The 31st

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of the

WESTERN TRIANGLE AGRICULTURAL RESEARCH CENTER

Montana Agricultural Experiment Station

Conrad, Montana

2008 Crop Year

Submitted by

Dr. Gregory D. Kushnak, Superintendent & Crop Scientist

and

Dr. Grant D. Jackson, Soil Scientist

Montana State University

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Summary of climatic data by month for the '07-'08 crop year (September - August) at the Western Triangle Agricultural Research Center, Conrad, MT.

Month	Precipitation (inches)		Mean Temperature (°F)	
	Current Year	Average (23-yr)	Current Year	Average (23-yr)
September, 2007	2.51	1.17	54.4	56.9
October, 2007	0.56	0.61	45.9	45.2
November, 2007	0.00	0.29	33.8	32.2
December, 2007	0.06	0.16	23.8	25.2
January, 2008	0.19	0.18	19.3	23.2
February, 2008	0.14	0.22	25.5	24.9
March, 2008	0.19	0.44	33.6	33.4
April, 2008	0.35	0.94	37.2	43.4
May, 2008	4.11	1.84	50.8	52.4
June, 2008	2.43	2.91	57.8	59.8
July, 2008	0.90	1.30	66.9	67.2
August, 2008	0.45	1.26	66.3	66.3
Total	11.89	--	--	--
Average	--	11.31	42.9	44.2

Last killing frost in Spring (32°F)
2008---------- June 12
Average 1986-2008---------- May 18

First killing frost in Fall (32°F)
2008---------- October 9
Average 1986-2008---------- Sept 23

Frost free period (days)
2008---------- 119
Average---------- 129

Maximum summer temperature------- 95°F (July 1 and Aug 19, 2008)

Minimum winter temperature------- -25°F (January 29, 2008)

2008 Winter Wheat Variety Evaluations in the Western Triangle Area.

Location: Western Triangle Research Center, Conrad, MT.

Personnel: Gregory D. Kushnak, Conrad, MT; and Dr. Phil Bruckner and Jim Berg, MSU Plant Science Dept.

Winter wheat variety trials were grown only on-station in 2008. The Intrastate nursery data are included in this report. The various preliminary trials are reported in the MAES Plant Science Department's Annual Winter Wheat Report.

Data for all 2008 Intrastate entries are presented in Table 1. A condensed version in Table 2 lists only the varieties and a few potential-release lines. Multi-year averages for the varieties are listed in Table 3.

The growing season was unusually cool in 2008, resulting in heading-dates eight days later than average. The cooler temperatures and prolonged growing period allowed for increased survival of emerging sawfly wasps, and for an extended time-frame for females to distribute their eggs more effectively. Consequently, sawfly infestation and stem-cutting were severe for susceptible varieties, with yields lower than the 6-year average.

Correlations between percent sawfly cutting and yield were highly significant for spring wheat varieties in 2008; but the winter wheat nurseries were harvested before lodging was fully completed, and stem-cutting data were not obtained. However, several winter wheat lines or varieties with solid or partially-solid stems ranked in the upper half for yield in 2008.

Among the sawfly resistant varieties, Genou was consistently higher yielding than Vanguard, Rampart and Bynum over the past six years (Table 3). Two hard-white experimental lines, MTS0531 and MTS0532, showed increased yield and stem-solidness over Genou.

Varieties with above-average yield over the past six years included Bond, Carter, Falcon, Ledger, Norris, Pryor, Rocky, Wahoo and Yellowstone.

Some of the varieties in the test were designed for Clearfield's 'Beyond' herbicide system, including Bond and Norris (hollow-stem hard red), Hyalite (hollow-stem hard white), and Bynum, a solid-stem hard red for sawfly resistance.

Detailed descriptions of most of the varieties tested are included in Extension Bulletin 1098 "Performance Summary of Winter Wheat Varieties in Montana", available at County Agent Offices. Additional observations concerning the varieties are presented in the following pages.

Winter Wheat Variety Notes & Comments

Western Triangle Agricultural Research Center, Conrad, MT

Winterhardiness ratings: 5 = very good; 1 = poor.
Coleoptile length: Long = 3.4" or more; Short = 3" or less.
Stem solidness scores of 19 or higher are generally required for reliable sawfly resistance.

Accipiter (Sask. DH0018196): First tested in 2008. High yield in 2008. 4" taller than Falcon. Similar to Falcon for test weight, head date and protein. Parentage = Raptor x Falcon.

Bauermeister (WA7939, 2005): Winterhardiness = 2. Medium height, med-strong straw. Medium coleoptile. Very late maturity. Very low test weight.

Big Sky (MT9432, 2001): Nuwest/Tiber cross, hard red kernels, white chaff. Good winterhardiness (4). Strong, stiff straw, very good lodging resistance, height equal to Tiber. Medium coleoptile. Medium maturity, heading 1-2 days later than Rocky, but 2 days earlier than Tiber and Morgan. Yield about equal to Rocky, and 2-3 bu higher than Tiber. High test weight and protein. Post-harvest seed dormancy is high, like Tiber. Septoria and tan spot resistance is good. A good alternative to Tiber.

Bond (CO 2004): Winterhardiness = 2. Clearfield system IMI resistant. Stiff straw, medium height & coleoptile, early maturity. Above average yield. Average test weight. Resistant to biotype 1 Russian wheat aphid. Low protein and poor quality.

Buteo (CDC, WPB, Sask., 2006): Winterhardiness = 4. Standard height, medium coleoptile. Medium-late maturity. Below average yield. Above average test wt. Average protein.

Bynum (MSU & WPB, 2005): Clearfield system single-gene resistance to imazamox or 'Beyond' herbicide. Winterhardiness = 2. Medium strong straw, medium height, long coleoptile. Stem solidness = 20 (compared to 22 for Rampart), which typically provides a reliable level of sawfly tolerance. Similar in yield and other characteristics to Rampart. Sawfly resistant, low yield, high protein, and excellent baking quality.

Carter (WestBred, 2007): Winterhardiness = 3. Semidwarf height, stiff straw, short coleoptile. Stem solidness score = 15. Medium early heading. Average yield. Above average test weight. Average protein. Moderate resistance to stripe rust.

Darrell (S. Dak., 2006): Medium height and coleoptile. Medium-early heading. High yield. Average test weight and protein.

Falcon (CDC, WPB, Sask. 1999): Good winterhardiness (4). Semidwarf, stiff straw, 4" shorter than Rocky. Short coleoptile. The first true winterhardy semidwarf available for irrigated conditions in Montana. Heading 1 day later than Rocky, 2 days earlier than Neeley & Tiber. Above average yield and test weight on dryland, good performance for irrigated or high rainfall conditions. Protein similar to Rocky. Not for stripe rust areas.

Genou (MSU, 2004): Sawfly resistant. Stem solidness not quite as solid as Rampart; and may be more sensitive to environmental factors than that of Rampart. Solid stem comparison: (max rating = 25): Rampart = 22, Genou = 19. Winterhardiness higher than Vanguard and Rampart, equal to Rocky. Medium stiff straw. Height similar to Vanguard, and 2" shorter than Rocky. Medium coleoptile. Maturity 1-2 days later than Rocky. Yield 7% higher than Vanguard & Rampart, 5% less than Rocky. Average test weight and protein.

Hawken (AgriPro, 2007): Semidwarf height, short coleoptile. Early maturity. Yield is below average. Above average test weight and protein.

Hatcher (CO 2004): Winterhardiness = 2. Strong straw, semidwarf height, medium coleoptile. Early maturity. Low protein. Resistant to biotype 1 Russian wheat aphid and Great Plains biotype Hessian fly. Very low quality.

Jagalene (AgriPro, 2002): Winterhardiness = 2. Semidwarf, stiff straw, medium coleoptile. Early maturity, 1 day earlier than Rocky. Shatter resistant. Average yield. Very high test weight. Avg protein, but higher than Rocky. Good milling quality. Good disease resistance package (stem & stripe rust, tan spot and Septoria).

Jerry (ND, 2001): Winterhardiness high (5). Medium-stiff, med-tall straw, medium coleoptile. Medium-late maturity. Yield is below average, except in winterkill areas where it's above average. Below-average test weight. Average protein. Has one of the worst sawfly stem-cutting ratings. Shatter susceptible.

Ledger (WestBred, 2005): Winterhardiness = 2. Semidwarf height & stiff straw, 4" less than Rocky. Medium coleoptile. Stem solidness = 10, variable & sensitive to cloudy conditions; not a reliable level of sawfly tolerance. Early heading. Above avg yield & test wt. Avg protein and acceptable quality. Moderate stripe rust resistance.

Morgan (Sask & WPB, 1996): High winterhardiness (5). Standard height. Medium stiff straw. Very short coleoptile. Three days later to head and slightly later maturity than Rocky; heading similar to Neeley. Below average yield. Test wt 1-lb less than Rocky or Tiber. Protein slightly higher than Rocky, similar to Neeley. Milling and baking acceptable. Recommended for areas needing high levels of winterhardiness.

Neeley (Idaho, 1980): Winterhardiness medium (3). Medium short straw. Medium coleoptile. Medium-late maturity. Susceptible to stem rust. High yielder in good years, but does poor if stressed for moisture. Below average test weight. Good shatter resistance. Protein & quality are erratic, ranging from low to high. Not for stripe rust areas.

Norris (MSU & WPB, 2005): Clearfield system single-gene resistance to imazamox or 'Beyond' herbicide (which controls cheatgrass, goatgrass and wild oats). Winterhardiness = 3. Stiff straw, medium height, medium coleoptile. Early maturity. Above average yield and test weight. Average protein, good quality. Replaces MT1159CL.

Promontory (Utah, 1990): Red head. Winter hardiness poor (2 or less). Medium-short, medium-strong straw. Short coleoptile. Medium maturity. Excellent stripe rust & dwarf smut resistance; Stem rust susceptible. Average yield and above average test weight. Protein medium low. Has severe sawfly stem cutting ratings.

Pryor (WPB, 2002): Winterhardiness 3 = Neeley. Short stiff straw, 4" shorter than Neeley. Short coleoptile. Medium late maturity similar to Neeley & Tiber, 2 days later than Rocky. Above average yield. Average test weight and protein, good quality. Intended mainly for Central Montana as a replacement for Neeley. Not for stripe rust areas.

Rampart (MSU, 1996): Sawfly resistant (sister line to Vanguard). Solid stem rating = 22. Red chaff, upright head. Winterhardiness is marginal (2-). Should not be grown in areas where high levels of winterhardiness are needed, unless protected by stubble. Height 1 inch shorter than Neeley, med-stiff straw. Very long coleoptile. Matures 1 day later than Rocky, 2 days earlier than Neeley. Some resistance to stem rust, and some tolerance to wheat streak mv. Medium shatter resistance. Yield is below average, but is above average under heavy sawfly conditions. Does not seem as prone to shatter as Vanguard. Good test weight, protein and quality. See Genou.

Ripper (Colorado, 2006): Semidwarf height, medium coleoptile. Early maturity. Above average yield and test weight. Average protein.

Rocky (Agripro, 1978): A selection from Centurk for soil borne mosaic resistance. Winterhardiness = 2. Medium weak straw, medium height. Medium coleoptile. Early maturity. High yield. Very susceptible to yellow berry expression under low nitrogen conditions. Medium protein. See Jagalene and Ledger for shorter-straw alternatives.

Tiber (MSU, 1988): Dark Red head, (blackish-red in years of favorable moisture). Winterhardiness = 3. Medium height with good lodging resistance. Stiff straw, which may cause it to thresh a little harder than weaker-strawed varieties. Med-long coleoptile. Very resistant to sprouting, causing some dormancy. Medium maturity. Susceptible to stem rust. Very resistant to shatter. Below average yield. Protein above average. Good milling and baking quality. Fdn seed being discontinued. See Big Sky for alternative.

Vanguard (MSU, 1995): Sawfly resistant. Good stem solidness. White chaff, nodding head. Winterhardiness marginal (2-). Straw slightly stiffer and 1 inch shorter than Rocky, but moderately susceptible to lodging under high-yield conditions. Long coleoptile. Medium head date, 1 day later than Rocky, 3 days earlier than Neeley. Good wheat streak mv tolerance. Susceptible to stem & stripe rust. Below average yield; but under heavy sawfly infestation, yield is above average. Medium shatter resistance. Good test weight. Protein high; quality adequate. Not a satisfactory variety for non-sawfly areas, and should not be grown where high levels of winterhardiness are needed unless protected by stubble. See Genou.

Wahoo (Nebr & Wyo, 2000): Winterhardiness = 3. Semidwarf, 2" shorter than Rocky, stiff straw. Short coleoptile. Very early maturity. High yield. Average test weight & protein, marginally poor quality.

Willow Creek (MSU 2005): Beardless forage winter wheat for hay. HRW class. Winterhardiness = 5. Very tall straw, lodging susceptible. Long coleoptile. Very late maturity. High forage yield. Tends to be safer than barley for nitrates, because earlier seasonal development escapes heat stress better. Low grain yield and test weight. High protein.

Yellowstone (MSU, 2005): Winterhardiness = 4. Medium height similar to Neeley, and taller than Falcon, and Pryor. Straw strength is excellent. Medium-short coleoptile length. Medium maturity. Broadly adapted state-wide, but is stem-rust susceptible (thus, not for District 6, eastern Montana). Moderate resistance to stripe rust. Very high-yielding, and 3% higher than Falcon. Below average test weight. Protein is medium. Excellent baking quality and good Asian noodle quality.

Hard White Winter Wheat

Protein of hard white wheat for bread baking needs to be higher than required for noodle markets. Some varieties are dual-purpose and can be used for both bread and noodles. Although not a concern for bread baking quality, varieties with low levels of polyphenol oxidase (PPO) are desirable for Chinese noodles, since high PPO levels are associated with noodle discoloration. Low PPO provides good noodle brightness and color stability. Some hard white varieties sprout more readily than hard reds, especially those developed from Australian germ-plasm. The pure white trait is difficult to maintain, as pollen from red wheats may pollinate a white variety, causing a mixture of red kernels. It is very important to clean the combine, storage bins and other grain handling equipment prior to harvest to avoid mixing hard white wheat with other wheat. Seeding equipment and seedbed must also be free of red wheat. It is important to have a market strategy in place before growing a hard white variety.

Alice (S. Dak., 2006): Hard white. Short straw, short coleoptile. Early heading. Above average yield, test weight and protein.

Golden Spike (UT, Gen Mills, 1998): Hard white, low PPO. Winterhardiness 3. Height similar to Rocky, med-stiff straw. Medium coleoptile. Medium maturity. Below average yield. Low test weight & protein.

Hyalite (MSU & WPB, 2005): Hard White, low PPO with good noodle brightness and color stability. Clearfield system single-gene resistance to imazamox or 'Beyond' herbicide. Winterhardiness = 3. Standard height, but stiff straw. Short coleoptile. Early maturity. Average yield and test weight. Red kernel occurrence is 0.7% (high, but still acceptable). Dual-purpose quality similar to NuWest & NuSky. Above average protein, good milling & baking quality. Stem rust resistant. Stripe rust susceptible.

MDM WA7936 (Wash., 2006): Hard white. Winterhardiness = 2. Medium stiff straw. Medium coleoptile. Very late maturity. Yield similar to NuWest. Low test weight.

NuDakota (AgriPro, 2005): Hard white. Winterhardiness = 2. Semidwarf height, stiff straw. Early heading. Average yield, test weight and protein. Medium PPO.

Nuwest (MSU, 1994): Hard white, low PPO. Dual purpose, noodle and bread. Winterhardiness = 4. One inch shorter than Rocky. Stiff straw. Very short coleoptile. Two days later than Rocky. Resistant to stem rust but susceptible to stripe rust, dwarf bunt, and WSMV. Susceptible to sawfly, RWA, and Hessian fly. Average yield and well adapted to Montana. Medium test weight and protein. Good resistance to preharvest sprouting – (In 1993, everything sprouted - red or white). Contains 1 red kernal/1000. Protein medium to high. Good quality.

NuSky (MSU, 2001): Hard white, low PPO. (Sister line to the hard red var BigSky). Good dual purpose quality for noodles & bread. Winterhardiness 4. Height and straw strength similar to Nuwest & Rocky, med-stiff. Short coleoptile. Heading similar to Nuwest, Tiber & Neeley; and 3 days later than Rocky. Shatter resistant. Average yield. Test weight similar to Nuwest. Medium to high protein. Quality similar to Nuwest. High level of post-harvest dormancy (similar to Tiber), and thus does not have the sprouting problems common to some of the other hard white wheats. NuSky is a public release.

Wendy (SD, 2004): Hard white. Winterhardiness = 3. Semidwarf height, Short coleoptile. Early heading. Average yield. Above-average test weight and protein. Medium PPO.

Table 1. 2008 Intrastate **Winter Wheat** Variety Test (Exp. 3518), Conrad, MT.

Variety	Source	Class**	Solid stem score*	Yield bu/ac	Test Wt lb/bu	Head date	Height in.	Protein %
Pryor	WestBred			60.5	62.5	173	28	10.0
MTS0705			23.0	60.1	63.0	173	33	10.9
MTS0531		HW	21.1	59.8	62.0	174	31	11.0
Accipiter	Sask.			59.6	61.5	175	31	11.1
MTS0532		HW	20.2	58.4	61.8	172	27	11.7
Carter	WestBred		14.1	57.4	62.9	171	26	11.8
MTS04114		HW	19.5	57.0	62.3	173	28	10.9
Wahoo	Nebr.			56.8	60.6	168	27	11.1
MTS0713			20.3	56.5	63.2	172	27	11.4
MT0552				56.2	62.4	170	26	12.0
MTS04120			18.3	55.9	62.4	173	32	11.5
Rocky	AgriPro			55.1	63.3	171	33	10.9
Darrell	S.Dak.			54.7	61.9	168	29	11.3
Norris	W.Bred/MSU	CL		54.6	62.2	170	32	11.8
Yellowstone	MSU			54.5	61.1	175	32	11.4
MT0686				54.1	61.6	172	35	11.6
MT06102				53.7	62.8	170	30	12.3
Tiber	MSU			53.1	61.9	173	36	11.8
MTS0633			23.1	52.4	61.3	175	30	12.4
BZ9W02-2051				52.3	62.1	175	29	10.8
MT06103				52.3	63.0	171	33	11.6
Alice	S.Dak.	HW		51.6	62.7	169	25	12.1
MTW06118		HW		51.5	63.0	172	31	11.2
Genou	MSU		18.5	51.4	62.1	173	33	12.0
Falcon	W.Bred/Sask		6.9	51.2	61.7	174	27	11.3
Bond CL	Colorado	CL		50.6	61.3	168	31	10.6
MT0495				50.5	61.8	172	30	11.1
MTS0608			20.5	50.5	62.2	174	31	11.7
Jagalene	AgriPro			50.3	63.5	172	28	11.1
MT0688				49.9	62.2	172	32	10.5

Continued

Table 1 continued. (2008 Intrastate winter wheat).

Variety	Source	Class	Solid stem*	Yield	Test Wt	Head date	Height	Protein %
Vanguard	MSU		18.0	49.9	61.6	173	28	12.6
Wendy	S.Dak.	HW		49.6	63.3	168	24	11.8
NuSky	MSU	HW		49.2	61.0	174	31	11.7
Peregrine	Sask.			48.7	61.6	173	35	11.5
Hyalite	W.Bred/MSU	HW, CL		48.5	61.5	169	28	12.1
Promontory	Utah			47.9	63.4	174	31	11.0
Ripper	Colorado			47.7	62.3	169	27	11.4
Neeley	Idaho		6.8	47.5	61.8	174	35	11.2
AP 503 CL2	AgriPro	CL		47.4	63.0	172	26	11.7
Jerry	N.Dak.			47.2	61.3	174	32	11.6
Rampart	MSU		21.4	46.2	61.8	174	28	12.8
Ledger	WestBred		11.1	46.0	62.9	173	27	11.0
NuWest	MSU/GenMill	HW		45.9	61.9	173	31	10.7
MT0641				45.5	61.9	172	30	11.8
Bynum	W.Bred/MSU	CL	20.2	42.6	62.0	173	31	12.6
Bill Brown	Colorado			42.3	62.5	169	26	11.3
WA8023				42.0	58.6	176	32	11.2
Hawken	AgriPro			39.0	62.7	168	25	12.1
Average				51.3	62.1	172.1	29.9	11.5
LSD (0.05)				8.78				
C.V. (%)				10.25				
P-value				<.0001				

* **Solid stem score of 19 or higher is generally required for reliable sawfly resistance**
Solid stem scores are average of four locations in 2008.

** Classes: HW = hard white; CL = Clearfield System.

Location: MSU Western Triangle Agr Research Center, Conrad, MT.
Planted Sept 14, 2007 on fallow. Fertilizer, actual: 71-52-0. Harvest August 12, 2008.

Table 2. 2008 Intrastate **Winter Wheat** Variety Test (**Condensed list**), Conrad, MT.

Variety	Source	Class**	Solid stem score*	Yield bu/ac	Test Wt lb/bu	Head date	Height in.	Protein %
Pryor	WestBred			60.5	62.5	173	28	10.0
MTS0705			23.0	60.1	63.0	173	33	10.9
MTS0531		HW	21.1	59.8	62.0	174	31	11.0
Accipiter	Sask.			59.6	61.5	175	31	11.1
MTS0532		HW	20.2	58.4	61.8	172	27	11.7
Carter	WestBred		14.1	57.4	62.9	171	26	11.8
Wahoo	Nebr.			56.8	60.6	168	27	11.1
MTS0713			20.3	56.5	63.2	172	27	11.4
MT0552				56.2	62.4	170	26	12.0
Rocky	AgriPro			55.1	63.3	171	33	10.9
Darrell	S.Dak.			54.7	61.9	168	29	11.3
Norris	W.Bred/MSU	CL		54.6	62.2	170	32	11.8
Yellowstone	MSU			54.5	61.1	175	32	11.4
Tiber	MSU			53.1	61.9	173	36	11.8
MT06103				52.3	63.0	171	33	11.6
Alice	S.Dak.	HW		51.6	62.7	169	25	12.1
Genou	MSU		18.5	51.4	62.1	173	33	12.0
Falcon	W.Bred/Sask		6.9	51.2	61.7	174	27	11.3
Bond CL	Colorado	CL		50.6	61.3	168	31	10.6
MT0495				50.5	61.8	172	30	11.1
Jagalene	AgriPro			50.3	63.5	172	28	11.1
Vanguard	MSU		18.0	49.9	61.6	173	28	12.6
Wendy	S.Dak.	HW		49.6	63.3	168	24	11.8
NuSky	MSU	HW		49.2	61.0	174	31	11.7
Peregrine	Sask.			48.7	61.6	173	35	11.5
Hyalite	W.Bred/MSU	HW, CL		48.5	61.5	169	28	12.1
Promontory	Utah			47.9	63.4	174	31	11.0
Ripper	Colorado			47.7	62.3	169	27	11.4
Neeley	Idaho		6.8	47.5	61.8	174	35	11.2
AP 503 CL2	AgriPro	CL		47.4	63.0	172	26	11.7

Continued

Table 2 continued. (2008 Intrastate winter wheat).

Variety	Source	Class	Solid stem*	Yield	Test Wt	Head date	Height	Protein %
Jerry	N.Dak.			47.2	61.3	174	32	11.6
Rampart	MSU		21.4	46.2	61.8	174	28	12.8
Ledger	WestBred		11.1	46.0	62.9	173	27	11.0
NuWest	MSU/GenMill	HW		45.9	61.9	173	31	10.7
Bynum	W.Bred/MSU	CL	20.2	42.6	62.0	173	31	12.6
Bill Brown	Colorado			42.3	62.5	169	26	11.3
Hawken	AgriPro			39.0	62.7	168	25	12.1
Average				51.3	62.1	172.1	29.9	11.5
LSD (0.05)				8.78				
C.V. (%)				10.25				
P-value				<.0001				

*** Solid stem score of 19 or higher is generally required for reliable sawfly resistance**
Solid stem scores are average of four locations in 2008.

** Classes: HW = hard white; CL = Clearfield System.

Location: MSU Western Triangle Agr Research Center, Conrad, MT.
Planted Sept 14, 2007 on fallow. Fertilizer, actual: 71-52-0. Harvest August 12, 2008.

Table 3. Six-year averages, **Winter Wheat** varieties, WTARC, Conrad 2003 - 08.

Variety	Source	Class	Solid stem* score	6-Year Average Yield bu/a	Test wt	Height in.	Head date	Protein %	Winter survival class ①
Pryor	WestBred			73.2	62.6	32.5	165.7	11.7	3
Darrell	S. Dakota			72.5	62.6	34.9	161.7	12.8	
Norris	WestBred	CL		72.3	62.7	34.8	162.3	12.9	3
MTS 0531		++ HW	21.1	72.3	62.0	33.2	164.9	13.3	
MTS 0532		++ HW	20.2	72.3	61.7	33.2	164.4	13.1	
Yellowstone	MSU			72.1	61.4	35.5	166.5	12.6	4
Wahoo	Nebraska			72.0	61.8	33.2	161.3	12.8	3
Bond CL	Colorado	CL		71.9	62.3	35.3	160.4	12.1	2
MT 0495				71.6	61.6	35.4	165.6	12.7	
Ripper	Colorado			71.4	62.7	32.1	160.5	12.7	
Rocky	AgriPro			70.0	63.9	38.3	163.2	12.3	2
Falcon	WestBred		6.9	69.7	63.0	31.2	164.5	12.4	4
Alice	S. Dakota	HW		69.5	63.0	29.5	161.0	13.6	
Ledger	WestBred		11.1	69.2	63.6	31.8	164.0	12.5	2
Carter	WestBred		14.1	67.5	63.1	31.0	164.1	13.2	3
Hyalite	WestBred	CL HW		67.1	61.9	35.4	162.1	13.1	3
Genou	MSU	++	18.5	66.6	62.4	37.0	165.3	12.9	2
Promontory	Utah			65.9	63.5	34.5	165.0	12.2	2-
Neeley	Idaho			65.7	61.8	37.5	167.3	12.6	3
Jagalene	AgriPro			65.4	64.6	32.2	162.5	13.1	2
Wendy	S. Dakota	HW		64.6	62.8	29.3	160.2	13.8	3
NuSky	MSU	HW		64.0	61.2	37.7	166.5	12.7	4
NuWest	Gen Mills	HW		63.7	61.3	36.7	165.3	12.6	4
Tiber	MSU			62.9	62.2	39.7	166.0	13.2	3
Vanguard	MSU	++	18.0	62.5	62.1	36.8	164.7	13.6	2-
Jerry	N. Dakota			60.3	61.5	39.0	165.3	13.1	5
Rampart	MSU	++	21.4	59.6	62.3	35.5	165.5	13.8	2-
Hawken	AgriPro			59.3	63.3	31.0	159.5	13.2	
Bynum	WestBred	++ CL	20.2	58.7	62.3	34.6	163.9	14.2	2
average				67.4	62.4	34.4	163.8	12.9	

Class: ++ sawfly resistant. HW = hard white. CL = Clearfield herbicide system.

*** Solid stem score of 19 or higher is generally required for reliable sawfly resistance.**

① Winterhardiness: 5 = high, 1 = low.

Location: MSU Western Triangle Agr Research Center, Conrad, MT.

2008 Spring Wheat & Durum Variety Evaluations In The Western Triangle Area.

Location: Western Triangle Research Center, Conrad, MT.

Personnel: Gregory Kushnak, Conrad, MT; Dr. Luther Talbert and Susan Lanning, MSU Plant Science Dept; and Dr. Joyce Eckhoff, EARC, Sidney, MT.

Off-station spring wheat variety trials were grown in Teton County near Choteau and Glacier County at Cut Bank. On-station trials at Conrad were grown on dryland, and also included durum varieties. Off-station trials were no-till planted on chem-fallow.

Results: Data for the spring wheat trials are presented in Tables 4 -11, and include 2008 and multi-year averages. All entries of the Advanced Yield trial at Conrad are listed in Table 4, with a condensed version in Table 5 showing only named varieties and a few potential-release lines. Table 11 is a summary of tests at three Western Triangle locations over the past six years, and is equivalent to 16 tests. Durum data are presented in Tables 12 - 13.

The growing season was unusually cool in 2008, resulting in heading dates six days later than average. The cooler temperatures and prolonged growing period allowed for increased survival of emerging sawfly wasps, and for an extended time-frame for females to distribute their eggs more effectively. Consequently, sawfly infestation and stem-cutting were severe for susceptible varieties.

At the Conrad and Choteau locations, correlations between percent sawfly cutting and yield were highly significant, with most solid or partially-solid stemmed varieties ranking in the upper half for yield (Tables 4, 5 and 9). Most cut stems were recovered during the harvest operation, indicating that yield reductions were largely associated with larval-feeding damage to the plant's vascular system. The Cut Bank location was harvested before lodging was fully completed, and stem-cutting data were not obtained. However, most varieties with stem solidness ranked in the upper half for yield (Table 7).

Averaged over five or six years at each location, nearly all top-ranking varieties for yield had either solid or partially-solid stems (Tables 6, 8, 10 and 11). Although the partially-solid stem varieties resisted sawfly cutting at Conrad 2008 (Table 5), they most often have exhibited much higher stem-cutting levels.

Among the durum varieties, Alzada, Levante, Normanno and Strongfield had above-average yield in the dryland trials over the past six years (Table 13). Varieties with above-average 6-yr test weights were Alzada, Alkabo, Dilse, Divide, Levante and Pierce (Table 12).

Additional comments on spring wheat and durum varieties are presented in the following pages. Also refer to MSU Extension Bulletin 1093 for descriptions of many of the varieties tested.

Spring Wheat Variety Notes & Comments

Western Triangle Agricultural Research Center, Conrad MT

Sawfly Resistant & Semi-resistant Hard Red Spring Wheat Varieties:

Resistance (stem-solidness) among varieties ranges from low to high and varies with yearly climate differences; none have total resistance. Stem-solidness scores range from 5 (hollow) to 25 (completely solid). Solidness should be at least 19 to provide a reliable level of sawfly tolerance. However, some partially-solid stem varieties, such as Conan and Corbin, are less attractive to sawflies and show higher tolerance than expected for their level of stem solidness.

Agawam: See Hard White Spring Wheat. (Solid stem score = 23).

Choteau (MSU, 2004): Semidwarf with good straw strength. Height is 2" shorter than McNeal and 4" shorter than Fortuna. Stems very solid with good sawfly resistance (more solid than Fortuna). Sawfly resistance comparisons (max rating = 25): Choteau = 21, Fortuna = 19, Ernest = 16. Medium-early, 2 days later than Hank, 0.5 day later than Ernest & Fortuna, 2 days earlier than McNeal. High yield, similar to McNeal on both dryland and irrigated. Yields substantially higher than Ernest and Fortuna. Above average test wt (similar to Fortuna, and higher than McNeal). Moderate resistance to Septoria, and good resistance to most stem rust races. Protein above average. Normal gluten strength and good milling and baking quality. Fair Hessian fly tolerance. Some tolerance to root-lesion nematode.

Conan (WPB, 1998): Semidwarf. Solid stem score is low (10), but has low levels of sawfly-attractant cis-3-hexenylacetate, which increases sawfly resistance to medium. Medium maturity. Average yield and test weight. Some tolerance to Wheat Streak M V. Protein 0.5-0.9% higher than Rambo, and better protein quality than Rambo.

Corbin (WPB, 2006). Semidwarf height, 1" taller than Conan. Stem-solidness score = 10, medium sawfly resistance. Medium maturity, 1 day earlier than Conan. Average yield. Above-average test weight. Higher yield and test weight than Conan. Moderate resistance to stripe rust. Average protein.

Ernest (ND, 1995): Tall, weak straw. Medium sawfly resistance (solid stem score = 16). High level of sawfly-attractant cis-3-hexenylacetate. Moderately late maturing, slightly earlier than McNeal. Poor threshability. Tolerant to Far-go. Resistant to prevalent races of leaf & stem rust. Below average yield. High protein and test weight. Good quality.

Lillian (Sask.): Tall weak straw. Late heading. Partial stem solidness. Sawfly cutting for Lillian was 30% at Conrad 2008, compared to 65% for susceptible varieties. Below average test weight. Above average protein.

Fortuna (ND): Beardless, tall straw. Too tall for irrigated conditions, vulnerable to lodging. Good sawfly resistance (solid stem score = 19). Early maturity. Tolerant to Fargo. Very susceptible to Septoria. Medium to low yield except under severe sawfly conditions, where Fortuna often ranks high for yield. Susceptible to shattering, especially in conditions favoring development of large kernels. Average test weight and protein. Fair Hessian fly tolerance.

Triangle II (WestBred, bz9m1024, 2008): Clearfield version of Conan, 2-gene resistance. Stem solidness less than Conan. Yield 1 bu higher than Conan, otherwise similar to Conan.

Hollow-Stem, Sawfly Susceptible Hard Red Spring Wheat Varieties:

Alsen (ND, 2004). Moderate Fusarium scab resistance (MR). Semidwarf height. Medium maturity. Average yield. High test weight. High protein. Very poor Hessian fly tolerance.

AP604CL (AgriPro-8): Medium height, med-early maturity. Avg yield. Above avg test weight & protein.

AP603CL (AgriPro): Two-gene IMI resistance for Clearfield System. Med-tall, med-late maturity. Below average yield. Above average test weight & protein. Medium scab tolerance.

Freyr (AgriPro-3, 2004): Semidwarf height. Good lodging resistance, but less than Norpro. Medium maturity, 2 days earlier than McNeal. Average yield. Above average test weight. Average protein. Fusarium Scab resistance slightly lower than for Alsen (MR). Stripe rust MR. Acceptable quality.

Hank (WestBred): Semidwarf height. Medium lodging resistance. Early heading, 3 days earlier than McNeal. Above average yield. Better shatter resistance than 926. Below average test weight. Good tolerance to dryland root rot, tolerant to Far-go. Protein above average. Good quality. Hessian fly tolerant (similar to Choteau).

Hanna (AgriPro): Fusarium Scab tolerant.

Jedd (WestBred, 2007): Clearfield System hard red with 2-gene resistance. BC-derived from Hank. Short semidwarf height, 3" shorter than Hank or Choteau. Medium heading. Above average yield and test weight, dryland or irrigated. Higher dryland yield than Hank. Average protein. High quality. Moderately susceptible to stripe rust. Tolerance to Hessian fly biotypes of Washington, but unknown for biotypes in Montana.

Kelby (AgriPro, 2006, AP06): Good scab tolerance. Semidwarf height, stiff straw. Early heading. Below average yield. Above average test weight and protein. Good foliar disease resistance.

Kuntz (AgriPro-7, 2006): Medium height and maturity. Average yield. Above avg test weight. Average protein.

McNeal (MSU, 1994): Red chaffed. Semidwarf. Good lodging resistance, but straw is less resilient, and is prone to breaking over in strong wind. Medium-late maturity. Fair tolerance to wheat streak mv (2.5 on scale of 1-3). Some tolerance to dryland root rot. Above average yield, similar to Reeder and Choteau. Average test weight. Very good quality with high protein and loaf volume. Medium-low Hessian fly tolerance. Some tolerance to root lesion nematode.

Norpro (AgriPro-1): Semidwarf, very strong straw. Medium-late maturity. Below avg yield and test weight. Average protein. Low flour yield and high ash. Not well-adapted for dryland in District 5 (Triangle), but **suitable for irrigated**.

ONeal (WestBred, bz999592, 2008): A McNeal/906R cross. Semidwarf height similar to McNeal. Head date similar to McNeal and one day later than Choteau. Above-average yield, 3-5 bu higher than McNeal and similar to Choteau. Average test weight, above-average protein. A high quality wheat for areas where McNeal is adapted. Hollow stemmed, but shows less sawfly damage than McNeal.

Outlook (MSU, 2002): Russian Wheat Aphid resistant, but susceptible to new biotype in 2004. Stiff straw, semidwarf, height equal to McNeal & Reeder. Med-late maturity = McNeal. Above average yield, similar to McNeal and Reeder. Below average test weight. Average protein. Quality acceptable, and superior to Reeder.

Reeder (ND, 1999): Semidwarf height. Medium head date, slightly earlier than McNeal, but maturity slightly later than McNeal. The "stay-green" trait provides a longer grain-fill period and higher yield, as long as moisture is available. Similar to McNeal for agronomics. Above average yield. Average test weight and protein. Quality is below average. Susceptible to Everest W.O. herbicide. Very poor Hessian fly tolerance.

Vida (MT 0245): Semidwarf height, medium straw strength. Med-late maturity, heading = McNeal, but stays green 3 to 4 days later than McNeal. High yield, 4 bu over McNeal. Average test weight and protein, acceptable quality. Possible replacement for Outlook and Reeder (except Outlook would remain in use for RWA resistance). MR stripe rust and Septoria. Partially-solid stem (stem score = 11), slightly less than Conan & Ernest for sawfly tolerance.

Volt (WestBred, 2007): Semidwarf height. Late heading. Average yield on dryland, above-average yield on irrigated. Above avg test wt. Average protein. Good tolerance to stripe rust and Fusarium head blight. Sawfly cutting similar to McNeal. A high yield, disease resistant variety **for irrigated conditions**.

WestBred - See also Agawam, Conan, Corbin, Hank, Jedd, ONeal, Triangle II, Volt.

Hard White Spring Wheat

Protein of hard white wheat for bread baking needs to be higher than wheat required for noodle markets. Some varieties are dual-purpose and can be used for both bread and noodles. Although not a concern for bread baking quality, varieties with low levels of polyphenol oxidase (PPO) are desirable for noodles, since high PPO levels are associated with noodle discoloration. At present, all Montana hard white spring varieties are high PPO, and thus better suited for bread baking. Many hard white varieties sprout more readily than hard reds, especially those developed from Australian germ plasm. The pure white trait is difficult to maintain, as pollen from red wheats may pollinate a white variety, causing a mixture of red kernels. It is very important to clean the combine, storage bins and other grain handling equipment prior to harvest to avoid mixing white wheat with other wheats. Seeding equipment and seedbed must also be free of red wheats. Seeding rate should be 10% higher than for red wheat to reduce late tillers and thereby reduce green kernels.

Agawam (WestBred, 2005): Hard White. Semidwarf height. Sawfly resistant: solid stem score = 22, similar to that of Choteau, and has a low level of sawfly-attractant cis-3-hexenylacetate . Early heading, similar to Explorer. Very high yield and test weight. Protein 1.4% lower than Explorer. Fair Hessian fly tolerance.

Blanca Grande (Gen Mills): Hard white. Short stiff straw. Early maturity. Medium high yield. High test weight and low protein.

Clarine (WestBred): Hard white. Clearfield system, 2-gene resistance. Very high milling/baking quality. A Clearfield version of Pristine. Available in 2009.

Explorer (MSU, 2002): Hard white, bread-baking type. Semidwarf, 2 inches shorter than McNeal. Slightly solid-stem, but not sufficient for sawfly resistance. Early maturing. Average yield and test weight. Very susceptible to Septoria, thus not recommended for far eastern Montana. High protein, and probably too high for noodles. Excellent bread baking quality.

Golden 86 (GP Seed & Research Inc, 1986): Hard white. Used by a commercial milling and baking firm north of Three Forks, Montana. High quality.

MTHW 9420 (MSU, 1999): Experimental for exclusive release. Medium height and maturity. Below average yield. Average test weight. Very susceptible to wheat streak mosaic virus. Excellent bread quality, but too high in protein for noodles.

Plata (Gen Mills): Hard white. Short stiff straw. Medium maturity. Medium yield & test wt. Med-low protein.

Pristine (WPB): Hard white. Semidwarf. 3 days earlier than McNeal. Yield = McNeal. Protein 0.5% < McNeal. Very high quality, and used for bread baking by industry in Mid-west. See also Clarine.

Table 4. 2008 Advanced **Spring Wheat** variety nursery, Conrad Dryland.

Variety	Class	Yield bu/a	Test Wt lb/bu	Height in.	Head date	Protein %	Sawfly cutting %
VIDA	+	53.4	61.4	29	189	12.0	13
BZ902413 con/agaw		52.3	61.2	29	188	12.7	1
MTHW0771		51.8	62.1	26	184	12.6	55
MT0718 chot/reed		51.3	61.1	28	189	12.4	15
ONEAL bz999592		49.8	61.4	30	189	12.7	10
CORBIN	+	49.8	62.1	30	188	12.3	1
MT0515		49.2	61.7	31	190	12.3	35
CONAN	+	49.1	61.0	27	189	13.3	1
MT0724		48.4	61.2	26	186	13.0	20
MT0745		46.6	61.4	27	187	13.4	45
MT0748		46.5	60.2	29	184	13.4	30
MT0747		46.2	61.0	28	189	12.7	40
MT0716 chot/reed		45.5	59.6	29	189	13.8	30
MT0715 chot/reed		44.9	60.2	28	189	13.5	26
MT0749		44.8	60.3	28	187	13.8	50
MT0614		44.7	60.6	31	187	13.2	30
FORTUNA	++	44.5	60.4	35	188	12.8	10
MT0750		44.1	60.3	31	188	13.4	65
MT0613		44.1	60.7	30	189	13.1	50
MT0744		44.1	61.5	32	189	13.3	75
PF906407 hank/chot		42.7	59.7	28	187	13.1	20
MT0770		42.1	62.4	32	186	12.6	70
MT0713 chot/reed		42.1	63.3	31	190	14.1	40
LILLIAN	+	41.8	58.8	33	191	14.1	30
MT0708		41.5	61.1	30	189	13.2	60
MT0657		41.4	59.8	28	189	13.1	75
MT0751		41.3	59.9	28	187	13.6	45
OUTLOOK		41.2	58.5	31	190	12.5	55
MT0674		41.0	58.9	31	186	13.6	65
MT0631		40.9	59.3	28	188	13.8	70
MT0669		40.8	61.5	29	189	11.8	60
CHOTEAU	++	40.7	58.1	29	187	13.6	10
MT0722		40.6	59.8	32	190	12.6	25
PF906408 hank/chot		40.5	58.8	25	187	12.9	25
FREYR		40.3	61.2	31	188	12.7	65

Continued

continued		Yield	TW	Height	Head	Prot	Sawfly cutting
PF906409 hank/chot		40.0	58.9	27	187	13.1	20
Triangle II bz9m1024	CL	39.8	60.6	28	189	12.7	40
MT0605		39.7	59.6	29	190	12.7	75
KELBY		39.5	63.0	26	188	13.5	45
MCNEAL		39.0	59.9	30	189	12.3	60
NORPRO		38.8	60.0	27	189	12.2	70
MT0414		38.5	61.0	30	189	12.8	70
MT0640		38.4	60.7	31	186	12.7	65
JEDD	CL	38.1	61.0	25	187	12.9	30
MT0707		37.2	60.0	30	188	13.2	40
MTHW0471		37.1	60.1	33	190	12.4	60
MT0735		36.8	59.8	32	186	12.9	80
REEDER		36.8	60.2	30	189	13.7	65
MT0759		36.6	61.1	27	188	13.3	65
MT0746		36.0	59.8	32	186	14.6	80
MT0766		35.7	58.8	29	188	13.6	50
AP604 CL	CL	35.3	63.2	27	186	13.0	60
HANK		34.7	59.8	27	188	12.4	60
MT0664		34.7	61.3	30	188	12.4	75
MT0761		34.7	60.1	29	187	13.9	70
MT0755		34.6	60.6	28	186	12.7	80
MT0415		34.6	60.2	30	189	13.4	65
THATCHER		34.3	58.3	39	192	13.1	60
MT0737		34.2	58.1	31	189	13.1	65
MT0658		33.9	61.0	28	189	12.3	80
MT0765		33.3	59.5	30	189	12.9	65
KUNTZ		31.8	60.7	26	190	11.7	90
MTHW0767		30.0	60.9	28	187	13.1	90
VOLT		28.5	61.7	29	192	12.6	93
Average		40.8	60.5	29.3	188.2	13.0	49.7

LSD (.05) = 5.49 bu. C.V = 7.95. Lattice RE% = 111.0
Correlation, sawfly cutting vs yield, = -0.729 $p<0.0001$
++ = sawfly resistant (solid stem score 19 or higher).
+ = partial sawfly resistance.
HW = hard white. CL = Clearfield System.

Location: MSU Western Triangle Ag Research Center, Conrad, MT
Planted May 5, 2008. Harvested Aug 25, 2008.
Fertilizer, actual: 71-52-0

Table 5. 2008 Advanced **Spring Wheat** variety nursery, Conrad Dryland.

Condensed List

Variety	Class	Yield bu/a	Test Wt lb/bu	Height in.	Head date	Protein %	Sawfly cutting %
VIDA	+	53.4	61.4	29	189	12.0	13
BZ902413 con/agaw		52.3	61.2	29	188	12.7	1
MT0718 chot/reed		51.3	61.1	28	189	12.4	15
ONEAL bz999592		49.8	61.4	30	189	12.7	10
CORBIN	+	49.8	62.1	30	188	12.3	1
CONAN	+	49.1	61.0	27	189	13.3	1
FORTUNA	++	44.5	60.4	35	188	12.8	10
LILLIAN	+	41.8	58.8	33	191	14.1	30
OUTLOOK		41.2	58.5	31	190	12.5	55
CHOTEAU	++	40.7	58.1	29	187	13.6	10
FREYR		40.3	61.2	31	188	12.7	65
Triangle II bz9m1024	CL	39.8	60.6	28	189	12.7	40
KELBY		39.5	63.0	26	188	13.5	45
MCNEAL		39.0	59.9	30	189	12.3	60
NORPRO		38.8	60.0	27	189	12.2	70
JEDD	CL	38.1	61.0	25	187	12.9	30
MTHW0471		37.1	60.1	33	190	12.4	60
REEDER		36.8	60.2	30	189	13.7	65
AP604 CL	CL	35.3	63.2	27	186	13.0	60
HANK		34.7	59.8	27	188	12.4	60
MT0415		34.6	60.2	30	189	13.4	65
THATCHER		34.3	58.3	39	192	13.1	60
KUNTZ		31.8	60.7	26	190	11.7	90
VOLT		28.5	61.7	29	192	12.6	93
Average		40.8	60.5	29.3	188.2	13.0	49.7

LSD (.05) = 5.49 bu. C.V = 7.95. Lattice RE% = 111.0
Correlation, sawfly cutting vs yield, = -0.729 $p<0.0001$
++ = sawfly resistant (solid stem score 19 or higher).
+ = partial sawfly resistance. CL = Clearfield
Location: MSU Western Triangle Ag Research Center, Conrad, MT
Planted May 5, 2008. Harvested Aug 25, 2008.
Fertilizer, actual: 71-52-0

Table 6. Six-year averages, **dryland Spring Wheat** varieties, Conrad area, Pondera Co. 2003 - 2008.

Variety	Source	Class	6-Year Average				
			Yield bu/a	Test weight	Height in.	Head date	Protein %
bz902413		++	58.0	59.8	31	181	13.9
Agawam	WestBred	++ HW	56.0	62.1	30	180	13.0
Vida	MSU	+	54.3	58.7	32	183	13.6
Oneal	WestBred		53.4	58.7	33	183	14.4
Choteau	MSU	++	52.5	59.4	31	182	14.4
Jedd	WestBred	CL	51.0	60.3	27	182	13.6
Corbin	WestBred	+	51.0	59.6	32	182	14.3
Reeder	N. Dak.		50.5	59.2	33	182	14.3
Outlook	MSU		49.9	57.0	32	184	14.3
MT 0415			49.6	59.4	34	183	14.8
Freyr	AgriPro		49.3	59.9	34	182	14.3
McNeal	MSU		48.9	58.9	32	183	13.9
Conan	WestBred	+	48.5	59.1	30	182	14.5
Norpro	AgriPro		48.4	57.7	28	182	14.1
Triangle II	WestBred	CL	48.1	59.1	31	182	13.9
Kelby	AgriPro		47.9	61.6	30	181	14.9
Explorer	MSU	HW	47.4	59.3	29	180	14.4
Hank	WestBred		47.3	57.1	31	181	14.4
Fortuna		++	46.5	60.1	39	182	14.0
AP604 CL	AgriPro	CL	46.3	61.2	31	180	14.1
Kuntz	AgriPro		45.9	59.6	30	182	13.6
Volt	WestBred		45.7	61.0	31	185	14.0
MTHW 0471		HW	44.1	59.3	37	184	14.7
average			49.5	59.2	31.9	182.3	14.2

++ Sawfly resistant (solid stem score of 19 or higher).
+ Partial sawfly resistance
CL = Clearfield System (2-gene). HW = Hard White
Location: MSU Western Triangle Agr Research Center, Conrad, MT

Table 7. 2008 **Spring Wheat** variety trial, Cut Bank.

Variety	Class	Yield bu/a	Test Wt lb/bu	Height in.	Protein %
VIDA	+	39.2	58.3	30	14.4
CHOTEAU	++	36.9	58.1	28	15.0
ONEAL		36.0	58.3	28	14.5
FORTUNA	++	35.8	59.9	36	13.8
REEDER		35.0	58.0	30	15.0
MT0415		34.3	57.8	30	15.2
Hank/Chot pf906408	+	33.4	59.0	25	13.8
VOLT		33.3	60.2	30	13.1
CORBIN	+	32.7	61.1	28	13.8
MCNEAL		32.4	58.8	29	14.7
JEDD	CL	32.4	60.5	26	13.3
KUNTZ		32.2	58.5	28	14.0
MTHW0471	HW	30.3	59.8	35	13.6
OUTLOOK		29.6	58.2	26	14.2
NORPRO		29.2	58.2	29	14.9
HANK		29.0	57.6	29	14.0
EXPLORER	HW	29.0	59.7	28	14.6
CONAN	+	28.0	58.8	29	14.8
FREYR		25.8	57.3	29	14.8
KELBY		25.0	60.0	26	16.3
Average		32.0	58.9	29.0	14.4
LSD .05		5.2			
C.V. %		5.67			

++ = sawfly resistant (solid stem score 19 or higher).
+ = partial sawfly resistance. HW = hard white.

Cooperator & location: Kevin Bradley, north of Cut Bank, MT
Planted April 28, 2008.
Fertilizer, actual: 71-52-0
Harvested Sept 8, 2008.
Conducted by MSU Western Triangle Ag Research Center.

Table 8. Five-year averages, **Spring Wheat** varieties, Cut Bank area, Glacier Co. 2004 - 08.

Variety	Source	Class	5-Year Average			
			Yield bu/a	Test weight	Height in.	Protein %
Agawam	WestBred	++ HW	50.8	61.8	30	12.4
Vida	MSU	+	49.6	57.5	32	12.8
Choteau	MSU	++	48.9	59.7	29	13.0
Fortuna		++	48.9	60.5	39	13.1
MT0415			47.8	58.7	32	13.3
Corbin	WestBred	+	47.6	60.4	31	12.6
Hank	WestBred		46.1	57.6	30	12.6
Outlook	MSU		44.6	57.0	32	12.5
Reeder	N. Dak		44.1	58.4	32	13.1
Explorer	MSU	HW	44.0	59.2	32	12.9
Conan	WestBred	+	42.3	58.0	30	13.3
McNeal	MSU		41.7	58.0	32	12.9
Freyr	AgriPro		41.7	58.3	33	12.7
Norpro	AgriPro		39.5	56.9	30	13.0
average			45.0	58.4	31.9	12.9

++ Sawfly resistant (solid stem score of 19 or higher).
+ Partial sawfly resistance
HW = Hard White

Cooperator & Location: Kevin Bradley, north of Cut Bank, MT
Conducted by MSU Western Triangle Agr Research Center.

Table 9. 2008 **Spring Wheat** variety trial, Choteau, MT.

Variety	Class	Yield bu/a	Test Wt lb/bu	Height in.	Protein %	Sawfly cutting %
VIDA	+	48.1	57.1	27	14.4	28.3
ONEAL		44.8	59.0	30	14.6	50.0
CORBIN	+	42.8	60.0	27	14.9	43.3
CHOTEAU	++	42.4	58.3	27	15.2	2.0
Hank/Chot pf906408	+	42.1	56.9	26	15.1	13.3
FORTUNA	++	41.3	59.6	32	15.2	5.7
CONAN	+	37.3	59.0	26	14.9	60.0
HANK		35.6	57.6	27	14.8	97.7
JEDD	CL	35.3	59.0	27	14.3	83.3
VOLT		34.9	60.0	28	13.7	96.3
MTHW0471	HW	33.9	57.8	30	14.4	81.7
REEDER		31.4	58.0	27	14.9	97.7
OUTLOOK		29.9	55.7	27	14.1	91.7
MCNEAL		29.7	57.4	28	14.3	97.7
NORPRO		29.5	54.2	24	14.8	96.3
EXPLORER	HW	28.8	58.2	29	14.5	96.3
KELBY		27.9	59.9	25	15.2	99.0
MT0415		26.5	58.2	27	15.7	99.0
FREYR		25.8	56.7	27	14.2	98.0
KUNTZ		24.9	56.9	27	14.0	99.3
Average		34.7	58.0	27.4	14.7	71.8
C.V. %		9.64				7.51
LSD .05		9.50				15.40

Correlation, sawfly cutting vs yield = -0.848 p<0.0001
Correlation, sawfly cutting vs test wt = -0.222 p=0.347
++ = sawfly resistant (solid stem score 19 or higher).
+ = partial sawfly resistance. HW = hard white.

Cooperator & location: Scott & Roy Inbody, east of Choteau, MT
Planted April 29, 2008.
Fertilizer, actual: 11-52-0
Harvested Aug 23, 2008.
Conducted by MSU Western Triangle Ag Research Center.

Table 10. Five-year averages, **Spring Wheat** varieties, Choteau area, Teton Co. 2004 - 08.

Variety	Source	Class	5-Year Average			
			Yield bu/a	Test weight	Height in.	Protein %
Corbin	WestBred	+	53.0	59.0	32	16.0
Vida	MSU	+	51.7	56.6	32	15.5
Agawam	WestBred	++ HW	48.9	60.3	30	14.7
Outlook	MSU		48.0	55.8	32	15.4
Choteau	MSU	++	47.3	57.3	30	16.0
Conan	WestBred	+	44.7	57.2	29	15.8
McNeal	MSU		44.6	55.9	32	16.0
Reeder	N. Dak.		43.4	57.4	32	16.1
Hank	WestBred		43.1	55.0	30	16.3
Fortuna		++	41.9	59.4	38	16.1
MT0415			40.7	57.9	32	16.6
Explorer	MSU	HW	40.1	57.3	31	15.7
Norpro	AgriPro		39.8	54.5	29	16.0
Freyr	AgriPro		38.0	57.0	33	15.3
average			44.5	56.8	31.7	15.9

++ Sawfly resistant (solid stem score of 19 or higher).
+ Partial sawfly resistance
HW = Hard White

Cooperator & Location: Scott & Roy Inbody, Choteau, MT. Teton Co.
Conducted by MSU Western Triangle Agr Research Center.

Table 11. Multi-Year x Location Averages - **Spring Wheat** Varieties.
Western Triangle Area

Variety	Source	Class	16 Year x Location Average* Yield bu/a	Test weight	Height in.	Protein %	Head date**
Agawam	WestBred	++ HW	51.9	61.4	30	13.4	180
Vida	MSU	+	51.9	57.6	32	14.0	183
Corbin	WestBred	+	50.5	59.7	32	14.3	182
Choteau	MSU	++	49.6	58.8	30	14.5	182
Outlook	MSU		47.5	56.6	32	14.0	184
MT0415	MSU		46.0	58.7	33	14.9	183
Reeder	N. Dak		46.0	58.3	32	14.5	182
Fortuna		++	45.8	60.0	38	14.4	182
Hank	WestBred		45.5	56.6	31	14.4	181
Conan	WestBred	+	45.2	58.1	30	14.5	182
McNeal	MSU		45.1	57.6	32	14.3	183
Explorer	MSU	HW	43.8	58.6	30	14.3	180
Freyr	AgriPro		43.0	58.4	33	14.1	182
Norpro	AgriPro		42.6	56.4	29	14.4	182
			46.5	58.1	31.8	14.3	182.0

++ Sawfly resistant (solid stem score of 19 or higher).
+ Partial sawfly resistance
HW = Hard White
** Head date, Conrad only.
* Conrad 6-yr + Choteau 5-yr + Cut Bank 5-yr.
Years included are 2003 to 2008. Comparable average calculations.

Cooperators: Kevin Bradley, Cut Bank; Roy and Scott Inbody, Choteau;
Conducted by MSU Western Triangle Agr Research Center.

Table 12. 2008 **dryland Durum** variety trial, Conrad, MT.

Variety	Yield bu/a	Test Wt lb/bu	Height in.	Heading, days from Jan 1	Heading, days from planting	Protein %	HAVC	100-seed wt, gm
Cimmyt11	55.1	60.3	27	187	62	11.4	68.0	3.17
MT01695	54.9	62.9	26	188	63	11.4	75.7	3.64
Cimmyt8	54.0	62.2	27	189	64	11.4	74.2	3.07
Strongfield	50.8	61.7	31	190	65	12.5	86.5	3.70
Normanno	50.1	59.5	24	187	62	11.8	74.1	3.62
MT02525	49.8	62.4	26	187	62	12.1	79.5	3.66
Saragolla	49.5	60.1	24	187	62	12.0	70.9	3.12
Cimmyt5	49.4	60.2	24	189	64	12.4	63.8	3.02
MT01649	49.3	58.8	24	186	61	12.5	76.7	3.40
MT04174	48.7	61.7	28	187	62	12.5	82.7	3.44
Alzada	46.3	61.5	25	187	62	11.9	78.6	3.89
Levante	45.0	61.0	24	187	62	12.2	70.8	3.38
Svevo	44.1	59.9	25	186	61	12.7	77.5	3.67
MT02DH82	42.8	61.0	35	189	64	12.7	77.4	3.64
Grenora	41.5	60.7	30	190	65	12.7	81.0	3.69
Divide	41.4	60.7	33	192	67	12.4	76.8	3.52
MT02DH55	40.9	59.4	30	189	64	12.3	76.5	2.90
Pierce	40.6	62.3	32	191	66	12.5	80.2	3.43
Alkabo	40.3	61.2	32	190	65	12.3	85.6	3.81
MT03012	39.9	59.8	27	186	61	12.8	81.6	3.25
Dilse	39.7	62.2	29	190	65	12.4	79.8	3.65
Lebsock	38.8	62.6	30	189	64	12.1	72.0	3.43
MT02DH75	38.1	58.3	31	190	65	12.4	70.1	3.53
Mountrail	36.8	59.6	30	192	67	12.6	75.9	3.53
Average	45.3	60.8	28.1	188.5	63.5	12.3	76.5	3.47
LSD (.05) =	6.2							
CV, S/mean	8.3							
P =	<0.001							

Planted May 5, 2008.
Fertilizer, actual: 71-52-0
Harvested Aug 25, 2008.
Location: MSU Western Triangle Ag Research Ctr, Conrad, MT

Table 13. Six-year averages, **dryland Durum** varieties, Conrad area, Pondera Co. 2003 - 08.

Variety	Source	6-Year Average Yield bu/a	Test weight	Height in.	Head date	Protein %
Normanno	AllStar	54.9	58.3	28	182	13.9
Alzada	WestBred	53.4	60.0	29	181	13.4
Strongfield	WestBred	52.8	59.7	36	184	14.8
Levante	AllStar	52.5	60.2	27	181	13.7
Alkabo	N. Dak.	50.0	60.6	35	183	14.0
Grenora	N. Dak.	49.5	59.5	34	183	14.3
Divide	N. Dak.	48.1	60.2	37	184	13.9
Mountrail	N. Dak.	47.4	58.9	35	184	14.4
Dilse	N. Dak.	47.2	60.6	34	184	14.6
Pierce	N. Dak.	46.9	60.5	36	184	14.3
average		50.1	59.8	33.6	182.9	14.2

Location: MSU Western Triangle Agr Research Center, Conrad, MT.

2008 Barley Variety Evaluations In The Western Triangle Area.

Location: Western Triangle Research Center, Conrad, MT.

Personnel: Gregory D. Kushnak, Research Center, Conrad; and
Dr. Tom Blake and Stan Bates, MSU Plant Science Dept.

Dryland off-station barley variety trials were grown in Teton County near Choteau, and Glacier County near Cut Bank. The on-station trial at Conrad was grown only on dryland in 2008. The Choteau and Cut Bank trials were no-till planted on chem-fallow.

Results: Data for the various locations are presented in Tables 14 - 21, and include 2008 results and multi-year averages. All entries of the dryland Intrastate trials at Conrad are listed in Table 14, with a condensed version in Table 15 showing only named varieties and a few potential-release lines. Table 21 is a summary of three Western Triangle variety-test locations over the past five years, and is equivalent to 15 tests.

The growing season was unusually cool in 2008, resulting in barley heading dates seven days later than average. The cooler temperatures allowed for increased water-use efficiency, resulting in high percent plump, test weight and yield. Protein and plant height were 1.4% and 4 inches less than average, respectively.

Nearly all malt varieties in these dryland trials met or exceeded market requirements for test weight and plump in 2008. Averaged over the past five years, the 2-row malt varieties Craft and Hockett had above-average yield, test weight and percent plump, and were substantially higher than Harrington and Metcalfe for those traits, as well as being 2 to 4 days earlier to head (Table 21). Malt status of Hockett appears promising, and Craft has been AMBA approved for organic malt production. Both lines would be intended for use in dryland malt barley production.

The feed varieties Haxby and Boulder had the highest five-year averages for yield and test weight (Table 21).

A 2-row winter-barley, variety 'Charles', was fall-planted at Conrad, but failed to survive over winter.

Additional comments on barley varieties are presented in the following pages. Also refer to MSU Extension Bulletin 1094.

Table 14. **Dryland Intrastate Barley** variety trial, Conrad 2008.

Variety	Yield bu/a	Test Wt lb/bu	Plump %	Thin %	Protein %	Head date	Height in.
MT010160	85.5	52.9	97	1.2	10.2	189	28
MT061045	84.1	54.0	97	0.9	8.9	190	24
Goldeneye	83.6	50.5	81	0.5	11.8	185	26
MT061035	83.2	53.7	98	0.4	9.5	189	25
Boulder	82.7	54.3	97	0.7	11.0	188	26
MT040204	82.7	53.1	86	2.2	10.7	191	26
MT061054	82.6	54.2	97	0.6	9.0	189	25
MT040209	82.5	54.1	95	1.2	10.7	188	26
MT050035	82.3	52.4	99	0.4	10.9	189	28
MT061047	82.2	53.7	94	1.3	8.5	191	23
MT020204	81.6	54.6	97	0.7	10.6	187	27
MT020162	81.3	52.5	96	1.0	9.7	190	28
MT050062	81.2	53.7	97	0.7	10.2	191	29
MT030063	81.0	54.4	98	0.7	9.6	189	28
Eslick	80.9	53.3	90	3.1	9.9	190	23
Champion	80.6	53.4	95	1.2	9.7	188	26
MT061048	80.4	54.4	96	0.9	9.3	189	26
MT061032	80.2	52.7	88	3.1	12.5	189	24
MT050049	80.0	53.9	97	0.7	10.3	187	28
MT061169	80.0	53.7	98	0.8	10.4	189	24
MT061160	79.6	53.4	95	1.3	10.0	189	23
MT040130	79.5	53.9	95	0.9	9.4	191	23
Geraldine	79.4	53.2	93	1.7	10.0	191	25
MT061034	78.7	53.4	98	0.7	9.5	189	26
MT040013	78.2	53.9	95	1.8	10.1	188	26
MT050030	78.2	52.8	98	0.5	10.1	191	26
MT061042	78.2	53.9	93	1.5	10.2	190	25
2B992657	78.2	49.6	98	0.6	9.2	190	28
MT030042	77.9	54.3	96	1.1	9.2	188	25
MT030137	76.9	54.3	96	1.2	11.6	186	25
MT040024	76.5	53.8	92	2.1	10.1	186	25
MT061248	76.1	52.9	99	0.4	10.3	188	24
Tradition	75.9	51.3	92	1.0	11.8	186	28
Hockett	75.8	53.8	99	0.4	10.4	185	28
Conrad	75.7	50.5	100	0.4	10.7	189	25

continued

continued	Yield	TW	Plump	Thin	Prot	Head	Height
MT040226	75.7	56.3	89	2.5	11.2	188	27
MT050050	75.6	53.4	97	0.6	10.4	187	27
MT040181	74.6	53.2	99	3.6	10.9	190	23
MT061104	74.3	53.7	99	0.5	9.5	189	27
MT061052	74.2	52.1	95	3.7	12.6	189	23
MT061134	74.1	51.4	95	1.3	12.2	190	28
MT061240	73.9	54.3	96	1.4	11.1	189	24
MT061058	73.5	54.4	97	0.7	9.0	190	25
Craft	73.3	53.7	98	0.7	11.0	187	29
MT061225	72.5	52.5	98	0.5	9.5	187	24
Aquila	72.4	54.0	96	1.5	10.5	183	30
MT061100	71.8	52.8	98	0.7	10.7	189	25
MT061051	71.7	53.5	95	1.3	8.5	191	25
MT040216	70.8	55.5	94	0.7	11.6	189	25
MT050048	70.4	54.4	98	0.4	10.9	188	29
MT050201	70.2	54.9	98	0.5	10.6	186	29
MT030079	70.1	54.9	97	1.2	11.0	187	26
MT040073	70.0	54.9	96	0.9	10.3	189	24
MT020155	69.3	53.0	99	0.6	11.7	185	28
MT061246	69.0	53.8	99	0.4	11.7	189	26
2B992316	68.6	50.7	96	1.0	10.0	190	24
MT010158	67.9	53.1	93	2.2	12.5	188	26
MT061207	67.6	52.2	99	0.5	11.5	186	26
MT061011	67.4	47.3	91	2.4	9.2	185	23
Haxby	67.1	55.3	94	1.4	10.7	186	25
MT061025	66.2	47.0	76	6.6	9.9	185	24
MT061201	66.1	53.1	98	0.7	10.9	187	29
MT061026	64.2	48.1	94	1.8	9.6	186	24
Average	76.0	53.1	95.2	1.3	10.4	188.2	25.9
LSD (.05)	8.9 bu						
C.V. %	7.59						
Lattice RE%	110.2						

Planted May 5, 2008. Harvested Aug 18, 2008.
Fertilizer, actual: 11-52-0
Location: MSU Western Triangle Ag Research Center, Conrad, MT.

Table 15. **Dryland Intrastate Barley** variety trial, Conrad 2008.

Condensed List

Variety	Spike rows	Yield bu/a	Test Wt lb/bu	Plump %	Thin %	Protein %	Head date	Height in.
Goldeneye	6	83.6	50.5	81	0.5	11.8	185	26
Boulder	2	82.7	54.3	97	0.7	11.0	188	26
MT020204	2	81.6	54.6	97	0.7	10.6	187	27
Eslick	2	80.9	53.3	90	3.1	9.9	190	23
Champion	2	80.6	53.4	95	1.2	9.7	188	26
Geraldine	2	79.4	53.2	93	1.7	10.0	191	25
2B992657	2	78.2	49.6	98	0.6	9.2	190	28
Tradition	6	75.9	51.3	92	1.0	11.8	186	28
Hockett	2	75.8	53.8	99	0.4	10.4	185	28
Conrad	2	75.7	50.5	100	0.4	10.7	189	25
Craft	2	73.3	53.7	98	0.7	11.0	187	29
Aquila	6	72.4	54.0	96	1.5	10.5	183	30
MT020155	2	69.3	53.0	99	0.6	11.7	185	28
2B992316	2	68.6	50.7	96	1.0	10.0	190	24
MT010158	2	67.9	53.1	93	2.2	12.5	188	26
Haxby	2	67.1	55.3	94	1.4	10.7	186	25
Average		76.0	53.1	95.2	1.3	10.4	188.2	25.9
LSD (.05)		8.9 bu						
C.V. %		7.59						
Lattice RE%		110.2						

Planted May 5, 2008. Harvested Aug 18, 2008.
Fertilizer, actual: 11-52-0
Location: MSU Western Triangle Ag Research Center, Conrad, MT.

Table 16. 5-year averages, **dryland Barley** varieties, Conrad, MT, 2004 - 2008.

Variety*	5-Year Average						
	Yield bu/a	Test Wt lb/bu	Plump %	Thin %	Protein %	Head date	Height in.
Champion WestBred	89.3	53.5	78	4.7	11.2	182	29
Boulder WestBred	87.1	54.3	89	1.9	12.4	181	31
MT020204	86.9	52.6	86	3.7	12.2	181	31
MT020155	86.3	51.6	85	3.2	12.4	178	32
Hockett MSU	86.1	52.7	92	1.9	11.5	179	30
Conrad Busch Ag	85.7	50.5	84	5.2	12.2	182	28
Haxby MSU	85.7	54.8	83	3.9	11.5	180	30
2b99 2657	83.9	47.1	84	5.1	11.1	183	30
Eslick MSU	83.9	51.9	74	9.9	11.2	183	29
2b99 2316	83.3	49.8	84	3.5	11.1	182	30
Geraldine MSU	82.9	51.5	62	11.4	11.5	183	28
Craft MSU	82.0	53.1	91	2.7	11.8	181	32
Harrington	81.1	50.2	85	4.3	12.1	183	30
Tradition* Busch Ag	79.4	50.2	72	6.1	11.9	180	33
MT010158	79.0	51.9	89	2.5	12.9	182	28
average	84.4	52.0	82.2	4.7	11.8	181.1	30.1

* Tradition is 6-row; all others are 2-row.

Location: MSU Western Triangle Agr Research Center, Conrad, MT.

Table 17. 2008 **Barley** variety trial, Cut Bank.

Variety	Spike	Yield bu/a	Test Wt lb/bu	Plump %	Thin %	Protein %	Height in.
Challenger WestBred	2	54.6	52.1	95	1.7	10.1	28
Haxby MSU	2	53.6	53.8	95	1.5	11.1	27
Boulder WestBred	2	53.0	53.1	98	0.8	10.5	28
Craft MSU	2	52.6	51.5	96	0.9	11.0	27
Hockett MSU	2	47.8	51.5	96	1.1	10.8	26
MT020155	2	47.8	50.7	95	1.7	11.2	28
Eslick MSU	2	47.2	49.9	92	2.2	9.1	22
Harrington	2	46.7	50.4	97	0.9	10.3	28
MT020204	2	46.5	52.1	97	0.9	10.7	26
Xena WestBred	2	46.1	50.7	96	0.9	9.6	28
Stellar ND	6	42.6	49.9	95	1.6	10.8	29
Baronesse	2	42.2	50.4	98	0.8	8.9	22
Geraldine MSU	2	42.0	50.5	95	1.8	10.0	25
Drummond ND	6	40.3	49.2	96	1.3	11.7	28
Conrad Busch AG	2	40.1	48.9	98	0.8	10.2	27
Legacy Busch Ag	6	39.6	49.0	94	1.4	10.1	29
Metcalfe	2	39.5	50.0	96	1.6	10.9	28
Tradition Busch Ag	6	39.2	50.4	98	0.5	11.6	26
Merit Busch Ag	2	38.7	47.4	94	1.6	8.9	22
MT010158	2	34.7	51.6	97	1.2	10.7	26
Average		44.7	50.7	95.9	1.3	10.4	26.5
LSD (.05) =		6.1					
C.V. =		8.71					

Cooperator & Location: Kevin Bradley, north of Cut Bank, MT.
Planted April 28, 2008. Harvested Aug 24, 2008.
Fertilizer, actual: 11-52-0
Conducted by MSU Western Triangle Ag Research Center.

Table 18. Five-year averages, **Barley** varieties, Cut Bank area, 2004 - 08.

Variety	Rows/ spike	5-Year Average Yield bu/a	Test Wt lb/bu	Plump %	Thin %	Protein %	Height in.
Eslick MSU	2	66.6	49.8	77	13	10.6	28
Haxby MSU	2	65.9	52.3	76	14	11.4	29
Boulder WestBred	2	65.3	51.9	81	10	13.4	29
Xena WestBred	2	65.3	50.0	76	12	10.8	29
Craft MSU	2	65.1	51.0	83	7	11.7	31
Legacy Busch Ag	6	65.0	46.7	75	16	13.4	32
Harrington	2	64.0	48.9	79	11	11.0	29
Stellar N Dak.	6	63.0	47.1	80	11	12.8	32
Tradition Busch Ag	6	62.9	48.3	80	10	11.4	32
Hockett MSU	2	62.8	50.6	81	10	11.4	28
Geraldine MSU	2	62.3	50.0	75	16	11.2	28
Metcalfe	2	62.0	49.6	80	11	11.6	30
Drummond N. Dak	6	61.5	47.5	77	15	13.8	32
Conrad Busch Ag	2	61.2	49.0	82	9	13.9	29
Merit Busch Ag	2	57.7	46.8	77	13	13.4	28
average		63.5	49.4	78.7	11.9	13.3	29.7

Cooperator & Location: Kevin Bradley, north of Cut Bank, MT.
Conducted by MSU Western Triangle Agr Research Center.

Table 19. 2008 **Barley** variety trial, Choteau.

Variety	Spike	Yield bu/a	Test Wt lb/bu	Plump %	Thin %	Protein %	Height in.
Baronesse	2	94.7	50.7	90	4.4	15.3	28
Drummond	6	92.3	51.9	91	1.4	14.8	33
MT020204	2	90.6	51.6	92	3.7	15.3	29
Challenger	2	89.6	53.1	97	1.5	13.8	30
Tradition	6	89.3	52.1	94	0.8	14.7	34
Legacy	6	88.8	49.9	93	1.6	14.5	33
Boulder	2	88.3	53.4	95	1.8	15.8	28
MT020155	2	87.4	52.6	90	2.6	14.5	30
Stellar	6	85.2	50.7	96	0.9	14.1	31
Craft	2	84.6	52.6	94	1.6	14.2	31
Haxby	2	83.9	55.4	93	2.0	14.4	28
Geraldine	2	82.8	50.4	79	8.6	15.5	27
Harrington	2	81.1	49.9	92	3.2	14.7	29
Eslick	2	80.7	50.0	78	10.3	14.8	27
Metcalfe	2	80.5	50.7	94	2.2	14.8	28
Xena	2	78.6	50.4	89	4.7	13.8	29
Hockett	2	78.5	52.3	94	2.2	14.3	29
Merit	2	75.9	46.3	81	8.2	14.9	25
Conrad	2	75.4	49.6	92	2.7	15.8	28
MT010158	2	74.6	52.3	94	1.9	15.1	30
Average		84.1	51.3	90.9	3.3	14.8	29.4
LSD (.05) =		6.9					
C.V. =		5.10					

Cooperator & Location: Scott & Roy Inbody, east of Choteau, MT.
Planted April 29, 2008. Harvested Aug 13, 2008.
Fertilizer, actual: 11-52-0
Conducted by MSU Western Triangle Ag Research Center.

Table 20. Five-year averages, **Barley** varieties, Choteau area, 2004 - 08.

Variety	Rows/ spike	5-Year Average Yield bu/a	Test Wt lb/bu	Plump %	Thin %	Protein %	Height in.
Haxby MSU	2	84.2	52.9	65	11	15.5	34
Boulder WestBred	2	82.1	50.5	64	16	16.9	32
Craft MSU	2	80.7	50.2	74	8	15.8	36
Tradition Busch Ag	6	79.6	46.2	48	22	16.4	36
Drummond N. Dak.	6	79.4	45.7	48	25	16.0	38
Hockett MSU	2	79.4	49.9	72	10	15.4	34
Xena WestBred	2	78.5	47.8	56	16	15.6	33
Eslick MSU	2	78.1	48.4	51	20	16.0	33
Stellar N. Dak.	6	74.2	45.9	61	17	15.3	36
Conrad Busch Ag	2	73.6	47.1	60	17	16.9	32
Metcalfe	2	72.4	47.2	60	16	16.9	34
Harrington	2	71.1	46.4	53	19	16.5	33
Legacy Busch Ag	6	71.0	45.2	45	26	16.1	37
Geraldine MSU	2	70.9	47.6	42	28	16.9	32
Merit Busch Ag	2	68.3	44.4	50	23	16.8	32
average		76.4	47.8	56.8	18.1	16.2	34.0

Cooperator & Location: Scott & Roy Inbody, east of Choteau, MT.
Conducted by MSU Western Triangle Agr Research Center.

Table 21. Multi-Year x Location Averages - **Barley** varieties, Western Triangle Area.

Variety	Rows/ spike	15-Year x Location Dryland Average* Yield bu/a	Test Wt lb/bu	Plump %	Thin %	Protein %	Height in.	Head date**
Haxby	2	78.6	53.3	74.8	9.5	12.8	30.9	180
Boulder	2	78.2	52.2	78.1	9.3	14.2	30.5	181
Eslick	2	76.2	50.0	67.3	14.1	12.6	29.9	183
Hockett	2	76.1	51.1	81.7	7.5	12.8	30.7	179
Craft	2	75.9	51.4	82.5	5.9	13.1	33.2	181
Tradition	6	74.0	48.2	66.7	12.8	13.3	33.7	180
Conrad	2	73.5	48.9	75.3	10.4	14.3	29.7	182
Drummond	6	73.1	47.6	67.0	15.7	13.9	34.3	179
Stellar	6	73.0	47.5	70.6	11.2	13.2	33.2	180
Legacy	6	72.3	47.0	64.0	16.6	13.8	34.1	180
Metcalfe	2	72.1	49.2	73.9	10.5	13.6	31.7	182
Harrington	2	72.1	48.5	72.6	11.5	13.2	30.9	183
Geraldine	2	72.1	49.7	59.7	18.3	13.2	29.3	183
Merit	2	67.1	46.7	67.8	14.3	14.1	29.2	184
average		73.9	49.4	71.6	12.0	13.4	31.5	181

** Head date, Conrad only.

* Conrad dryland 5-yr + Choteau 5-yr + Cut Bank 5-yr.
Years included 2004 thru 2008. Comparable average calculations.

Cooperators: Kevin Bradley, Cut Bank; Roy and Scott Inbody, Choteau.
Conducted by MSU Western Triangle Agr Research Center.

Title: **Planting Date and Rate Study with Spring Wheat and Barley.**

Year: 2008

Location: Western Triangle Research Center, Conrad, MT

Personnel: Gregory D. Kushnak

Introduction: With warmer seasonal temperatures becoming the trend, it is possible that previously established optimum spring planting-date windows need to be shifted to an earlier time-frame. The optimum window of April 7 to May 7 at Conrad was determined from planting date studies conducted nearly 30 years ago, when seasonal temperatures were cooler than they are today. A planting date study for spring grains was initiated in 2007 and continued in 2008 to determine whether previous planting-date recommendations are still applicable.

Methods: In 2008, spring wheat (var. Choteau) and barley (var. Hockett) were planted on three dates: May 5, May 14 and May 31. Earlier plantings were not possible due to wet soil conditions, and the last date was delayed a week by rain. Within each date, three rates of seeding were applied: 15, 23 and 30 seeds/sq ft. Nitrogen fertilizer (71 lb/a N) was applied to the spring wheat, but not to the barley in order to enhance plump and test weight for malt quality.

Results, Spring Wheat Dates: Unusually cold temperatures and wet conditions delayed all planting in 2008. Consequently, the calendar dates for the three plantings in 2008 are much later than the analogous treatments in 2007. In 2008, yield, test weight and plant height decreased as planting was delayed beyond May 14 (Table 22).

Yield for the May 31 planting was 10.6 bu/ac lower than for the May 5 planting. Test weight declined 2.3 lb/bu between the May 5 and May 31 plantings, and plant height declined 1.6 inches.

Protein was not affected by planting date in 2008 (Table 22). In 2007, protein increased with delayed planting (Table 23).

Heading dates for the May 14 and May 31 plantings were 3.3 and 12.4 days later, respectively, than for the May 5 planting. Ripening dates for the delayed treatments were 5 and 10 days later, respectively, than for the May 5 planting.

Results, Barley Dates: Yield, test weight and percent plump decreased as planting was delayed beyond May 14 (Table 24).

Yield for the May 31 planting was 11.9 bu/ac lower than for the May 5 planting. Test weight declined 2.4 lb/bu between the May 5 and May 31 plantings, and percent plump declined 2.1%.

Heading dates for the May 14 and May 31 plantings were 5.4 and 15.4 days later, respectively, than for the May 5 planting. Ripening dates for the delayed treatments were 4 and 13 days later, respectively, than for the May 5 planting.

Seeding Rate: No significant interactions between date and rate of seeding occurred for any of the traits in spring wheat and barley. In spring wheat, the 23 and 30 seeds/ft rates were significantly greater than the 15-seed rate for yield, but not for test weight. In barley, yield, test weight and percent plump were not significantly different among seeding rates, but in the previous year (2007) plump significantly increased as seeding rate decreased. Heading date was significantly later for the 15-seed rate in both crops.

Conclusion: In the cooler year of 2008, the entire planting season was shifted to a later time frame. Regardless, within the respective planting time-frames for each year, the effect of delayed planting had similar effects on agronomic performance over the two-year study period (Tables 23 and 25). The results indicate that planting early as the season will allow is the best practice.

Future Plans: The study, in its present design, is concluded. It is suggested that future planting-date studies include both day-length sensitive and insensitive varieties.

Table 22. Planting Dates & Rates - **Spring Wheat**, Conrad 2008

Rate** seeds/ft	Planting Date	Yield bu/a	Test Wt lbs/bu	Height inch	Head date	Protein %	Ripening date
15	May 5	51.0	61.9	28.0	188.8	13.1	Aug 26
23	May 5	54.0	61.7	28.8	188.3	13.0	Aug 25
30	May 5	54.7	61.4	29.0	187.0	13.2	Aug 25
May 5 means:		**53.3** a	**61.7** a	**28.6** a	**188.0** c	**13.1**	**Aug 25**
15	May 14	46.4	61.7	27.3	191.8	12.7	Sep 2
23	May 14	54.0	62.3	28.3	191.3	12.7	Aug 31
30	May 14	56.1	62.2	28.3	190.8	12.8	Aug 31
May 14 means:		**52.2** a	**62.0** a	**27.9** b	**191.3** b	**12.7**	**Sep 1**
15	May 31	41.2	58.9	25.8	201.0	13.5	Sep 7
23	May 31	43.9	59.4	27.3	200.3	13.3	Sep 5
30	May 31	43.1	59.8	28.0	200.0	13.2	Sep 5
May 31 means: *		**42.7** b	**59.4** b	**27.0** c	**200.4** a	**13.3**	**Sep 6**
15	May 5	51.0	61.9	28.0	188.8	13.1	Aug 26
15	May 14	46.4	61.7	27.3	191.8	12.7	Sep 2
15	May 31	41.2	58.9	25.8	201.0	13.5	Sep 7
rate 15 means:		**46.2** b	**60.8** a	**27.0** b	**193.8** a	**13.1**	**Sep 1**
23	May 5	54.0	61.7	28.8	188.3	13.0	Aug 25
23	May 14	54.0	62.3	28.3	191.3	12.7	Aug 31
23	May 31	43.9	59.4	27.3	200.3	13.3	Sep 5
rate 23 means:		**50.7** a	**61.1** a	**28.1** a	**193.3** b	**13.0**	**Aug 31**
30	May 5	54.7	61.4	29.0	187.0	13.2	Aug 25
30	May 14	56.1	62.2	28.3	190.8	12.8	Aug 31
30	May 31	43.1	59.8	28.0	200.0	13.2	Sep 5
rate 30 means:		**51.3** a	**61.1** a	**28.4** a	**192.6** c	**13.1**	**Aug 31**
LSD (.05)		3.77	3.87	0.46	0.42		
C.V. %		9.07	7.62	1.98	0.26		
Date P		.0000***	.0228*	.0000***	.0000***		
Rate P		.0202*	.4074 ns	.0000***	.0000***		
Interaction P		.4836 ns	.4997 ns	.1645 ns	.2930 ns		

* 3rd planting date (May 31) delayed by rain.

** Seed rates are pure live seeds per square foot:
15/ft = 653,400/acre; 23/ft = 1,001,880/acre; 30/ft = 1,306,800/acre

Spring wheat variety: 'Choteau'. Planted on fallow. Fertilizer, actual: 71-52-0.

Location: Western Triangle Ag Research Center, Conrad,MT.

Table 23. 2-yr Summary, Planting Dates & Rates - **Spring Wheat**, Conrad 2007-08.

Planting date	Yield bu/a	Test Wt lbs/bu	Height inch	Head date	Protein %	Ripening date
Apr 27, 2007	34.9	57.7	26.7	178.3	15.5	Aug 8
May 5, 2008	53.3	61.7	28.6	188.0	13.1	Aug 25
2-yr avg.	**44.1**	**59.7**	**27.6**	**183.2**	**14.3**	**Aug 17**
May 7, 2007	33.7	57.1	25.3	182.3	16.2	Aug 8
May 14, 2008	52.2	62.0	27.9	191.3	12.7	Sep 1
2-yr avg.	**43.0**	**59.6**	**26.6**	**186.8**	**14.5**	**Aug 20**
May 17, 2007	25.7	56.7	23.3	188.3	16.7	Aug 15
May 31, 2008	42.7	59.4	27.0	200.4	13.3	Sep 6
2-yr avg.	**34.2**	**58.1**	**25.2**	**194.4**	**15.0**	**Aug 26**
Rate** seeds/ft						
rate 15	30.0	57.0	25.7	183.5	16.2	
rate 15	46.2	60.8	27.0	193.8	13.1	
2-yr avg.	**38.1**	**58.9**	**26.3**	**188.7**	**14.7**	
rate 23	32.3	57.2	25.0	182.7	16.2	
rate 23	50.7	61.1	28.1	193.3	13.0	
2-yr avg.	**41.5**	**59.2**	**26.6**	**188.0**	**14.6**	
rate 30	31.9	57.3	24.7	182.7	16.1	
rate 30	51.3	61.1	28.4	192.6	13.1	
2-yr avg.	**41.6**	**59.2**	**26.5**	**187.7**	**14.6**	

** Seed rates are pure live seeds per square foot:
15/ft = 653,400/acre; 23/ft = 1,001,880/acre; 30/ft = 1,306,800/acre
Spring wheat variety: 'Choteau'. Planted on fallow. Fertilizer, actual: 71-52-0.
Location: Western Triangle Ag Research Center, Conrad,MT.

Table 24. Planting Dates & Rates - **Barley**, Conrad 2008

Rate** seeds/ft	Planting Date	Yield bu/a	Test Wt lbs/bu	Plump %	Thin %	Height inch	Head date	Protein %	Ripe date
15	May 5	74.7	53.9	97.0	1.0	27.0	186.3	9.1	Aug18
23	May 5	72.9	53.9	96.3	1.0	26.3	186.3	8.7	Aug18
30	May 5	74.9	53.6	95.3	1.2	27.3	185.3	8.6	Aug18
May 5 means:		**74.1** a	**53.8** a	**96.2** a	**1.1** b	**26.8** a	**185.9** c	**8.8**	**Aug18**
15	May 14	72.6	52.0	97.5	0.8	26.0	192.3	9.3	Aug23
23	May 14	77.2	53.0	97.3	0.9	26.3	191.3	8.7	Aug21
30	May 14	82.2	53.2	97.0	0.9	26.0	190.5	9.2	Aug21
May 14 means:		**77.3** a	**52.7** b	**97.3** a	**0.9** b	**26.1** a	**191.3** b	**9.1**	**Aug22**
15	May 31	56.3	51.4	94.8	1.2	26.5	201.8	8.9	Sep1
23	May 31	65.3	51.4	94.0	1.7	26.5	201.0	9.1	Aug30
30	May 31	65.1	51.5	93.5	1.7	26.3	201.0	9.0	Aug30
May 31 means: *		**62.2** b	**51.4** c	**94.1** b	**1.5** a	**26.4** a	**201.3** a	**9.0**	**Aug31**
15	May 5	74.7	53.9	97.0	1.0	27.0	186.3	9.1	Aug 18
15	May 14	72.6	52.0	97.5	0.8	26.0	192.3	9.3	Aug 23
15	May 31	56.3	51.4	94.8	1.2	26.5	201.8	8.9	Sep 1
rate 15 means:		**67.8** a	**52.5** a	**96.4** a	**1.0** a	**26.5** a	**193.4** a	**9.1**	**Aug 24**
23	May 5	72.9	53.9	96.3	1.0	26.3	186.3	8.7	Aug 18
23	May 14	77.2	53.0	97.3	0.9	26.3	191.3	8.7	Aug 21
23	May 31	65.3	51.4	94.0	1.7	26.5	201.0	9.1	Aug 30
rate 23 means:		**71.8** a	**52.8** a	**95.8** a	**1.2** a	**26.3** a	**192.8** b	**8.8**	**Aug 23**
30	May 5	74.9	53.6	95.3	1.2	27.3	185.3	8.6	Aug 18
30	May 14	82.2	53.2	97.0	0.9	26.0	190.5	9.2	Aug 21
30	May 31	65.1	51.5	93.5	1.7	26.3	201.0	9.0	Aug 30
rate 30 means:		**74.1** a	**52.7** a	**95.3** a	**1.3** a	**26.5** a	**192.3** c	**8.9**	**Aug 23**
LSD (.05)		6.85	0.70	1.27	0.30	0.74	0.41		
C.V. %		11.41	1.58	2.22	30.87	3.31	0.25		
Date P		.0003***	.0000***	.0001***	.0005***	.1306 ns	.0000***		
Rate P		.1873 ns	.6176 ns	.1917 ns	.1638 ns	.8654 ns	.0000***		
Interaction P		.6381 ns	.4594 ns	9461 ns	.7337 ns	.5706 ns	.0863 ns		

* 3rd Planting date (May 31) delayed by rain.
** Seed rates are pure live seeds per square foot:
15/ft = 653,400/acre; 23/ft = 1,001,880/acre; 30/ft = 1,306,800/acre
Barley variety: 'Hockett'. Planted on fallow. Fertilizer, actual: 11-52-0.
Location: Western Triangle Ag Research Center, Conrad,MT.

Table 25. Two-year Summary, Planting Dates & Rates - **Barley**, Conrad 2007-08.

Planting Date	Yield bu/a	Test Wt lbs/bu	Plump %	Thin %	Height inch	Head date	Protein %	Ripe date
Apr 27, 2007	69.0	50.8	62.1	9.0	25.7	175.3	12.4	July31
May 5, 2008	74.1	53.8	96.2	1.1	26.8	185.9	8.8	Aug18
2-yr avg.	**71.6**	**52.3**	**79.2**	**5.1**	**26.2**	**180.6**	**10.6**	**Aug 9**
May 7, 2007	65.6	48.9	56.1	13.9	25.0	179.8	13.0	July31
May 14, 2008	77.3	52.7	97.3	0.9	26.1	191.3	9.1	Aug22
2-yr avg.	**71.5**	**50.8**	**76.7**	**7.4**	**25.6**	**185.6**	**11.0**	**Aug 11**
May 17, 2007	47.9	46.9	44.2	22.4	23.7	188.8	15.5	Aug 9
May 31, 2008	62.2	51.4	94.1	1.5	26.4	201.3	9.0	Aug31
2-yr avg.	**55.1**	**49.2**	**69.2**	**12.0**	**25.0**	**195.1**	**12.3**	**Aug 20**
Rate** seeds/ft								
rate 15	59.6	48.9	58.7	12.2	25.3	181.9	13.6	
rate 15	67.8	52.5	96.4	1.0	26.5	193.4	9.1	
2-yr avg.	**63.7**	**50.7**	**77.6**	**6.6**	**25.9**	**187.7**	**11.4**	
rate 23	62.9	49.2	56.7	14.1	25.0	181.0	13.5	
rate 23	71.8	52.8	95.8	1.2	26.3	192.8	8.8	
2-yr avg.	**67.4**	**51.0**	**76.3**	**7.7**	**25.7**	**186.9**	**11.2**	
rate 30	60.0	48.6	47.1	19.0	24.0	180.9	13.8	
rate 30	74.1	52.7	95.3	1.3	26.5	192.3	8.9	
2-yr avg.	**67.1**	**50.7**	**71.2**	**10.2**	**25.3**	**186.6**	**11.4**	

** Seed rates are pure live seeds per square foot:
15/ft = 653,400/acre; 23/ft = 1,001,880/acre; 30/ft = 1,306,800/acre
Barley variety: 'Hockett'. Planted on fallow. Fertilizer, actual: 11-52-0.
Location: Western Triangle Ag Research Center, Conrad,MT.

Title: **Evaluation of Solid- and Hollow-Stem Winter Wheat Variety Mixtures for Control of Sawfly-Induced Stem Lodging.**

Year: 2008

Location: Western Triangle Research Center, Conrad, MT

Personnel: Gregory D. Kushnak

Introduction: Lodging associated with sawfly stem-cutting is sometimes delayed when cut stems lean against supporting un-cut stems, or when un-cut stems block wind that would otherwise break the cut stems over. This study was conducted to measure the amount of lodging-reduction in a hollow-stem variety by the presence of un-cut stems of a solid-stem variety.

Methods: The solid-stem sawfly-resistant winter wheat variety Genou was planted with the hollow-stem sawfly-susceptible variety Falcon as a mixed stand. Two levels of seed mixture were included: 25% Genou + 75% Falcon; and 50% Genou + 50% Falcon. Both mixtures were compared to pure stands of each variety.

Lodging in this study was defined as stems horizontal on or near the ground. Lodging was measured on a "timely-harvest" basis – no more than two days beyond dead-ripe. Harvest was not delayed, and therefore no temporal data were obtained. The study was grown at two locations in the Western Triangle Area.

Results: Stem lodging from sawfly cutting was less than 10% for Genou, and greater than 80% for Falcon. Lodging was substantially less for the variety-mixture treatments than for Falcon, but considerably greater than for Genou (Tables 26 – 27).

Yields were not significantly different among treatments, and test weights and protein percentages were not significantly greater than for Genou.

Conclusion: Stem lodging of the mixture treatments, though less than Falcon, was greater than for Genou. Consequently, Genou was the easiest to harvest with the combine. Yield, test weight and percent protein of the mixture treatments were not greater than for Genou. Therefore, the data indicate no advantage of variety mixtures over pure-stand Genou for lodging control, yield, test weight or percent protein.

Future Plans: This study is concluded.

Table 26. Effect of solid- and hollow-stem variety mixtures on sawfly stem-lodging.

On-Station:

Treatment	% Stem lodging	Yield bu	Test Wt lbs	Protein %
Genou	7.1	56.2 a	61.3 a	11.1
50:50 mix	43.4	50.7 a	61.6 a	10.1
25 Genou:75 Falcon	53.8	51.0 a	61.3 a	10.4
Falcon	82.5	54.6 a	61.3 a	10.6
Average	46.7	53.1	61.3	10.6
LSD.05		7.82	0.67	
C.V.		9.20	0.69	

Location: Western Triangle Ag Research Center, Conrad MT.
Planted Sept 14, 2007.
Harvest: Aug 12, 2008.
Fertilizer: 71-52-0

Table 27. Effect of solid- and hollow-stem variety mixtures on sawfly stem-lodging.

Off-Station:

Treatment	% Stem lodging	Yield bu	Test Wt lbs	Protein %
Genou	7.5	54.1 a	61.6 a	13.9 a
50:50 mix	32.5	55.3 a	60.8 ab	13.5 ab
25 Genou:75 Falcon	38.8	55.6 a	60.1 b	12.9 b
Falcon	86.3	59.7 a	60.8 ab	13.0 ab
Average	41.3	56.2	60.8	13.3
LSD.05		8.98	1.34	0.97
C.V.		9.99	1.37	4.54

Cooperator & location: Bob Inabnit, 20 mi east of Conrad.
Planted Sept 13, 2007
Harvest: Aug 7, 2008.
Fertilizer: 50-30-25
Conducted by Western Triangle Ag Research Center, Conrad MT

Title: Canola variety evaluation.

Year: 2008

Location: Western Triangle Agriculture Research Center, Conrad, MT.

Personnel: Grant Jackson and John Miller, Western Triangle Ag. Research Center, Conrad, MT 59425.

Objectives: To evaluate the performance of canola varieties or hybrids under conventional fallow conditions.

Procedures: Seven canola varieties were seeded into fallow with a six-row, 12 inch spaced, double disk, no-till plot drill. Nitrogen, potassium, and chloride were broadcast and phosphorus was placed with the seed while planting. Plot size was 6 x 25 feet with four replicates. Seeding rate was seven lbs seed/a. Plots were threshed with a Hege plot combine.

Results: The data are summarized in Table 1s.

Table 1s. Dryland canola variety test. The experiment was located at Western Triangle Ag. Research Center, Conrad, MT. 2008.

Variety	Seed yield (lb/a)	Oil content (%)
IS 7145 RR	1535	
DKL 52-41	1410	
Hyola 357 Mag	1403	
HyClass 9? RR	1333	
HyClass 9? RR	1331	
DKL 30-42	1280	
IS 3057 RR	1259	

Summary Statistics

Experimental Means	1365	
Error Mean Square	310	
P-value	0.8890	
C.V.: (s/mean)*100	22.7	
LSD (0.05)	NS	

Notes:
Seeding Date: 4/17/08 Threshed: 8/14/08
Growing Season ppt: 9.98"
Planting Rate: 7 lbs/a Previous Crop: Fallow
Herbicide: Roundup WeatherMax® at 32 oz/a.
Fertilizer: 30-30-0-20

Soil Test	WTARC
pH	7.9
O.M. (%)	2.3
P (ppm)	25
K (ppm)	327
EC (mmhos/cm)	0.48
NO_3-N (0-3', lb/ac)	78

Title: Dryland Spring Pea Variety Performance Trial.

Year: 2008.

Location: Western Triangle Agricultural Research Center, Conrad, MT 59425.

Personnel: Grant Jackson and John Miller, Western Triangle Agricultural Research Center, Conrad, MT 59425.

Objectives: To evaluate spring pea varieties under dryland conventional fallow conditions.

Procedures: Plots were planted into conventional fallow with a five-row no-till plot drill with 12" row spacing. Seeding rate was about five seeds/ft^2. Peas were inoculated with a liquid inoculum. P fertilizer (15 lbs 11-52-0) was placed with the seed. Twenty five lbs of K as KCl was broadcast while planting. Plot size was six by 25 feet with four replications. Plots were direct cut with a Hege plot combine.

Results: Seed yield are summarized in Table 2s.

Table 2s. Dryland spring pea performance nursery trial located at Western Triangle Agricultural Research Center, Conrad, MT. 2008.

Variety	Seed Yield (lbs./a)
PS01102958	2287 a
PS9910140	2203 a
Delta	2177 a
Mozart	2033 ab
Admiral	1966 ab
Stirling	1887 ab
Majoret	1884 abc
PS0010836	1877 abc
Medora	1811 abc
MSUPBL29	1598 bc
Cruiser	1592 bc
Aragorn	1533 bc
Amigo	1459 c
MSUPBL19	1433 c

Summary Statistics

Experimental Means	1836
Error Mean Square	353
P-Value (≤ 0.05)	0.0103
C.V. 1: (s/mean)*100	19.2
LSD (0.05)	583

Notes:Planted: 4/28 Harvested: 8/26 Fertilizer: 6-30-25 Herbicide: Basagran@1.5 pt/a
Previous Crop: Conventional Fallow Growing Season ppt.: 7.54"

Title: Effect of Headline and Stratego fungicides and KCl on the yield and quality of irrigated, no-till malt barley.

Year: 2008

Location: Western Triangle Ag. Research Center, Conrad.

Personnel: Mary Burrows, Grant Jackson, Ken Baker, and John Miller

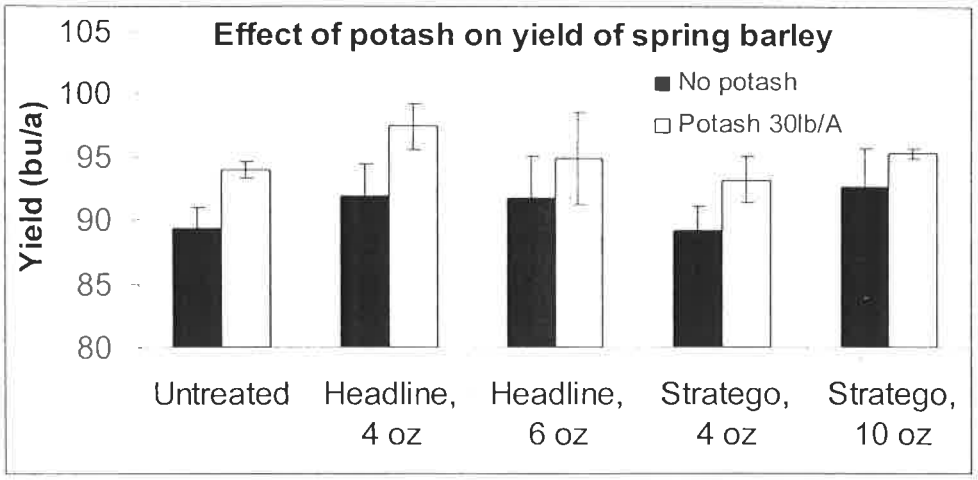
Objectives: Determine the plant health benefit of fungicides and KCl (potash) on irrigated, no-till malt barley

Procedures: Merit barley was planted into barley stubble, no-till on April 28. Blanket fertilizer rate was 100-30-0. Phosphorus (monoammonium phosphate) fertilizer were applied with the seed and N and KCl was applied broadcast while planting. Plots (5' x 25') were established as a randomized complete block with four replications in late May. Fungicide applications were made at tillering on 9 June, 2008. All fungicide applications were made with a handheld, CO_2-powered spray boom with four TeeJet® Flat Fan 8002E nozzles spaced at 12 inch intervals. Air pressure was 30 PSI and all fungicides were applied in a volume of 20 GPA. The boom was held approximately 1 foot above the crop canopy. Plots were irrigated as needed.

Treatments were as follows:
1 = Untreated
2 = 30 lbs of K_2O/acre
3 = Headline, 4 oz/acre
4 = Headline, 6 oz/acre
5 = Stratego, 4 oz/acre
6 = Stratego, 10 oz/acre
7 = Headline 4 oz + 30 lbs of K_2O/acre
8 = Headline 6 oz + 30 lbs of K_2O/acre
9 = Stratego 4 oz + 30 lbs of K_2O/acre
10 = Stratego 10 oz + 30 lbs of K_2O/acre

Results: Grain yield results are shown in Figure 1. No phytotoxicity was observed due to any of the treatments. The spot form of net blotch was noted at very low incidence and severity in late June. No visual differences were observed due to treatment. Average yield was 93 bu/a. No overall differences in yield were observed, but a trend was observed in the data that potash increased yield. When a contrast was run it did show potash-treated plot yield was significantly different than non-treated plots (P = 0.011). The average yield benefit due to potash amendment was approximately 4 bu/A. This is typical response to KCl in the area, and there were no interactions with the fungicide treatments. Average plumps were 93%, thins were 3% and protein was 11%. No differences in plumps, thins, or protein was noted due to treatment.

Figure 1. Effect of fungicides and KCl (potash) on spring barley.



Title: Phosphorus soil test as affected by sample depth, row position, and field location, in a no-till cropping system.

Year: 2008

Locations: East of Conrad (Bjelland Farm)
North of Cut Bank (Bradley Farm)
Northwest of Cut Bank (Broberg Farm)
North of Joplin (Moog Farm)

Objectives: To determine the extent and stratification of extractable soil P in a no-till cropping system; to determine the effect lime, field location and row position on extractable soil P.

Procedures: Small grain fields (two fields per cooperator) that have been chemical fallowed since 1994 (other site characteristics are shown in Table 3s.) were sampled in April 2008. Fields were sampled to the six inch depth in two inch increments with a two inch diameter probe in the bottom of the furrow of the previous crop, on the side of the ridge, and on the top of the ridge between rows. Three locations per field were sampled: top of the ridge, mid slope, and toe slope. Thus each field was sampled nine times. Samples were dried and analyzed for sodium bicarbonate extractable P and lime ($CaCO_3$). Data were analyzed by multiple regression.

Table 3s. Planter and other location characteristics. Western Triangle Ag. Research Center. 2008.

Cooperator	Planter row space, inches	Opener
Bjelland	9	Narrow Point
Bradley	12	Narrow Point
Broberg	12	Narrow Point
Moog	12	4" shovel, paired row

Results: Multiple regression analysis indicates the only important variable affecting soil test P was the sample depth. These data are shown in Figure 1. The other site variables, such as the position of the soil sample relative to the planted row, had no effect as shown in Table 4s. However the Moog location was an exception. Soil test P was the lowest in the bottom of the furrow in contrast to the other locations. This was probably caused by the paired row opener.

Figure 1. Phosphorus Soil Test as Influenced by Soil Depth

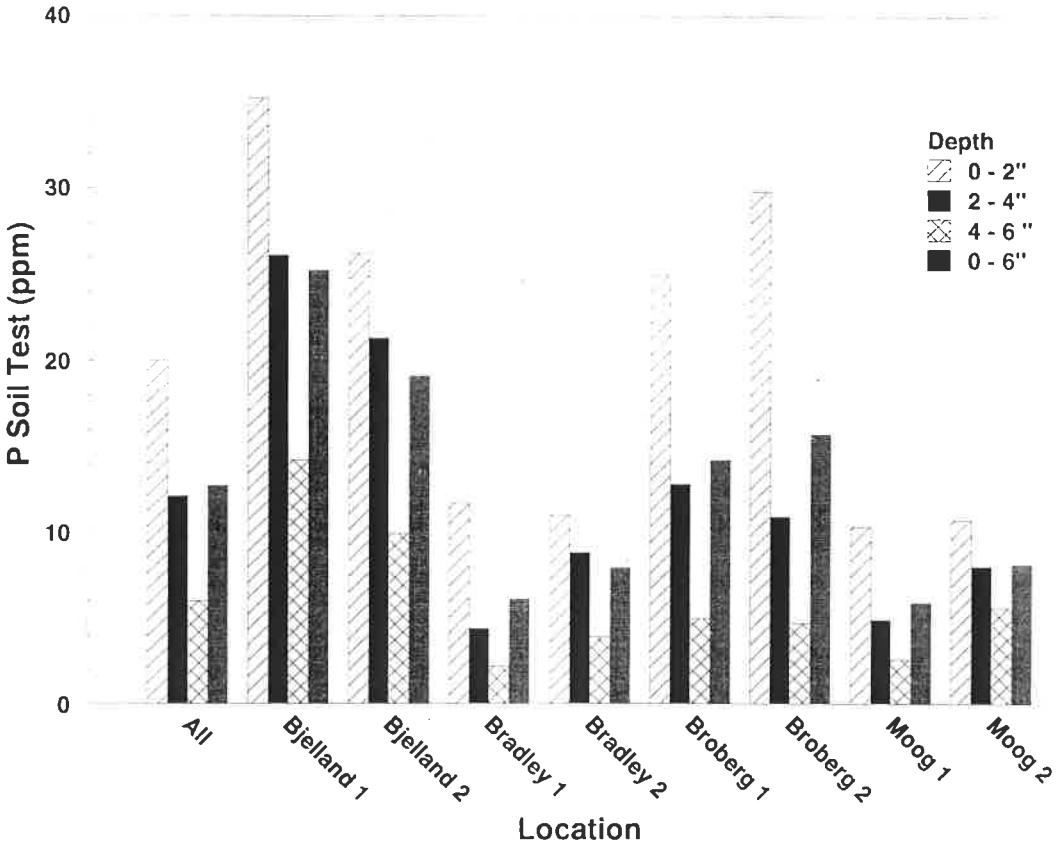


Table 4s. Effect of sample depth and row position on soil test P and lime. Western Triangle Ag. Research Center. 2008.

	Bjelland Fields 1 and 2						Bradley Fields 1 and 2					
	Position 1		Position 2		Position 3		Position 1		Position 2		Position 3	
Depth	P	$CaCO_3$	P	$CaCO_3$	P	$CaCO_3$	P	$CaCO_3$	P	$CaCO_3$	P	$CaCO_3$
Inches	ppm	%	ppm	%	ppm	%	ppm	%	ppm	%	ppm	%
0-2"	31	0.22	29.8	0.10	31.3	0.23	13.8	2.32	11	2.33	9.2	2.47
2-4"	23.5	0.8	24.7	0.55	23.0	0.75	4.8	2.98	7	2.58	8.0	2.68
4-6"	11	1.7	14.3	1.25	10.8	1.83	3.0	3.45	3.5	2.85	2.7	3.48
0-6"	21.8	0.89	22.9	0.63	21.7	0.94	7.2	2.92	7.2	2.59	6.6	2.88
	Broberg Fields 1 and 2						Moog Fields 1 and 2					
	Position 1		Position 2		Position 3		Position 1		Position 2		Position 3	
Depth	P	$CaCO_3$	P	$CaCO_3$	P	$CaCO_3$	P	$CaCO_3$	P	$CaCO_3$	P	$CaCO_3$
inches	ppm	%	ppm	%	ppm	%	ppm	%	ppm	%	ppm	%
0-2"	32.5	1.30	24.7	1.52	24.8	1.20	7.7	2.50	11.0	2.38	12.8	2.65
2-4"	9.7	3.73	10.2	3.22	15.7	2.47	4.3	3.07	6.7	2.57	8.3	2.35
4-6"	4.5	5.80	3.8	5.38	6.2	4.98	3.2	4.77	5.0	5.68	4.0	3.32
0-6"	15.6	3.61	12.9	3.37	15.6	2.88	5.1	3.44	7.6	3.54	8.4	2.77

Title: Improving Nitrogen Use Efficiency in Spring Wheat Using Sensing Technology and Split Applications of Nitrogen.

Year: 2008

Location: Western Triangle Ag. Research Center

Personnel: Grant Jackson and John Miller, Western Triangle Ag. Research Center, Conrad, MT 59425;

Objectives:

1. To determine the optimum sensor light frequencies for spring wheat in Montana;
2. To establish relationships between vegetation indices determined by a universal radiometer sensor and fertilizer N, pre-plant soil N, flag leaf N, SPAD chlorophyll meter readings, total plant yield, grain yield, and grain protein content of irrigated spring wheat.

Procedures: An irrigated location was established at WTARC using spring wheat cultivars of Vida, McNeal, and Choteau with four N rates that depend upon the initial soil N status. Crop N indices will be determined with a radiometer sensor after planting, at tillering, at heading, immediately after flowering, and after grain fill. Flag leaf N analysis, and SPAD chlorophyll meter readings will be taken at heading. The plots will be divided into two subplots to receive 0 and 40 lbs N/ac after flowering followed by irrigation. Total yield and total crop N uptake will be determined at crop maturity, and grain yield and protein content determined after ripening. Grain yield and protein content response to N will be regressed against the measures of crop N status and vegetation indices to determine their effectiveness in detecting crop N deficiencies. Nitrogen as urea and 25 lbs/acre of potassium (K) as KCl were applied while seeding in a band approximately one inch above and to the side of the seed row. All plots received 30 lbs P_2O_5/ acre as 11-52-0 applied with seed as well as KCl. Soils were sampled initially for water and nitrate-N in one foot increments to a depth of three feet. Surface soil samples (0-6") were collected for standard soil analyses of pH, organic matter, phosphorus, etc. Results are shown in below along with other site characteristics. Plots were harvested with a small plot combine, and the grain weighed and tested for protein content and test weight. Plot size was 5 rows wide (12 inch spacing) and 25 feet long.

Planting Date: April 28 — Previous Crop: Fallow
Harvest Date: September 10 — Growing Season Rainfall: 7.9"
Number of Irrigations: 4 — Total irrigation water applied: 10.1"
Soil Analysis: pH = 6.8; O.M. = 1.9 %; P = 31 ppm; K = 462 ppm; EC = 0.51 mmhos/cm; Nitrate N = 65 lbs/acre (0-3')

Results: Grain yield and other agronomic data are summarized in Table 5s.

Table 5s. Effect of nitrogen and variety on agronomic characteristics of spring wheat. Western Triangle Ag. Research Center. 2008.

Variety	Initial N Rate	Topdress N Rate	Grain yield	Grain Protein	Test Weight	Total Yield	Plant N Content
	lbs/ac		bu/ac	%	lb/bu	cwt/ac	%
Choteau	0	0	57.3	10.7	60.1	80.5	
Choteau	80	0	80.6	12.0	60.4	117.7	
Choteau	160	0	91.7	13.4	60.4	122.7	
Choteau	240	0	86.5	14.9	59.5	128.7	
Choteau	0	40	59.3	11.9	60.4	89.7	
Choteau	80	40	78.0	13.3	60.2	119.9	
Choteau	160	40	89.2	14.1	60.0	137.1	
Choteau	240	40	88.9	15.0	59.8	141.7	
McNeal	0	0	52.2	10.2	61.0	74.3	
McNeal	80	0	78.0	11.6	61.4	131.2	
McNeal	160	0	77.1	13.5	61.1	130.1	
McNeal	240	0	87.1	14.1	60.8	141.5	
McNeal	0	40	51.5	11.7	60.7	75.6	
McNeal	80	40	76.6	12.6	61.2	115.0	
McNeal	160	40	78.5	13.2	61.0	131.5	
McNeal	240	40	87.6	14.3	60.8	139.7	
Vida	0	0	61.3	10.3	61.0	75.4	
Vida	80	0	77.5	12.0	60.9	129.5	
Vida	160	0	78.1	12.1	60.1	129.7	
Vida	240	0	94.9	14.1	59.7	143.5	
Vida	0	40	60.5	11.4	61.1	86.8	
Vida	80	40	82.3	12.5	60.8	136.4	
Vida	160	40	75.9	12.5	60.1	116.4	
Vida	240	40	91.9	14.3	58.7	136.7	
Variety Summary							
Choteau			79.0 a	13.1 a	61.0 a	117.2 a	
McNeal			73.7 a	12.7 ab	60.3 b	117.4 a	
Vida			77.7 a	12.2 b	60.1 b	119.3 a	
Initial N Summary							
0			57.1 c	11.0 d	60.7 bc	79.9 c	
80			78.6 b	12.3 c	60.8 c	124.7 b	
160			81.9 b	13.1 b	60.4 b	128.5 ab	
240			89.4 a	14.4 a	59.9 a	138.9 a	
Flowering N Summary							
0			76.3 a	12.2 a	60.5 a	117.2 a	
40			77.2 a	13.1 b	60.4 a	118.8 a	
Statistical Summary							
Mean			76.8	12.7	60.5	118.0	
CV (%)			7.7	3.1	0.6	15.0	

Table 5s. Statistical Summary - Continued					
N rate x variety, p-value	0.070	0.375	0.008	0.663	
N rate x N top, p-value	0.674	0.002	0.486	0.626	
N rate x N top x variety, p-value	0.783	0.161	0.018	0.988	

Means with the same letter are not significantly different accord to the LSD (p=0.

Title: Evaluation of the effect of Actosol® (humic acid) on irrigated spring wheat

Year: 2008

Locations: Western Triangle Ag. Research Center

Personnel: Grant Jackson and John Miller, Western Triangle Ag. Research Center, Conrad, MT 59425;

Objectives: To evaluate the response of Actosol® on the yield and quality of spring wheat.

Procedures: A coal based humic acid product Actosol® was applied immediately after planting and at tillering at the rates of the material, as supplied, indicated in Table 1. Nitrogen rates were 80 and 160 lbs N/acre as urea topdressed while planting. All plots received 30 lbs P_2O_5/acre as 11-52-0 applied with seed as well as 25 lbs K/acre as KCl applied broadcast while planting. Soils were sampled initially for water and nitrate-N in one foot increments to a depth of three feet. Surface soil samples (0-6") were collected for standard soil analyses of pH, organic matter, phosphorus, etc. Results are shown in below with other site characteristics. Plots were harvested with a small plot combine, and the grain weighed and tested for protein content and test weight. Plot size was five rows wide (12 inch spacing) and 25 feet long.

Planting Date: May 6 Previous Crop: Fallow
Date for second Actosol® Treatment : May 13
Harvest Date: September 10 Growing Season Rainfall: 7.9"
Number of Irrigations: 4 Total irrigation water applied: 10.1"
Soil Analysis: pH = 6.8; O.M. = 1.9 %; P = 31 ppm; K = 462 ppm; EC = 0.51 mmhos/cm;
Nitrate N = 65 lbs/acre (0-3')

Results: As shown in Table 6s, there were no differences in grain yield, test weight, or protein content due to N fertilizer or Actosol®. Results were affected by an early September storm that caused considerable shatter and delayed harvest.

Table 6s. Effect of nitrogen and Actosol® on agronomic characteristics of irrigated spring wheat. Western Triangle Ag. Research Center. 2008.

Treatment	Actosol® rate Planting	Actosol® rate Tillering	N Rate	Grain yield	Grain Protein	Test Weight
No.	Gal/acre		lbs/acre	bu/acre	%	lb/bu
1	2.5	2.5	160	86.9 a	11.3 a	62.1 a
2	5	5	160	82.3 a	11.0 a	62.3 a
3	7.5	7.5	160	82.9 a	11.4 a	62.3 a
4	2.5	2.5	80	84.2 a	11.6 a	62.2 a
5	5	5	80	85.1 a	12.4 a	62.2 a
6	7.5	7.5	80	87.5 a	12.0 a	62.1 a
7	2.5	5	160	83.6 a	11.1 a	62.4 a
8	2.5	5	80	85.6 a	12.1 a	62.3 a
9	0	5	160	82.6 a	11.4 a	62.3 a
10	0	5	80	88.5 a	12.5 a	61.9 a
11	0	0	160	86.2 a	11.6 a	62.1 a
12	0	0	80	82.6 a	10.8 a	62.3 a
Nitrogen Summary						
80 lbs N/acre				85.5 a	11.9 a	62.2 a
160 lbs N/acre				84.6 a	11.3 a	62.3 a
Actosol Summary						
0				84.3 a	11.2 a	62.2 a
5 Gal/acre				85.4 a	12.0 a	62.1 a
5 Gal/acre - split				85.6 a	11.4 a	62.2 a
7.5 Gal/acre				84.6 a	11.6 a	62.4 a
10 Gal/acre				83.7 a	11.7 a	62.3 a
15 Gal/acre				85.2 a	11.7 a	62.2 a
Statistical Summary						
Mean				84.8	11.6	62.2
CV (%)				8.6	9.8	0.4

Means with the same letter are not significantly different accord to the LSD (p=0.05).

Title: Evaluation of winter wheat response to JumpStart® (*Penicillium bilaii*) and phosphorus fertilization.

Year: 2008

Locations: North of Conrad (Western Triangle Ag. Research Center, WTARC)
East of Conrad (Inabnit farm)

Personnel: Grant Jackson and John Miller, Western Triangle Ag. Research Center, Conrad, MT 59425;

Objectives: To evaluate the response of winter wheat to phosphorus fertilization with and without *Penicillium bilaii* seed inoculant (JumpStart®).

Procedures: JumpStart® was applied (6 oz/bu) to Genou winter wheat, and P fertilizer treatments of 0, 10, 20, and 30 lbs P_2O_5/acre as monoammonium phosphate (11-52-0) were applied with the seed with and without JumpStart® in a RCB design with six replications. Nitrogen as urea and KCl were applied while seeding in a band approximately one inch above and to the side of the seed row at the rates indicated in Table 7s. Nitrogen fertilizer rates were adjusted to account for the varying N content of the P fertilizer rate. Soil test results and other site characteristics are shown in Table 7s also. Plots were harvested with a small plot combine, and grain samples were cleaned, allowed to air dry to about 10 % moisture, weighted, and sampled for grain protein analysis.

Results: Grain yield, test weight, protein content, and stand count data are summarized in Tables 8s and 9s. Grain yields and the high yield variability were probably caused by dry soil conditions around the crown area of the winter plants throughout the winter at the WTARC location. At the Inabnit location, grain yields were affected by variable cheat grass infestations.

Grain yield, test weight, protein content, and stand counts were unaffected by Jump-Start® at the Inabnit location. At WTARC JumpStart® reduced grain yield by 5 bu/acre; however, test weight, protein content, and stand counts were unaffected.

Phosphorus fertilization significantly increased grain yield at both locations. Maximum response occurred at 10 lbs P_2O_5/acre; however, P soil tests were high at both locations. These data support the current recommendation of 10 to 15 lbs P_2O_5/acre regardless of the P soil test level. Test weight, grain protein, and stand counts were unaffected by P fertilization.

Table 7s. Site characteristics and soil test results. Western Triangle Ag. Research Center. 2008.

	Location	
Character	**WTARC**	**Inabnit**
Planting Date	9-14-2007	9-13-2007
Previous Crop	Conventional fallow	Chemical Fallow
Blanket Fertilizer	60-0-25	50-0-25
Growing Season Precipitation(inches)	7.6	
Harvest Date	8-18-2008	8-7-2008
Autumn Stand Count Date	10-29-2007	10-30-2007
Spring Stand Count Date	4-10-2008	5-16-2008
Soil Test		
pH	7.8	6.7
O.M. (%)	2.0	1.7
P (ppm)	17	27
K (ppm)	380	446
EC (mmhos/cm)	0.42	0.27
NO_3-N (0-3', lb/ac)	39	123

Table 8s. Effect of JumpStart® and Phosphorus on Genou winter wheat. Western Triangle Ag. Research Center. 2008.

Jump Start	P Rate	Grain yield	Grain Protein	Test Weight	Autumn Stand Ct	Spring Stand Ct
	lbs P_2O_5/ac	bu/ac	%	lb/bu	plants/ft	plants/ft
No	0	45.8	13.1	61.1	15.0	13.3
No	10	48.7	13.1	61.5	14.8	15.3
No	20	53.7	12.9	62.6	16.5	16
No	30	52.5	12.9	62.4	14.0	11.8
Yes	0	37.7	13.4	60.0	15.2	18.3
Yes	10	46.2	13.1	60.8	17.3	14.8
Yes	20	49.2	12.8	62.4	12.5	12
Yes	30	47.6	13.0	61.8	16.0	16.3
JumpStart® Summary						
No		50.2 a	13.0 a	61.9 a	15.0 a	14.0 a
Yes		45.6 b	13.1 a	61.3 a	15.3 a	15.4 a
P Rate Summary						
0		41.7 b	13.3 a	60.5 c	15.0 a	15.8 a
10		47.5 a	13.1 ab	61.2 bc	16.2 a	15.1 a
20		51.5 a	12.9 b	62.5 a	14.5 a	14.0 a
30		50.0 a	13.0 b	62.1 ab	15.0 a	14.1 a
Statistical Summary						
Mean		47.7	13.1	61.6	15.2	14.7
CV (%)		14.3	2.4	2.0	20.2	31.9
Interaction p-value		0.790	0.597	0.817	0.060	0.067

Means with the same letter are not significantly different accord to the LSD (p=0.05).

Table 9s. Effect of JumpStart® and Phosphorus on Genou winter wheat. Western Triangle Ag. Research Center. Conrad East Location. 2008.

Jump Start	P Rate	Grain yield	Grain Protein	Test Weight	Autumn Stand Ct	Spring Stand Ct
	lbs P_2O_5/ac	bu/ac	%	lb/bu	plants/ft	plants/ft
No	0	44.7	13.5	62.1	16.2	17.8
No	10	50.0	13.5	62.7	17.2	19.7
No	20	51.3	13.5	62.9	12.7	16.3
No	30	52.0	13.6	62.4	12.0	13.8
Yes	0	45.0	13.5	62.7	10.8	12.2
Yes	10	47.9	13.3	62.6	16.5	20.5
Yes	20	51.5	13.6	62.9	14.0	18.2
Yes	30	48.4	13.6	63.0	13.0	15.3
JumpStart® Summary						
No		49.5 a	13.5 a	62.6 a	14.5 a	16.9 a
Yes		48.2 a	13.5 a	62.8 a	15.6 a	16.5 a
P Rate Summary						
0		44.9 a	13.5 a	62.4 a	13.5 b	15.0 a
10		49.0 b	13.4 a	62.6 a	16.8 a	20.1 a
20		51.4 b	13.5 a	62.9 a	13.3 b	17.3 a
30		50.2 b	13.6 a	62.7 a	12.5 b	14.6 a
Statistical Summary						
Mean		48.9	13.5	62.7	14.0	16.7
CV (%)		9.6	2.8	2.2	23.1	36.6
Interaction p-value		0.691	0.826	0.889	0.061	0.400

Means with the same letter are not significantly different accord to the LSD (p=0.05).

Title: Response of winter wheat to Nutrisphere-N® and Avail® treated phosphorus fertilizers.

Year: 2008

Locations: North of Conrad (Western Triangle Ag. Research Center, WTARC)
East of Conrad (Inabnit farm)

Personnel: Grant Jackson and John Miller, Western Triangle Ag. Research Center, Conrad, MT 59425;

Objectives: To compare Nutrisphere-N® (NSN) with urea and monoammonium phosphate (11-52-0) with and without Avail®.

Procedures: NSN treated urea, urea, monoammonium P with and without Avail® fertilizers were applied in a RCB field plot design with four replications to Genou winter wheat while planting according to the treatments listed in Tables 11s and 12s. Except for treatment 26, all plots received 25 lbs K/acre as KCl. Nitrogen fertilizers and KCl were applied while seeding in a band approximately one inch above and to the side of the seed. Nitrogen fertilizer rates were adjusted to account for the varying N content of the P fertilizer rate. Soil test results and other site characteristics are shown in Table 10s. Plots were harvested with a small plot combine, and grain samples were cleaned, allowed to dry to about 10 % moisture, weighted, and sampled for grain protein analysis.

Results: Grain yield, test weight, and protein content data are summarized in Tables 2 and 3. Grain yields and the high yield variability were probably caused by dry soil conditions around the crown area of the winter plants throughout the winter at the WTARC location. At the Inabnit location, grain yields were affected by variable cheat grass infestations.

Table 10s. Site characteristics and soil test results. Western Triangle Ag. Research Center. 2008.

	Location	
Character	**WTARC**	**Inabnit**
Planting Date	9-14-2007	9-13-2007
Previous Crop	Conventional fallow	Chemical Fallow
Blanket Fertilizer	0-0-25	0-0-25
Growing Season Precipitation(inches)	7.6	NA
Harvest Date	8-18-2008	8-7-2008
Autumn Stand Count Date	10-29-2007	10-30-2007
Spring Stand Count Date	4-10-2008	5-16-2008
Herbicide Date applied	Brox-M @ 1.5 pt/a 5-10-2008	LV-6 @ 6 oz/a & Ally @1/10 oz/a. 5-16-2008
Soil Test		
pH	7.8	6.7
O.M. (%)	2.0	1.7
P (ppm)	17	27
K (ppm)	380	446
EC (mmhos/cm)	0.42	0.27
NO_3-N (0-3', lb/ac)	39	123

Table 11s. Effect of Nutrisphere-N® and Avail® treated Phosphorus fertilizer on Genou winter wheat. Western Triangle Ag. Research Center. WTARC Location. 2008.

Treatment					Yield	Test WT.	Protein
No.	N Rate	P Rate	NSN	Avail	bu/ac	lb/bu	%
1	0	0	No	No	40.8	62.3	9.6
2	40	0	No	No	54.1	62.5	10.4
3	80	0	No	No	**63.0**	62.1	11.9
4	0	15	No	No	46.3	62.4	9.5
5	40	15	No	No	56.2	62.3	10.6
6	80	15	No	No	57.2	61.7	12.1
7	0	30	No	No	45.4	61.8	9.0
8	40	30	No	No	54.5	61.8	10.2
9	80	30	No	No	52.9	62.0	11.5
10	0	15	No	Yes	44.6	61.9	8.9
11	40	15	No	Yes	53.9	62.0	10.4
12	80	15	No	Yes	60.2	61.5	12.0
13	0	30	No	Yes	49.1	62.1	8.4
14	40	30	No	Yes	60.3	62.4	10.2
15	80	30	No	Yes	60.1	61.8	11.9
16	40	0	Yes	No	60.7	**62.5**	10.0
17	80	0	Yes	No	60.3	60.9	12.0
18	40	15	Yes	No	60.3	62.1	10.1
19	80	15	Yes	No	57.0	61.0	**12.2**
20	40	30	Yes	No	60.6	62.3	9.9
21	80	30	Yes	No	62.1	61.4	11.8
22	40	15	Yes	Yes	55.4	62.3	11.0
23	80	15	Yes	Yes	59.9	61.1	11.9
24	40	30	Yes	Yes	61.2	62.3	9.6
25	80	30	Yes	Yes	59.6	61.7	12.0
26	80 no K	30 no K	No	No	60.1	61.6	11.7
Statistical Summary							
Mean					55.9	61.9	10.7
Treatment p value					0.118	0.0214	0.000
LSD (0.05)					NS	1.0	1.4
CV (%)					18.1	1.1	9.3
Contrast Treat 9 vs. 26					0.319	0.350	0.804
Contrast Treat 2, 5, 8, 11, 14 vs 16, 18, 20, 22, 24					0.232	0.628	0.487
Contrast Treat 3, 6, 9, 12, 15 vs 17, 19, 21, 23, 25					0.824	0.009	0.704
Contrast Treat 1, 4, 7, 10, 13 vs 2, 5, 8, 11, 14					0.002	0.685	0.000
Contrast Treat 1, 4, 7, 10, 13 vs 16, 18, 20, 22, 24					0.000	0.374	0.002
Contrast Treat 1, 4, 7, 10, 13 vs 3, 6, 9, 12, 15					0.000	0.158	0.000
Contrast Treat 1, 4, 7, 10, 13 vs 17, 19, 21, 23, 25					0.000	0.000	0.000
Contrast Treat 2, 5, 8, 11, 14 vs 3, 6, 9, 12, 15					0.370	0.071	0.000
Contrst Treat 16, 18, 20 , 22, 24 vs 17, 19, 21, 23, 25					0.937	0.000	0.000

Table 1. Continued.			
	Yield	Test WT.	Protein
	bu/ac	lb/bu	%
Contrast Treat 16, 18, 20, 22, 24 vs 3, 6, 9, 12, 15	0.763	0.023	0.000
Contrast Treat 1, 2, 3, 16, 17 vs 4, 5, 6, 18, 19	0.998	0.397	0.704
Contrast Treat 1, 2, 3, 16, 17 vs 10, 11, 12, 22, 23	0.848	0.123	0.849
Contrast Treat 4, 5, 6, 18, 19 vs 7, 8, 9, 20, 21	0.920	0.791	0.197
Contrast Treat 10, 11, 12, 22, 23 vs 13, 14, 15, 24, 25	0.309	0.164	0.192
Contrast Treat 4, 5, 6, 18, 19 vs 10, 11, 12, 22, 23	0.664	0.755	0.788
Contrast Treat 7, 8, 9, 20, 21 vs 13, 14, 15, 24, 25	0.355	0.338	0.837
Contrast Treat 10, 11, 12, 22, 23 vs 7, 8, 9, 20, 21	0.925	0.659	0.270

Table 12s. Effect of Nutrisphere-N® and Avail® treated Phosphorus fertilizer on Genou winter wheat. Western Triangle Ag. Research Center. Conrad East Location. 2008.

Treatment					Yield	Test WT.	Protein
No.	N Rate	P Rate	NSN	Avail	bu/ac	lb/bu	%
1	0	0	No	No	38.2	61.9	12.4
2	30	0	No	No	47.7	62.4	11.9
3	60	0	No	No	**50.5**	61.2	12.7
4	0	15	No	No	47.7	62.6	12.5
5	30	15	No	No	53.1	61.4	12.7
6	60	15	No	No	55.1	61.5	13.4
7	0	30	No	No	56.9	62.3	12.6
8	30	30	No	No	51.0	60.2	12.9
9	60	30	No	No	55.3	61.2	13.4
10	0	15	No	Yes	57.8	61.3	12.8
11	30	15	No	Yes	49.4	61.2	12.9
12	60	15	No	Yes	55.6	60.5	13.2
13	0	30	No	Yes	54.7	60.6	12.6
14	30	30	No	Yes	53.1	60.7	13.3
15	60	30	No	Yes	50.1	60.4	13.1
16	30	0	Yes	No	51.1	**61.3**	12.5
17	60	0	Yes	No	45.3	61.6	13.1
18	30	15	Yes	No	51.1	61.9	12.1
19	60	15	Yes	No	56.5	60.0	**13.0**
20	30	30	Yes	No	**59.4**	62.1	12.4
21	60	30	Yes	No	57.7	62.8	12.9
22	30	15	Yes	Yes	57.5	**63.0**	12.7
23	60	15	Yes	Yes	57.4	60.6	13.1
24	30	30	Yes	Yes	56.6	61.5	12.7
25	60	30	Yes	Yes	57.2	60.2	13.2
26	60 no K	30 no K	No	No	58.1	61.6	**13.7**
Statistical Summary							
Mean					53.4	61.4	12.8
Treatment p-value					0.008	0.325	0.081
LSD (0.05)					11.4	NS	NS
CV (%)					10.6	2.2	4.4
Contrast Treat 9 vs. 26					0.544	0.728	0.478
Contrast Treat 2, 5, 8, 11, 14 vs 16, 18, 20, 22, 24					0.014	0.107	0.193
Contrast Treat 3, 6, 9, 12, 15 vs 17, 19, 21, 23, 25					0.482	0.854	0.614
Contrast Treat 1, 4, 7, 10, 13 vs 2, 5, 8, 11, 14					0.925	0.258	0.480
Contrast Treat 1, 4, 7, 10, 13 vs 16, 18, 20, 22, 24					0.017	0.601	0.535
Contrast Treat 1, 4, 7, 10, 13 vs 3, 6, 9, 12, 15					0.279	0.114	0.008
Contrast Treat 1, 4, 7, 10, 13 vs 17, 19, 21, 23, 25					0.078	0.162	0.029
Contrast Treat 2, 5, 8, 11, 14 vs 3, 6, 9, 12, 15					0.240	0.647	0.046
Contrst Treat 16, 18, 20 , 22, 24 vs 17, 19, 21, 23, 25					0.483	0.062	0.007

Table 3. Continued.			
	Yield	Test WT.	Protein
	bu/ac	lb/bu	%
Contrast Treat 16, 18, 20, 22, 24 vs 3, 6, 9, 12, 15	0.168	0.042	0.002
Contrast Treat 1, 2, 3, 16, 17 vs 4, 5, 6, 18, 19	0.001	0.732	0.327
Contrast Treat 1, 2, 3, 16, 17 vs 10, 11, 12, 22, 23	0.000	0.539	0.067
Contrast Treat 4, 5, 6, 18, 19 vs 7, 8, 9, 20, 21	0.285	0.642	0.689
Contrast Treat 10, 11, 12, 22, 23 vs 13, 14, 15, 24, 25	0.547	0.173	0.820
Contrast Treat 4, 5, 6, 18, 19 vs 10, 11, 12, 22, 23	0.327	0.976	0.581
Contrast Treat 7, 8, 9, 20, 21 vs 13, 14, 15, 24, 25	0.413	0.034	0.448
Contrast Treat 10, 11, 12, 22, 23 vs 7, 8, 9, 20, 21	0.843	0.463	0.607