	8.0 b	4.1 bc

[1]Means followed by the same letter are not significantly different (Fisher's LSD, P = 0.05).
[2]Stem solidity ratings: 1 = 100% solid stem, 2 = <75% solid stem, 3 = <50% solid stem, 4 = <25% solid stem, and 5 = hollow stem (or 0% solid stem).

Across all locations (Table 8), the five highest yielding varieties were Corbin, Vida, Agawam, NDSW0449 and Steel-ND. The five varieties with the lowest percentage of infested stems were Corbin (only from Williston), NDSW0449, Agawam, Conan and Choteau. The five varieties with the most stem solidity were Agawam, Ernest, NDSW0449, Choteau and Corbin. There was a severe drought in the western region of North Dakota during 2008. The drought produced lower wheat yields across the different locations and made assessing the relationship between stem solidity and sawfly resistance more difficult.

Table 8. Mean yield, % WSSF infestation and stem solidity in lower two internodes for hard red spring wheat variety trials across all locations 2008.

Treatment	Type	Yield (bu/acre)[1]	% Infested Stems[1]	Stem Solidity[1,2]
Corbin[3]	Resistant	23.5 a	12.0 d	3.1 d
Vida	Resistant	20.9 ab	27.2 abc	3.4 c
Agawam	Resistant	20.7 ab	16.8 cd	1.7 f
Steele-ND	Susceptible	18.8 abc	28.2 ab	4.0 b
NDSW0449	Resistant	18.8 abc	14.4 d	2.0 e
Reeder	Susceptible	18.4 bc	25.8 abc	4.0 b
AC Lillian	Resistant	18.0 bc	25.8 abc	3.1 d
Conan	Resistant	17.1 bc	20.0 bcd	2.9 d
Choteau	Resistant	16.9 bc	20.2 bcd	1.9 ef
Howard	Susceptible	16.8 bc	25.8 abc	4.1 ab
Glenn	Susceptible	16.7 bc	31.8 a	4.3 a
Ernest	Resistant	15.6 c	19.8 bcd	1.8 ef

[1]Means followed by the same letter are not significantly different (Fisher's LSD, P = 0.05).
[2]Stem solidity ratings: 1 = 100% solid stem, 2 = <75% solid stem, 3 = <50% solid stem, 4 = <25% solid stem, and 5 = hollow stem (or 0% solid stem).
[3]Data collected only from Williston.

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Weaning Date Impacts on Backgrounding and Finishing Performance of May Born Angus Calves

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ABSTRACT: This study evaluated the effects of weaning date on May born Angus calves during the grow-finish period. Forty-eight calves from the NDSU-Hettinger Research Extension Center cowherd were randomly assigned to one of two treatments (**TRT**): early weaning (**EW**; 139 d of age) or normal weaning (**NW**; 197 d of age). After weaning, calves were weighed, stratified by BW and sex, and randomly allotted to one of 12 pens (4 calves/pen; n=6) for backgrounding (EW = 91 d; NW = 42 d). Calves were fed a 43:57 forage:concentrate diet (13% CP; 1.19 Mcal NEg/kg). Interim calf weights were measured on d 36, 52, and 64 and diet samples collected on d 14, 32, 54, 67, and 78. Following backgrounding, calves were finished at the NDSU-Carrington Research Extension Center. Calves were commingled into one finishing pen and fed a 14:86 forage:concentrate diet (14.7% CP; 1.39 Mcal NEg/kg) for 112 d. Calves were harvested and individual carcass data collected when calf back fat was estimated at 1.27 cm. Results were analyzed as a randomized complete design using generalized least squares (PROC MIXED, SAS); LSD was used to separate TRT means ($P < 0.05$). Weaning weight was predictably less for EW calves (190 ± 1.31kg) vs. NW calves (254 ± 1.31kg; $P < 0.0001$); EW calves were 6.0% heavier than the NW calves (EW = 355 kg, NW = 335 kg; $P < 0.004$) at the end of the background period. Despite EW calves having higher feed costs during backgrounding than NW calves ($148.27 vs. $65.11; $P < 0.0001$), feed cost of gain and total cost of gain did not differ among TRT ($P = 0.11$). Weaning date did not affect DMI, ADG, G:F, and mortality rates ($P = 0.10$). No treatment differences were observed for carcass data ($P =0.23$) or age at slaughter ($P =0.86$). Early weaning is a viable option for producers who feed their calves for 91 d post weaning; EW calves grew as well as or better than NW calves in this study.
Key Words: calves, carcass, growth, and weaning.

Introduction

The western region of North and South Dakota is characterized by a semi-arid climate, with an agricultural base consisting of dryland farming and beef cattle production. In 2005, the Dakotas had a beef cattle inventory of over 5.23 million head worth over $5.4 billion to the two states' economies (USDA NASS, 2005). The majority of cows in the region calve in the early spring (Jan - Mar.) and calves are sold at weaning (Oct.-Nov.).

During the past six years, this area was impacted by drought, drastically reducing winter-feed supplies for gestating/lactating beef cows. One management practice regional cattle producers use to spare forage for grazing gestating/lactating beef cows is to early wean calves. Peterson et al. (1987) reported that cows with early-weaned calves consumed 45.3% less hay than cows with nursing calves. The definition of early weaning varies, but calves weaned at less than 150 days of age are usually considered early-weaned

(Loy et. al, 1999). Other reasons producers choose to early wean their calves include poor quality feed available, feed in short supply, cows are poor milkers or first calf heifers, and when cows calve late (Myers et al., 1999c).

Most research on early weaning has focused on early spring (Feb. - Mar.) calving cowherds (Schoonmaker et al., 2001; Story et al., 2000). Little research has evaluated the impacts of early weaning on late spring (May-June) born calves. The objective of this study was to evaluate the effects of weaning date on May born Angus calves during the growing and finishing period.

Materials and Methods

Study Area. The experiment was conducted at the NDSU Hettinger Research Extension Center's Southwest Feeders feedlot in Hettinger, ND and the NDSU Carrington Research Extension Center's feedlot in Carrington, ND.

Animals, management, and measurements. The North Dakota State University Animal Care and Use Committee approved the protocols used in this study. A randomized complete design was used to evaluate the effects of weaning date on May born Angus calves during the grow-finish period. Forty-eight steer and heifer calves (average birth date = May 1 ± 3.43 d) from the NDSU Hettinger Research Extension Center's May calving cowherd were randomly assigned to one of two treatments (**TRT**): early weaning (**EW**; 139 d of age; Sept. 19, 2006) or normal weaning (**NW**; 197 d of age; Nov. 15, 2006). Brood cow age ranged from 2 to 6 years, no first calf heifers were in the calving herd in 2006. The NW calves remained on pasture with their dams 57 d longer than the EW treatment group. Neither set of calves (EW and NW) were creep fed while on pasture. Early weaned calves were hauled (8 km) to the feedlot after morning gathering and weighing in the pasture. Calves assigned to the EW treatment weighed 189.5 kg at weaning. The NW calves were weaned 57 d later after morning gathering and weighing in the pasture and hauled (8 km) to the feedlot. Normal weaned calves weighed 254 kg at weaning. All calves were fed a dry hay based receiving ration for the first 14 d (NW) and 22 d (EW) post arrival at the feedlot. The receiving diet for EW calves consisted of 43.4% shell corn, 22.15% alfalfa-grass hay, 13.05% oat hay, 12.80% barley hay, 7.15% protein supplement, and 1.45% Decoquinate medicated crumbles (DM basis; 14.3% CP; 1.19 Mcal NEg/kg). The receiving diet for NW calves consisted of 39.90% shell corn, 35.90% mixed hay, 12.30% oat hay, 5.20% protein supplement, 4.50% soybean meal (44% CP), 1.60% Decoquinate medicated crumbles, and 0.60% calcium carbonate (DM basis; 13.20% CP; 1.12 Mcal NEg/kg). The hay sources utilized in the receiving diets were chopped (6.35 cm length) prior to feeding.

At the end of the receiving period (EW = Oct. 12, 2006; NW = Nov. 30, 2006), calves were weighed, stratified by BW and sex, and allotted randomly to one of 12 pens (4 calves/pen; six pens per TRT) for the backgrounding phase (EW = 91 d; NW = 42 d). Calves were fed a 43:57 forage:concentrate diet (13% CP; 1.19 Mcal NEg/kg; growing diet; $91.25/ton DM; Table 1). Target gain for the background period was 1.14 kg/d. Diet formulations were isonitrogenous and isocaloric at the start of the study. Fence line feed bunks were read daily at 0700 hrs and slick bunk management was used to determine individual pen daily feed allotment. Calves were fed diets once daily commencing at 0900 hrs and had continual access to water. Initial and final weights were determined using average unshrunk weights from two consecutive weigh days by weighing each individual animal prior to daily feeding. Interim calf weights were measured on d 36, 52, and 64 of the background phase prior to daily feeding. Diet samples were collected on d 14, 32, 54, 67, and 78.

All calves were vaccinated with a modified live vaccine for respiratory diseases (Bovi-Shield® Gold 5; Pfizer Animal Health, NY, NY; EW = Sept. 29, 2006; NW = Nov. 16, 2006), clostridial diseases, and Mannheimia hemolytica bacterin-toxid (One Shot Ultra™ 7, Pfizer Animal Health, NY, NY). Calves were also poured with an anthelmintic (Dectomax Pour On, Pfizer Animal Health, NY, NY) at time of vaccination for internal and external parasite control. Calves were implanted with a Ralgro® implant (36 mg zeranol; Schering-Plough Animal Health Corporation, Kenilworth, NJ) at the start of the background period. During the course of the study, calves had intermittent nasal discharges due to seasonally variable weather. Calves were revaccinated on d 53 (EW calves) and d 69 (NW calves) for respiratory diseases and Hemophilus somnus using a modified live vaccine (Express™ 5-HS, Boehringer-Ingelheim Vetmedica, Inc, St. Joseph, MO).

On January 16, 2007, the backgrounded calves were sent to the NDSU Carrington Research Extension Center (NDSU-CREC) in Carrington, ND for finishing. Calves were commingled into one finishing pen and fed a 14:86 forage:concentrate diet (14.7% CP; 1.39 Mcal NEg/kg; finishing diet; Table 1) for 112 d. Calves were revaccinated for respiratory (Bovi-Shield® Gold 5; Pfizer Animal Health, NY, NY) and clostridial (Ultrabac® 7; Pfizer Animal Health, NY, NY) diseases at arrival at the finishing yard. Additionally, calves were poured with an anthelmintic (Dectomax Pour On; Pfizer Animal Health, NY, NY) for internal and external parasite control at the time of vaccination. Calves (EW and NW) were not implanted during the finishing period. Calves were harvested when back fat thickness was visually estimated at 1.27 cm. On March 26, 2007 and March 27, 2007, five calves were sent each day to Barton Meats, Carrington, ND for slaughter. These calves were fed for 70 and 71 d before harvest. The remaining calves were slaughtered at Tyson Foods, Dakota City, IA on May 7, 2007. Remaining calves were on feed for 112 d. Finishing end weights were taken on all calves prior to shipping for harvest: weights were unshrunk weights (feed was present in the bunk at time of weighing). Individual carcass data of hot carcass weight (**HCW**), backfat thickness (**BF**), longissimus muscle area (**LMA**), percentage kidney, pelvic, and heart fat (**KPH**), marbling score, and yield grades (**YG**) were collected at the two commercial slaughter facilities.

Statistical Analysis. All data for the background period and carcass collection were analyzed as a randomized complete design using generalized least squares (PROC MIXED, SAS Institute, Cary, NC), with pen as the experimental unit. Means were separated using the LSD procedure of SAS ($\alpha = 0.05$) when the F-test was $P < 0.05$. Performance data from the finishing period was not analyzed statistically due to the calves being commingled into one pen during the feeding period.

Results and Discussion

Early wean calves were lighter at the start of the background period than NW calves (217 ± 0.64 kg vs. 269± 0.64 kg, respectively; $P < 0.001$). When NW calves were weaned, EW calves (242 ± 2.95 kg) were 10% lighter BW than NW calves (269 ± 2.95 kg; $P = 0.0002$). However, at the end of the background period, EW calves were 6.0% heavier than the NW calves. Early weaned calves gained 136 kg while NW calves gained only 65 kg ($P < 0.004$; Table 2). Calf weight gain was directly influenced by the number of days on feed. Early weaned calves spent 49 d more on higher energy rations (based on weaning date) as compared to the NW calves (EW= 91 d; NW = 42 d, respectively). Average daily gain was not different between TRT (1.47 vs. 1.56 kg/d, for EW and NW calves respectively; $P = 0.24$). Additionally, weaning date did not affect DMI ($P = 0.71$; Table 2) or G:F ($P = 0.16$); however, DMI as a percent of BW tended to be higher for EW calves than NW calves ($P < 0.10$; Table 2). Early wean calves had greater feed costs per head ($148.27 compared to $65.11 for NW calves; $P < 0.0001$; Table 2) due to a longer time spent in the feedlot during the background period; however, feed cost of gain and total cost of gain did not differ between TRT ($P = 0.11$; Table 2).

During the finishing period, calves were fed an ionophore (monensin; Table 1) daily. Finishing data is reported as observations for the commingled pen. During the finishing phase, calves averaged 1.33 kg ADG, consume 9.59 kg/d DMI, and had a G:F of 0.14.

Calf age at slaughter was similar among TRT ($P = 0.86$; Table 2) and averaged 360 ± 7 d. The ten calves that were slaughtered early (d 70 and d 71) at Barton Meats in Carrington, ND, were smaller framed animals as compared to the other calves in the group. As a result, these calves were ready for market at much lighter weights as compared to the rest of the calves in this study. Calf weaning date did not negatively influence carcass characteristics for EW and NW calves: calves had similar live weights at the end of the finish period ($P = 0.24$) and HCW were not different between TRT ($P = 0.23$; Table 2). Additionally, dressing percentage, BF, LMA, and KPH were similar among TRT ($P \geq 0.27$; Table 2). Marbling scores for the EW calves averaged 483 and 465 for the NW calves ($P = 0.43$; Table 2). These carcass results are similar to those reported by Myers et al. (1999b) and Schoonmaker et al. (2001). The EW calves' quality grades ranged from low to high choice, with two EW calves achieving prime and one select; NW calves' quality grades ranged from select to high choice, with seven NW calves scoring select and one prime. Myers et al. (1999a) reported that 40% more early-weaned steers graded average choice or higher at harvest than did their normal weaned contemporaries. USDA YG (adjusted for HCW, BF, LMA, and KPH) were not different among TRT ($P = 0.65$).

Implications

Early weaned calves were predictably younger and lighter at weaning; however, EW calves were heavier at the conclusion of the background period as compared to NW calves. Weaning date did not affect calf ADG, DMI, or G:F during backgrounding. Additionally, weaning date showed no effect on calf carcass characteristics in this study. Early weaning is a viable option for producers who feed their calves for 91 d post weaning. Additional research is warranted with larger numbers of calves over multiple years.

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Table 1. Calf diets fed during the grow-finish period

	Dry Matter	
Item	Growing	Finishing
Ingredient		
Shelled corn, %	43.43	52.33
Barley silage, %	29.67	---
Oat hay, chopped, %	12.87	---
Protein supplement[1], %	6.64	---
44% Soybean meal, %	2.50	---
Decoquinate crumbles, %	1.82	---
Aureomycin crumbles[2], %	2.65	---
Calcium carbonate, %	0.42	0.56
Field peas, dry rolled, %		14.17
Wet distillers grains, %		9.65
Corn silage, %		7.95
Naked oats, %		7.61
Straw, chopped, %		6.32
Monensin supplement[3], %		1.41
Nutrient Density		
Crude protein, %	13.00	14.68
Net energy for gain, Mcal/kg[4]	1.19	1.39

[1] 27% Commercial supplement (as fed): 27% CP, Ca min 2.0% , P min 0.7%, K min 0.7%, Vitamin A min 59.4 KIU/kg, Vitamin D_3 min 3.74 KIU/kg, Vitamin E min 0.22 KIU/kg, and Monensin 495 mg/kg.

[2] Calves fed Aureomycin crumbles at 22 mg/kg BW for the first 8 d in feedlot and when the calves had nasal discharges on d 44-46, d 64-66, and d 90-91.

[3] Monensin supplement (as fed): 13.43% CP, Ca min 5.0%, P min 0.2%, K min 2.0%, and Monensin 1980 mg/kg.

[4] Calculated analysis.

Table 2. The influence of weaning date on backgrounding calf performance and carcass characteristics

Item	EW [1]	NW [1]	SEM [2]	*P*-value [3]
Backgrounding calf performance				
Initial Wt, kg	217	269	0.64	< 0.0001
Final Wt, kg	355	335	3.66	0.004
Days on Feed, d	91	42		
Weight gain, kg	136	65	2.44	< 0.0001
ADG, kg	1.47	1.56	0.05	0.24
DMI, kg	8.05	7.95	0.19	0.71
DMI, % BW	2.82	2.65	0.07	0.099
G:F	0.08	0.09	0.01	0.16
Feed costs, $/hd	148.27	65.11	3.03	< 0.0001
Veterinary medicine costs, $/hd	15.37	14.50	3.50	0.86
Feed cost of gain, $/kg	1.14	1.03	0.04	0.11
Total cost of gain, $/kg	1.25	1.28	0.09	0.76
Morbidity, %	12.50	33.33	0.08	0.096
Mortality, %	4.17	0	0.03	0.35
Carcass characteristics				
Age at slaughter, d	361	359	6.97	0.86
Days on Feed, d	225	168		
Live weight, kg	489	474	8.45	0.24
Hot carcass weight, kg	295	284	6.0	0.23
Dressing percent [4], %	63.5	63.2	0.31	0.44
Backfat thickness, cm	0.22	0.21	0.02	0.68
Longissimus muscle area, cm^2	76.13	71.49	2.77	0.27
Kidney, pelvic, and heart fat, %	2.41	2.50	0.53	0.29
Marbling score [5]	483	465	14.8	0.43
USDA Yield Grade [6]	3.04	3.19	0.22	0.65

[1] Early wean (EW) and Normal Wean (NW).
[2] Standard Error or Mean; n=6.
[3] *P*-value for separation of treatment means.
[4] Dressing percentage calculation: hot carcass weight divided by shrunk weight (adjusted for 5% shrink).
[5] Marbling score conversion to USDA Quality Grade: 300-399 = Select; 400-449 = Low Choice; 450-499 = Average Choice; 500-549 = High Choice; 600^+ = Prime.
[6] Yield grade calculations: Preliminary Yield Grade minus carcass weight adjustment minus longissimus muscle area adjustment minus kidney, pelvic, and heart fat adjustment.

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60% Dried Distillers Grains in Lamb Rations Result in Acceptable Performance and Carcass Quality

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ABSTRACT: Little research is available evaluating the maximum level of dried distillers grain (DDG) inclusion in lamb rations. Our objectives were to evaluate increasing levels of DDG on performance and carcass characteristics of lambs. Two-hundred forty Rambouillet wether and ewe lambs (31.7 ± 0.6 kg BW) were stratified by weight and sex, randomly allotted to one of 16 pens, and assigned to treatment (n = 4). Diets were balanced to meet CP, energy, and Cu requirements; however, treatments were not kept isocaloric or isonitrogenous. The basal diet consisted of alfalfa, soybean meal, barley, and a trace mineral supplement. Dried distillers grains replaced barley and soybean meal at 0, 20, 40, and 60% of the diet (0%, 20%, 40%, and 60%, respectively; DM basis). Sulfur concentrations of diets were 0.22, 0.32, 0.47, and 0.55% for 0%, 20%, 40%, and 60%, respectively. Thiamin was included at 142 mg·hd-1·d-1 (DM basis) in all rations for the prevention of polioencephalomalacia. Rations were mixed, ground, and provided ad-libitum. Lambs were weighed on day 0, 32, 56, 83, and 111. Lambs were harvested and carcass data collected. Performance and carcass data were analyzed as a randomized complete design. The model included treatment. Contrast statements included 1) 0% vs DDG inclusion; 2) linear effect of DDG inclusion; and 3) uadratic effect of DDG inclusion. Final weight, ADG, G:F, mortality, hot carcass weight, leg score, conformation score, fat depth, body wall thickness, ribeye area, quality grade, yield grade, and % boneless closely trimmed retail cuts were not affected by treatment ($P \geq 0.15$). Feed intake increased in a linear manner ($P < 0.001$) as level of DDG inclusion increased. Additionally, flank streaking increased quadratically ($P = 0.09$) as level of DDG inclusion increased. Dried distillers grains maintained lamb performance and had no negative effect on lamb carcass traits. Maximizing the use of DDG may become economically feasible for lamb feeders when prices become favorable compared to conventional grains. However, the level of use of supplemental thiamin for the prevention of potential S toxicity in lambs needs to be evaluated.
Key Words: DDG, Lamb, S

Introduction

Coproducts from the ethanol industry are increasingly available in the northern Great Plains as the ethanol industry continues to expand. Dried distillers grain (**DDG**), one such coproduct, is an excellent source of energy and
protein for beef cattle and sheep (Lardy, 2003). Historically, research conducted in beef cattle diets report that DDG can be fed as a source of both supplemental protein and energy to cattle during backgrounding and finishing, with optimum inclusion levels at approximately 20% of the diet dry matter (Lardy, 2003). However, DDG are high in potassium, phosphorus, and sulfur; therefore care must be used when feeding DDG at the upper limits of the feeding recommendations because of health problems. Additionally, as commodity grain prices remain high, the interest in feeding maximum levels of DDG in ruminant finishing rations increases. To prevent polioencephalomalacia in sheep, current recommendations are to keep dietary concentrations of S below 0.3% DM when animals are fed concentrate diets or below 0.5%

DM when fed high-forage diets (NRC, 2007). Recent research results in cattle indicate that as much as 50% of the ration (DM basis) may contain DDG when 150 mg·hd-1·d-1 supplemental thiamin is provided (Huls et al., 2008). Little research has evaluated the inclusion of DDG as a replacement for concentrate in lamb finishing rations, especially as inclusion rates rise to the point where S becomes potentially toxic. Schauer et al. (2005, 2006) and Huls et al. (2006) reported that DDG can be included at levels up to 22.5% of a finishing ration with no negative affect on lamb performance or carcass traits. Thus, our objectives were to evaluate the influence of increasing levels of DDG in lamb finishing rations on performance and carcass characteristics, specifically when S concentrations become potentially toxic.

Materials and Methods

All procedures were approved by the North Dakota State University Institute for Animal Care and Use Committee. A randomized complete design was used to evaluate the influence of DDG in lamb finishing diets. Two-hundred forty western white-faced Rambouillet wether and ewe lambs (31.8 ± 0.6 kg initial BW) were stratified by weight and sex and assigned randomly to 16 pens (15 lambs/pen). Pens were then assigned to one of four treatments (n = 4). Lambs were fed a finishing diet for 111 days. Diets were balanced to at least meet crude protein, energy, and copper requirements (NRC, 2007); however, they were not kept isocaloric or isonitrogenous as level of DDG inclusion increased (Table 1). The basal diet consisted of alfalfa, soybean meal, barley, and a trace mineral supplement (Table 1). Dried distillers grains replaced barley and soybean meal at 0, 20, 40, and 60% of the diet (**0%**, **20%**, **40%**, and **60%**, respectively; DM basis). Thiamin was included at 142 mg·hd-1·d-1 (DM basis) in all rations for the prevention of polioencephalomalacia. Rations were mixed and ground through a grinder-mixer and provided ad-libitum via bulk feeders. Grab samples of the ration were collected on d 0, 56, and 111, dried at 55°C for 48 h, and analyzed by a commercial laboratory (Midwest Laboratories Inc., Omaha, NE) for DM, OM, NDF, ADF, TDN, Crude Fat, N, S, mineral concentrations, and thiamin (Table 1). Sulfur concentrations of diets were 0.22, 0.32, 0.47, and 0.55% for 0%, 20%, 40%, and 60%, respectively. Lambs were weighed on d 0, 32, 56, 83, and 111. Initial and final weights were an average of two-day un-shrunk weights. Following the 111 d finishing period, lambs were harvested and carcass data collected at Iowa Lamb Corp, Hawarden, IA. Feedlot performance and carcass trait data were analyzed as a randomized complete design using the GLM procedure of SAS (SAS Inst. Inc., Cary, NY). The model included treatment. Contrast statements included 1) 0% vs DDG inclusion; 2) linear effect of DDG inclusion; and 3) quadratic effect of DDG inclusion.

Results and Discussion

The effects of treatments on feedlot performance and carcass traits are shown in Table 2. Final weight, ADG, G:F, mortality, hot carcass weight (**HCW**), leg score, conformation score, fat depth, body wall thickness, ribeye area, quality grade, yield grade, and % boneless closely trimmed retail cuts (**%BCTRC**) were not affected by treatment ($P \geq 0.15$). Intake increased in a linear manner ($P < 0.001$) as level of DDG inclusion increased. Additionally, flank streaking increased ($P = 0.09$) in a quadratic relationship to the control as level of DDG inclusion increased, with all DDG treatments having greater ($P = 0.02$) flank streaking than 0%.

Dried distillers grains replacing up to 60% of the ration in a barley and alfalfa based finishing ration had no affect on lamb performance. However, intake did increase linearly as level of DDG inclusion increased. One possibility for the increase in intake was increased ration palatability, possibly due to the increased fat concentration of the ration. Although intake increased, a significant increase in ADG was not observed. However, a numerical increase in ADG of approximately 6% was observed for all DDG treatments when compared to the control diet. Other researchers suggest that DDG can be an effective replacement of concentrate with no affect of livestock performance compared to control rations. Erickson et al. (1989) provided up to 28% of a finishing ration as DDG and observed no negative affects on lamb performance. Similarly, Schauer et al. (2005) incorporated DDG up to 15% of the total ration and Huls et al. (2006) substituted up to 22.9% of the finishing rations with DDG and found no difference in lamb performance or carcass traits. However, Schauer et al. (2006) reported an increase in performance from increasing DDG levels up to 22.5% of the ration. In both Schauer et al. (2006) and the current trial, CP levels of the DDG rations are in excess of the requirements for lambs (NRC, 2007). In the control rations, CP may be limiting as corn and barley CP concentrations are substantially lower than DDG crude protein concentrations. Additionally, supplemental fat from the DDG may have affected intake and performance in both trials. Future research is needed to determine if adequate lamb performance can be maintained while utilizing lower quality forages than alfalfa with DDG replacing a portion of the concentrate in the diet.

The majority of carcass traits were not affected by increasing levels of DDG in the ration. These results are supported in research conducted by Schauer et al. (2005, 2006) and by Huls et al. (2006). In the current trial only marginal increases in flank streaking were observed. This response could potentially be the result of the increased energy density in the rations with higher levels of DDG inclusion.

In our trial supplemental thiamin was provided to aid in the prevention of S toxicity, potentially preventing the incidence of polioencephalomalacia. Current research suggests that S toxicity in concentrate rations fed to lambs is 0.3% DM, and 0.5% DM in lamb fed high-forage diets (NRC, 2007). As concentrate levels increase in lamb diets, ruminal pH decreases and excessive production of rumen sulfide can result (Gould, 1998). While decreases in ruminal pH have not been found to decrease the microbial production of thiamin (Alves de Oliveira et al., 1996), the ruminants main source of thiamin, the decreases in pH have been found to increase the bacteria that produce thiaminase – a compound that in turn destroys the thiamin that is already present, inducing a thiamin deficiency and subsequently polioencephalomalacia (Morgan and Lawson, 1974; Boyd and Walton, 1977, Thomas et al., 1987). In rations containing greater than 0.3% sulfur, the combination of increased dietary S concentration, increased ruminal sulfide production, and increased thiaminase production can result in an increase in polioencephalomalacia (Gould, 1998). Sulfur toxicity may additionally result in decreased intake and performance as well as health problems associated with S binding to copper, resulting in secondary copper deficiencies. One potential remedy for excessive dietary S is to include supplemental thiamin in the ration (NRC, 2007). Recent beef cattle research has reported mixed results using supplemental thiamin. Huls et al. (2008) successfully fed 50% of the diet as modified distillers grains plus solubles while supplementing with 150 mg/hd/d thiamin, noting no change in performance when compared to control diets. However, a 50% DDG with solubles treatment had to discontinued by Buckner et al. (2007) when multiple steers exhibited signs of polioencephalomalacia, even though they were providing 150 mg/hd/d supplemental thiamin. In our trial, no increases in mortality or morbidity were observed, indicating that the lambs on increasing levels of DDG had no deleterious effects from increasing dietary S concentrations. Additional research is needed to further quantify the supplemental thiamin needs of lambs fed high DDG rations.

Implications

The expansion of the ethanol industry in the U.S. may result in an increase in the availability of dried distillers grains for cattle and sheep feeders. Maximizing the use of dried distillers grains may become economically feasible for lamb feeders when prices become favorable, especially in relation to the current grain prices. When appropriately priced relative to corn and barley, dried distillers grains and supplemental thiamin can effectively replace up to 60% of a lamb finishing ration with no negative effects on feedlot performance or carcass traits.

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Table 1. Dietary ingredient and nutrient composition of control and dried distillers grain (DDG) diets

	Diets[1]			
Item	0%	20%	40%	60%
Ingredient	%, DM basis			
Barley	76.5	61.48	41.48	21.48
DDG	---	20.0	40.0	60.0
Alfalfa	12.5	12.5	12.5	12.5
Soybean Meal	5.0	---	---	---
Ammonium Chloride	0.50	0.5	0.50	0.50
Trace Mineral[2]	5.0	5.0	5.0	5.0
CTC[3]	0.50	0.5	0.50	0.50
Nutrient Concentration				
CP, %	19.8	20.1	25.1	27.2
$NE_{maintenance}$, Mcal/kg[4]	1.87	1.94	2.02	2.02
NE_{gain}, Mcal/kg[4]	1.25	1.30	1.34	1.34
Crude Fat, %	2.50	4.03	6.69	8.34
ADF, %	10.2	9.72	10.9	12.5
Sulfur, %[5]	0.22	0.32	0.47	0.55
Calcium, %	2.14	1.77	1.17	1.38
Phosphorus, %	0.48	0.55	0.66	0.67
Copper, ppm	12	10	11	10
Zinc, ppm	73	75	86	63
Thiamin, $mg \cdot hd^{-1} \cdot d^{-1}$	142	142	142	142

[1]Control = 0% replacement of barley with dried distillers grains; 20% = 20% dried distillers grain in ration replacing barley; 40% = 40% dried distillers grain in ration replacing barley; 60% = 60% dried distillers grain in ration replacing barley.

[2]Trace mineral: 0.12 % S, 0.31% P, 1.2% K, 1.45% Mg, 17.47% Ca, 2.82% Na, 509 ppm Fe, 375 ppm Mn, 50 ppm Cu, 715 ppm Zn, 5 ppm Se, 1960 mg/kg Thiamine, 95.15 KIU/kg Vitamin A, 9.46 KIU/kg vitamin D3, 9504 IU/kg Vitamin E, 946 mg/kg lasalocid.

[3]CTC (chlorotetracycline - 4G) was formulated to provide 48 g/ton chlortetracycline.

[4]Calculated analysis.

[5]Sulfur may be toxic at levels of 0.30% of diet (DM basis).

Table 2. The influence of dried distillers grains (DDG) on feedlot lamb performance and carcass characteristics

	Treatment[1]						*P*-value[3]		
Item	0%	20%	40%	60%	SEM[2]	*P*-value	Linear	Quadratic	0% Vs. DDG
Initial Weight, kg	31	32	32	32	0.6	0.55	0.47	0.22	0.22
Final Weight, kg	60	62	62	62	0.9	0.27	0.15	0.25	0.06
ADG, kg/d	0.26	0.28	0.28	0.28	0.01	0.21	0.11	0.41	0.05
Intake, $kg \cdot hd^{-1} \cdot d^{-1}$	1.68	1.78	1.83	1.91	0.03	0.001	< 0.001	0.71	< 0.001
G:F	0.16	0.16	0.15	0.15	0.005	0.53	0.20	1.00	0.39
Mortality, %	0.75	0.25	0.25	0	0.30	0.38	0.12	0.68	0.12
Hot Carcass Weight, kg	30	32	31	31	0.45	0.27	0.19	0.16	0.06
Leg score	10.3	10.5	10.5	10.5	0.3	0.89	0.56	0.66	0.45
Conformation score	10.3	10.3	10.5	10.5	0.27	0.83	0.42	1.0	0.60
Fat Depth, cm	0.74	0.81	0.76	0.81	0.05	0.57	0.36	0.69	0.24
Body Wall Thickness, cm	2.44	2.16	2.57	2.59	0.08	0.47	0.13	0.87	0.22
Ribeye Area, cm^2	14.96	15.35	15.16	15.42	0.32	0.72	0.43	0.83	0.35
Flank Streaking	324	357	342	345	8	0.08	0.19	0.09	0.02
Quality Grade	10.3	10.8	10.8	11	0.2	0.15	0.04	0.57	0.04
Yield Grade[4]	3.26	3.57	3.42	3.55	0.18	0.63	0.39	0.65	0.26
%BCTRC[5]	45.1	44.9	44.9	44.8	0.21	0.76	0.35	0.70	0.31

[1]0% = 0% replacement of barley and SBM with dried distillers grains; 20% = 20% dried distillers grain in ration replacing barley and SBM; 40% = 40% dried distillers grain in ration replacing barley and SBM; 60% = 60% dried distillers grain in ration replacing barley and SBM.

[2]Standard Error of Mean; n = 4.

[3]*P*-value for 0% vs DDG treatments and linear and quadratic affect of dried distillers grains inclusion.

[4]Yield Grade = 0.4 + (10 x adjusted fat depth).

[5]% boneless closely trimmed retail cuts (49.936 - (0.0848 x Hot Carcass Weight) - (4.376 x Fat Depth)-(3.53 x BW) + (2.456 x Ribeye Area)).

Feeding of 60% Dried Distillers Grains in Finishing Rations Results in Acceptable Lamb Performance and Carcass Quality

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Dried distillers grains, replacing barley and soybean meal in up to 60% of the ration, maintained lamb performance and had no negative effect on lamb carcass traits when compared to a barley based ration.

Introduction

Coproducts from the ethanol industry are increasingly available in the northern Great Plains as the ethanol industry continues to expand. Dried distillers grain (**DDG**), one such coproduct, is an excellent source of energy and protein for beef cattle and sheep (Lardy, 2003). North Dakota, Minnesota, and South Dakota annually produced about 900,000 tons of DDG, approximately 80% of which are fed to ruminants. Historically, research in beef cattle backgrounding and finishing diets report that DDG can be fed as a source of supplemental protein and/or energy, with optimum inclusion levels at approximately 20% of the diet dry matter (Lardy, 2003). However, DDG are high in potassium, phosphorus, and sulfur, and care must be used when feeding DDG at the upper limits of the recommendation. Additionally, as DDG prices stabilize and become cheaper as more product becomes available, some producers are interested in the maximum inclusion levels of DDG in finishing rations. . To prevent polioencephalomalacia in sheep, current recommendations are to keep dietary concentrations of sulfur below 0.3% DM when animals are fed concentrate diets, or 0.5% DM when fed high-forage diets (NRC, 2007). When feeding greater than 20% of the diet as DDG, dietary sulfur concentrations usually will exceed 0.3% DM. However, recent research results in cattle indicate that as much as 50% of the ration (DM basis) may contain DDG when 150 mg/hd/d supplemental thiamin is provided (Huls et al., 2008). Little research has evaluated the inclusion of dried distillers grains as a replacement for concentrate in lamb finishing rations. Schauer et al. (2005, 2006) and Huls et al. (2006) reported that DDG can be included at levels up to 22.5% of a finishing ration with no negative affect on lamb performance or carcass traits. In fact, the supplemental energy and protein supplied by DDG, when compared to either barley or corn based diets, may in fact increase performance (Schauer et al., 2006). While it is widely accepted that DDG are an excellent source of protein and energy, the unique problems of feeding feedstuffs high in phosphorus and sulfur to sheep warrant additional research. Maintaining a calcium to phosphorus ratio of 2:1 or greater for the prevention of urinary calculi may become difficult as the level of DDG included in lamb finishing rations increases. This study was designed to evaluate how lambs respond to increasing levels of DDG in a finishing ration, specifically when sulfur concentrations become toxic, while providing supplemental thiamin to prevent polioencephalomalacia.

Procedures

A randomized complete design was used to evaluate the influence of DDG in lamb finishing diets. Two-hundred forty western white-faced Rambouillet wether and ewe lambs (69.8 ± 1.3 lbs initial BW) were stratified by weight and sex and assigned randomly to 16 pens (15 lambs/pen). Pens were then assigned to one of four diets; 0% replacement of barley with DDG (**Control**), 20% DDG in ration replacing barley (**20%**), 40% DDG in ration replacing barley (**40%**), or 60% DDG in ration replacing barley (**60%**; Table 1). Lambs were fed a finishing diet for 111 days. Diets were balanced to at least meet crude protein, energy, and copper requirements (NRC, 2007); however, they were not kept isocaloric or isonitrogenous as level of DDG inclusion increased (Table 1). Thiamin was included at 142 mg/hd/d (DM basis) in all rations for the prevention of polioencephalomalacia. The control diet consisted of 76.5% barley and 12.5% alfalfa hay. Rations were formulated as to maintain a Ca:P ratio of 2:1 or greater and sulfur was evaluated (Table 1). Rations were mixed and ground through a grinder-mixer and provided ad-libitum via bulk feeders. Lambs were weighed on day 0, 32, 56, 83, and 111. Initial and final weights were an average of two-day weights. Following the 111 day finishing period, lambs were harvested and carcass data collected at Iowa Lamb Corp, Hawarden, IA. Feedlot performance and carcass trait data were analyzed as a randomized complete design using the GLM procedure of SAS (SAS Inst. Inc., Cary, NY). The model included treatment. Contrast statements included 1) Control vs DDG inclusion; 2) linear effect of DDG inclusion; 3) quadratic effect of DDG inclusion; and 4) cubic effect of DDG inclusion.

Results

The effects of treatments on feedlot performance and carcass traits are shown in Table 2. Final weight, ADG, Feed:Gain, Gain:Feed, mortality, hot carcass weight (**HCW**), leg score, conformation score, fat depth, body wall thickness, ribeye area, quality grade, yield grade, and % boneless closely trimmed retail cuts (**% BCTRC**) were not affected by treatment ($P \geq 0.15$). Intake increased in a linear manner ($P < 0.001$) as level of DDG inclusion increased. Additionally, flank streaking increased ($P = 0.09$) in a cubic relationship to the control as level of DDG inclusion increased

Discussion

Dried distillers grains replacing up to 60% of the ration in a barley and alfalfa based finishing ration had no affect on lamb performance. However, intake did increase linearly as level of DDG inclusion increased. One possibility for the increase in intake was increased palatability of the ration, possibly due to increased fat concentration of the ration. Although intake increased, a significant increase in ADG was not observed. However, a numerical increase in ADG of approximately 6% was observed for all DDG treatments when compared to the control. Other researchers suggest that DDG can be an effective replacement of concentrate with no affect of livestock performance compared to control rations. Erickson et al. (1989) provided up to 28% of a finishing ration as DDG and observed no negative affects on performance. Similarly, Schauer et al. (2005) replaced up to 15% of the total ration and Huls et al. (2006) replaced up to 22.9% of the ration with DDG and found no difference in lamb performance or carcass traits. However, Schauer et al. (2006) reported an increase in performance from increasing levels of DDG at levels up to 22.5% of the ration. In boththe Schauer et al. (2006) trial and the current trial, CP levels of the DDG rations are in excess of the requirements for lambs (NRC, 2007). In the control rations, CP may be limiting as corn and/or barley CP concentrations are substantially lower than DDG crude protein concentrations. Future research is needed to determine if adequate performance can be maintained while utilizing lower quality forages than alfalfa with DDG replacing a portion of the concentrate in the diet. Additionally, continued quantification of CP requirements is needed. In the current trial and in Schauer et al. (2006) the control ration was balanced for the CP requirements based on current literature, but marginal increases in ADG were observed as dietary CP increased with increasing levels of DDG.

The majority of carcass traits were not affected by increasing levels of DDG in the ration. These results are supported in research conducted by Schauer et al. (2005, 2006) and by Huls et al. (2006). In the current trial only marginal increases in flank streaking were observed, potentially the result of increased energy density in the rations with higher levels of DDG inclusion .

In the current trial supplemental thiamin was provided to aid in the prevention of sulfur toxicity, hopefully preventing the incidence of polioencephalomalacia. Current research suggests that sulfur toxicity in concentrate rations fed to lambs is 0.3% DM, and 0.5% DM in lamb fed high-forage diets (NRC, 2007). As concentrate levels increase in lamb diets, ruminal pH decreases and excessive production of rumen sulfide can result (Gould, 1998). While decreases in ruminal pH have not been found to decrease the microbial production of thiamin (Alves de Oliveira et al., 1996), the ruminants main source of thiamin, the decreases in pH have been found to increase the bacteria that produce thiaminase – a compound that in turn destroys the thiamin that is already present, inducing a thiamin deficiency and subsequently polioencephalomalacia (Morgan and Lawson, 1974; Boyd and Walton, 1977, Thomas et al., 1987). In rations containing greater than 0.3% sulfur, the combination of increasing dietary sulfur concentration, increased ruminal sulfide production, and increasing thiaminase production can result in an increase in polioencephalomalacia (Gould, 1998). Sulfur toxicity may additionally result in decreased intake and erformance as well as health problems associated with sulfur binding to copper, resulting in copper deficiencies. One potential remedy for excessive dietary sulfur is to include supplemental thiamin in the ration (NRC, 2007). Recent beef cattle research has had mixed results with supplemental thiamin. Huls et al. (2008) successfully fed 50% of the diet as modified distillers grains plus soluble while supplementing with 150 mg/hd/ d thiamin, noting no change in performance when compared to control diets. However, a 50% DDG with solubles treatment had to be discontinued by Buckner et al. (2007) when multiple steers exhibited signs of polioencephalomalacia, even though they were providing 150 mg/hd/d supplemental thiamin. In our trial, no increases in mortality or morbidity were observed, indicating that the lambs on increasing levels of DDG had no deleterious effects from increasing dietary sulfur concentrations. Additional research is needed to further quantify the supplemental thiamin needs of lambs fed high DDG rations.

Implications

The expansion of the ethanol industry in the region may result in an increase in the availability of dried distillers grains. Maximizing the use of dried distillers grains may become economically feasible for lamb feeders when prices become favorable. When appropriately priced relative to corn and/ or barley, dried distillers grains and supplemental thiamin can effectively replace up to 60% of a lamb finishing ration with no negative effects on feedlot performance or carcass traits.

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Table 1. Dietary ingredient and nutrient composition of control and dried distillers grain diets

	Diets[a]			
Item	Control	20%	40%	60%
	%, DM basis			
Ingredient				
Barley	76.5	61.48	41.48	21.48
Dried distillers grain	---	20.0	40.0	60.0
Alfalfa	12.5	12.5	12.5	12.5
Soybean Meal	5.0	---	---	---
Ammonium Chloride	0.50	0.50	0.50	0.50
Trace mineral[b]	5.0	5.0	5.0	5.0
CTC[c]	0.50	0.50	0.50	0.50
Nutrient Concentration				
CP, %	19.8	20.1	25.1	27.2
TDN, %	79.1	81.6	84.0	84.6
$NE_{maintenance}$, Mcal/lb	0.85	0.88	0.92	0.92
NE_{gain}, Mcal/lb	0.57	0.59	0.61	0.61
Crude Fat, %	2.50	4.03	6.69	8.34
Acid Detergent Fiber, %	10.2	9.72	10.9	12.5
Sulfur, %[e]	0.22	0.32	0.47	0.55
Calcium, %	2.14	1.77	1.17	1.38
Phosphorus, %	0.48	0.55	0.66	0.67
Copper, ppm	12	10	11	10
Zinc, ppm	73	75	86	63
Thiamin, mg/hd/d	142	142	142	142

[a]Control = 0% replacement of barley with dried distillers grains; 20% = 20% dried distillers grain in ration replacing barley; 40% = 40% dried distillers grain in ration replacing barley; 60% = 60% dried distillers grain in ration replacing barley.
[b]Trace mineral: 0.12 % S, 0.31% P, 1.2% K, 1.45% Mg, 17.47% Ca, 2.82% Na, 509 ppm Fe, 375 ppm Mn, 50 ppm Cu, 715 ppm Zn, 5 ppm Se, 891 mg/lb Thiamine, 43.25 KIU/lb Vitamin A, 4.3 KIU/lb vitamin D3, 4320 IU/lb Vitamin E, 430 mg/lb Bovatec®.
[c]CTC (4G) was formulated to provide 48 g/ton chlortetracycline.
[e]Sulfur may be toxic at 0.30% of diet.

Table 2. The influence of dried distillers grains on feedlot lamb performance and carcass characteristics

Item	Treatment[a]						*P*-value[c]			
	Control	20%	40%	60%	SEM[b]	*P*-value	Linear	Quadratic	Cubic	Con. Vs. DDG
Initial Wt (lbs)	68	70	71	70	1.3	0.55	0.47	0.22	0.97	0.22
Final Wt (lbs)	132	137	137	137	2.0	0.27	0.15	0.25	0.49	0.06
ADG (lbs/day)	0.58	0.62	0.61	0.62	0.02	0.21	0.11	0.41	0.25	0.05
Intake (lbs/hd/d)	3.69	3.91	4.03	4.20	0.07	0.001	< 0.001	0.71	0.64	< 0.001
F:G	6.38	6.31	6.66	6.75	0.20	0.38	0.13	0.72	0.48	0.41
G:F	0.16	0.16	0.15	0.15	0.005	0.53	0.20	1.00	0.51	0.39
Mortality	0.75	0.25	0.25	0	0.30	0.38	0.12	0.68	0.58	0.12
HCW (lbs)	66	69	69	68	1.0	0.27	0.19	0.16	0.56	0.06
Leg score	10.3	10.5	10.5	10.5	0.3	0.89	0.56	0.66	0.84	0.45
Conformation score	10.3	10.3	10.5	10.5	0.27	0.83	0.42	1.0	0.67	0.60
Fat Depth (in)	0.29	0.32	0.30	0.32	0.02	0.57	0.36	0.69	0.33	0.24
Body Wall Thick (in)	0.96	0.98	1.01	1.02	0.03	0.47	0.13	0.87	0.82	0.22
Ribeye Area (in^2)	2.32	2.38	2.35	2.39	0.05	0.72	0.43	0.83	0.44	0.35
Flank Streaking	324	357	342	345	8	0.08	0.19	0.09	0.09	0.02
Quality Grade	10.3	10.8	10.8	11	0.2	0.15	0.04	0.57	0.45	0.04
Yield Grade	3.26	3.57	3.42	3.55	0.18	0.63	0.39	0.65	0.39	0.26
%BCTRC[d]	45.1	44.9	44.9	44.8	0.21	0.76	0.35	0.70	0.79	0.31

[a]Control = 0% replacement of barley with dried distillers grains; 20% = 20% dried distillers grain in ration replacing barley; 40% = 40% dried distillers grain in ration replacing barley; 60% = 60% dried distillers grain in ration replacing barley.
[b]Standard Error of Mean; n = 4 .
[c]*P*-value for Control vs DDG treatments and linear, quadratic, and cubic affect of dried distillers grains inclusion.
[d]% boneless closely trimmed retail cuts (49.936-(0.0848*HCW)-(4.376*Fat Depth)-(3.53*BW)+(2.456*Ribeye Area)).

Response of North Dakota Lamb and Wool Producer Association members to the National Animal Identification System Strategic Plan (NAIS)

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Summary
This study evaluates responses that North Dakota Lamb and Wool Producers Association members had to the release of the National Animal Identification System Strategic Plan (NAIS). Overall, 27% of NDLWPA respondents recommend the continuation of the scrapie tag program for animal identification purposes; 8% recommended implants; 8% recommended eliminating identification programs; and 27% did not provide recommendations. A third of the respondents did not specify a type of identification but provided recommendations for how the system should be implemented.

Introduction
This study surveyed members of the North Dakota Lamb and Wool Producers Association (NDLWPA) following the release of the National Animal Identification System Strategic Plan (NAIS). Members of NDLWPA were asked their perceptions of USDA-APHIS, the National Animal Identification System, RFID technology, and the role of the North Dakota Lamb and Wool Producers Association. In addition, in order to compare the study with the previous survey of the North Dakota Stockmen's Association (NDSA), questions were asked regarding ownership of cattle and membership in NDSA.

Procedures
Conducting research as an innovation is being diffused can provide insight into the motivations for adopting or rejecting an innovation (Rogers, 2003). Rather than surveying participants after an innovation has been accepted, as is common in diffusion research, this study surveyed members of the North Dakota Lamb and Wool Producers Association (NDLWPA) following the release of the National Animal Identification System Strategic Plan (NAIS). Members of NDLWPA were asked their perceptions of USDA-APHIS, the National Animal Identification System, RFID technology, and the role of the North Dakota Lamb and Wool Producers Association. In addition, in order to compare the study with the previous survey of the North Dakota Stockmen's Association (NDSA), questions were asked regarding ownership of cattle and membership in NDSA.

Questionnaires have been used extensively in diffusion studies (Rogers, 2003). Questionnaires have also been used effectively to study risk perception and behavior related to the diffusion process (Singhal & Rogers, 2003). At the North Dakota Lamb and Wool Producers Association Annual Meeting in December 2006, open-ended questionnaires were distributed to attending members to learn their perceptions of the adoption or rejection process of RFID technology. The method was naturalistic (Lincoln & Guba, 1985) in that the researcher adopted "strategies that parallel how people act in the course of daily life" (Taylor & Bogdan, 1998, p. 8). Participants were already attending the meeting, and panels had already been scheduled during the meeting to discuss NAIS, allowing for an environment in which the participants would feel comfortable revealing related information (Taylor & Bogdan, 1998). The study was authorized by the North Dakota State University Institutional Review Board.

Participants
Participants were selected based on their attendance at the NDLWPA Annual Meeting. The participants were all adults and members of NDLWPA. Participation in the survey was voluntary, and the decision

about whether to participate in the study did not affect the standing of the participants in NDLWPA. If individuals decided not to participate, they were free not to complete the questionaire or to stop at any time. Those partipating in the survey signed an informed consent form allowing the information to be studied. Of the 95 attendants, 26 participants returned questionaires for a 27% response rate. All 26 respondents were sheep producers, however, 1 listed university and 1 listed marketing agent as additional industry affiliations. Producers were classified by length of time in the industry; 2 had been farming for under 10 years, 2 had been farming between 10 and 19 years, 8 had been farming between 20 and 29 years, 6 had been farming between 30 and 39 years, 6 had been farming for more than 40 years, and 2 did not provide how long they had been farming (Figure 1). Producers were further classified by the county in which they farm for description purposes. Producers represented 18 counties in 2 states (Figure 2). Of the North Dakotans who listed producer as at least one affiliation to the industry, 3 were from Burleigh County, 3 from Kidder, 2 from Richland, 2 from Ramsey, 2 from Adams, and 1 from Oliver, Hettinger, Sargent, Walsh, Eddy, Barnes, Dickey, Slope, Mercer, Steele, Cass, and Stutsman Counties. One producer farms in Wisconsin and another did not list the county.

Survey Environment

The organizational setting of the Annual Meeting was determined to be conducive to the process of encouraging members of NDLWPA to elaborate on their opinions, questions, and concerns regarding a major topic of discussion at the meeting (Taylor & Bogdan, 1998). Based on observation and personal communication with participants, questionnaires were completed immediately at the registration table, during the course of meetings, during discussions with other participants at lunches and banquets, and in the privacy of hotel rooms.

Survey Instrument

The questionnaire consisted of three description questions; one Likert-type scale to gauge the respondent's likeliness to adopt the technology; eight open-ended questions pertaining to the reasoning for the proposal of NAIS, advantages and disadvantages of RFID technology, perceptions of the roles of USDA-APHIS and NDLWPA, and recommendations for animal identification procedures; and three questions pertaining to whether the individuals also own cattle, are members of NDSA, and perceptions of adoption likelihood of sheep producers compared to cattle producers. Questions were composed based on feedback from members of the Biosurveillance Working Group. The questions were then pre-tested and revised based on feedback from the president of NDLWPA.

Data Collection

Questionnaires were distributed at the registration table as participants picked up their registration packets and entered the general assembly meeting. Before receiving a questionnaire, participants were asked if they had already completed a questionnaire to avoid duplication. Participants were able to complete the questionnaire at their leisure over the course of the three-day convention. In exchange for completing the questionnaire, respondents received a vented cap with the researcher's university extension center logo. In speaking with members of NDLWPA before the Annual Meeting, extension services are seen as a supportive entity to producers.

Procedures for Data Analysis

Frequency measures were used to analyze responses to questions regarding the role of NDLWPA in the adoption/rejection process of RFID technology, whether USDA-APHIS was effectively addressing the concerns of producers, the purpose of NAIS, and recommendations for tracking sheep. Frequency measures were also used to analyze the likelihood of members to voluntarily adopt RFID technology for tracking purposes. Responses to the questions regarding the advantages and disadvantages of the innovation and the respondent's conditions for adoption were coded and classified using the subsequent procedure: (1) Following Yin's (2003) process of pattern-matching logic, responses to the three questions were analyzed repeatedly to identify barriers to the adoption process. (2) Each questionnaire was then repeatedly analyzed to determine if additional themes, as constituted by negative terms, also existed in the data. (3) Following Coffey and Atkinson's (1996) clustering of themes for organization, the themes were conceptually organized by an underlying construct (Boyatzis, 1998). Using the theoretical lens of diffusion of innovation, themes were organized into clusters relating to the five attributes that affect the adoption process. (4) Any themes identified that did not fit into the cluster classification system were documented.

Results and Discussion

When asked what role respondents thought NDLWPA should play in the adoption/rejection of RFID technology, whether they were for or against adoption, 85% (n = 22) of the respondents felt NDLWPA should be involved in the process. Suggestions ranged from having the organization be involved in the education process to implementing the system. A 20-year producer from Dickey County wrote, "The Association will be the educational tool to inform producers of opportunities and advancements in the technology." Assuming adoption will occur, a 20-year producer from Kidder County wrote, "Once RFID is accepted, Lamb and Wool could help educate people in the sheep industry on the advantages of being able to record information. Also work with research (ex. Hettinger) on best equipment." While a 21-year producer from Burleigh County felt the role of NDLWPA was to make sure the adoption did not occur until everyone agreed, "Central in policy development and 100% agreement before adoption." Other respondents looked to NDLWPA as the bridge to USDA and identified the organization an opinion leader in the industry. A producer from Sargent County explained the role of NDLWPA as "making sure that our voice is heard in adopting standards that are practical and serve a purpose to the industry." While a 6-year producer from Eddy County wrote, "They should have the final say in this process because they are the people who will implement it and make it successful."

In contrast to the support for NDLWPA, many respondents were unsure as to how well concerns were being addressed by USDA-APHIS. Some producers wrote USDA was addressing their concerns adequately (19%; n = 5), or even very well via the state veterinarian's office and university extension (12%; n=3). However, 54% (n=14) of producers specifically stated their concerns were not being addressed. A 2-year producer from Ramsey County wrote, "I don't think the government agencies will listen to the producers or others that will be using this ID system." A 34-year producer from Adams County agreed, "I don't feel that they are listening to the producers." Four producers (15%; n=4) opted not to respond.

Seeing the connection between past crises and failures in the industry, respondents referred to specific events as the motivation for proposing NAIS. Participants who mentioned BSE as reasoning for the new system represented 62% (n = 16) of the total sample, while 15% (n=4) specifically mentioned scrapies, 12% (n = 3) mentioned 9/11, and 8% (n = 2) mentioned FMD. Some producers (19%; n=5) were more general in listing disease breakout, global food safety, and consumer demand as the reason for NAIS. However, a 40-year producer from Slope County was very specific in stating the reason was "politics," and a 21-year producer from Burleigh County stated NAIS was proposed because of "Economic interests outside of the producers of the actual livestock."

In determining how likely respondents were to voluntarily adopt RFID tagging, respondents were asked to rate their likelihood to adopt on a Likert scale (Table 1). Of the 26 who responded, 12% (n = 3) had already adopted RFID, 46% (n = 12) were likely to adopt, 8% (n = 2) were undecided, 19% (n = 5) were unlikely to adopt, and 15% (n = 4) indicated they will not adopt RFID technology. A 40-year producer from Slope County wrote the only circumstances that would make him adopt RFID were "mandatory or jail time." The majority of the respondents (57%; n=15) indicated they had either already adopted or were likely to adopt RFID tagging. However, of the 12 respondents who were likely to adopt, but had not yet adopted 75% (n=9) listed conditions that need to be in place for them to adopt RFID tagging. Regardless of adoption likelihood, respondents listed 27 conditions for adoption.

Table 1. Likelihood to Adopt RFID Technology

Likelihood	Number of Respondents
Already adopted	3
Likely to adopt – no conditions	3
Likely to adopt – under conditions	9
Undecided	2
Unlikely to adopt	5
Will not adopt	4

n = 26.

Despite concerns over the reasoning behind the implementation of NAIS and some reservations in adoption, 77% (n = 20) of respondents were able to list advantages for adopting RFID technology for animal identification. Advantages included safe food, reduced animal theft, faster identification, speed of trace-back, speed of commerce, increased flock performance and profit, record retention, and determination of domestic meat from imported meat.

Meanwhile, 81% (n = 21) were able to identify disadvantages to the technology. Some respondents listed multiple disadvantages for a total of 33 comments. Using the theoretical lens of diffusion of innovation, disadvantages of the system and circumstances that needed to be in place for adoption were categorized and coded into the five attributes that affect the adoption process (Rogers, 2003).

Relative Advantage

Before anyone will replace a product or system, the advantages of the new product or system must be demonstrated. Relative advantage is defined as the degree to which an innovation is perceived as better than the idea it replaces (Rogers, 2003). The advantages must also be worth the additional costs. The scapie program already requires tagging, so the change in the system would be a different type of tag and reading equipment. At the time of the survey, USDA had not addressed who would be responsible for paying for any additional costs. Multiple respondents, like the 34-year producer from Adams County, specifically asked, “Who is going to pay for all the additional work and supplies involved with this?” Respondents who mentioned disadvantages regarding relative advantage or cost represented 42% (n = 11) of the total sample (Table 2), while 35% (n = 9) indicated relative advantage was a condition that would have to be met before adoption (Table 3). A 40-year from Slope County wrote, “Stupid to try to track – lots of work with no benefits.” A 30-year producer from Stutsman County listed the disadvantage as, “Cost paid by producer – no compensation.” A 6-year producer from Eddy County wrote, “I will adopt it if there is <u>No Added Cost</u> to me for adopting it. ”

Table 2. Classification of Disadvantages

Disadvantage	Number of Respondents
Relative Advantage	11
Compatibility	3
Complexity	9
Trialability	7
Observability	3
None	5

n = 38.

Table 3. Classification of Conditions for Adoption

Condition	Number of Respondents
Relative Advantage	9
Compatibility	5
Complexity	6
Trialability	2
Observability	2
Manditory	3
None	5

n = 32.

Compatibility

Compatibility is defined as the degree to which an innovation is perceived as being consistent with existing values, experiences, and the needs of potential adopters (Rogers, 2003). Comments related to a need to integrate the new technology with the current system of tagging were classified as concerns regarding compatibility. Respondents that mentioned compatibility as a disadvantage represented 12% (n = 3) of the total sample (Table 2), while 19% (n = 5) indicated that compatibility was a condition that would have to be met before adoption (Table 3). A 36-year producer from Steele County wrote as a condition of adoption, "Convert the N.D. ID. system to the RFID system." While a 34-year producer from Adams County recommended, "That the scrapie program already in place stays the same and the sheep will not have to do anything else."

Complexity

Complexity is the degree to which an innovation is perceived as difficult to understand and use (Rogers, 2003). Concerns regarding complexity in user friendliness, compliance, and confidentiality were mentioned by 35% (n = 9) of respondents (Table 2), while 23% (n = 6) indicated that complexity was a condition that would have to be met before adoption (Table 3). The concern over the ease of using the information was summed up in a comment from a 30-year producer from Burleigh County regarding a potential disadvantage as "Hard to use." While a producer from Cass County wrote, "Most won't do it right."

While a few comments centered on compliance, including one from 15-year Hettinger County producer listing the disadvantage, "to get 100% cooperation." Most comments regarding the complexity of the technology concentrated on the level of privacy for the information. A 21-year producer from Burleigh County felt a disadvantage to RFID was "…control of the data collected and how that info will be used." A 2-year producer from Ramsey County mirrored the question in asking, "Who has control of the information and will have access to the information?" A 25-year producer from Wisconsin specifically asked, "Will RFID results ever be used to prosecute a producer?"

Trialability

Trialability is the degree to which an innovation may be experienced on a limited basis (Rogers, 2003). Comments related to trialability or testing the technology and demonstrating that it will work were made by 27% (n = 7) of respondents (Table 2), while only 8% (n = 2) indicated that trialability was a condition that would have to be met before adoption (Table 3). A 20-year Dickey County producer listed a disadvantage as, "Accuracy of reading tags." While the main concern, as described by a Sargent County producer was "Retention of tag." A circumstance needed to be in place for adoption was listed by a 30-year producer from Burleigh County as, "Get new tags."

Observability

Observability is the degree to which the results of an innovation are visible to others (Rogers, 2003). Comments of concern, beyond if the technology would work, centered on if the respondents could see the technology working at the speed of commerce. Respondents with these concerns represented 12% (n = 3) of the total sample (Table 2), while 8% (n = 2) indicated that observability was a condition that would have to be met before adoption (Table 3). Respondents in this category did not see how RFID could work outside the test system. A 25-year producer from Wisconsin asked, "Can RFID actually work in everyday life?" A 20-year producer from Dickey County said a disadvantage would be "Reading tags in large numbers of animals."

Other

All the disadvantages listed by respondents were encompassed by the elements of the adoption process. However, 12% (n=3) indicated a condition that would have to be met before adoption would be mandatory enrollment or a law passed (Table 3).

Recommendations

When asked what the respondents recommend for an animal identification process, 27% (n = 7) recommended the continuation of the scrapie tag currently being used; 8% (n = 2) recommended implants; 8% (n = 2) recommended eliminating identification programs; and 27% (n =7) did not provide recommendations. A third of the respondents, (31%; n=8) did not specify a type of identification but provided recommendations for how the system should be implemented. A 36-year producer from Steele Country recommended "Do it in a non-busy time for the farmer." While a 6-year producer from Eddy County recommended, "Should be kept on state control level as what we have now." A 40-year producer from Mercer County simply suggested, "Cheap, permanent, easy."

Table 4. Recommendations for Animal Identification

Recommendation	Number of Respondents
Tagging	7
Implants	2
No Animal ID	2
No Recommendation	7
Implementation Recommendation	8

n = 26.

Recognizing the impact of NAIS on cattle producers as well as sheep producers, respondents were asked if they also owned cattle. Of the respondents who also own cattle (46%; n=12), only 25% (n=3) responded they were likely to adopt RFID tagging. In comparison, of the 54% (n=14) of respondents who only own sheep, 86% (n=12) said they are either likely to adopt or have already adopted RFID tagging. A producer from Sargent County stated the reason for the difference as, “Tradition – stockmen’s still believes branding is adequate form of animal tracking (flawed) sheep producers don’t have that same stigma.” While a 20-year producer from Kidder County wrote, “We already do scrapies so we are started.”

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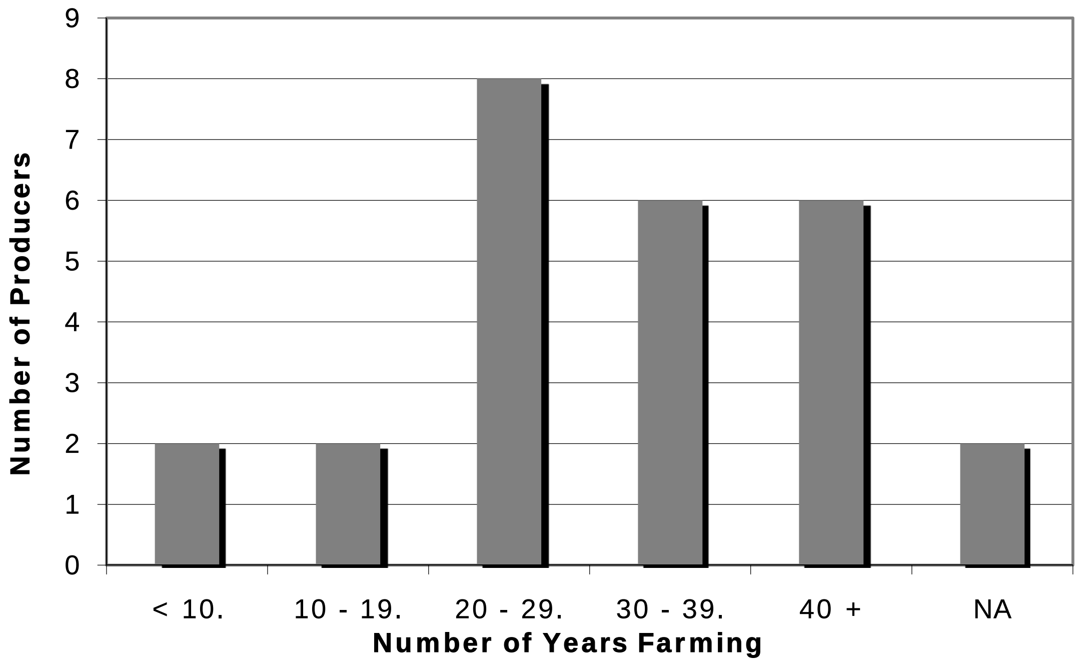

Figure 1. Number of Years Farming Graph shows how long participating producers have been farming.

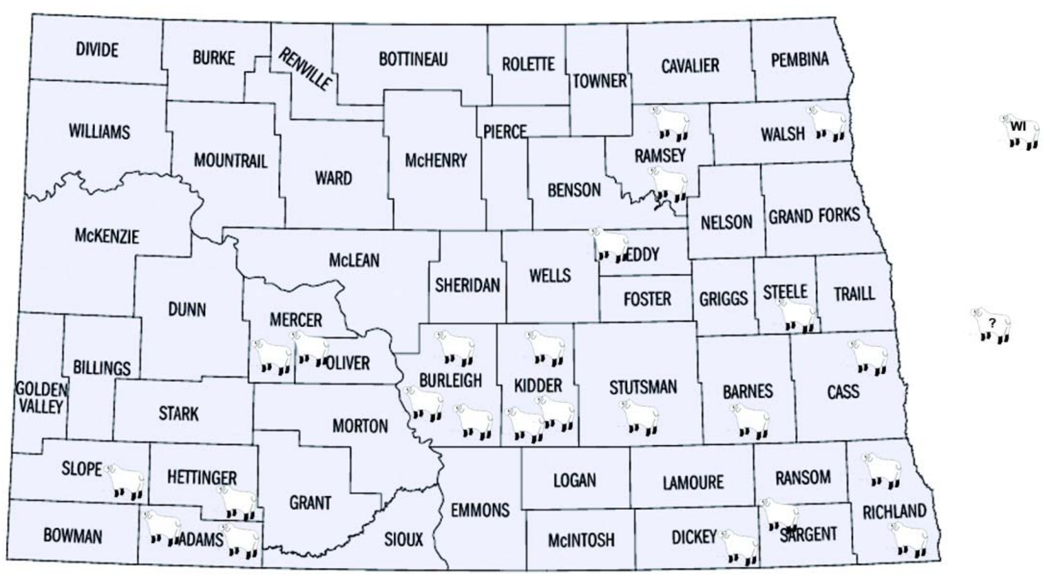

Figure 2. Producer Participant Map shows the counties in which respondents farm.

Effect of backgrounding rate of gain on subsequent feedlot performance, carcass characteristics, Warner-Bratzler shear force and sensory analysis

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The objective of this study was to determine the influence of rate of gain during the backgrounding period on finishing performance, carcass characteristics, shear force and consumer sensory analysis. Backgrounding rates of gain between 3.09 and 3.68 pounds per day have no effect on subsequent feedlot performance and meat quality.

Summary
Seventy-nine Angus and Angus × Simmental steers (507 initial body weight) were used in a completely random design to determine the effect of rate of gain during the backgrounding period on subsequent feedlot performance, carcass characteristics, Warner-Bratzler shear force and sensory analysis. Dietary treatments were formulated to have an average daily gain (ADG) of 2 pounds per day (lbs/d) or 2.75 lbs/d. Steers were fed for 70 days during the backgrounding period. The low-gain (LG) diet consisted of 52.5 percent barley silage, 39 percent whole-shell corn and 8.5 percent supplement, while the high-gain (HG) diet contained 43.9 percent barley silage, 47.4 percent whole-shell corn and 8.7 percent supplement on a dry matter (DM) basis. Initial body weight was not different ($P = 0.70$) between treatments. Steers fed the HG diet had increased ($P < 0.001$) ADG, compared with steers fed the LG diet (3.68 vs. 3.09 kilograms per day [kg/d], respectively). Following the growing period, steers were fed a common diet for 135 days. During the finishing period, LG steers had greater ($P = 0.01$) dry-matter intake (DMI), compared with those fed HG diets; however, ADG was not different ($P = 0.68$) among treatments. Hot carcass weight, marbling score, 12th rib fat, lean meat (LM) area, and U.S. Department of Agriculture yield grade (363 kg, Sm30, 1.33 cm, 83.8 cm2 and 2.7, respectively) were not different ($P > 0.12$) between treatments. There were no differences ($P = 0.77$) in Warner-Bratzler shear force tenderness of rib eye steaks (3.63 kg). Feeding steers to gain between 3.09 and 3.68 kg/d during the growing period does not affect meat quality.

Materials and Methods
Seventy-nine Angus and Angus × Simmental steer calves were assigned randomly to one of two dietary treatments in a completely random design. Steers were weighed, stratified by initial body weight (505 ± 154 pounds) and allotted to one of 10 pens (eight steers per pen). The pen was considered the experimental unit, with two treatments and fi ve replications. Treatments were a low-gain (LG) ration, targeting an ADG of 2 lbs/d, and a high-gain (HG) ration, targeting 2.75 lbs/d. Dietary treatments for the backgrounding period are in Table 1. Steers were fed the dietary treatments for 70 days during the backgrounding period. Steers were vaccinated with Bovi-shield® Gold 5 and One Shot Ultratm 7, and implanted with a Ralgro® implant at the start of the period.

Steers were finished on a common corn-based diet at the University of Nebraska Panhandle Research and Extension Center feedlot in Scottsbluff. Steers weights and feed refusals were weighed to determine ADG, DMI and gain-to-feed ratio (G:F) for both backgrounding and finishing periods. Carcass endpoint was determined by ultrasonic evaluations of 12th rib fat. When average fat depth of one-third of the calves was determined to be 0.45 inch, calves were marketed for slaughter. Steers were slaughtered at a commercial slaughtering facility and carcass measurements were taken 48 hours postharvest. Rib eye samples (2 inches thick) were collected and returned to NDSU for Warner-Bratzler shear force and consumer sensory analysis. Once frozen, the steaks were cut to a thickness of 1 inch. Steaks were allowed to thaw for 24 hours and were cooked in a convection oven at 350 F until they reached an internal temperature of 150 F to be used in Warner-Bratzler shear force and consumer sensory analysis. Prior to sensory analysis, panelists were trained to determine tenderness, juiciness and flavor (1 being extremely tough, dry, bland; 8 being extremely tender, juicy, flavorful). Data was analyzed as a completely random design using the PROC MIXED procedure of SAS (SAS Institute, Cary, N.C.). The model contained effects for treatment and replicate. Least square means were calculated and means were considered signifi cant if $P < 0.05$.

Results and Discussion

Backgrounding and finishing performances, carcass characteristics, shear force and consumer sensory analysis is shown in Table 2. Backgrounding Period - Initial body weight for the backgrounding period was not different between treatments. By design, ADG was increased in the HG treatment group (P = 0.009), which led to an increased body weight (P = 0.006) at the end of the period. Dry-matter intake also was increased in the HG treatment group (P <0.001), causing G:F to be similar among treatments (0.17 ± 0.01, P = 0.225). Backgrounding feed costs also were increased for the HG treatment group (P< 0.001); however, feed cost per pound of gain was not different (0.44 ± 0.01, P = 0.394). Finishing Period - Initial body weight (BW) tended to be increased in the HG treatment group (P = 0.073), while final weights were not different among treatment groups (1,263.5 ± 27.7 pounds, P = 0.175). Dry-matter intakes tended to increase in the LG treatment group (P = 0.101), but ADG (3.40 ± 0.01 pound, P = 0.921) and G:F (0.15 ± 0.01, P = 0.304) were not affected by treatment. Finishing feed costs were increased in the LG treatment group (P = 0.023), while feed cost per pound of gain was not affected (0.73 ± $0.04/pound, P = 0.187). Hot carcass weights were not different between treatments (P = 0.175). Marbling score; 12th rib fat; rib eye area; percentage kidney, pelvic and heart fat (KPH); and USDA yield grade and quality grade were not different between treatments ($P \geq 0.126$). Backgrounding treatment did not affect shear force analysis (8.02 ± 0.18 pound, P = 0.777). Percent thaw loss was not affected (1.98 ± 0.59 percent, P = 0.545), but percent cook loss was increased in the LG treatment group (P = 0.017). Consumer sensory analysis ratings of tenderness (5.43 ± 0.12, P = 0.606), juiciness (5.70 ± 0.13, P =0.276) and fl avor intensity (5.16 ± 0.01 P = 0.857) were not different between treatments.

Implications

Steers grown on the LG treatment achieved similar final weights to those on the HG treatment and had similar finishing performance, carcass characteristics, shear force and consumer sensory analysis. Backgrounding steers at rates of gain between 3.08 and 3.69 lb/d has no effects on fi nishing performance, carcass characteristics, shear force and consumer sensory analysis.

Table 1. Dietary composition fed to Angus and Angus × Simmental steers during the backgrounding period.

Ingredients	Diets[a]		
	Receiving diet	LG	HG
	- - - - - - - - %, DM basis - - - - - - - -		
Alfalfa-grass hay	23.0	---	---
Barley hay	12.9	---	---
Oat hay	13.1	---	---
Barley silage	---	52.6	43.9
Whole-shell corn	43.3	39.0	47.4
Supplement pellets[b]	7.0	6.2	5.2
Deccox medicated crumbles	1.5	1.6	1.3
Soybean meal, 44%	---	---	1.3
Calcium carbonate	---	0.7	0.9
Chemical composition, %			
DM	86.6	50.9	56.7
	- - - - - - - - %, DM basis - - - - - - - -		
Ash	9.7	11.5	10.7
CP	13.5	13.1	12.2
ADF	14.3	20.1	14.8
NDF	40.4	37.4	27.6
Calculated analysis			
NE_m, Mcal/lb	0.80	0.75	0.81
NE_g, Mcal/lb	0.46	0.48	0.54

[a]LG = low gain, HG = high gain.
[b]27% commercial supplement (as fed): 27% CP, min Ca 2.0%, min P 0.7%, min K 0.7%, min Vit D3 1,700 IU·lb^{-1}, min Vit A 27,000 IU·lb^{-1}, min Vit E 100 IU·lb^{-1}, and Rumensin 225 mg·lb^{-1}.

Table 2. Effect of backgrounding rate of gain on backgrounding and finishing performance, carcass characteristics, shear force and consumer sensory analysis.

	Treatments[a]			
	HG	LG	SEM[b]	*P*-value
Backgrounding performance				
Initial weight, lb	567.3	564.5	7.1	0.701
End weight, lb	825.7	778.7	12.8	0.006
ADG, lb	3.69	3.08	0.12	0.009
DMI, lb	20.90	18.44	0.31	<0.001
DMI % BW	3.03	2.76	0.07	0.006
G:F	0.18	0.17	<0.01	0.225
Feed cost, $/lb gain	0.44	0.45	0.01	0.394
Feed cost, $/hd	110.68	95.95	1.05	<0.001
Finishing performance				
Initial wt, lb	825.7	783.1	20.6	0.073
Final wt, lb	1284.1	1242.9	27.7	0.175
DMI, lb	22.76	23.66	0.48	0.101
ADG, lb	3.40	3.41	0.10	0.921
G:F	0.15	0.14	<0.01	0.304
Feed cost, $/lb	0.70	0.76	0.04	0.187
Feed cost, $/hd	315.61	344.72	7.35	0.023
Carcass characteristics				
HCW[c], lb	815.3	789.3	17.6	0.175
Marbling score[d]	435.04	421.44	9.85	0.358
12th rib fat	0.52	0.52	0.03	0.917
Rib eye area, in^2	12.99	12.98	0.25	0.984
KPH	2.50	2.50	0.07	0.946
USDA YG	2.74	2.66	0.12	0.651
USDA QG[e]	175.57	155.24	7.58	0.126
Shear force				
Thaw loss, %	2.38	1.58	0.59	0.545
Cook loss, %	29.43	31.04	0.05	0.017
WBSF, lb	8.04	7.99	0.18	0.777
Sensory analysis[f]				
Tenderness	5.38	5.48	0.12	0.606
Juiciness	4.96	5.17	0.13	0.276
Flavor intensity	5.16	5.17	0.05	0.875

[a]HG = high gain; LG = low gain
[b]SEM = standard error of the mean
[c]HCW = hot carcass weight
[d]Marbling score: 300 = slight; 400 = small
[e]USDA QG: 100 = select; 200 = choice
[f]Sensory analysis: 1 = extremely tough, dry, bland; 8 = extremely tender, juicy, flavorful

Weaning date effects on growing and finishing performance of May-born Angus calves*

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The objective of this study was to evaluate the effects of weaning date on the performance of May-born Angus calves during the growing and finishing period. Weaning date did not affect calf daily gain, dry-matter intake or gain-to-feed ratio during the background period and had no effect on carcass characteristics at harvest. Early weaning is a viable option for producers who feed their calves for 91 days postweaning.

Summary
Forty-eight steer and heifer calves from the NDSU Hettinger Research Extension Center's May calving cowherd were assigned randomly to one of two treatments: early weaning (EW, 139 days of age) or normal weaning (NW, 197 days of age). At the end of the receiving period, calves were weighed, stratified by body weight and sex, and allotted randomly to one of 12 pens (four calves/pen, six pens/treatment) for backgrounding (EW = 91 days, NW = 42 days). Calves were fed a 43-to-57 forage-to-concentrate diet (13 percent crude protein [CP], 0.54 megacalorie of net energy gain per pound [Mcal NEg/lb]). Interim calf weights were measured on day 36, 52 and 64 and diet samples collected on day 14, 32, 54, 67 and 78. Following backgrounding, calves were finished at the NDSU Carrington Research Extension Center. Calves were commingled into one finishing pen and fed a 14-to-86 forage-to-concentrate diet (14.7 percent CP, 0.63 Mcal NEg/lb) for 112 days. Calves were harvested and individual carcass data collected when back fat was visually estimated to be 0.50 inch. Weaning weight was predictably less for EW calves (417 ± 3 pounds) vs. NW calves (559 ± 3 pounds, $P < 0.0001$); EW calves were 6 percent heavier than the NW calves (EW = 782 pounds vs. NW = 736 pounds, $P < 0.004$) at the end of the background period. Despite EW calves having higher feed costs during backgrounding than NW calves ($148.27 vs. $65.11, $P < 0.0001$), feed cost of gain and total cost of gain (dollar/pound gain) did not differ among treatments ($P = 0.11$). Weaning date did not affect dry-matter intake (DMI), average daily gain (ADG), gain-to-feed ratio (G:F) or mortality rates ($P \geq 0.10$). No treatment differences were observed for carcass data ($P = 0.23$) or age at slaughter ($P =0.86$). Early weaning is a viable option for producers who feed their calves for 91 days postweaning; EW calves grew as well as or better than NW calves in this study.

Introduction
The western region of North and South Dakota is characterized by a semiarid climate, with an agricultural base consisting of dryland farming and beef cattle production. In 2005, the Dakotas had a beef cattle inventory of more than 5.23 million head worth in excess of $5.4 billion to the two states' economies (USDA National Agricultural Statistics Service, 2005). The majority of cows in the region calve in the early spring (February and March) and calves are sold at weaning (October and November).

During the past six years, this area was impacted by drought, drastically reducing winter-feed supplies for gestating/ lactating beef cows. One management practice regional cattle producers use to spare forage for grazing gestating/lactating beef cows is to early wean calves. Peterson et al. (1987) reported that cows with early weaned calves consumed 45.3 percent less hay than cows with nursing calves. The definition of early weaning varies, but calves weaned at less than 150 days of age usually are considered early weaned (Loy et. al, 1999). Other reasons producers choose to early wean their calves include poor quality of feed available, feed is in short supply, cows are poor milkers or first calf heifers, and cows calve late (Myers et al., 1999c).

Most research on early weaning has focused on early spring (February and March) calving cowherds (Schoonmaker et al., 2001; Story et al., 2000). Little research has evaluated the impacts of early weaning on late spring-born (May and June) calves. The objective of this study was to evaluate the effects of weaning date on May-born Angus calves during the growing and finishing period.

Materials and Methods

The North Dakota State University Animal Care and Use Committee approved the protocols used in this study. This research was conducted at the NDSU Hettinger Research Extension Center's Southwest Feeders feedlot in Hettinger, N.D., and the NDSU Carrington Research Extension Center's feedlot in Carrington, N.D.

A randomized complete design was used to evaluate the effects of weaning date on May-born Angus calves during the grow-fi nish period. Forty-eight steer and heifer calves (average birthdate = May 1 ± 3.43 days) from the NDSU Hettinger Research Extension Center's May calving cowherd were randomly assigned to one of two treatments: early weaning (EW, 139 days of age, Sept. 19, 2006) or normal weaning (NW, 197 days of age, Nov. 15, 2006). Brood cow age ranged from 2 to 6 years; no first-calf heifers were in the herd in 2006. The NW calves remained on pasture with their dams 57 days longer than the EW treatment group. Neither set of calves (EW and NW) was creep fed while on pasture. Early weaned calves were transported (five miles) to the feedlot after morning gathering and weighing in the pasture; calves assigned to the EW treatment weighed 417 pounds at weaning. The NW calves were weaned 57 days later after morning gathering and weighing in the pasture and transported (five miles) to the feedlot. Normally weaned calves weighed 559 pounds at weaning. All calves (EW and NW) were fed a dry hay-based receiving ration for the first 14 days (NW) and 22 days (EW) post-arrival at the feedlot. The receiving diet for EW calves consisted of 43.4 percent shell corn, 22.15 percent alfalfa-grass hay, 13.05 percent oat hay, 12.80 percent barley hay, 7.15 percent protein supplement and 1.45 percent Deccox™-medicated crumbles (dry matter [DM] basis; 14.3 percent CP, 0.54 Mcal NEg/lb). The receiving diet for NW calves consisted of 39.90 percent shell corn, 35.90 percent mixed hay (equal parts alfalfa, barley and grass hays), 12.30 percent oat hay, 5.20 percent protein supplement, 4.50 percent soybean meal (44 percent CP), 1.60 percent Deccox™ -medicated crumbles and 0.60 percent calcium carbonate (DM basis; 13.20 percent CP, 0.51 Mcal NEg/lb). The hay sources utilized in the receiving diets were chopped (2.5-inch length) prior to feeding.

At the end of the receiving period (EW = Oct. 12, 2006, NW = Nov. 30, 2006), calves were weighed, stratified by body weight and sex, and allotted randomly within weaning date to one of 12 pens (four calves/pen, six pens/ treatment) for the backgrounding phase (EW = 91 days, NW = 42 days). Calves were fed a 43-to-57 forage-toconcentrate diet (13 percent CP, 0.54 Mcal NEg/lb growing diet, $91.25/ ton DM, Table 1). Target gain for the background period was 2.5 pounds/ day. Diet formulations were isonitrogenous and isocaloric at the start of the study. Fence line feed bunks were read daily at 7 a.m. and slick bunk management was used to determine individual pen daily feed allotment. Calves were fed diets once daily commencing at 9 a.m. and had continual access to water. Initial and final weights were determined using average unshrunk weights from two consecutive weigh days by weighing each animal prior to daily feeding. Interim calf weights were measured on day 36, 52 and 64 of the background phase prior to daily feeding. Diet samples were collected on day 14, 32, 54, 67 and 78 during the growing period.

All calves were vaccinated with a modified live vaccine for respiratory diseases (Bovi-Shield® Gold 5, Pfizer Animal Health, New York, N.Y.; EW = Sept. 29, 2006, NW = Nov. 16, 2006), clostridial diseases and Mannheimia hemolytica bacterin-toxid (One Shot Ultra™ 7, Pfizer Animal Health, New York, N.Y.). Calves also were poured with an anthelmintic (Dectomax® Pour On, Pfi zer Animal Health, New York, N.Y.) at time of vaccination for internal and external parasite control. Calves were implanted with a Ralgro® implant (36 milligrams [mg] zeranol, Schering-Plough Animal Health Corp., Kenilworth, N.J.) at the start of the background period. During the course of the study, calves had intermittent nasal discharges due to seasonally variable weather. Calves were revaccinated on day 53 (EW calves) and day 69 (NW calves) for respiratory diseases and Hemophilus somnus using a modified live vaccine Express™ 5-HS, Boehringer-Ingelheim Vetmedica Inc., St. Joseph, Mo.).

On Jan. 16, 2007, the backgrounded calves were sent to the NDSU Carrington Research Extension Center (NDSU-CREC) in Carrington, N.D., for finishing. Calves were commingled into one finishing pen and fed a 14-to-86 forage-to-concentrate diet (14.7 percent CP, 0.63 Mcal NEg/lb fi nishing diet, Table 1) for 112 days. Calves were revaccinated for respiratory (Bovi-Shield® Gold 5, Pfi zer Animal Health, New York, N.Y.) and clostridial (Ultrabac® 7, Pfi zer Animal Health, New York, N.Y.) diseases at arrival at the finishing yard. Additionally, calves were poured with an anthelmintic (Dectomax® Pour On, Pfizer Animal Health, New York, N.Y.) for internal and external parasite control at the time of vaccination. Calves (EW and NW) were not implanted during the fi nishing period. Calves were harvested when back fat thickness was visually estimated to be 0.50 inch. On March 26, 2007, and March 27, 2007, five calves were sent each day to Barton Meats, Carrington, N.D., for slaughter. These calves were fed for 70 and 71 days, respectively, before harvest. The remaining calves were slaughtered at Tyson Foods, Dakota City, Iowa, on May 7, 2007; remaining calves were on feed for 112 days. Finishing end weights were taken on all calves prior to shipping for harvest; weights were unshrunk weights (feed was present in the bunk at time of weighing). Individual carcass data of hot carcass weight (HCW); back fat thickness (BF); ribeye area (REA); percentage kidney, pelvic and heart fat (KPH); marbling score; and yield grades were collected at the two commercial slaughter facilities.

Results and Discussion

Early weaned calves were lighter at the start of the background period than NW calves (478 ± 1.4 pounds vs. 591± 1.4 pounds, respectively; Table 2, $P < 0.0001$). When NW calves were weaned, EW calves (532 ± 6.5 pounds) were 10 percent lighter body weight (BW) than NW calves (591 ± 6.5 pounds, $P = 0.0002$). However, at the end of the background period, EW calves were 6 percent heavier than the NW calves; EW calves gained 299 pounds during the background period, while NW calves gained only 144 pounds ($P < 0.004$, Table 2). Calf weight gain was directly influenced by the number of days on feed. Early weaned calves spent 49 days more on higher energy rations (based on weaning date) as compared with the NW calves (EW= 91 days, NW = 42 days, respectively). Average daily gain was not different between treatments (3.34 ± 0.11 pound, $P = 0.24$). Additionally, weaning date did not affect DMI (17.6 ± 0.42 pound, $P = 0.71$, Table 2) or G:F (0.19 ± 0.006, $P = 0.16$); however, DMI, as a percent of body weight, tended to be higher for EW calves than NW calves (EW = 2.82 vs. NW = 2.65, respectively; $P = 0.099$, Table 2). Early weaned calves had greater feed costs per head ($148.27 compared with $65.11 for NW calves, $P < 0.0001$, Table 2) due to a longer time spent in the feedlot during the background period. However, feed cost of gain ($0.495/pound gain) and total cost of gain ($0.575/pound gain) did not differ between treatments (P = 0.11, Table 2).

In this study, one steer from the EW group died during the background period due to severe ruminal bloat, resulting in the EW calves having a numerically higher mortality rate (EW = 4.17 percent vs. NW = 0 percent, $P = 0.35$, Table 2). The mortality rate difference seen in this study is due to the use of a small animal population (48 calves) rather than experimental treatment differences. Veterinary medical costs were not different between the two groups (EW = $15.37/head vs. NW = $14.50/head, $P = 0.86$, Table 2); how ever, NW calves had a slightly higher incidence of morbidity as compared with the EW calves

(33.33 percent vs. 12.5 percent, *P* = 0.096, Table 2). The increased morbidity observed in the NW calves is attributed to nine cases of respiratory illness, one rectal prolapsed and an ear abscess (requiring multiple treatments), which occurred during the growing period. Early weaned calves, on the other hand, had fewer morbidity events (three cases of respiratory illness and one rectal prolapse) during backgrounding.

During the fi nishing period, calves were fed an ionophore (Rumensin®, 300 mg/head/day, Table 1) daily. Finishing data is reported as observations for the commingled pen. During the fi nishing phase, calves averaged 2.92 pounds of daily gain, consumed 21.1 pounds of DM and had a G:F of 0.14.

Calf age at slaughter was similar among treatments (*P* = 0.86, Table 2) and averaged 360 ± 7 days. The 10 calves that were slaughtered early (day 70 and day 71) at Barton Meats in Carrington, N.D., were smaller framed animals as compared with the other calves in the group. As a result, these calves were ready for market at much lighter weights as compared with the rest of the calves in this study. Calf weaning date did not influence carcass characteristics for EW and NW calves; calves had similar live weights at the end of the finish period (1,059 ± 18.6 pounds, *P* = 0.24) and HCW was not different between treatments (637 ± 13.2 pounds, *P* = 0.23, Table 2). Additionally, dressing percentage (63.4 percent, *P* = 0.44), BF (0.55 ± 0.05 inch, *P* = 0.68), REA (11.5 ± 0.43 square inch, *P* = 0.27), and KPH (2.46 percent, *P* = 0.29) were similar among treatments (Table 2). Marbling scores for the EW calves averaged 483 and 465 for the NW calves (*P* = 0.43, Table 2). These carcass results are similar to those reported by Myers et al. (1999b) and Schoonmaker et al. (2001). The EW calves' quality grades ranged from low to high choice, with two EW calves achieving prime and one select; NW calves' quality grades ranged from select to high choice, with seven NW calves scoring select and one prime. Myers et al. (1999a) reported that 40 percent more early weaned steers graded average choice or greater at harvest than did their NW contemporaries. Yield grades (adjusted for HCW, BF, REA and KPH) were not different among treatments (EW = 3.04 vs. NW = 3.19, respectively, *P* = 0.65).

Previous research (Myers et al., 1999abc; Schoonmaker et al., 2001, Story et al., 2000) reported early spring-born (February and March), early weaned calves could be fed highenergy finishing rations (0.60 to 0.64 Mcal NEg/lb) successfully postweaning to harvest. In these studies, calf carcasses with higher quality grades were produced. In our research, EW calves had carcass quality similar to NW calves. Early weaned calves consuming moderate energy (0.54 Mcal NEg/ lb) growing diets for 91 days prior to finishing still allowed cattle to have quality grades that are acceptable by industry standards. These results are supported by previous work conducted by Iiams and Trenkle (1997). In today's climate of high grain and high roughage prices, calves fed moderate-energy diets in a defi ned growing period prior to finishing may be a necessity to prevent high costs of feed and gain for finishing cattle. Additional research is required with larger numbers of calves during multiple years to evaluate the economics of early weaning May-born calves.

Implications

By design, early weaned calves were predictably younger and lighter at weaning; however, EW calves were heavier at the conclusion of the background period as compared with NW calves. Weaning date did not affect ADG, DMI or G:F during backgrounding. Additionally, weaning date showed no effect on calf carcass characteristics in this study. Early weaning is a viable option for producers who feed their calves for 91 days postweaning. Additional research is required with larger numbers of calves during multiple years to evaluate the economics of early weaning May-born calves.

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Table 1. Calf diets fed during the grow-finish period.

Item	Growing	Finishing
Ingredient, % dry matter		
Shelled corn	43.43	52.33
Barley silage	29.67	---
Oat hay, chopped	12.87	---
Protein supplement[1]	6.64	---
44% Soybean meal	2.50	---
Deccox™ crumbles	1.82	---
Chlortetracycline crumbles[2]	2.65	---
Calcium carbonate	0.42	0.56
Field peas, dry rolled	---	14.17
Wet distillers grains	---	9.65
Corn silage	---	7.95
Naked oats	---	7.61
Straw, chopped	---	6.32
Monensin supplement[3]	---	1.41
Nutrient density, dry matter basis		
Crude protein, %	13.00	14.68
Net energy for gain, Mcal/lb[4]	0.54	0.63

[1]27% Commercial supplement (as fed): 27% CP, Ca min 2.0%, P min 0.7%, K min 0.7%, Vitamin A min 27,000 IU/lb, Vitamin D3 min 1,700 IU/lb, Vitamin E min 100 IU/lb, and Rumensin® 225 mg/lb.
[2]Calves fed Chlortetracycline crumbles at 10 mg/lb body weight to prevent bovine respiratory disease. Calves were fed crumbles for the first 8 days in feedlot and when the calves had nasal discharges on day 44-46, day 64-66, and day 90-91.
[3]Monensin supplement (as fed): 13.43% CP, Ca min 5.0%, P min 0.2%, K min 2.0%, and Rumensin® 900 mg/lb.
[4]Calculated analysis.

Table 2. The influence of weaning date on backgrounding calf performance and carcass characteristics.

Item	EW[1]	NW[1]	SEM[2]	P-value[3]
Backgrounding calf performance				
Initial weight, lb	478	591	1.41	< 0.0001
Final weight, lb	782	736	3.66	0.004
Days on feed[4], days	91	42		
Weight gain, lb	299	144	5.37	< 0.0001
ADG, lb	3.24	3.43	0.11	0.24
DMI, lb	17.70	17.50	0.42	0.71
DMI, % BW	2.82	2.65	0.07	0.099
Gain:Feed	0.183	0.197	0.006	0.16
Feed costs, $/hd	148.27	65.11	3.03	< 0.0001
Veterinary medicine costs, $/hd	15.37	14.50	3.50	0.86
Feed cost of gain, $/lb	0.52	0.47	0.02	0.11
Total cost of gain, $/lb	0.57	0.58	0.04	0.76
Morbidity, %	12.50	33.33	0.08	0.096
Mortality, %	4.17	0	0.03	0.35
Carcass characteristics				
Age at slaughter, days	361	359	6.97	0.86
Days on feed[5], days	203	154		
Live weight, lb	1075	1042	18.6	0.24
Hot carcass weight, lb	649	625	13.2	0.23
Dressing percent[6], %	63.5	63.2	0.31	0.44
Back fat thickness, in	0.56	0.53	0.05	0.68
Ribeye area, sq. in	11.8	11.1	0.43	0.27
Kidney, pelvic and heart fat, %	2.41	2.50	0.53	0.29
Marbling score[7]	483	465	14.8	0.43
USDA Yield Grade[8]	3.04	3.19	0.22	0.65

[1]Early wean (EW) and normal wean (NW).
[2]Standard error or mean, n=6.
[3]P-value for separation of treatment means; *P*-values < 0.05 are considered significantly different.
[4]Days on feed for background period.
[5]Days on feed for background and finish period.
[6]Dressing percentage calculation: hot carcass weight divided by shrunk weight (adjusted for 5% shrink).
[7]Marbling score conversion to USDA Quality Grade: 300-399 = Select; 400-449 = Low Choice; 450-499 = Average Choice; 500-549 = High Choice; 600+ = Prime.
[8]Yield grade calculations: Preliminary Yield Grade minus carcass weight adjustment minus ribeye area adjustment minus kidney, pelvic and heart fat adjustment.

Range Research

Ring-necked pheasant production on post-contract Conservation Reserve Program grasslands in southwest North Dakota

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Summary

The objective of our research was to use post-Conservation Reserve Program lands to evaluate the effect of multi-use land management systems and demonstrate the potential viability and sustainability of producing both agricultural and wildlife outputs. Ring-necked pheasant (*Phasianus colchicus*) utilized the season long grazing pasture and idle land to a greater extent than crop and hay lands for nesting cover. Our findings suggest that under proper utilization a multi-use land management system has the potential to produce both agricultural and wildlife outputs.

Introduction

The Conservation Reserve Program (**CRP**) was established in 1985 as amended by the Food Security Act (United States Department of Agriculture, 1997). The program intended to aid farmers in placing marginal agricultural land into the CRP for at least a 10-year period. The goals of the CRP include the improvement of water quality and the prevention of soil erosion. Recent additions to the CRP have included the creation of prime wildlife habitat as a goal of the program (Risley et al., 1995).

Throughout the northern Great Plains enrollment into CRP has been substantial (Farm Service Agency, 2008). As well as providing income to landowners (Leistritz et al., 2002), many wildlife populations have benefited, including ring-necked pheasant (Riley, 1995). The increase in ring-necked pheasant populations has been, in part, contributed to the increased nesting and winter habitat provided by CRP. Along with increased ring-necked pheasant populations, the region has seen an associated increase in hunting opportunity. For many economically stressed communities, an increase in hunting opportunity has led to an increase in revenues brought about by the large influx of in-state and out-of-state sportspeople. The increase in revenue has been a beneficial boost for many local economies, as well as a source of income for landowners who may charge for guiding services and access fees (Hodur et al., 2004).

The future of the CRP is not clear. In 2007, approximately 419,794 acres of CRP lands were removed from the program in North Dakota with more lands due to expire before 2010 (Farm Service Agency, 2007). The future use of CRP land could impact both local economies as well as aspects of the environment, including ring-necked pheasant populations.

Previous research has demonstrated differences in use between row crops and CRP grasslands by ring-necked pheasant during the breeding season (Best et al., 1995). However, little data is available with respect to ring-necked pheasant use of grazing lands. Early research in southwestern North Dakota found no nests in heavily grazed pastures (North Dakota Game and Fish Department, 1956). For some landowners it may be beneficial, both economically and environmentally, to manage post-CRP lands for both agricultural and environmental outputs. Therefore, the objective of this research was to use post-Conservation Reserve Program lands to evaluate the effect of multi-use land management systems and demonstrate the potential viability and sustainability of producing both agricultural and wildlife outputs.

Procedures

The study sites were located in Adams County, situated in southwestern North Dakota. Both study sites were located within 3 miles of Hettinger, ND. All animal care and handling procedures were approved by the North Dakota State University Institutional Animal Care and Use Committee prior to the initiation of the study. Each study site consists of approximately 640 acres of land. Treatments were determined using a randomized complete block design on two different study sites (replicates). Each study site was divided into three different plots and treatments (grazed, hayed, idle, crop) randomly selected. The season long (**SL**) treatment comprised 320 acres and 33-45 Angus x Hereford cows. The remaining treatments comprised 80 acre parcels and included no-till barley (**NTB**), no-till corn (**NTC**), hayed (**HAY**), or idle (**ID**). The SL was grazed from June 1 to January 1 each year, targeting 50% use. Stocking densities were adjusted each year to achieve approximately 50% use. HAY was harvested annually during the second week in July. The NTB was harvested for forage as hay in early July and grazed as aftermath with unharvested NTC from January 1 to April 1, at which time the cows were returned to the Hettinger Research Extension Center, calved and fed harvested forage until June 1. The ID represented continued CRP and remained intact without any forage harvesting. The NTC and NTB were managed using an annual crop rotation system between two 80 acre parcels.

Pheasant nest recruitment of each land management type (SL, NTB, NTC, HAY, and ID) was determined using a technique described by Higgins et al. (1969). Pheasant nests were located by dragging a 100 ft chain, 0.33 inch in diameter between two all terrain vehicles (ATVs). Presence of a nest was determined when a hen was flushed from her nest and one or more eggs were present. Each study site was searched in its entirety once every two weeks beginning in late April or early May and continuing until July 15 to determine the presence of nests and timing of primary nesting (Hanson and Progulske, 1973). Upon locating each nest, time of nest initiation was determined utilizing a technique described by Westerkov (1950). Each nest was revisited every 3-5 days to determine nest fate. Ring-necked pheasant nest success was calculated using a modified Mayfield method as described by Miller and Johnson (1978). A nest was considered successful when at least one chick hatched and left the nest. Nest density and standard errors of the mean were calculated for each treatment.

Results

Degree of disappearance was lower than the target 50% on all ecological sites for both years (Table 1). Forage utilization was greatest on the loamy overflow ecological sites compared to loamy or shallow loamy sites in 2006 and 2007. The loamy sites were more utilized than the shallow loamy sites in 2006 and 2007. The loamy ecological sites had greater disappearance than the shallow loamy sites in 2006; however, the shallow loamy sites had greater disappearance than the loamy sites in 2007.

Thirty-three ring-necked pheasant nests were located in 2006. On average, hen pheasant nest initiation occurred during the third week of May, with the earliest observed nest initiated on April 18 and latest initiated on June 7. In 2007, 46 nests were located with the average initiation date occurring about a week earlier (9 May) than 2006. The earliest observed nest was initiated April 11 and latest initiated June 10. In 2006 (representing pre-treatment of study), nest densities (# of nests/100 acres) were similar among treatments (P=0.90; Table 2). Nest densities ranged from 1.25 nests/100 acres in the ID to 2.8 nests/100 acres in the SL. Nest density exhibited a trend for treatment effect (P=0.06; Table 2) in 2007, with nest densities ranging from no nests in the NTB to 10.0 nests/100 acre in the ID.

The percentages of successful nests (*P*=0.41; Table 2) did not differ among treatments for 2006. However, nest success was different (*P*=0.05; Table 2) between the NTB and the HAY treatments in 2007 at 0 and 100 percent, respectively. There were no other significant differences in nest success among treatments in 2007.

Discussion

Results obtained from the 2006 field season were baseline in nature. The blocks (replicates) had been previously enrolled in the CRP for at least the previous 10 years. Consistent with previous studies, ring-necked pheasant at our study sites used the crop land to a lesser degree as nesting cover than those treatments which consisted of a permanent cover, primarily season long grazing and idle lands. Under a moderate grazing strategy (50% disappearance), hen pheasant continued to utilize these areas as nesting cover. In contrast with previous studies, a moderate grazing plan may be more beneficial for nesting ring-necked pheasant than pastures and rangelands which are heavily grazed.

Our findings demonstrate the importance of maintaining areas of permanent cover for ring-necked pheasant production and recruitment. Fifty percent disappearance of available herbage may leave sufficient residue to meet the nesting and cover requirements of breeding pheasants. Therefore, land owners may benefit economically under such a grazing regiment by providing forage for continued livestock production as well as maintaining the appropriate cover required for ring-necked pheasant production. Although we are currently two years into our four year trial, our data suggests that land owners with lands currently enrolled in CRP that are concerned with both agricultural and environmental outputs may benefit from a similar management plan as the one utilized in this study.

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Table 1. Degree of disappearance (%) for the loamy, loamy overflow, and shallow loamy ecological sites near Hettinger, ND, in 2006 and 2007.

	2006		2007	
Ecological Site	Grass	Forbs	Grass	Forb
Loamy	45.2 ± 10.4	32.4 ± 7.6	28.0 ± 6.8	70.0 ± 10.0
Loamy Overflow	53.7 ± 1.6	21.2 ± 0	44.2 ± 8.8	50.0 ± 0
Shallow Loamy	27.5 ± 15.0	39.8 ± 10.6	31.3 ± 8.5	80.0 ± 10.0

Table 2. Nest Density (nests/100 ac.) and Nest Success (% Successful) on NTC, NTB, HAY, SL, and ID treatments on Post Conservation Reserve Program lands near Hettinger, ND, in 2006 and 2007.

	Treatment[1]					
Item	SL	ID	HAY	NTC	NTB	*P*-value[2]
Nest Density/100 ac.						
2006	2.8 ± 0.60	1.3 ± 0	2.5 ± 1.35	1.9 ± 1.9	2.5 ± 2.5	0.90
2007	3.4 ± 1.25	10.0 ± 5.0	1.3 ± 0.00	1.3 ± 1.25	0	0.06
Nest Success, %						
2006	53.5 ± 17.5	1.0 ± 1.0	18.5 ± 17.5	6.0 ± 6.0	50.0 ± 50.0	0.41
2007	33.5 ± 16.5[ab]	58.5 ± 41.5[ab]	100.0 ± 0.0[a]	1.0 ± 1.0[ab]	0[b]	0.05

[1]Treatment abbreviations: SL = season long grazing, ID = idle, HAY = hay lands, NTC = no-till corn, NTB = no-till barley.
[2]*P*-value for treatment; $P \leq 0.05$ considered significant.
[a,b]Means within rows having differing superscripts differ $P \leq 0.05$.

Interpreting Statistical Analysis

Field research involves the testing of one or more variables such as crop varieties, fertilizers, weed control methods, etc. Field testing of such variables are conducted in order to determine which variety, fertilizer, herbicide, etc. is best for the particular area of production. The main objectives of crop production research are to determine the best means of producing a crop and how to maximize yield and economic return from farming.

Agricultural researchers use statistics as a tool to help differentiate production variables so that real and meaningful conclusions can be drawn from a relatively large amount of data gathered from relatively small research plots.

One of these tools is the Coefficient of Variability (C.V.). This statistic gives an indication of the amount of variation in an experimental trial and is a measure of the precision or effectiveness of the trial and the procedures used in conducting it. Attempts are made to control human error and some environmental conditions such as soil variability by replicating the variable in question. For example, there were four plots (replications) of the variety Briggs grown in the Hettinger HRSW variety trial. The plots are mixed and dispersed throughout the trial to help eliminate differences that might be a result of soil or other variations. The numbers that you see in the tables are an average of all four replications. The C.V. for yield in the 2008 Hettinger HRSW variety trial was 8.7 meaning that there was an 8.7 percent average variation between high and low yields among replications. In summation, a trial with a C.V. of 6 is more precise and more can be concluded from it than a trial with a C.V. of 16.

Another important statistical tool is the Least Significant Difference or LSD. If the yield of variety A exceeds variety B by more than the LSD value, you can conclude that under like environmental conditions, variety A is expected to significantly out-yield variety B. The LSD value allows you to separate varieties, fertilizers, herbicides, or any other variable and determine whether or not they are actually different. The LSD .01 or 1% value is always larger and gives you more precision than the LSD .05 or 5% value. Little confidence can be placed in a variety or treatment unless the results differ by more than the LSD value.

Outreach, Presentations and Publications

Christopher Schauer, Hettinger REC Director

Persentations

Lamb Finishing and Use of Co-products
Shepherd's Clinic, Tappen, ND
January 10, 2008

Ram Management for Fertility and Longevity
Perkins County Livestock Improvement Association
January 16, 2008

Inclusion of DDG in Lamb Rations
Perkins County Livestock Improvement Association
January 16, 2008

Impacts of Sustainable Livestock Production Systems on Soil Carbon Levels and Plant Community Composition of Post-contract Conservation Reserve Program Lands
Society of Range Management Annual Meeting, Louisville, KY
January 26-31, 2008

Impacts of Sustainable Livestock Production Systems on Ring-Necked Pheasant Nest Success and Density on Post-contract Conservation Reserve Program Lands
Society of Range Management Annual Meeting, Louisville, KY
January 26-31, 2008

Observations of Ring-Necked Pheasant (Phasianus colchicus) Nest Parasitism of Sharp-tailed Grouse (Tympanuchus phasianellus) Nests in Southwestern North Dakota – poster
Society of Range Management Annual Meeting, Louisville, KY
January 26-31, 2008

Dakota Performance Ram Test – Results of Test
Hettinger Research Extension Center
March 1, 2008

Ring-Necked Pheasant Nest Success and Density on Post-Conservation Reserve Program Grasslands
Pfizer Scientific Exchange, Hettinger, ND
April 8, 2008

60% Dried Distillers Grains in Lamb Rations Results in Acceptable Performance and Carcass Quality
WERA Annual Meeting, Chico Hot Springs, MT
June 2, 2008

Sheep/Goat Nutrition and Production using DDGS
NCI – US Grains Council Team
June 18, 2008

Weaning date impacts on backgrounding and finishing performance of May born Angus calves – poster
Western Section ASAS, Laramie, WY
June 24-26, 2008

60% dried distillers grains in lamb rations results in acceptable performance and carcass quality – poster
Western Section ASAS, Laramie, WY
June 24-26, 2008

Impacts of L-Arginine on Ovarian Function and Reproductive Performance in Ewes
National American Society of Animal Science Meeting, Indianapolis, IN
July 7-11, 2008

Research on the McKenzie County Grazing District
North Dakota Section – Society of Range Management
September 12, 2008

Improving wildlife habitat through haying and grazing
Sportmen's Night Out – HREC and NRCS
September 16, 2008

Cows, Pheasants, and Sharp-Tailed Grouse: Can They Co-Exist?
Range Forum
October 22, 2008

Past, Present and Future Directions of the Hettinger Research Extension Center
Animal Science Senior Seminar
October 29, 2008

Using Co-Product Feedstuffs: Sheep & Goat Nutrition and Production
Mountain Plains Sheep and Goat Conference, Greeley, CO
November 14, 2008

HREC Shearing School
Hettinger, ND
November 18-20, 2008

Publications

Schauer, C.S., M.M. Stamm, T.D. Maddock, and P.B. Berg. 2008. Feeding 60% of lamb finishing rations as dried distillers grains results in acceptable performance and carcass quality. Sheep & Goat Res. J. 23:15-19.

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Stamm, M.M., **C.S. Schauer,** V.L. Anderson, and B.R. Ilse. 2008. Weaning date impacts on backgrounding and finishing performance of May born Angus calves. J. Anim. Sci. Proc. 59:83-86.

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Eric Eriksmoen, Hettinger REC Agronomist

Professional and Community Activities

ND Crop Variety Selection committee member
ND REC/Extension Fall Conference Planning Committee member
Paramedic with West River Ambulance
Member ND EMT Testing Team
Hettinger Chamber of Commerce member
Hettinger Ag. Marketing Club
Treasurer for the West River Breeders Association
Member Boy Scouts Board of Directors
Coordinator - ND Uniform Proso Millet Trials
Coordinator - ND Uniform Winter Lentil Trials
Coordinator - ND Uniform Winter Pea Trials
Hettinger REC Safety Officer
Speech judge - Adams Co. 4-H
Crops judge - Adams Co. Fair
Certified >First Detector= with the National Plant Diagnostic Network

Meetings Training and Presentations
ND Variety Release meeting - Fargo
Diversity, Direction and Dollars XI conference – Dickinson
Everest Herbicide Research Exchange - Denver, CO
Northern Pulse Growers Convention - Minot
Commercial Pesticide Certification Training - Williston
ND REC Agronomists meeting - Bismarck
Best of the Best Wheat Research & Marketing Forum - Dickinson
ManDak Zero Till Association Convention - Minot
Adams Co. Crop Improvement meeting – Reeder
ND Grain Growers Meeting - Fargo
Hettinger Ag. Marketing Club - Hettinger
Small Grain Summer Field Tour Planning Committee - Mandan
Mandan ARS Board of Directors Meeting - Mandan
Mandan ARS Annual Growers Workshop - Mandan
Hettinger REC Advisory Board meetings - Hettinger
Hettinger Co. Crop Improvement Assn. meeting - Regent
Slope Co. Crop Improvement Assn. meeting - Amidon
Stark Co. Crop Improvement Assn. meeting - Taylor
NDSU Branch Station Conferences – Fargo
Oilseed meeting - Bison, SD
Tree Pruning Workshop - Hettinger
HarvestMaster Combine Computer Training - Fargo
Malt Barley Institute Stakeholders meeting - Golden, CO
Hettinger Chamber of Commerce Ag. Committee meetings - Hettinger
Dow Chemical Research Exchange - Phoenix, AZ
Mandan ARS Research Tour - Mandan
Adams Co. SCD Soil Health Workshop - Hettinger
Plot Tours - Hettinger, Scranton, Regent, New Leipzig and Wilton
West River Breeders Ag. Recognition Planning meeting
Senator Kent Conrad Town Hall meeting - Hettinger
Alliance Ag. Fall Ag. Wrap up meeting - Hettinger
25th Annual Western Dakota Crops Day show - Hettinger

Presentations
Everest Herbicide in SW ND - Everest Research Exchange - Denver, CO
Small Grain Varieties & Sawfly Strategies - Hettinger Co. Crop Improvement Assn. - Regent
Variety Update and Sawfly Strategies – Slope Co. Crop Imp. Assn. – Amidon
Planned Research - HREC Advisory Board
Small Grain Variety Update - West River Breeders - Reeder
Small Grain Varieties & Sawfly Strategies - 60th Annual Taylor Institute - Taylor
Sawfly Grant Proposal - ND Grain Growers Assn. Board Meeting - Bismarck
Research at the HREC (Poster) - Mandan ARS Annual Convention - Mandan
Potential Oilseed Production for the Western Dakota's - Bison, SD
Malt Barley in SW ND - Malt Barley Institute meeting - Golden, CO
Dormant Seeded Crops - KXMA TV
Winter Pulse Crop Research - ND Farm and Ranch Guide
HREC Field Tour and Crops Day - KNDC Radio
HREC BioFuel Tour - Hettinger
HREC Small Grain Variety Trial Field Tour - Hettinger
Small Grain Variety Trial Field Tour - Scranton

Small Grain Variety Trial Field Tour - Regent
Small Grain Variety Trial Field Tour - Mandan
Small Grain Variety Trial Field Tour - New Leipzig
Crop Failures in Adams Co. - Federal Crop Insurance Agency - Hettinger
GoldSky and PowerFlex Herbicide Res. in SW ND. Dow Chem. Res. Exchange - Phoenix, AZ
25th Annual Western Dakota Crops Day Show - Hettinger

Publications

USDA-ARS. Annual Report. W. Regional Dryland Spring Barley Nursery 2007. National Small Grains Germplasm Research Facility, Aberdeen, ID. Jan. 2008.

USDA-ARS. Annual Report. Report on Wheat Varieties Grown in Cooperative Plot and Nursery Experiments in Spring Wheat Region in 2007. USDA-ARS Midwest Area. St. Paul, MN. Jan. 2008.

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R. Jay Goos, B. Johnson, **E. Eriksmoen**, J. Nelson, G. Martin, P. Carr, N. Riveland and G. Bradbury. Calibration of the Nitrate Soil Test for Malting Barley in Western North Dakota. In Proc. 2008 Great Plains Soil Fertility Conference. March 4-5, 2008. Denver.

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NDSU Ext. Bul. A-1049. ND Barley, Oat, Rye and Flax Variety Trial Results for 2008 and Selection Guide. Nov. 2008.

NDSU Crop Production Guide No.19. Crop Production Guide 2009. Dec. 2008.

NDSU Ext. Bul. A-1124 rev. 2008 Canola Variety Trials. Dec. 2008.

NDSU Ext. Bul. A-574. ND Hard Red Spring Wheat Variety Trial Results for 2008 and Selection Guide. Dec. 2008.

NDSU Ext. Bul. A-843 rev. ND Soybean Performance Testing 2008. Dec. 2008.

NDSU HREC Ag. Report 25. 25th Annual Western Dakota Crops Day Research Report. Dec. 2008.

NDSU Ext. Bul. A-1196 (rev.) ND Hard Red Winter Wheat Variety Results for 2008 and Selection Guide. Dec. 2008.

Michele (Stamm) Thompson, Hettinger REC Southwest Feeders Coordinator

Outreach Summary

January 9, 2008	Minot Cattlemen's Day	Minot
January 10, 2008	HREC Beef Research Review	Hettinger
February 13, 2008	Annie's Project	Hettinger
March 14, 2008	HREC Scientist meeting with Co. Ext. Agents	Hettinger
April 2, 2008	Dave Merwin	Hettinger
April 8, 2008	Pfizer Animal Health/NDSU Scientific Exchange	Hettinger
April 11, 2008	Drought Call	Hettinger
April 18, 2008	Drought Call	Hettinger
April 22, 2008	Dakota Land Feeds LLC	Hettinger
April 25, 2008	Drought Call	Hettinger

July 10, 2008	Bowman Co. Fair Record Book Judge	Bowman
July 25, 2008	Drought Call	Hettinger
August 1, 2008	Adams Co. Fair Barn Steward	Hettinger
August 8, 2008	Drought Call	Hettinger
September 18, 2008	Chris Lindquist Fundraiser	Hettinger
September 25, 2008	Knudson Feeds and Nutra Lix Feeds	Hettinger
October 8, 2008	Ivy Natural Solutions	Hettinger
November 5, 2008	Jerry Tuhy	Hettinger

Twelve local Cattle producers: Further information and topics covered: tissue and excretory shrink and how to manage shrink at shipping; opportunities for grass cattle; use of distillers grains for heifer reproduction; backgrounding rations; breakevens; use of liquid feeds in backgrounding diets; replacement heifer growth and reproduction; pricing wet corn in feedlot rations; appropriate pen sizes for cattle feeding.

Four local Sheep producers: Further information and topics covered: corn gluten feeding; mineral formulation; selenium in feeder lambs; how TDN relates to corn test weights; feed formulation; implants for feeder lambs; NDSU HREC sheep research studies.

One local Hog producer: Further information and topics covered: Paylean usage.

One local Goat producer: Further information and topics covered: feeding lentils to goats.

Newspaper interviews

The Prairie Star Livestock Guide: "Cull cow, calf performance feeding trials aid management decisions" by Sue Roesler, p. 22-24. January 2008.

Farm & Ranch Guide: "How much thiamine is needed to feed at 60 percent DDGS?" by Sue Roesler, p. 43-45. September 12, 2008.

The Prairie Star: "How much thiamine is needed to feed at 60 percent DDGS?" by Sue Roesler, p. 51-53. September 12, 2008.

Presentations

The Conservation Reserve Program and Low Input Cattle Production System: Impacts on Ring Neck Pheasant Production
Minot Cattlemen's Day, Minot, ND
January 9, 2008 (40 producers)

Influence of Weaning Date (Early or Normal) on Performance, Health, and Carcass Characteristics of May-born Angus Calves
HREC Beef Research Review: Developing & Enriching the Region's Production Resources for a More Profitable Future, Hettinger, ND
January 10, 2008 (40 producers)

Animal Feeding
Annie's Project, Hettinger, ND

February 13, 2008 (7 producer wives)

Publications

Schauer, C. S., **M. M. Stamm**, T. D. Maddock, and P. B. Berg. 2008. Feeding 60% of lamb finishing rations as dried distillers' grains results in acceptable performance and carcass quality. Sheep and Goat Res. J. 23: 15-19.

B. Loken, R. Maddock, **M. Stamm**, C. Schauer, I. Rush, S. Quinn, and G. Lardy. Impacts of growing rate of gain on subsequent feedlot performance, carcass characteristics, Warner-Bratzler shear force, and sensory taste panel analysis of steers. J. Animal Sci. (Submitted).

Stamm, M. M., C. S. Schauer, V. L. Anderson, and B. R. Ilse. 2008. Weaning date impacts on backgrounding and finishing performance of May-born Angus calves. J. Animal Sci. Proc. 59: 83-86.

Schauer, C. S., **M. M. Stamm**, T. Maddock, and P. B. Berg. 2008. 60% dried distillers' grains in lamb rations results in acceptable performance and carcass quality. J. Animal. Sci. Proc. 56: 396-399.

B. A. Stoltenow, G. P. Lardy, **M. M. Stamm**, and R. J. Maddock. 2008. # 58 Abs. Impact of growing rate of gain on subsequent feedlot performance, carcass characteristics and Warner-Bratzler shear force. Midwest Sect., Amer. Soc. Animal Sci. meetings, Des Moines, IA.

Stamm, M. M., C. S. Schauer, V. L. Anderson, and B. R. Ilse. 2008. Weaning date impacts on backgrounding and finishing performance of May-born Angus calves. NDSU Beef Cattle and Range Report, p. 38-42.

Loken, B., R. Maddock, **M. Stamm**, and G. Lardy. 2008. Effect of backgrounding rate of gain on subsequent feedlot performance, carcass characteristics, Warner-Bratzler shear force and sensory analysis. NDSU Beef Cattle and Range Report, p. 35-37.

ADVISORY BOARD MEETING
HETTINGER RESEARCH EXTENSION CENTER
March 18, 2008

After noon lunch the meeting was called to order by Chairman Anthony Larson at 1:00 PM at the Hettinger Research Extension Center.

Those present were board members: Ted Sailer, Joe Rohr, Gloria Payne, Matt Benz, Larry Leistritz, David Merwin, and Anthony Larson. Staff: Eric Eriksmoen, Christopher Schauer, Michele Stamm, Dan Nudell, Cassie Dick, Ben Geaumont, and Amanda Gearhart. Administration and guests: Duane Hauck and Tim Faller.

Larry Leistritz moved to approve the minutes of the previous July's meeting. Gloria Payne seconded and the motion passed.

Gloria Payne moved to approve the agenda. Larry Leistritz seconded and the motion passed.

Administration – Duane Hauck

1. Highlighted new funding in Extension and the Ag Experiment Station from the 2007-2009 Biennium

Director's Report – Christopher Schauer

1. handout
2. Larry Leistritz moved and Gloria Payne second to send communication to SBARE indicating advisory board's desire to have the positions funded that were requested. Motion passed.

Animal & Range Science Report – Christopher Schauer

1. handout (Chris, Ben, Amanda)
2. SW Feeders report – Michele Stamm

Agronomy Report – Eric Eriksmoen

1. handout
2. Sawfly
    a. Huge problem in the state, hoping for Montana State Univ. research projects
3. Drought
    a. Continuing problem
4. Corn and ethanol
    a. How is it going to affect us?
5. Bio-energy
    a. Switchgrass – currently a trial is up and running at HREC
    b. Hemp – limited by Federal regulations, but we are looking into it
6. Pulse Crops
    a. A pulse breeder in ND would help out our program significantly
7. Wheat
    a. Drought tolerance, seed inoculation

Economics Report – Dan Nudell

1. handout

Strategic Plan – Discussion

1. Chris indicated that this plan was to stay into effect until 2010, at which time the staff and the advisory board will have to come up with a new one.

Open Discussion

1. Summer Crops Tour – July 8
2. Matt Benz indicated the sheep extension program appears to be working effectively

Election of board members

Denise Andress (West River Health Services) and Julie Kramlich (Adams County Extension Agent) were nominated to fill the vacancies of Karan Ehlers and Wayne Markegard, respectively.

Gloria Payne, Forrest Nash, and Matt Benz were nominated to serve a second term.

-David Merwin moved nominations cease, Larry Leistritz second, nominations ceased. Motion passed and unanimous ballot cast

Officer elections

Matt Benz nominated Gloria Payne for Vice-Chair, declined.
Larry Leistritz nominated Ted Sailer for Vice-Chair, accepted
Larry Leistritz motion for unanimous ballot, Gloria Payne second, motion passed.

Matt Benz nominated Shawn Arndorfer for Chair.
Matt Benz motion for unanimous ballot, Gloria Payne second, motion passed.

Anthony declared the meeting adjourned at 3:00 PM (MDT). The next meeting is scheduled for July 8, 2008, 12:00 noon.

ADVISORY BOARD MEETING
HETTINGER RESEARCH EXTENSION CENTER
July 8, 2008

After noon lunch the meeting was called to order by Chairman Shawn Arndorfer at 1:00 PM at the Hettinger Research Extension Center.

Those present were board members: Shawn Arndorfer, Anthony Larson, Rodney Howe, Forrest Nash, Julie Kramlich, Nathan Swindler, Gloria Payne, Joe Rohr, Larry Leistrtiz, and Ted Sailer. Staff: Eric Eriksmoen, Christopher Schauer, Michele Stamm, Dan Nudell, Cassie Dick, and Ben Geaumont. Administration and guests: Ken Grafton, DC Coston, Duane Hauck and Tim Faller.

Larry Leistritz moved to approve the minutes of the previous meeting. Joe Rohr seconded and the motion passed.

Anthony Larson moved to approve the agenda. Forrest Nash seconded and the motion passed.

Administration:

1. D.C. Coston
    a. Highlighted capital improvement projects at NDSU and SBARE rankings
2. Ken Grafton
    a. Pulse Breeder hiring process
    b. Infrastructure/facilities upgrading at NDSU
    c. Update on Greenhouse and Beef Research facilities
3. Duane Hauck
    a. Highlighted Extension SBARE rankings
4. Rodney Howe – SBARE representative
    a. Update

Director's Report – Christopher Schauer

3. Handout
    a. New Annual Report
    b. Post-doctoral research associate – wildlife/range position will be advertised
    c. Federal funding for SW Feeders is in limbo
    d. Crops Tour next year will also be the Centennial Celebration for the HREC

Animal & Range Science Report – Christopher Schauer

3. handout (Chris, Ben, Amanda)
    a. Ben highlighted new pheasant research using radio transmitters
4. SW Feeders report and handout – Michele Stamm

Agronomy Report – Eric Eriksmoen

8. Highlighted need for Weed Scienetist

Economics Report – Dan Nudell

2. Discussed land sale patterns, highlighting Bowman County

Strategic Plan – Discussion

2. Chris indicated that this plan was to stay into effect until 2010, at which time the staff and the advisory board will have to come up with a new one.

Open Discussion

3. Duane Hauck – cost increases in agriculture

Shawn Arndofer at 3:00 PM (MDT). The next meeting is scheduled for February 3, 2009 at 12:00 pm.

Hettinger Research Extension Center Personnel

Christopher Schauer	Director/Animal & Range Scientist
Eric Eriksmoen	Associate R/E Center Specialist- Agronomy
Daniel Nudell	Assistant R/E Center Specialist- Ag Economics
Michele Thompson	Assistant R/E Center Specialist- Livestock
Amanda Gearhart	Research Specialist- Range
Ben Geaumont	Research Specialist- Wildlife
Terri Lindquist	Finance Paraprofessional
Cassie Dick	Administrative Secretary
Don Stecher	Manager of Ag Operation
Nels Rick Olson	Ag Research Technician- Agronomy
David Pearson	Ag Research Technician/Shepherd
Don Drolc	Ag Research Technician- Livestock

Throughout the years, the RE Center hires individuals on a part-time basis to help in the research effort. Many of these are students as well as local residents. We would like to acknowledge the following people who helped at some time during the past year: Matt Korang, Abbey Richards, Derrick Stecher, Kristine Larson, Dean Houchen, Catie Pearson, Gwen Kristy, Jennifer Johnson, Megan Baxter, Holly Gangl, Cole Turner and Samantha Sayler.

Advisory Board

Shawn Arndorfer	Hettinger, ND
Nathan Swindler	Mott, ND
Joe Rohr	Elgin, ND
Steve Pfeifer	McLaughlin, SD
Ted Sailer	Lodgepole, SD
Greg Seamands	Lemmon, SD
Rodney Howe	Hettinger, ND
Gloria Payne	Elgin, ND
Denise Andress	Lodgepole, SD
Forrest Nash	Hettinger, ND
Matthew Benz	Beulah, ND
Julie Kramlich	Hettinger, ND
Larry Leistritz	Fargo, ND
David Merwin	Hettinger, ND
Cole Ehlers	Hettinger, ND
Denise Sabin	Morristown, SD
Dean Wehri	Mott, ND

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