

The 30th
ANNUAL RESEARCH REPORT
of the
WESTERN TRIANGLE AGRICULTURAL RESEARCH CENTER
Montana Agricultural Experiment Station
Conrad, Montana
2007 Crop Year

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	<u>Page</u>
Weather Summary	1
Winter Wheat Varieties	2
Conrad Intrastate Winter Wheat, Table 1	7
Conrad Intrastate W. Wht. Condensed list, Table 2	9
Conrad W. Wht. Five-year summary, Table 3	11
Spring Wheat and Durum Varieties	12
Conrad Dryland Adv Yield Spr Wheat, Table 4	18
Conrad Dryland Adv Yield Condensed list, Table 5	20
Conrad Dryland Spr Wheat 6-year summary, Table 6	21
Conrad Irrigated Spr Wheat, Table 7	22
Conrad Irrigated 6-year summary, Table 8	23
Cut Bank Spr Wheat, Table 9	24
Cut Bank 5-year summary, Table 10	25
Choteau Spr Wheat, Table 11	26
Choteau 5-year summary, Table 12	27
Oilmont Spr Wheat, Table 13	28
Oilmont 3-year summary, Table 14	29
All Location x Multi-year Spr Wheat, Table 15	30
Dryland Durum, Conrad, Table 16	31
Dryland Durum, 6-year summary, Table 17	32
Irrigated Durum, Conrad, Table 18	33
Irrigated Durum, 6-year summary, Table 19	34
Barley Varieties	35
Conrad Dryland Intrastate Barley, Table 20	38
Conrad Dryland Intrastate Condensed list, Table 21	40
Conrad Dryland Barley 8-year summary, Table 22	41
Conrad Irrigated Intrastate Barley, Table 23	42
Conrad Irrigated Intrastate Condensed list, Table 24	44
Conrad Irrigated Barley 8-year summary, Table 25	45
Irrigated Malt Nursery, Table 26	46
Irrigated Malt 7-year summary, Table 27	47
Cut Bank Barley, Table 28	48
Cut Bank 5-year summary, Table 29	49
Choteau Barley, Table 30	50
Choteau 5-year summary, Table 31	51
Oilmont Barley, Table 32	52
Oilmont 3-year summary, Table 33	53
All Location x Multi-year Barley, Table 34	54
Planting Date & Rate Study, Spring Grains	55
Spring Wheat Planting Date & Rate, Table 35	57
Barley Planting Date & Rate, Table 36	58

Soils Report

Cultural practices for producing barley.	59
Table 1s. Site characteristics and soil test results by location. WTARC. 2007.	60
Table 2s. Effect of nitrogen and variety on agronomic characteristics of dryland barley. Cut Bank location. WTARC. 2007.	61
Table 3s. Effect of nitrogen and variety on agronomic characteristics of dryland barley. Joplin location. WTARC. 2007.	62
Table 4s. Effect of nitrogen and variety on agronomic characteristics of dryland barley. Sunburst location. WTARC. 2007.	63
Table 5s. Effect of nitrogen and variety on agronomic characteristics of dryland barley. WTARC-dryland. WTARC. 2007.	64
Table 6s. Effect of nitrogen and variety on agronomic characteristics of irrigated barley. WTARC location. WTARC. 2007.	65
Effect of nitrogen (N) on camelina seed yield and oil content.	66
Table 7s. Site characteristics and soil test results. WTARC. 2007.	66
Table 8s. Effect of nitrogen on camelina seed yield and oil content. WTARC. 2007.	67
Effect of chloride on the cadmium of two durum varieties.	68
Table 9s. Effect of chloride and variety on yield and cadmium content of dryland spring durum. WTARC. 2007.	69
Table 10s. Effect of chloride and variety on yield and cadmium content of irrigated spring durum. WTARC. 2007.	70
Dryland spring pea variety performance trial:	71
Table 11s. Dryland spring pea performance nursery located at WTARC. 2007.	71
Effect of nitrogen on spring wheat varieties.	72
Table 12s. Site characteristics and soil test results by location. WTARC. 2007.	73
Table 13s. Effect of nitrogen and variety on agronomic characteristics of dryland spring wheat. Cut Bank location. WTARC. 2007.	74
Table 14s. Effect of nitrogen and variety on agronomic characteristics of dryland spring wheat. Ethridge location. WTARC. 2007.	75
Table 15s. Effect of nitrogen and variety on agronomic characteristics of dryland spring wheat. Joplin location. WTARC. 2007.	76

Table 16s. Effect of nitrogen and variety on agronomic characteristics of dryland spring wheat. Sunburst location. WTARC. 2007.	77
Table 17s. Effect of nitrogen and variety on agronomic characteristics of dryland spring wheat. WTARC-dryland. WTARC. 2007.	78
Table 18s. Effect of nitrogen and variety on agronomic characteristics of dryland spring wheat. WTARC-irrigated location. WTARC. 2007.	79
Evaluation of a slow release nitrogen source RUAG 521G33 on irrigated spring wheat.	80
Table 19s. Effect of nitrogen sources on agronomic characteristics of irrigated spring wheat. WTARC. 2007.	81

1
2
3



Summary of climatic data by month for the '06-'07 crop year (September thru August) at the Western Triangle Agricultural Research Center, Conrad, MT.

Month	Precipitation (inches)		Mean Temperature (°F)	
	Current Year	Average (22-yr)	Current Year	Average (22-yr)
September, 2006	1.46	1.10	56.8	57.1
October, 2006	0.64	0.61	40.6	45.2
November, 2006	0.24	0.30	28.5	32.1
December, 2006	0.16	0.17	29.1	25.3
January, 2007	0.06	0.18	25.8	23.4
February, 2007	0.94	0.23	21.7	24.9
March, 2007	0.01	0.45	39.0	33.4
April, 2007	2.16	0.96	39.8	43.7
May, 2007	1.12	1.74	52.4	52.5
June, 2007	1.78	2.94	60.9	59.9
July, 2007	0.05	1.32	74.4	67.2
August, 2007	0.28	1.29	65.3	66.2
Total	8.86	--	--	--
Average	--	11.28	44.5	44.2

Last killing frost in Spring (32°F)

2007----- May 15

Average 1986-2007----- May 17

First killing frost in Fall (32°F)

2007----- Sept 13

Average 1986-2007----- Sept 23

Frost free period (days)

2007----- 121

Average----- 129

Maximum summer temperature----- 103°F (July 7, 2007)

Minimum winter temperature----- -21°F (Nov 29, 2006)

2007 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 2007. 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.

Results: The 2007 winter wheat variety tests at the Western Triangle Ag Research Center near Conrad were able to develop fairly good growth, yield and test weight before the unusually-high heat and moisture stress of mid-summer could fully impact the crop. The early-heading varieties were generally the highest yielders under these conditions. Yields and test weights for 2007 averaged 56 bu/a and 61 lbs/bu, respectively, which were somewhat below the long-term average.

Data for all 2007 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.

Varieties with above-average yield included Carter, Hyalite, Falcon, Ledger, Norris, Pryor, Rocky, Wahoo and Yellowstone.

Among the sawfly resistant varieties, Genou was consistently higher yielding than Vanguard, Rampart and Bynum over the 5-year period. Two hard-white experimental lines, MTS0531 and MTS0532, showed increased yield and stem-solidness over Genou.

Some of the varieties in the test were designed for Clearfield's 'Beyond' herbicide system, including 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.

Above (CO, 2001): IMI resistant (imazamox or 'Beyond' herbicide), as part of American Cyanamid's Clearfield System. 'Beyond' controls cheatgrass, goatgrass and wild oats. 'Above' has stiff straw, medium coleoptile, Winterhardiness = 2. Early maturity. Medium yield and protein, poor quality.

AP502 CL (AgriPro, 2001): Clearfield system IMI resistant. Semidwarf height, early maturity. Low yield & test weight. Medium protein.

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. Long coleoptile. Medium maturity, heading 1-2 days later than Rocky, but 2 days earlier than Neeley, Tiber and Morgan. Yield about equal to Rocky and Neeley, 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.

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

Bynum, MTCL0318 (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 = 14.4. Medium early heading. Average yield. Above average test weight. Average protein.

Darrell (S. Dak., 2006): Medium height. Medium-early heading. High yield & test weight in 2007. Medium protein.

Falcon (CDC, WPB, Sask. 1999): Good winterhardiness (4), similar to Morgan. 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 & Neeley. 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. Test weight equal to Vanguard, 1.5 lb less than Rocky. Protein 1.0% higher than Rocky.

Hawken (AgriPro, 2007): Semidwarf height. Early maturity. Medium yield & high test weight in 2007. Avg 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.

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 = 12, 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.

Millenium (Nebr, 1999): Winterhardiness = 2 or less. Height slightly shorter than Rocky, medium-weak straw. Short coleoptile. Early heading. Average yield and test weight. Below average protein.

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. Has one of the worst sawfly stem-cutting ratings.

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; apparently more sensitive to Nitrogen deficiency. Not for stripe rust areas.

Norris, MTCL 0316 (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. Medium-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.

Ripper (Colorado, 2006): Semidwarf height. Early maturity. High yield and test weight in 2007. Medium protein.

Rocky (Agripro, 1978): A selection from Centurk for soil borne mosaic resistance. Winterhardiness = 2. Medium weak straw, medium height. Long 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, (darker than redwin); 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. Tiber straw seems to persist longer after tillage, thus may enhance conservation compliance. 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.

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

Willow Creek (MSU 2005): Beardless forage winter wheat for hay. HRW class. Winterhardiness = 5. Very tall straw, lodging susceptible. 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 (MT00159, 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. Early heading. High yield and test weight in 2007. High protein.

Gary (Idaho 550, 2001): Hard white. Winterhardiness 3. Semidwarf, med-weak straw. Med-late maturity. High yield, low test wt & 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 MTCL0306 (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. Medium-early maturity. Medium to above-average yield. Average 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.

Nuwest (MSU, General Mills, 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 kernel/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, and higher than Neeley. 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. Early heading. Average yield. Above-average test weight.

Table 1. 2007 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 %
Ripper				67.5	61.8	154	30	12.5
MTS0532		++ HW	20.0	66.0	61.3	158	29	12.9
Pryor	WestBred			65.1	63.3	161	31	11.5
MT0585				63.8	62.6	158	33	12.5
Darrell				62.3	62.0	157	33	12.8
MT0552				62.0	61.1	159	34	13.1
Wahoo	Nebr.			61.6	60.7	155	35	12.7
Falcon	WestBred			60.9	62.1	159	32	12.3
Carter	Westbred		14.8	60.9	62.6	160	30	13.1
MTS04114		HW	18.8	60.8	62.2	158	34	13.0
Alice		HW		60.5	62.1	155	29	13.7
Bond	Colorado	CL		60.5	62.5	154	35	11.7
MT0419				60.3	61.2	163	34	12.9
MT0495				60.3	60.0	161	34	12.7
Rocky	AgriPro			60.1	63.6	158	37	12.1
MTS0531		++ HW	20.3	60.0	62.2	160	30	12.6
BZ9W02-2051				59.9	61.5	163	31	12.3
Ledger	WestBred		10.0	59.7	63.2	160	30	12.1
Norris CL0316	WestBred	CL		59.7	61.7	156	31	12.6
MTCL0477		CL		59.4	57.7	160	33	12.6
MT0554				59.2	60.3	161	37	12.3
Yellowstone	MSU			58.9	61.2	163	34	12.6
WA007976				57.2	59.0	164	31	12.5
NuDakota	AgriPro	HW		56.9	61.3	156	29	12.7
Genou	MSU		19.0	56.8	60.2	159	35	12.8
Hawken	AgriPro			56.6	62.6	153	30	12.8
Wendy	S. Dakota	HW		56.5	62.5	154	28	13.7
Jagalene	AgriPro			56.1	64.8	156	32	12.6
MTCL0537				55.6	60.8	161	34	12.9
MT0565				55.1	59.0	160	32	13.6
Morgan	WestBred			54.8	61.2	163	34	13.2
Jerry	N. Dakota			53.4	60.0	161	36	12.8
MT0598				53.2	57.3	163	34	12.4

Continued

Table 1 continued. (2007 Intrastate winter wheat).

Variety	Source	Class	Solid stem*	Yield	Test Wt	Head date	Height	Protein %
Hatcher	Colorado			52.6	63.1	156	30	11.5
MTS04120			19.0	52.3	60.0	163	34	12.9
Vanguard	MSU		20.0	52.2	60.7	160	33	13.4
Tiber	MSU			52.2	61.3	162	36	13.2
NuWest	Gen Mills	HW		52.1	60.9	160	33	12.8
Neeley	Idaho			51.9	59.2	164	33	12.6
Hyalite CL0306	WestBred	HW,CL		51.0	59.4	157	36	13.7
MT1159CL	WestBred	CL		50.7	60.2	162	33	12.5
BigSky	MSU			50.2	60.2	160	37	13.4
Rampart	MSU		21.5	49.6	60.0	161	33	13.7
Promontory	Utah			49.3	62.3	161	33	11.7
NuSky	MSU	HW		49.1	59.9	162	35	13.1
Buteo	WestBred			48.7	64.0	159	35	12.7
Bynum CL0318	WestBred	CL	19.2	47.5	60.2	159	33	13.8
Willow Creek	MSU	forage		42.3	59.7	170	43	14.8
FWW-25		forage		36.0	53.5	166	40	13.9
Average				56.1	61.0	159.7	33.2	12.8
LSD (0.05)				6.57				
C.V. (%)				6.75				
P-value				<.0001				

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

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

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

Planted Sept 9, 2006 on fallow. Fertilizer, actual: 71-52-0. Harvest July 24, 2007.

Table 2. 2007 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 %
Ripper				67.5	61.8	154	30	12.5
MTS0532		++ HW	20.0	66.0	61.3	158	29	12.9
Pryor	WestBred			65.1	63.3	161	31	11.5
Darrell				62.3	62.0	157	33	12.8
Wahoo	Nebr.			61.6	60.7	155	35	12.7
Falcon	WestBred			60.9	62.1	159	32	12.3
Carter	Westbred		14.8	60.9	62.6	160	30	13.1
MTS04114		HW	18.8	60.8	62.2	158	34	13.0
Alice		HW		60.5	62.1	155	29	13.7
Bond	Colorado	CL		60.5	62.5	154	35	11.7
Rocky	AgriPro			60.1	63.6	158	37	12.1
MTS0531		++ HW	20.3	60.0	62.2	160	30	12.6
Ledger	WestBred		10.0	59.7	63.2	160	30	12.1
Norris CL0316	WestBred	CL		59.7	61.7	156	31	12.6
Yellowstone	MSU			58.9	61.2	163	34	12.6
NuDakota	AgriPro	HW		56.9	61.3	156	29	12.7
Genou	MSU		19.0	56.8	60.2	159	35	12.8
Hawken	AgriPro			56.6	62.6	153	30	12.8
Wendy	S. Dakota	HW		56.5	62.5	154	28	13.7
Jagalene	AgriPro			56.1	64.8	156	32	12.6
Morgan	WestBred			54.8	61.2	163	34	13.2
Jerry	N. Dakota			53.4	60.0	161	36	12.8
Hatcher	Colorado			52.6	63.1	156	30	11.5
MTS04120			19.0	52.3	60.0	163	34	12.9
Vanguard	MSU		20.0	52.2	60.7	160	33	13.4
Tiber	MSU			52.2	61.3	162	36	13.2
NuWest	Gen Mills	HW		52.1	60.9	160	33	12.8
Neeley	Idaho			51.9	59.2	164	33	12.6
Hyalite CL0306	WestBred	HW,CL		51.0	59.4	157	36	13.7
MT1159CL	WestBred	CL		50.7	60.2	162	33	12.5
BigSky	MSU			50.2	60.2	160	37	13.4
Rampart	MSU		21.5	49.6	60.0	161	33	13.7
Promontory	Utah			49.3	62.3	161	33	11.7

Continued

Table 2 continued. (2007 Intrastate winter wheat, condensed list).

Variety		Class	Solid stem*	Yield	Test Wt	Head date	Height	Protein %
NuSky	MSU	HW		49.1	59.9	162	35	13.1
Buteo	WestBred			48.7	64.0	159	35	12.7
Bynum	CL0318 WestBred	CL	19.2	47.5	60.2	159	33	13.8
Willow Creek	MSU	forage		42.3	59.7	170	43	14.8
FWW-25		forage		36.0	53.5	166	40	13.9
Average				56.1	61.0	159.7	33.2	12.8
LSD (0.05)				6.57				
C.V. (%)				6.75				
P-value				<.0001				

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

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

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

Planted Sept 9, 2006 on fallow. Fertilizer, actual: 71-52-0. Harvest July 24, 2007.

Table 3. Five-year averages, **Winter Wheat** varieties, WTARC, Conrad 2003 - 07.

Variety	Source	Class	Solid stem* score	5-Year Average					Winter survival class ①
				Yield bu/a	Test wt	Height in.	Head date	Protein %	
Pryor	WestBred			75.8	62.6	33	164	12.0	3
Yellowstone	MSU			75.6	61.5	36	165	12.8	4
Norris	WestBred	CL		75.6	62.8	35	161	13.1	3
Wahoo	Nebr.			75.1	62.1	34	160	13.1	3
Ledger	WestBred		10.0	73.9	63.7	33	162	12.8	2
Bond CL	Colorado	CL		73.7	62.5	38	159	12.2	2
Falcon	WestBred			73.3	63.2	32	163	12.7	4
Rocky	AgriPro			73.0	64.0	39	162	12.6	2
MTS 0532		++ HW	20.0	72.5	61.6	37	164	13.3	
Hatcher	Colorado			72.5	63.3	34	162	12.2	2
Hyalite	WestBred	HW CL		70.9	62.1	37	161	13.2	3
MTS 0531		++ HW	20.3	70.8	61.9	35	163	13.6	
Carter	WestBred		14.8	70.4	62.9	33	163	13.3	3
Genou	MSU	++	19.0	69.7	62.4	38	164	13.1	2
Promontory	Utah			69.5	63.5	35	163	12.5	2-
Neeley	Idaho			69.4	61.8	38	166	12.8	3
BigSky	MSU			68.5	62.2	39	164	13.5	4
Jagalene	AgriPro			68.5	64.8	33	161	13.5	2
NuWest	Gen Mills	HW		67.3	61.2	38	164	13.0	4
NuSky	MSU	HW		67.0	61.2	39	165	12.9	4
MTS 04120		++	19.0	66.5	62.0	39	165	13.0	
MTS 04114		++ HW	18.8	66.2	62.6	38	163	13.8	
Morgan	WestBred			65.8	61.9	38	166	12.9	5
Vanguard	MSU	++	20.0	65.0	62.2	39	163	13.7	2-
Tiber	MSU			64.8	62.3	40	165	13.4	3
Jerry	N. Dak.			63.0	61.5	40	164	13.3	5
Rampart	MSU	++	21.5	62.3	62.4	37	164	14.0	2-
Bynum	WestBred	++ CL	19.2	61.9	62.3	35	162	14.4	2
MT1159CL	WestBred	CL		61.8	60.6	34	164	13.3	2-
means				69.8	62.4	36.3	163.0	13.1	

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.

2007 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, Glacier County at Cut Bank, and Toole County near Oilmont. On-station trials at Conrad were grown on both dryland and irrigated conditions, 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 -15, and include 2007 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 15 is a summary of all the Western Triangle area tests over the past six years, and is equivalent to 30 tests on each variety. Durum data are presented in Tables 16 - 19.

Temperatures were unusually high for most of the growing season, and rainfall was far below average. Consequently, spring grain yield and test weight were below average.

'Agawam', 'Vida', 'Choteau' and MT0515 were the top-ranking spring wheat varieties for yield across all locations over the past six years (Table 15). Other varieties with above-average yield included 'Outlook', 'Hank', 'Reeder' and 'McNeal'. Agawam, Choteau, Reeder and MT0515 also had above-average test weight. Agawam is in the Hard White class, and had the highest test weight of the varieties tested. MT0515 is a hard-red experimental line with semi-solid stem. 'Corbin' was in the off-station trials for the first time in 2007, and averaged 3 bu/a higher than 'Conan' across all locations this season.

Agawam and Choteau exhibited good sawfly tolerance, and had stem-solidness ratings slightly higher than 'Fortuna'. The semi-solid stemmed Corbin and Conan had medium levels of sawfly cutting in 2007. The semi-solid MT0515 had slight sawfly cutting.

Among the durum varieties, 'Alzada', 'Alkabo', 'Strongfield' and 'Grenora' had above-average yield in the dryland trials over the past six years (Table 17). Alzada, Alkabo, 'Pierce' and 'Divide' had above-average 6-yr test weight, and were 58.8 lbs/bu or higher in 2007. In the irrigated trial, Alzada, 'Mountrail', Pierce and Grenora ranked above average for yield (Table 19).

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 needs to be at least 19 to provide a reliable level of sawfly tolerance.

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.

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.

Scholar (MSU, 1999): Medium tall, but slightly shorter than Fortuna. Moderate lodging resistance. Medium solid stem score (13) combined with high levels of cis-3-hexenylacetate result in medium-low sawfly resistance. Maturity medium-late. Below average yield. High test weight. Good quality. Good resistance to Septoria & tan spot.

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.

Glenn (ND, 2006, ND747): Fusarium Scab tolerance slightly better than Alsen (MR).

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. Semidwarf height. Above average yield and test weight. Medium heading. Average protein.

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.

Knudson (AgriPro): Semidwarf, strong straw. Medium maturity, similar to Reeder. Below average yield. High test weight. Average protein. Not well-adapted for District 5 (Triangle Area). Intermediate scab tolerance.

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.

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. Above avg test wt. Average protein.

WestBred 926R (WPB, 1987): Semidwarf. Good straw strength; 4 inches shorter than McNeal. Early maturity. Susceptible to Avenge herbicide; good FarGo tolerance. Some resistance to Washington race of Hessian fly. Fairly good tolerance to dryland root rot. Average yield & test wt. Tendency to shatter. Above average protein.

WestBred - See also Agawam, Conan, Corbin, Hank, Jedd, 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.

Clear White (PI635044): Semidwarf height. Early maturity. Medium yield & test weight in 2007. Low protein.

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.

Durum

Durum is generally much more susceptible to wheat streak mv and Fusarium crown rot than spring wheat.

Quality durum has strong gluten. Growers who plan to grow weak-gluten varieties need to have a marketing organization identified that will purchase those varieties. Kernel color is a very important quality trait. Rainfall or irrigation after heading causes color loss (bleaching), but some varieties are less prone to color loss. Canadian varieties are screened for bleaching resistance. Such varieties are the preferred choice in areas of late-season rainfall. Varieties that lose color more readily may be okay for drier areas of Montana. Seeding rate for durum should be 30% higher than for spring wheat due to the larger durum kernel (fewer kernels per bushel). An additional seed-rate increase may be desirable to suppress late tillers and thereby decrease green kernels. Color score is important, and green kernels contribute to poor color and dockage. 23 to 29 seeds per square foot (approx 1.0 to 1.26 million seeds per acre) has normally been a good seeding rate for durum.

Alkabo (ND, 2006): Medium-tall height, very stiff straw. Medium maturity. Above average yield and test wt. Good quality.

Alzada (WestBred, 2005): Semidwarf height, short stiff straw. Early maturing. High yield, average test weight. Medium protein. Good quality and gluten strength, and very good semolina color.

Avonlea (Can, 1997): Medium tall. Medium straw strength and lodging resistance. Early maturity. High yield and average test weight. Good quality and protein.

Belzer (ND, 1997): Medium-tall, moderate suscept to lodging. Late maturity. Moderate scab resistance. Large kernels, low test weight, medium protein. Good quality.

Ben (ND, 1997): Medium height, medium strong straw. Medium maturity. Below average yield. Large kernel size, high test weight & average protein. Good quality.

Command (ND): Semidwarf. High irrigated yield, medium dryland yield. Severe leaf spots in 1999.

Dilse (ND): Medium height, late maturity. Below average yield. Average weight. High protein, excellent quality.

Divide: (ND, 2006): Medium-tall height, stiff straw. Medium maturity. Average yield. Above average test wt. Excellent quality.

Grenora (ND, 2006): Medium-tall height, stiff straw. Medium maturity. Average yield and test wt. Good quality.

Kyle (Canada, 1984): Very tall weak straw, poor lodging resistance. Very late maturing. Average yield and test weight, large kernel size. Kyle has the highest tolerance to color-loss (rain-bleaching). Above average protein. Strong gluten; good quality.

Lebsock (ND): Medium-short height, stiff straw. Late maturing. Below average yield and protein. Above average test weight. Good quality.

Levante (AllStar Seeds, 2007): Short semidwarf height. Early heading. Above average yield & test weight on dryland in 2007; and average performance on irrigated.

Maier (ND, 1998): Medium height, stiff straw, good lodging resistance. Medium maturity. Above-average yield. Medium large kernels, very high test weight. Average protein. The best milling quality of any durum so far.

Mountrail (ND,1998): Medium-tall, but stiff straw and fair lodging resistance. Medium-late maturity. Average yield and test weight. Medium large kernel and average protein. Medium quality, but kernel color more sensitive to late rain than some other varieties. (All durums are sensitive to late rain/irrigation relative to color loss).

Napolean (Can): Tall, but med lodging resistance. Low test weight and protein.

Navigator (Can): Med short, but weak straw. Med late maturity. Medium test weight & protein, good quality.

Normanno (AllStar Seeds, 2007): Semidwarf height. Medium maturity. Average yield and below average test weight in 2007.

Pathfinder (Can): Med tall, weak straw. Med late maturity. Med test weight. Med low protein, good quality.

Pierce (ND): Medium-tall height and lodging resistance. Below average yield. High test weight. Average protein, good quality.

Plaza (ND): Med-short straw, med lodging resistance. Late maturity. Below-average yield on dryland; above-average yield on irrigated. Below average test weight. Low protein, medium quality.

Strongfield (WestBred/Canada, 2005): Medium tall, med-late maturity. Above average yield. Average test weight. Above-average protein. Good color and quality. Low Cadmium uptake.

Table 4. 2007 Advanced **Spring Wheat** variety nursery, Conrad Dryland.

Variety	Class	Yield bu/a	Test Wt lb/bu	Height in.	Head date	Protein %
MT 0515	+	43.6	59.4	29	180	14.5
MT 0638		42.4	59.6	30	176	15.5
MT 0613		42.3	59.8	26	179	15.0
MT 0516		42.0	60.1	29	176	15.1
MT 0614		41.9	60.1	29	179	15.4
MT 0628	CL	40.6	57.6	28	178	16.0
MT 0415		40.5	58.6	31	180	16.1
JEDD		39.8	61.2	24	177	14.0
KELBY		39.7	61.8	25	176	15.2
MT 0632		39.6	60.2	26	179	15.0
MT 0336	++	39.6	59.0	30	179	14.6
MT 0643		39.6	59.8	26	176	15.7
MT 0626		39.5	59.0	29	177	14.8
ERNEST	+	39.4	59.4	36	180	15.4
BZ902413		39.3	59.3	26	176	14.5
MT 0414		39.1	58.9	28	179	15.7
MT 0539		39.0	58.4	28	178	14.7
MT 0605		38.8	57.4	26	179	15.3
MT 0413		38.4	60.0	26	175	14.4
MT 0669		38.4	58.3	31	180	15.4
MT 0674		++	38.1	57.6	27	175
MT 0645	38.1		58.7	26	180	15.1
CHOTEAU	37.8		59.8	25	179	15.2
MT 0606	37.6		58.8	26	179	15.0
VIDA	37.6		58.8	27	180	14.9
MT 0519	HW	37.5	58.8	29	178	16.1
CLEAR WHITE		37.4	58.3	25	175	13.9
MT 0608		37.1	58.2	29	178	15.5
CORBIN	+	37.0	57.8	29	177	15.6
BZ999592		37.0	58.5	26	179	15.1
KUNTZ	CL	37.0	59.5	27	178	14.8
AP604 CL		36.6	60.4	28	176	14.8
MCNEAL		36.6	57.1	28	179	15.3
MT 0657		36.5	57.6	25	179	15.2
MT 0667		36.5	59.6	23	177	14.3

Continued

<i>continued</i>		Yield	TW	Height	Head	Prot
SAGITTARIO		36.5	56.7	22	182	15.5
CONAN	+	36.2	59.6	25	179	15.2
MT 0607		36.2	57.5	25	179	15.3
MT 0602		36.2	56.5	30	179	15.2
MT 0664		35.7	59.3	27	179	14.7
MT 0663		35.5	59.3	29	179	14.7
MT 0666		35.3	57.2	28	180	15.0
REEDER		35.0	59.1	25	179	15.1
MT 0623		34.9	56.7	28	181	14.6
NORPRO		34.8	58.3	24	179	15.0
MT 0640		34.7	59.3	27	176	15.4
MT 0550		34.7	60.7	29	175	14.9
VOLT		34.5	60.6	25	181	15.1
MT 0416		34.5	58.6	28	179	14.1
MT 0405		34.4	58.7	27	178	16.1
PATWIN		34.3	54.3	21	182	16.5
MT 0631		34.0	59.1	29	178	16.0
BZ9M1024		34.0	58.4	28	178	14.7
MTHW0471	HW	33.9	58.6	33	181	15.4
MT 0658		33.8	58.4	29	178	15.0
MT 0562		33.8	59.1	29	179	15.5
OUTLOOK		33.6	54.5	26	180	15.8
FREYR		33.5	58.4	30	177	15.5
MT 0617		33.3	57.8	25	175	14.7
HANK		33.1	55.9	27	176	15.9
FORTUNA	++	32.9	58.8	34	178	15.1
MT 0624		32.8	58.4	30	180	14.4
VAIOLET	HW	32.8	56.0	18	183	15.7
MT 0659		32.6	56.4	29	180	15.1
MT 0627		32.3	53.8	27	177	15.2
THATCHER		29.7	54.2	35	181	16.6
mean		36.7	58.5	27.7	178.3	15.2

LSD (.05) = 5.87 bu in same block; 6.0 bu for different blocks. C.V = 9.41

++ = 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 April 27, 2007 on fallow. Harvested Aug 8, 2007.
 Fertilizer, actual: 71-52-0

Table 5. 2007 Advanced **Spring Wheat** variety nursery, Conrad Dryland.**Condensed list**

Variety	Class	Yield bu/a	Test Wt lb/bu	Height in.	Head date	Protein %
MT 0515	+	43.6	59.4	29	180	14.5
MT 0415		40.5	58.6	31	180	16.1
Jedd	CL	39.8	61.2	24	177	14.0
KELBY		39.7	61.8	25	176	15.2
MT 0336	++	39.6	59.0	30	179	14.6
ERNEST	+	39.4	59.4	36	180	15.4
BZ902413		39.3	59.3	26	176	14.5
MT 0414		39.1	58.9	28	179	15.7
CHOTEAU	++	37.8	59.8	25	179	15.2
VIDA		37.6	58.8	27	180	14.9
CLEAR WHITE	HW	37.4	58.3	25	175	13.9
CORBIN	+	37.1	57.8	29	177	15.6
BZ999592		37.0	58.5	26	179	15.1
KUNTZ		37.0	59.5	27	178	14.8
AP604 CL	CL	36.6	60.4	28	176	14.8
MCNEAL		36.6	57.1	28	179	15.3
Sagittario		36.5	56.7	22	182	15.5
CONAN	+	36.2	59.6	25	179	15.2
REEDER		35.0	59.1	25	179	15.1
NORPRO		34.8	58.3	24	179	15.0
VOLT		34.5	60.6	25	181	15.1
PATWIN		34.3	54.3	21	182	16.5
BZ9M1024		34.0	58.4	28	178	14.7
MTHW0471	HW	33.9	58.6	33	181	15.4
OUTLOOK		33.6	54.5	26	180	15.8
FREYR		33.5	58.4	30	177	15.5
HANK		33.1	55.9	27	176	15.9
FORTUNA	++	32.9	58.8	34	178	15.1
Vaiiolet	HW	32.8	56.0	18	183	15.7
THATCHER		29.7	54.2	35	181	16.6
mean		36.4	58.4	27.4	178.6	15.2

LSD (.05) = 5.87 bu in same block; 6.0 bu for different blocks. C.V. = 9.41

++ = 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 April 27, 2007 on fallow. Harvested Aug 8, 2007.

Fertilizer, actual: 71-52-0

Table 6. Six-year averages, **dryland Spring Wheat varieties**,
Conrad area, Pondera Co. 2002 - 2007.

Variety	Source	Class	6-Year Average				
			Yield bu/a	Test weight	Height in.	Head date	Protein %
MT 0515		+	57.0	60.3	33	184	14.1
Agawam	WestBred	++ HW	56.9	62.4	30	179	13.2
Choteau	MSU	++	53.3	59.8	31	182	14.5
Vida	MSU		52.9	58.6	31	183	13.9
MT 0414			52.9	59.6	34	182	15.0
Jedd	WestBred	CL	52.7	60.7	27	181	13.6
Reeder	ND		52.4	59.4	33	181	14.3
bz999592			52.3	58.5	32	183	14.7
MT 0415			52.0	59.8	35	182	15.1
Norpro	AgriPro		49.8	58.0	28	182	14.3
Freyr	AgriPro		49.7	60.1	33	181	14.5
Corbin	WestBred	+	49.7	59.7	32	181	14.5
Outlook	MSU		49.7	57.3	31	183	14.5
Hank	WestBred		49.2	57.4	32	180	14.6
McNeal	MSU		49.1	59.2	32	183	14.1
Volt	WestBred		49.1	61.5	30	184	14.2
Kuntz	AgriPro		48.9	60.0	30	182	14.1
Triangle II 9m1024		+ CL	48.4	59.3	31	181	14.0
Kelby	AgriPro		48.2	61.7	30	180	15.1
Explorer	MSU	HW	48.1	59.6	29	179	14.6
Conan	WestBred	+	46.9	59.2	30	182	14.7
Fortuna	ND	++	45.9	60.2	38	182	14.1
Ernest	ND	+	44.9	59.2	37	182	15.2
Nursery Mean			50.2	59.5	31.9	181.1	14.4

++ 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 19. Six-year average, irrigated Durum varieties,
Conrad area, Pondera Co. 2002 - 07.

Variety	Source	6-Year Average				
		Yield bu/a	Test weight	Height in.	Head date	Protein %
Grenora	ND	83.9	61.3	35	182	13.9
Mountrail	ND	82.0	61.6	37	182	13.3
Pierce	ND	81.3	62.5	39	183	13.5
Alzada	WestBred	81.1	62.1	32	180	13.6
Alkabo	ND	79.4	62.1	38	182	13.8
Strongfield	WBred/Can	79.1	62.0	37	183	14.0
Divide	ND	79.0	62.2	38	182	14.1
nursery mean		81.1	62.0	36.4	181.8	13.7

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

2007 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, Glacier County near Cut Bank, and Toole County near Oilmont. On-station trials at Conrad were grown on both dryland and irrigated conditions. The Choteau, Cut Bank and Oilmont trials were no-till planted on chem-fallow.

Results: Data for the various locations are presented in Tables 20 - 34, and include the 2007 and multi-year averages. All entries of the dryland and irrigated Intrastate trials at Conrad are listed in Tables 20 and 23, respectively, with a condensed version of each in Tables 21 and 24 showing only named varieties and a few potential-release lines. The irrigated trial in Tables 26 - 27 is more specific to malt varieties. Table 34 is a summary of all Western Triangle dryland barley tests over the past few years, and is equivalent to 26 tests.

Temperatures were unusually high for most of the growing season, and rainfall was far below average. Consequently, dryland barley yield, test weight and plump were below average.

Averaged across all dryland locations over the past several years, the feed barley 'Haxby' had the highest yield and test weight (Table 34). The 2-row malt varieties 'Craft' and 'Hockett' had above-average yield, test weight and percent plump, and were substantially higher than 'Metcalfe' and 'Harrington' for those traits, as well as being 2 to 4 days earlier to head. Malt status of Hockett is pending, and Craft has been AMBA approved for organic malt production. Both lines would be intended for use in dryland malt barley production. 'Conlon' was grown only at the Conrad location, where it surpassed Hockett and Craft for test weight and plump (Table 21).

The 2-row malt variety 'Geraldine' had the highest yield among malt varieties on irrigated conditions (Table 27). Official malt status of Geraldine is pending.

Among the 6-row malt varieties, 'Tradition', and in some cases 'Stellar', produced substantially higher yield, test weight and plump than other 6-row varieties for both dryland and irrigated conditions (Tables 34 and 27).

A 2-row winter-barley, variety 'Charles', was grown near the dryland spring trial at Conrad, and had 30% winter survival and low yield (included in Tables 20 & 21).

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

Barley Variety Notes & Comments

Western Triangle Agricultural Research Center, Conrad, MT

Baroness (WestBred): 2-row feed. Short straw and good lodging resistance; 2.5" shorter than Harrington. Equal or slightly later maturity than Harrington. High yield when tested in favorable moisture conditions. Average test weight. Stripe rust resistant.

Boulder (WestBred, 2005): 2-row feed. Composite-cross, non-Baroness derived. Height similar to Haxby. Heading 1 day later than Haxby, and 1 day earlier than Baroness. High yield, similar to Haxby. High test weight, 0.5 lb less than Haxby. Replacement for Baroness and Xena.

Calgary (Ariz Plt Br): 2-row feed for irrigated conditions. Very stiff straw, 2" shorter than Baroness. Head date = Baroness. Irrigated yield greater than Baroness. Test weight = Baroness.

Champion (WestBred, 2007; YU501385): 2-row feed. Medium stiff straw. Heading one day later than Haxby and Boulder. Very high yield, greater than for Boulder & Baroness. Test weight 1.5 lb less than Haxby & Boulder.

Conlon (ND, 1996): 2-row malt. Medium height, weak straw. Early maturity, 1-2 days earlier and higher test weight than Bowman. Developed for areas of heat & drought stress. High resistance to net blotch; susceptible to spot blotch & Fusarium head blight.

Conrad (Busch Ag): 2-row malt, Busch Agr Resources. About 2 inches shorter than Harrington. Medium maturity, similar maturity as Harrington. Higher yield than Harrington. Slightly higher test weight and plump than Harrington.

Coors 37 (Moravian 37): Currently the main variety contracted by Coors in 2007.

Copeland (Sask. Canada, 1999): 2-row malt. Better straw strength and earlier maturity than Harrington. Similar yield, test weight, and plump than Harrington. Net blotch resistant. Scald & Septoria susceptible.

Craft (MT970116; MSU, 2006): 2-row malt. Taller than Harrington & Merit. 2 days earlier heading than Harrington, but later heading than Hockett. High yield, test weight, & plump. Moderate stripe rust resistance. Susceptible to net blotch. European style of malt enzyme activity for microbrew market. AMBA approved for organic malt production.

Drummond (ND 15477): 6-row malt. Stronger straw than other 6-row malt types. Improved yield over Morex, Robust and Foster. Plump higher than Morex.

Eslick (MSU, 2005): 2-row feed. Height 1" taller than Baroness, 1" shorter than Haxby. Heading date similar to Harrington, and 1-2 days later than Haxby. Yield similar to Baroness and Haxby. Test wt = Baroness, greater than Harrington, and 2# less than Haxby. Eslick has superior performance in areas of ample moisture, while Haxby is preferred where lower moisture conditions are expected.

Geraldine (MT960101; MSU, Miller Brewing): 2-row malt for Miller Brewing Co. Possible release date 2008, pending plant-scale tests. About 1 day later heading than Harrington. Good performance on irrigated conditions; below average performance on dryland. Moderate stripe rust resistance.

Harrington (Sask. Can): 2-row malt. Medium height; medium weak straw. Medium-late maturity. Sensitive to hot dry areas; yields good in moist areas. Can sprout or germinate (internal falling number) at a lower moisture content than other varieties. Sweating in the bin can be enough to ruin germination. Susceptible to skinning unless carefully threshed.

Haxby (MSU, 2002): 2-row feed. 3 inches taller and two days earlier than Baroness. Among highest yielders in Triangle Area. Highest test weight of all varieties. High feed quality. Non-Baroness derived, providing good diversity. Haxby has superior yield performance in lower moisture conditions, while Eslick has a yield advantage in high moisture conditions.

Hays (MSU, 2004): Hooded 2-row forage. Shorter than Haybet and more resistant to lodging. Higher grain yield than Haybet. Low test weight. Higher forage yield than Haybet and Westford (8%). Harvest between heading stage and 5 days post-heading for highest protein. Caution: any cereal grain grown for hay should be tested for nitrate level prior to cutting. Nitrates decrease during grain filling, but in drought conditions, nitrates may be high all season, unless irrigation is available.

Hockett (MSU, MT910189): 2-row dryland malt. Possible release date 2008, pending plant-scale test results. Experimental 2-row malt for dryland. 4 days earlier than Harrington, and retains plump on dryland much better than Harrington. 5 bu/a higher yield than Harrington. Very susceptible to stripe rust.

Kendall (Can): 2-row malt. High irrigated yield.

Lacey (M98, MN 1999): 6-row malt. Intended to replace Robust. Height intermediate between Robust & Stander. Lodging resistance greater than Robust, but less than Stander.

Legacy (Busch Ag): 6-row malt. 2 to 4 inches taller than Harrington. Higher yield than Morex and Robust, but lower than Harrington. Has 30% resistance to vomatoin. Very susceptible to stripe rust.

Manley (Canada): 2-row. Slightly stiffer strawed and three days later than Harrington. Longer shelf life than Harrington - does not lose germination as readily. Superior to Harrington in high rainfall, stripe rust areas.

Merit (Busch Ag): 2-row malt. Late maturing, too late for dryland. Lodges easier than Harrington, but yields higher. Very high diastatic power for excellent malting ability. Net blotch resistance, and moderate Scald resistance.

Metcalfe (Manitoba Canada, 1994): 2-row malt. Replacement for Harrington in Canada. Medium straw strength. Latitude sensitive - higher yield, test weight and plump than Harrington in Canada, but similar to Harrington in Montana. Similar protein as Harrington. Medium-late, slightly earlier to head than Harrington. Moderate resistance to spot-form net blotch. Susceptible to scald and Septoria.

Morex (Minn, 1978): 6-row malt. Tall; medium straw strength. Early maturity. Shatters readily - swathing advised. Agronomically the worst malting barley on the list. Excel may be a better choice.

Stellar (ND16301, 2005): 6-row malt. Medium-short. Good straw strength and widely adapted across North Dakota. Medium maturity. High plump and low protein. Excellent malt quality. Moderate spot-blotch resistance. Net-blotch susceptible.

Stockford (WestBred, 2005). 2-row hooded hay barley. Height is 2" taller than Hays. Heading is 2 days earlier than Hays. Forage yield is similar to Hays and Haybet. Harvest between heading stage and 5 days post-heading for highest protein. Caution: any cereal grain grown for hay should be tested for nitrate level prior to cutting (see note for Hays).

Tradition (Busch Ag.): 6-row malt. Stiffer straw than Legacy, good lodging resistance. Higher yield, test weight and plump than Legacy and other 6-row varieties. Very susceptible to stripe rust.

Xena (WPB bz594-19): baroness/stark cross. 2-row feed. Two inches taller and better boot emergence than Baroness. Lodging resistance equal to Baroness. Late maturity, similar to Baroness. Better adapted to dryland than Baroness, (higher test wt and plump than Baroness on dryland). Equal or better yield than Baroness on dryland.

Table 20. Dryland Intrastate Barley variety trial, Conrad 2007.

Variety	Yield bu/a	Test Wt lb/bu	Plump %	Thin %	Protein %	Head date	Height in.
MT050048	74.6	53.5	85.5	2.5	13.4	179	29
MT050049	72.0	52.7	77.1	4.5	14.4	176	27
MT050062	71.2	50.6	64.5	8.0	13.5	178	29
MT040013	69.9	50.7	46.7	12.5	13.6	179	22
MT050201	68.8	52.0	66.2	9.1	13.6	177	26
MT050030	68.3	49.5	57.8	7.4	14.0	179	25
MT050080	67.9	51.2	79.7	4.9	13.9	178	25
MT040216	67.1	53.3	53.1	8.4	14.1	179	25
MT050050	67.1	51.9	74.5	5.5	14.5	176	27
MT050110	66.8	51.6	91.0	1.4	14.3	176	26
MT040024	66.5	51.9	21.1	20.7	13.7	178	23
MT040107	65.8	49.8	42.7	16.5	14.3	180	22
MT050187	65.7	53.1	75.9	4.1	14.6	175	27
Tradition	65.7	48.4	32.3	17.5	13.6	175	29
MT020204	65.6	50.9	51.0	13.2	14.7	178	27
MT030063	65.6	51.1	53.2	9.9	14.4	179	28
MT020064	65.3	51.9	86.7	2.2	14.0	176	25
Craft	64.9	51.7	72.2	6.9	13.3	177	24
MT040073	64.9	51.9	42.7	10.0	13.4	176	23
Champion	64.7	51.5	26.0	18.0	14.1	178	24
MT050088	64.6	50.9	75.0	3.9	14.2	178	25
2B992316	64.4	46.6	57.1	10.3	14.6	178	26
MT020205	64.2	52.2	52.7	12.7	13.9	176	24
MT050081	64.2	51.5	77.8	4.6	13.4	177	29
MT050182	64.2	52.8	88.7	2.0	14.2	178	28
MT040226	64.2	54.0	65.3	6.2	14.2	179	25
Haxby	64.1	52.9	43.0	13.1	14.4	175	27
MT970116-6	64.0	51.5	66.8	8.8	14.2	176	24
MT050117	64.0	48.4	58.3	9.7	14.2	176	21
MT030079	63.9	52.1	41.3	12.1	14.2	177	24
MT040058	63.9	51.8	48.4	11.9	12.8	178	23
MT050082	63.4	50.4	66.0	6.4	13.8	177	27
Hockett	63.2	51.7	69.4	6.5	13.9	176	24
MT040106	63.2	50.3	85.0	3.6	14.2	178	22
MT020162	62.9	50.3	54.7	12.5	15.0	180	22

continued

<i>continued</i>	Yield	TW	Plump	Thin	Prot	Head	Height
MT040231	62.6	52.5	61.8	7.7	14.1	178	24
MT020155	62.6	49.5	53.4	9.6	13.8	175	23
Harrington	61.7	46.8	58.1	11.9	15.0	179	26
MT050047	61.6	53.1	84.0	2.8	13.8	178	27
Boulder	61.6	52.3	61.0	6.2	13.7	178	24
MT010160	61.6	48.7	39.5	16.3	13.9	180	24
MT040136	61.5	53.3	57.7	7.7	14.3	178	24
MT050035	61.1	50.9	73.8	4.2	14.0	179	25
MT030042	60.9	51.1	31.2	23.3	13.4	178	21
Conlon	60.9	52.4	90.5	2.3	14.9	173	26
MT030144	60.7	51.0	59.8	7.3	14.2	179	23
MT030137	60.4	50.2	49.2	13.2	14.1	178	24
MT020167	60.3	51.2	73.3	5.7	13.5	178	25
MT040220	59.3	50.3	35.8	18.4	14.9	180	25
2B992657	59.1	43.5	57.4	16.0	13.8	178	23
MT040130	58.7	49.3	28.8	24.0	14.5	179	20
Metcalfe	58.6	47.7	46.4	17.4	14.2	178	23
MT050104	58.5	50.8	81.2	3.1	13.3	176	24
MT040204	58.4	47.5	16.0	33.3	13.8	180	26
MT040110	58.3	48.7	34.5	22.0	14.0	180	22
Baronesse	58.2	48.7	25.5	25.4	12.9	179	22
Conrad	58.1	48.0	44.4	19.1	15.0	179	24
MT010158	58.0	49.7	64.2	7.0	14.7	179	24
MT960101-30	57.2	48.5	16.3	33.6	15.0	180	23
MT040181	57.1	49.1	27.7	34.9	14.4	179	22
MT050184	56.8	52.9	80.8	3.8	13.1	176	26
MT040209	56.6	49.2	43.0	12.8	14.6	179	23
Eslick	55.7	48.0	10.1	40.3	15.4	179	24
Geraldine	54.6	48.0	16.4	37.0	13.4	180	19
Mean	62.9	50.6	55.8	12.1	14.1	177.8	24.5

LSD (.05) = 9.4 bu in same block.

C.V. = 8.66

Planted April 27, 2007 on fallow. Harvested July 31, 2007.

Fertilizer, actual: 51-52-0

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

Table 21. **Dryland Intrastate Barley** variety trial, Conrad 2007.**Condensed List**

Variety	Yield bu/a	Test Wt lb/bu	Plump %	Thin %	Protein %	Head date	Height in.
Tradition	65.7	48.4	32.3	17.5	13.6	175	29
Craft	64.9	51.7	72.2	6.9	13.3	177	24
Champion	64.7	51.5	26.0	18.0	14.1	178	24
2B992316	64.4	46.6	57.1	10.3	14.6	178	26
Haxby	64.1	52.9	43.0	13.1	14.4	175	27
MT970116-6	64.0	51.5	66.8	8.8	14.2	176	24
Hockett	63.2	51.7	69.4	6.5	13.9	176	24
Harrington	61.7	46.8	58.1	11.9	15.0	179	26
Boulder	61.6	52.3	61.0	6.2	13.7	178	24
Conlon	60.9	52.4	90.5	2.3	14.9	173	26
2B992657	59.1	43.5	57.4	16.0	13.8	178	23
Metcalfe	58.6	47.7	46.4	17.4	14.2	178	23
Baronesse	58.2	48.7	25.5	25.4	12.9	179	22
Conrad	58.1	48.0	44.4	19.1	15.0	179	24
MT960101-30	57.2	48.5	16.3	33.6	15.0	180	23
Eslick	55.7	48.0	10.1	40.3	15.4	179	24
Geraldine	54.6	48.0	16.4	37.0	13.4	180	19
Mean	62.9	49.3	46.6	17.1	14.1	177.5	24.2

LSD (.05) = 9.4 bu in same block.

C.V. = 8.66

Planted April 27, 2007 on fallow. Harvested July 31, 2007.

Fertilizer, actual: 51-52-0

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

Table 22. 8-year averages, **dryland Barley** varieties, Conrad, MT, 2000 - 2007.

Variety*	8-Year Average						
	Yield bu/a	Test Wt lb/bu	Plump %	Thin %	Protein %	Head date	Height in.
Champion WestBred	79.2	53.1	69	8.0	12.9	181	28
Hockett 910189	78.0	51.6	80	6.6	13.1	178	29
Baronesse	77.6	50.3	72	9.0	13.4	181	27
2b99 2316	77.4	49.1	76	6.1	12.6	181	30
Haxby MSU	76.9	53.7	71	8.0	13.0	180	29
Conrad BuschAg	76.6	49.9	74	9.3	14.0	182	27
Boulder WestBred	75.2	52.9	78	6.2	14.0	181	29
Eslick MSU	74.7	50.6	65	12.9	13.0	182	29
Craft MSU	74.3	52.6	87	4.1	13.1	179	31
2b99 2657	74.0	45.6	74	9.3	13.1	182	29
LR116-6	73.8	52.8	86	4.5	13.5	179	29
LR101-30	73.4	50.5	55	17.2	13.1	183	27
Metcalfe	72.6	49.9	70	10.5	14.0	181	30
Harrington	71.7	49.2	74	8.6	13.6	182	29
Geraldine MSU	70.9	50.5	53	17.4	13.2	182	27
Tradition BuschAg	70.4	49.1	61	12.2	13.4	179	32
Mean	74.6	51.0	71.5	9.4	13.3	180.6	28.9

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

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

Table 23. Irrigated Intrastate Barley variety trial, Conrad 2007.

Variety	Yield bu/a	Test Wt lb/bu	Plump %	Thin %	Protein %	Head date	Height in.
Champion	113.0	54.1	87	4.4	11.1	178	31
Baronesse	112.2	54.0	91	3.3	11.4	180	31
MT050182	109.8	54.3	91	3.3	11.9	176	30
Boulder	109.5	55.1	87	6.4	12.5	180	34
MT030137	109.0	52.8	74	12.5	12.6	178	29
MT960101-30	108.4	51.6	65	15.0	12.5	181	28
MT050117	107.8	51.9	79	10.1	12.3	179	30
MT040209	107.7	51.6	73	9.1	11.0	179	31
2B992316	107.0	50.3	72	11.8	12.0	179	31
MT040024	105.9	52.6	70	11.9	11.1	178	27
Eslick	105.4	53.6	81	6.2	11.2	180	27
MT050035	105.4	51.9	82	7.7	12.1	180	28
MT050030	104.8	51.9	84	5.6	11.4	179	31
MT040136	104.4	55.5	86	3.7	12.8	179	27
MT030079	104.3	54.6	83	6.9	11.3	179	27
Craft	103.7	52.4	75	14.2	12.4	178	33
Haxby	103.3	54.9	85	4.5	12.1	176	26
MT970116-6	103.0	52.8	78	10.7	12.4	176	35
Tradition	102.1	51.9	84	3.3	12.1	175	30
MT050048	102.1	54.7	88	4.0	12.1	179	26
MT050080	102.1	53.0	89	4.6	12.6	178	36
Conrad	102.0	51.5	84	6.6	12.5	179	29
MT040181	101.2	51.2	61	19.7	12.2	180	30
MT010158	100.7	51.9	77	10.2	11.9	178	33
MT020162	100.6	53.9	81	6.5	12.6	180	29
MT050062	100.5	54.2	90	3.3	10.9	180	34
MT030042	100.1	53.5	72	14.3	11.1	179	32
MT050047	100.1	53.5	85	7.5	12.2	176	36
MT040231	99.5	52.8	79	9.7	12.2	179	25
MT030063	99.2	53.8	86	5.7	11.8	179	30
MT050049	99.1	53.5	85	7.3	11.3	176	33
MT050050	98.7	53.5	85	5.6	12.0	178	32
MT040226	98.2	54.3	83	6.5	11.7	179	28
MT050184	98.2	52.8	74	12.5	12.3	176	31
MT050088	98.1	52.8	84	6.8	12.7	179	32

continued

<i>continued</i>	Yield	TW	Plump	Thin	Prot	Head	Height
MT040220	97.9	53.3	82	7.1	12.1	180	26
MT020155	97.6	50.7	76	11.0	11.8	174	29
MT050201	97.6	54.4	81	8.1	11.8	179	36
MT040216	97.1	55.2	79	9.0	12.0	179	27
MT020167	97.1	53.3	87	4.7	12.3	179	27
MT050082	96.7	53.5	89	3.9	12.5	176	32
MT040204	96.7	51.8	76	9.2	11.6	181	33
Geraldine	96.5	51.9	64	16.9	11.8	180	29
MT040058	96.3	53.6	83	7.5	11.6	176	25
MT020205	95.6	50.6	70	17.9	12.7	176	29
MT020064	95.2	52.4	88	5.1	12.5	176	28
Conlon	95.0	53.5	86	6.2	12.9	172	30
MT040130	94.7	52.4	79	8.5	11.7	180	28
MT020204	93.0	52.3	74	11.5	12.6	176	29
MT050081	92.6	54.5	92	3.0	12.4	176	31
MT050187	91.4	54.0	83	7.9	13.0	175	36
MT040073	91.1	53.5	77	10.8	12.7	178	28
MT040107	90.5	52.9	69	16.2	11.8	181	27
MT040110	90.4	52.5	78	9.9	11.8	180	24
2B992657	90.0	46.0	71	10.5	12.1	180	30
MT050104	88.1	52.0	87	4.6	13.0	177	29
MT040013	87.9	51.9	78	9.0	11.4	180	31
Metcalfe	87.6	50.7	81	7.9	12.1	179	28
MT010160	87.2	52.1	77	9.0	12.0	179	33
Harrington	86.1	49.7	77	8.6	11.7	179	27
MT040106	84.8	51.5	82	7.7	12.6	179	29
MT050110	84.8	51.7	81	9.0	12.7	176	30
MT030144	80.4	52.1	78	10.4	11.8	180	29
Hockett	79.1	50.8	72	15.5	11.5	176	27
Mean	98.2	52.7	80	8.6	12.0	178	30

LSD (.05) = 15.7 bu in same block.

C.V. = 9.4

Planted April 27, 2007 on fallow. Harvested Aug 9, 2007.

Fertilizer, actual: 71-52-0

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

Table 24. Irrigated Intrastate Barley variety trial, Conrad 2007.

Condensed List

Variety	Yield bu/a	Test Wt lb/bu	Plump %	Thin %	Protein %	Head date	Height in.
Champion	113.0	54.1	87	4.4	11.1	178	31
Baronesse	112.2	54.0	91	3.3	11.4	180	31
Boulder	109.5	55.1	87	6.4	12.5	180	34
MT960101-30	108.4	51.6	65	15.0	12.5	181	28
2B992316	107.0	50.3	72	11.8	12.0	179	31
Eslick	105.4	53.6	81	6.2	11.2	180	27
Craft	103.7	52.4	75	14.2	12.4	178	33
Haxby	103.3	54.9	85	4.5	12.1	176	26
MT970116-6	103.0	52.8	78	10.7	12.4	176	35
Tradition	102.1	51.9	84	3.3	12.1	175	30
Conrad	102.0	51.5	84	6.6	12.5	179	29
Geraldine	96.5	51.9	64	16.9	11.8	180	29
Conlon	95.0	53.5	86	6.2	12.9	172	30
2B992657	90.0	46.0	71	10.5	12.1	180	30
Metcalfe	87.6	50.7	81	7.9	12.1	179	28
Harrington	86.1	49.7	77	8.6	11.7	179	27
Hockett	79.1	50.8	72	15.5	11.5	176	27
Mean	98.2	52.7	80	8.6	12.0	178	30

LSD (.05) = 15.7 bu in same block.

C.V. = 9.4

Planted April 27, 2007 on fallow. Harvested Aug 9, 2007.

Fertilizer, actual: 71-52-0

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

Table 25. 8-year averages, irrigated Barley varieties, Conrad, MT, 2000 - 2007.

Variety*	8-Year Average						
	Yield bu/a	Test Wt lb/bu	Plump %	Thin %	Protein %	Head date	Height in.
Champion WestBred	114.0	54.9	99	1.2	11.2	180	31
Calgary	111.2	53.5	90	2.7	12.0	181	27
Eslick MSU	111.1	53.6	92	2.3	11.3	182	29
LR101-30	110.9	52.2	82	4.4	12.3	183	30
Baronesse	110.6	53.3	92	2.7	11.6	181	31
Geraldine MSU	110.2	52.9	88	4.3	11.7	182	30
Haxby MSU	107.7	55.1	94	2.0	12.0	180	31
Conrad BuschAg	107.5	52.5	95	2.0	12.7	182	30
Boulder WestBred	105.6	55.1	95	2.0	12.5	180	32
2b99 2316	105.0	51.6	87	3.4	12.2	181	31
LR116-6	103.7	54.0	93	3.1	12.4	178	35
Tradition BuschAg	102.1	51.7	93	1.4	12.0	179	33
Craft MSU	100.4	53.9	92	3.5	12.3	179	34
Metcalfe	97.2	52.4	92	2.5	12.2	181	31
2b99 2657	95.0	48.2	81	3.9	11.6	183	31
Hockett 910189	94.7	53.0	91	3.8	11.9	179	30
Legacy BuschAg	92.2	49.6	82	5.2	12.3	180	33
Harrington	92.2	51.8	90	3.3	11.8	181	30
Mean	103.7	52.9	90.7	3.0	12.0	180.6	31.0

* Tradition and Legacy are 6-row; all others are 2-row.

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

Table 26. Irrigated Malt Barley variety trial, Conrad 2007.

Variety	Spike	Yield bu/a	Test Wt lb/bu	Plump %	Thin %	Protein %	Head date	Height in.
Calgary	2	108.7	52.8	77	10.6	11.9	180	24
Geraldine 960101	2	108.4	53.0	82	7.9	12.7	180	29
Boulder	2	106.7	54.0	87	5.9	11.8	179	26
Xena	2	106.3	50.7	69	13.9	11.7	180	29
Eslick	2	105.7	51.8	81	7.8	11.5	179	27
Merit	2	101.1	48.4	76	11.5	12.9	180	27
Craft 970116	2	98.8	52.1	74	12.5	11.5	178	33
Conrad	2	95.6	51.1	77	11.6	12.2	180	28
Haxby	2	94.5	54.2	77	9.1	11.9	176	26
Stellar	6	94.3	52.0	93	1.5	12.9	175	32
Tradition	6	93.2	51.4	81	5.7	10.8	178	29
Hockett 910189	2	92.0	50.9	73	15.4	12.3	176	28
Legacy	6	91.6	49.5	67	12.5	11.4	178	30
Drummond	6	89.3	50.7	83	5.2	11.1	175	31
Harrington	2	85.1	47.9	62	19.4	12.6	180	31
Metcalfe	2	83.7	49.7	73	13.1	12.8	179	32
mean		97.2	51.3	77.0	10.2	12.0	178.3	28.9
LSD (.05) = 14.9								
C.V. = 9.3								

Planted April 27, 2007 on fallow. Harvested Aug 9, 2007.

Fertilizer, actual: 71-52-0

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

Table 27. Seven-year averages, irrigated Malt Barley varieties, Conrad 2001 - 07.

Variety	Spike	7-Year Average						
		Yield bu/a	Test Wt lb/bu	Plump %	Thin %	Protein %	Head date	Height in.
Geraldine 960101	2	107.8	52.6	89	3	12.3	182	29
Haxby MSU	2	105.2	54.4	93	3	12.5	180	31
Craft 970116	2	103.6	53.4	92	3	12.6	179	35
Stellar	6	102.7	52.2	96	1	12.5	178	32
Merit BuschAg	2	101.7	49.9	89	4	12.2	182	30
Tradition BuschAg	6	100.8	51.1	92	2	12.1	179	32
Conrad BuschAg	2	100.8	51.9	92	4	12.3	181	31
Hockett 910189	2	95.4	52.7	91	4	12.4	178	30
Metcalfe	2	95.4	51.8	90	4	12.6	181	32
Drummond	6	94.5	50.6	90	3	12.2	178	35
Legacy BuschAg	6	93.4	49.6	80	6	12.0	180	34
Harrington	2	89.2	49.6	82	6	12.2	181	31
Mean		99.0	51.6	89.3	3.6	12.3	180.1	31.8

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

Table 28. 2007 Barley variety trial, Cut Bank.

Variety	Spike	Yield bu/a	Test Wt lb/bu	Plump %	Thin %	Protein %	Height in.
Haxby	2	57.4	46.9	10.6	58.0	15.4	25
Craft ⁹⁷⁰¹¹⁶	2	56.7	46.8	34.3	27.7	15.1	29
Tradition	6	56.5	42.5	21.6	44.4	14.2	29
Xena	2	55.5	43.9	15.8	51.6	14.9	25
Hays ^{forage}	2	55.3	42.3	14.3	57.3	16.5	24
Legacy	6	51.8	37.9	7.4	74.5	14.7	27
Boulder	2	51.2	45.5	23.5	42.6	15.7	25
Harrington	2	51.2	42.0	17.2	52.1	15.8	25
Eslick	2	50.4	43.7	15.3	53.8	14.9	25
Drummond	6	50.0	40.4	11.0	67.1	14.6	28
Hockett ⁹¹⁰¹⁸⁹	2	49.7	43.7	22.5	45.5	15.0	24
Conrad	2	49.1	44.0	20.5	42.0	16.1	25
Metcalfe	2	49.0	43.0	23.1	45.8	16.4	26
Stellar	6	48.1	37.0	18.9	50.3	13.8	28
Geraldine ⁹⁶⁰¹⁰¹	2	44.1	42.8	10.6	70.2	17.0	25
Merit	2	42.7	40.3	12.5	58.8	16.6	26
mean		51.2	42.7	17.4	52.6	15.4	26.0
LSD (.05) =		6.5					
C.V. =		7.44					

Cooperator & Location: Kevin Bradley, north of Cut Bank, MT.
 Planted April 17, 2007 on chem-fallow. Harvested Aug 2, 2007.
 Fertilizer, actual: 51-52-0
 Conducted by MSU Western Triangle Ag Research Center.

Table 29. Five-year averages, **Barley** varieties, Cut Bank area, 2003 - 07.

Variety	Spike	5-Year Average					
		Yield bu/a	Test Wt lb/bu	Plump %	Thin %	Protein %	Height in.
Haxby MSU	2	66.7	51.2	59	22	12.0	30
Eslick MSU	2	66.7	48.6	61	23	11.8	30
Xena WestBred	2	66.2	48.9	60	21	12.1	30
Craft 970116	2	65.7	50.3	71	12	12.3	33
Tradition BuschAg	6	65.4	47.1	64	17	12.1	33
Stellar ND	6	65.4	45.0	65	19	11.3	32
Hays forage	2	65.1	44.7	57	24	12.5	29
Legacy BuschAg	6	65.0	45.2	59	28	12.3	33
Boulder WestBred	2	64.6	50.9	66	17	12.2	29
Metcalfe	2	64.2	48.8	65	18	12.5	31
Drummond ND	6	64.2	46.4	62	25	12.2	34
Hockett 910189	2	64.1	49.7	66	17	12.2	29
Harrington	2	64.0	47.6	64	19	12.1	30
Conrad BuschAg	2	63.9	48.4	66	16	12.8	30
Geraldine 960101	2	63.1	48.6	59	26	12.2	29
Merit BuschAg	2	59.8	46.0	62	22	12.7	30
Mean		64.6	48.2	62.7	20.6	12.2	30.6

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

Table 30. 2007 Barley variety trial, Choteau.

Variety	Spike	Yield bu/a	Test Wt lb/bu	Plump %	Thin %	Protein %	Height in.
Haxby	2	79.8	53.1	62.1	7.8	14.8	30
Eslick	2	79.5	48.4	58.5	10.4	14.7	31
Boulder	2	77.9	50.9	68.4	7.1	16.1	28
Hays <i>forage</i>	2	77.3	45.4	61.5	13.5	15.3	25
Tradition	6	76.3	45.7	61.1	8.4	15.1	30
Stellar	6	74.5	45.5	74.7	5.4	14.2	30
Craft ⁹⁷⁰¹¹⁶	2	74.0	47.4	81.5	4.2	15.5	32
Drummond	6	73.5	44.2	60.3	10.2	15.3	31
Metcalfe	2	73.1	46.5	72.8	7.8	16.0	29
Xena	2	72.8	47.7	56.1	11.4	15.3	28
Geraldine ⁹⁶⁰¹⁰¹	2	70.4	48.3	50.0	15.3	16.0	28
Conrad	2	68.8	45.6	67.3	11.2	16.4	27
Hockett ⁹¹⁰¹⁸⁹	2	67.6	47.1	75.9	7.1	14.5	29
Legacy	6	67.6	43.7	46.1	14.7	15.4	31
Harrington	2	67.0	45.4	62.3	10.3	15.7	27
Merit	2	66.1	43.7	53.5	16.5	16.6	26
mean		72.9	46.8	63.3	10.1	15.4	28.9
LSD (.05) =		7.6					
C.V. =		6.78					

Cooperator & Location: Scott & Roy Inbody, east of Choteau, MT.

Planted April 17, 2007. Harvested July 31, 2007.

Fertilizer, actual: 11-52-0

Conducted by MSU Western Triangle Ag Research Center.

Table 31. Five-year averages, **Barley** varieties, Choteau area, 2003 - 07.

Variety	Spike	5-Year Average					
		Yield bu/a	Test Wt lb/bu	Plump %	Thin %	Protein %	Height in.
Haxby MSU	2	82.0	51.8	50	17	16.0	34
Boulder WestBred	2	79.3	49.3	51	22	17.3	32
Craft 970116	2	78.7	49.3	63	12	16.4	37
Hockett 910189	2	78.0	49.0	59	14	15.8	34
Xena Westbred	2	75.7	46.6	42	22	16.5	33
Eslick MSU	2	75.3	47.4	44	19	16.3	33
Tradition BuschAg	6	75.3	44.3	32	31	17.0	36
Drummond ND	6	74.3	43.4	32	35	16.4	38
Hays forage	2	73.9	43.0	35	31	16.4	32
Conrad BuschAg	2	72.4	46.0	46	23	17.3	32
Metcalfe	2	69.0	45.9	46	22	17.5	35
Stellar ND	6	68.7	43.8	46	25	15.6	36
Harrington	2	67.7	44.9	37	26	17.0	34
Geraldine 960101	2	67.4	46.1	27	38	17.3	33
Merit BuschAg	2	65.1	43.5	37	31	17.4	33
Legacy BuschAg	6	64.1	43.4	27	37	16.6	37
Mean		73.4	46.4	42.4	24.8	16.7	34.3

Hays = awnless forage-hay variety.

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

Table 32. 2007 Barley variety trial, Oilmont.

Variety	Spike	Yield bu/a	Test Wt lb/bu	Plump %	Thin %	Protein %	Height in.
Haxby	2	37.1	49.8	8.8	57.0	16.0	22.0
Hays forage	2	35.7	43.6	4.8	78.0	18.1	19.0
Hockett 910189	2	34.3	47.2	22.0	48.0	16.0	23.0
Drummond	6	33.3	42.5	7.0	70.0	15.8	25.0
Xena	2	33.1	46.6	5.1	70.0	16.2	20.0
Tradition	6	32.9	44.4	10.8	59.0	15.1	22.0
Eslick	2	32.7	45.8	1.6	77.0	16.5	22.0
Metcalfe	2	32.2	44.5	5.0	66.0	18.3	22.0
Conrad	2	31.8	46.1	8.2	68.0	17.4	19.0
Legacy	6	31.7	39.9	7.2	76.0	16.0	21.0
Harrington	2	31.4	44.3	8.2	66.0	17.8	20.0
Craft 970116	2	31.3	48.4	14.6	44.0	16.5	26.0
Boulder	2	29.9	46.3	5.9	70.0	17.0	19.0
Merit	2	27.3	42.8	6.8	74.0	18.3	19.0
Geraldine 960101	2	27.2	45.9	2.6	83.0	18.3	20.0
Stellar	6	26.2	38.9	8.6	70.0	15.6	22.0
mean		31.7	44.8	8.0	67.3	16.8	21.3
LSD (.05) =		4.7					
C.V. =		5.49					

Cooperator & Location: Terry Alme, east of Oilmont, MT.
 Planted April 17, 2007 on chem-fallow. Harvested July 26, 2007.
 Fertilizer, actual: 11-52-0
 Conducted by MSU Western Triangle Ag Research Center.

Table 33. Three-year averages, **Barley** varieties, Oilmont, 2003, 2006 & 2007.

Variety	Spike	3-Year Average					
		Yield bu/a	Test Wt lb/bu	Plump %	Thin %	Protein %	Height in.
Haxby MSU	2	49.7	47.9	17	44	16.7	28
Tradition BuschAg	6	45.0	43.0	15	53	15.8	30
Craft 970116	2	44.6	45.9	17	47	16.6	31
Hockett 910189	2	42.8	44.4	19	49	16.3	28
Xena WestBred	2	41.0	44.9	11	56	15.9	27
Drummond ND	6	40.7	41.3	11	62	16.0	30
Eslick MSU	2	40.5	43.6	7	68	16.4	26
Conrad BuschAg	2	40.3	44.7	16	52	17.2	25
Metcalfe	2	38.9	43.1	15	50	17.5	28
Stellar ND	6	38.7	39.1	15	58	15.6	27
Harrington	2	38.3	42.6	16	51	17.1	27
Hays forage	2	38.1	41.4	6	70	17.3	24
Boulder WestBred	2	38.0	46.4	19	48	17.2	25
Legacy BuschAg	6	35.1	39.2	10	66	16.2	27
Merit BuschAg	2	32.4	40.7	10	63	17.8	26
Geraldine 960101	2	29.9	42.9	6	75	18.1	25
mean		39.7	43.4	12.9	57.1	16.8	27.2

Hays = awnless forage-hay variety.

Cooperator & Location: Terry Alme, east of Oilmont, MT.
 Conducted by MSU Western Triangle Agr Research Center.

Table 34. Multi-Year x Location Averages - **Barley** varieties, Western Triangle Area.

Variety	Spike	26-Year x Location Dryland Average*						
		Yield bu/a	Test Wt lb/bu	Plump %	Thin %	Protein %	Height in.	Head date**
Haxby MSU	2	69.1	51.4	53	20	14.2	31	180
Hockett 910189	2	66.5	49.0	60	18	14.2	30	178
Craft 970116	2	66.1	49.7	63	17	14.4	33	179
Boulder Westbred	2	65.8	50.0	55	22	15.1	29	181
Eslick MSU	2	65.8	47.7	47	27	14.2	30	182
Conrad BuschAg	2	64.2	47.5	54	22	15.0	29	182
Tradition BuschAg	6	63.5	46.2	46	25	14.5	32	179
Metcalfe	2	62.7	47.2	52	23	15.2	31	181
Harrington	2	61.1	46.2	51	24	14.8	30	182
Stellar	6	60.7	44.6	50	25	13.8	31	178
Legacy BuschAg	6	59.9	44.2	39	32	14.3	33	180
Geraldine 960101	2	58.9	47.2	39	37	15.0	29	182
Merit BuschAg	2	58.5	44.7	45	29	15.3	30	183
Mean		63.3	47.3	49.8	25.1	14.6	30.8	180.3

** Head date, Conrad only.

* Conrad dryland 8-yr + Choteau 5-yr + Cut Bank 5-yr + Oilmont 3-yr + Knees 5-yr.
Years included thru 2007. Comparable average calculations.

Cooperators: Kevin Bradley, Cut Bank; Roy and Scott Inbody, Choteau;
Terry Alme, Oilmont; Dan Picard, Knees area.

Conducted by MSU Western Triangle Agr Research Center.

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

Year: 2007

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 in effort to verify whether previous planting-date recommendations are still applicable.

Methods: Spring wheat (var. Choteau) and barley (var. Hockett) were planted on three dates 10 days apart: April 27, May 7 and May 17. Earlier plantings were not possible due to wet soil conditions. Within each date, three rates of seeding were applied: 15, 23 and 30 seeds/sq ft. Nitrogen fertilizer (60 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: Yield, test weight and plant height decreased, and protein increased as planting was delayed beyond April 27 (Table 35).

Yields for the May 7 and May 17 plantings were 1.2 and 9.2 bu/ac lower, respectively, than for the April 27 planting. The rate of decrease was lower for the period between April 27 and May 7, with a non-significant decrease of 0.12 bu/ac for each day of delay. After May 7, yield decreased more rapidly, losing 0.8 bu/ac for each day of delay.

Test weight declined about 0.5 lb/bu for each 10-day period in delayed planting, with the May 17 planting weighing 1.0 lb/bu less than the April 27 planting.

Plant heights for the May 7 and May 17 plantings were 1.4 and 3.4 inches shorter, respectively, than for the April 27 planting.

Protein increased 0.7 and 1.2% as planting was delayed until May 7 and May 17, respectively.

Seedling emergence occurred 10 days after planting the April 27 treatments, and six days after planting the May 7 treatments. Cooler weather conditions occurred after the May 17 planting, delaying emergence time to 8 days.

Heading dates for the May 7 and May 17 plantings were 4 and 10 days later, respectively than for the April 27 planting. Ripening dates were nearly equal for the April 27 and May 7 plantings, while the May 17 planting ripened 7 days later.

Results, Barley Dates: Yield, test weight, plump and plant height decreased as planting was delayed after April 27, while percent thin and protein increased (Table 36).

Yields for the May 7 and May 17 plantings were 3.4 and 21.1 bu/ac lower, respectively, than for the April 27 planting. The rate of decrease was lower for the period between April 27 and May 7, with a non-significant decrease of 0.34 bu/ac for each day of delay. After May 7, yield decreased more rapidly, losing 1.77 bu/ac for each day of delay.

Test weight significantly declined 2 lb/bu for each 10-day period in delayed planting, with the May 17 planting weighing 3.9 lb/bu less than the April 27 planting.

Percent plump for the May 7 and May 17 plantings were 6 and 18% lower, respectively, than for the April 27 planting. The rate of decrease was lower for the period between April 27 and May 7, with a non-significant decrease of 0.6% for each day of delay. After May 7, percent plump decreased more rapidly, losing 1.2% for each day of delay. Percent thin was likewise more sensitive to the latest planting date, increasing 0.5% per day of delay between April 27 and May 7 (non-sig), while increasing 0.9% per day between May 7 and May 17.

Plant heights for the May 7 and May 17 plantings were 0.7 and 2.0 inches shorter, respectively, than for the April 27 planting. Protein increased 0.6 and 3.1% as planting was delayed until May 7 and May 17, respectively.

Seedling emergence occurred 10 days after planting the April 27 treatments, and six days after planting the May 7 treatments. Cooler weather conditions occurred after the May 17 planting, delaying emergence time to 8 days.

Heading dates for the May 7 and May 17 plantings were 4.5 and 13.5 days later, respectively than for the April 27 planting. Ripening dates were nearly equal for the April 27 and May 7 plantings, while the May 17 planting ripened 9 days later.

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 and test weight were not significantly different among seeding rates, but plump significantly increased as seeding rate decreased. Heading date was significantly later for the 15-seed rate in both crops.

Conclusion: Yield differences for the April 27 and May 7 plantings were not significant in spring wheat or barley, but significantly lower for the May 27 planting. Test weights were significantly different between the April 27 and May 7 plantings. The results indicate the recommended latest planting date of May 7 may still apply for yield, but not for test weight. Moving the recommended latest planting date to April 27 should be considered if succeeding years of this study prove conclusive.

Table 35. Planting Dates & Rates - **Spring Wheat**, Conrad 2007

Rate** seeds/ft	Planting Date	Yield bu/a	Test Wt lbs/bu	Height inch	Head date	Protein %	Emergence date	Ripening date
15	Apr 27	34.4	57.8	27.0	178.8	15.6		
23	Apr 27	35.3	57.4	27.0	178.0	15.6		
30	Apr 27	34.9	57.8	26.0	178.0	15.4		
Apr 27 means:		34.9 a	57.7 a	26.7	178.3 c	15.5	May 7	Aug 8
15	May 7	32.3	56.6	26.0	183.0	16.3		
23	May 7	35.5	57.7	25.0	182.0	16.1		
30	May 7	33.3	57.1	25.0	182.0	16.3		
May 7 means:		33.7 a	57.1 b	25.3	182.3 b	16.2	May 13	Aug 8
15	May 17	23.4	56.5	24.0	188.8	16.6		
23	May 17	26.1	56.6	23.0	188.0	16.9		
30	May 17	27.6	57.1	23.0	188.0	16.7		
May 17 means:		25.7 b	56.7 b	23.3	188.3 a	16.7	May 25*	Aug 15

15	Apr 27	34.4	57.8	27.0	178.8	15.6		
15	May 7	32.3	56.6	26.0	183.0	16.3		
15	May 17	23.4	56.5	24.0	188.8	16.6		
rate 15 means:		30.0 b	57.0 a	25.7	183.5 a	16.2		
23	Apr 27	35.3	57.4	27.0	178.0	15.6		
23	May 7	35.5	57.7	25.0	182.0	16.1		
23	May 17	26.1	56.6	23.0	188.0	16.9		
rate 23 means:		32.3 a	57.2 a	25.0	182.7 b	16.2		
30	Apr 27	34.9	57.8	26.0	178.0	15.4		
30	May 7	33.3	57.1	25.0	182.0	16.3		
30	May 17	27.6	57.1	23.0	188.0	16.7		
rate 30 means:		31.9 a	57.3 a	24.7	182.7 b	16.1		
LSD (.05)		1.79	0.55		0.20			
C.V. %		6.75	1.15		0.13			
Date P		.0000***	.0044**		.0000***			
Rate P		.0356*	.4065 ns		.0000***			
Interaction P		.2851 ns	.1900 ns		.7501 ns			

* Emergence of May 17 planting date was preceded by several cold days.

** 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 36. Planting Dates & Rates - Barley, Conrad 2007

Rate** seeds/ft	Planting Date	Yield bu/a	Test Wt lbs/bu	Plump %	Thin %	Height inch	Head date	Protein %	emerge date	Ripe date
15	Apr 27	67.1	51.2	67.0	7.3	26.0	176.0	12.5		
23	Apr 27	68.8	50.8	60.7	8.5	26.0	175.0	12.4		
30	Apr 27	71.0	50.5	58.5	11.3	25.0	175.0	12.3		
Apr 27 means:		69.0 a	50.8 a	62.1 a	9.0 b	25.7	175.3 c	12.4	May 7	July 31
15	May 7	64.1	48.6	60.0	11.5	26.0	180.3	12.9		
23	May 7	70.5	49.4	63.1	10.7	25.0	179.5	12.9		
30	May 7	62.4	48.6	45.3	19.6	24.0	179.5	13.3		
May 7 means:		65.6 a	48.9 b	56.1 a	13.9 b	25.0	179.8 b	13.0	May 13	July 31
15	May 17	47.6	46.9	49.1	17.8	24.0	189.5	15.4		
23	May 17	49.4	47.2	46.1	23.0	24.0	188.5	15.3		
30	May 17	46.7	46.6	37.5	26.3	23.0	188.3	15.7		
May 17 means:		47.9 b	46.9 c	44.2 b	22.4 a	23.7	188.8 a	15.5	May 25	Aug 9

15	Apr 27	67.1	51.2	67.0	7.3	26.0	176.0	12.5		
15	May 7	64.1	48.6	60.0	11.5	26.0	180.3	12.9		
15	May 17	47.6	46.9	49.1	17.8	24.0	189.5	15.4		
rate 15 means:		59.6 a	48.9 a	58.7 a	12.2 b	25.3	181.9 a	13.6		
23	Apr 27	68.8	50.8	60.7	8.5	26.0	175.0	12.4		
23	May 7	70.5	49.4	63.1	10.7	25.0	179.5	12.9		
23	May 17	49.4	47.2	46.1	23.0	24.0	188.5	15.3		
rate 23 means:		62.9 a	49.2 a	56.7 ab	14.1 ab	25.0	181.0 b	13.5		
30	Apr 27	71.0	50.5	58.5	11.3	25.0	175.0	12.3		
30	May 7	62.4	48.6	45.3	19.6	24.0	179.5	13.3		
30	May 17	46.7	46.6	37.5	26.3	23.0	188.3	15.7		
rate 30 means:		60.0 a	48.6 a	47.1 b	19.0 a	24.0	180.9 b	13.8		
LSD (.05)		3.67	0.79	11.02	6.25		0.39			
C.V. %		7.17	1.92	24.17	49.18		0.26			
Date P		.0000***	.0000***	.0089**	.0007***		.0000***			
Rate P		.1585 ns	.3457 ns	.0888 ns	.0854 ns		.0000***			
Interaction P		.2266 ns	.7898 ns	.8304 ns	.8599 ns		.8600 ns			

* Emergence of May 17 planting date was preceded by several cold days.

** 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: Cultural practices for producing barley

Year: 2007

Locations: Western Triangle Ag. Research Center
Ethridge area (Griffin farm)
Sunburst area (Karst farm)
Joplin area (Moog farm)
Cut Bank area (Bradley farm)

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

Objectives: To compare the response of new barley varieties to nitrogen (N) fertilization in the Western Triangle area.

Procedures: Nitrogen fertilizer was applied to Champion, Harrington, Hockett, Metcalfe, and Tradition barley at the following locations: Cut Bank, Ethridge, Joplin, Sunburst, and WTARC. At the WTARC irrigated location, Merit barley was added, and N rates were based on preplant soil tests at all locations. 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 the varieties were malting quality with Champion being the exception. All plots received 30 lbs P_2O_5 / acre as 0-45-0 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 Table 1b along with other site characteristics. Plots were harvested with a small plot combine, and the grain weighed and tested for protein content, percent plump and thins, and test weight. Plot size was 5 rows wide (12 inch spacing) and 25 feet long.

Results: The Ethridge location was lost due to a planter malfunction. The Sunburst location was the only one that had acceptable malting barley quality. Most locations had low yields, high protein content, low plump and test weight, and high thin kernels typical of a hot and dry growing season. The only feed barley, Champion, was the highest yielding variety at all locations including the irrigated location. Results are shown in Tables 2s thru 6s.

Table 1s. Site characteristics and soil test results by location. Western Triangle Ag. Research Center. 2007.

Site Characteristics						
Character	Cut Bank	Ethridge	Joplin	Sunburst	WTARC i	WTARC
Planting Date	4/26	4/16	5/1	4/27	4/28	4/30
Harvest Date	8/2		7/26	8/14	8/7	7/31
Previous Crop	Chem. Fallow	Chem. Fallow	Barley, no-till	Chem. Fallow	Conv. Fallow	Conv. Fallow
Growing Season Precipitation (inches)	1.6	1.2	2.9	2.3	3.0	2.9
Spray Date	6/4	6/1**	6/4***	6/4	6/10	
Soil Test Results						
Test	Cut Bank	Ethridge	Joplin	Sunburst	WTARC i	WTARC
pH	6.9	8.0	7.8	6.6	8.1	7.9
O.M. (%)	2.8	2.4	1.6	2.8	2.2	2.4
P (ppm)	38	13	16	29	18	17
K (ppm)	491	477	454	414	340	283
EC (mmhos/cm)	0.26	0.31	0.25	0.25	0.32	0.43
NO ₃ -N (0-3', lb/ac)	70	101	96	20	78	77

ND=Not determined. **=Bronate Advanced @ 1.6 pt/a tank mixed with Achieve SC @ 8oz/a. *=Soil sample to two feet depth. **Farmer sprayed with Axial, Clarity, and Ally @ labeled rates. ***Farmer sprayed with Bronate Advanced @ 1 pt/a.

Table 2s. Effect of nitrogen and variety on agronomic characteristics of dryland barley. Cut Bank location. Western Triangle Ag. Research Center. 2007.

Variety	N Rate	Grain yield	Grain Protein	Test Weight	Plump	Thins
	lbs/ac	bu/ac	%	lb/bu	%	%
Champion	0	51.0	13.3	47.3	11.0	43.3
Champion	30	55.3	13.8	46.5	12.0	42.3
Champion	60	54.5	15.0	47.0	6.0	53.3
Champion	90	54.0	14.8	46.0	7.8	46.3
Harrington	0	43.0	13.4	44.8	40.5	21.0
Harrington	30	42.5	15.2	43.3	27.0	31.5
Harrington	60	37.3	16.3	43.0	22.8	37.5
Harrington	90	37.0	17.5	43.0	18.5	43.3
Hockett	0	48.0	12.8	46.8	46.3	20.0
Hockett	30	45.3	14.2	46.3	31.0	29.8
Hockett	60	47.8	15.1	45.3	26.8	31.8
Hockett	90	46.3	15.8	45.8	29.0	31.3
Metcalfe	0	42.0	15.0	44.3	27.5	27.5
Metcalfe	30	41.3	15.7	43.8	23.0	33.3
Metcalfe	60	42.3	17.5	43.3	22.5	33.5
Metcalfe	90	41.3	16.7	43.8	24.8	30.3
Tradition	0	46.3	13.2	44.0	25.3	30.5
Tradition	30	47.0	14.8	42.8	14.0	47.3
Tradition	60	45.0	15.7	41.5	11.0	53.3
Tradition	90	42.0	16.8	40.0	8.8	63.3
Variety Summary						
Champion		53.7 a	14.2 a	46.7 a	9.2 c	46.1 a
Harrington		39.8 d	15.6 c	43.6 b	27.1 ab	33.4 b
Hockett		46.9 b	14.5 a	46.0 a	33.2 a	28.1 b
Metcalfe		41.8 cd	16.2 d	43.7 b	24.4 b	31.0 b
Tradition		45.0 bc	15.1 b	42.2 c	14.8 c	48.4 a
Nitrogen Summary						
0		46.1 a	13.5 a	45.5 a	30.1 a	28.3 c
30		46.3 a	14.8 b	44.5 b	21.3 b	36.7 b
60		45.3 a	15.9 c	44.0 bc	17.8 c	41.8 a
90		44.1 a	16.3 c	43.6 c	17.8 c	42.7 a
Linear contrast p-value		0.027	0.000	0.000	0.000	0.000
Quadratic cont. p-value		0.279	0.090	0.111	0.000	0.014
Statistical Summary						
Mean		45.6	15.1	44.4	21.7	37.4
CV (%)		6.5	7.4	2.0	24.0	17.2
Interaction p-value		0.074	0.641	0.167	0.019	0.004

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

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

Table 3s. Effect of nitrogen and variety on agronomic characteristics of dryland barley. Joplin location. Western Triangle Ag. Research Center. 2007.

Variety	N Rate	Grain yield	Grain Protein	Test Weight	Plump	Thins
	lbs/ac	bu/ac	%	lb/bu	%	%
Champion	0	51.8	15.6	44.8	3.3	68.5
Champion	20	57.5	15.5	45.8	4.3	65.0
Champion	40	54.5	16.2	45.5	5.5	68.8
Champion	60	54.6	16.1	46.0	6.2	60.6
Harrington	0	42.5	17.6	40.0	3.0	74.8
Harrington	20	41.5	17.8	41.0	3.8	75.5
Harrington	40	40.8	18.4	40.7	2.4	81.1
Harrington	60	40.0	18.6	39.5	6.5	70.3
Hockett	0	45.5	16.5	42.0	4.8	65.5
Hockett	20	45.3	16.5	42.4	4.7	67.6
Hockett	40	48.3	16.5	43.0	8.0	60.5
Hockett	60	46.3	17.0	42.0	6.3	65.3
Metcalfe	0	41.5	19.1	39.8	6.0	70.0
Metcalfe	20	38.8	19.6	40.0	1.8	78.5
Metcalfe	40	43.5	19.6	40.8	4.3	69.8
Metcalfe	60	39.8	20.1	40.5	4.8	72.0
Tradition	0	49.2	16.5	38.3	3.1	76.6
Tradition	20	47.8	16.9	39.5	3.8	74.8
Tradition	40	46.8	17.4	38.8	2.5	81.8
Tradition	60	47.8	17.9	38.3	1.8	82.8
Variety Summary						
Champion		54.6 a	15.9 a	45.5 a	4.8 a	65.7 bc
Harrington		41.2 c	18.1 c	40.3 c	3.9 a	75.4 ab
Hockett		46.3 b	16.6 b	42.4 b	5.9 a	64.7 c
Metcalfe		40.9 c	19.6 d	40.3 c	4.2 a	72.6 abc
Tradition		47.9 b	17.2 b	38.8 d	2.8 a	79.0 a
Nitrogen Summary						
0		46.1 a	17.1 a	41.1 a	4.0 a	71.1 a
20		46.2 a	17.3 a	41.7 a	3.6 a	72.3 a
40		46.8 a	17.6 b	41.7a	4.5 a	72.4 a
60		45.7 a	17.9 c	41.3 a	5.1 a	70.2 a
Linear contrast p-value		0.867	0.001	0.645	0.229	0.767
Quadratic cont. p-value		0.520	0.577	0.351	0.532	0.393
Statistical Summary						
Mean		46.2	17.5	41.5	4.3	71.5
CV (%)		8.7	2.4	2.9	78.1	12.3
Interaction p-value		0.654	0.476	0.829	0.626	0.550

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

Table 4s. Effect of nitrogen and variety on agronomic characteristics of dryland barley. Sunburst location. Western Triangle Ag. Research Center. 2007.

Variety	N Rate	Grain yield	Grain Protein	Test Weight	Plump	Thins
	lbs/ac	bu/ac	%	lb/bu	%	%
Champion	0	25.8	10.3	51.0	85.8	3.8
Champion	40	52.0	10.4	49.5	58.5	10.8
Champion	80	60.5	12.3	48.0	52.8	12.8
Champion	120	63.8	13.6	47.5	51.3	13.8
Harrington	0	21.5	11.4	49.3	93.3	1.8
Harrington	40	40.5	11.6	47.8	84.0	4.3
Harrington	80	48.5	13.4	45.5	75.8	7.5
Harrington	120	47.8	14.9	45.8	77.0	7.5
Hockett	0	22.8	11.2	50.8	93.5	2.3
Hockett	40	43.5	11.0	19.8	83.8	4.3
Hockett	80	51.5	12.7	48.5	73.5	8.0
Hockett	120	49.8	14.3	48.0	69.5	10.0
Metcalfe	0	17.0	11.8	49.3	90.5	2.3
Metcalfe	40	38.0	12.1	47.8	79.3	5.8
Metcalfe	80	43.0	13.9	46.5	73.5	7.8
Metcalfe	120	41.5	16.0	45.8	69.8	9.5
Tradition	0	16.3	11.3	48.3	83.3	4.0
Tradition	40	39.5	11.2	47.5	69.0	8.3
Tradition	80	40.0	12.7	46.3	59.8	15.0
Tradition	120	45.8	14.3	45.3	52.3	19.5
Variety Summary						
Champion		50.6 a	11.6 a	48.9 b	62.0 b	10.1 a
Harrington		39.6 b	12.8 b	47.1 b	82.4 a	5.3 b
Hockett		41.8 b	12.3 b	49.2 a	79.9 a	6.0 b
Metcalfe		34.9 c	13.4 c	47.3 b	78.3 a	6.4 b
Tradition		35.4 c	12.4 b	46.6 b	66.1 b	11.7 a
Nitrogen Summary						
0		20.6 c	11.2 a	49.6 a	89.2 a	2.8 a
40		42.7 b	11.3 a	48.3 b	74.9 b	6.6 b
80		48.7 a	13.0 b	46.9 c	67.0 c	10.2 a
120		49.8 a	14.6 c	46.5 c	63.9 c	12.0 a
Linear p-value		0.000	0.000	0.000	0.000	0.000
Quadratic cont. p-value		0.000	0.000	0.027	0.000	0.106
Statistical Summary						
Mean		40.4	12.5	47.8	73.7	7.9
CV (%)		9.4	3.4	2.3	10.4	51.6
Interaction p-value		0.042	0.679	0.975	0.392	0.593

Title: Effect of Chloride on the Cadmium Content of two Durum Varieties

Year: 2007

Locations: Western Triangle Ag. Research Center

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

Objectives: To investigate the effect of Chloride (Cl) on Cadmium (Cd) concentration of durum varieties of Strongfield and Alzada.

Procedures: Potassium chloride (KCl) fertilizer was applied to Alzada and Strongfield durum at WTARC under irrigated and dryland conditions. Chloride rates of 0, 15, and 30 lbs Cl/acre were applied with the seed in a split plot design with variety as the whole plot. All plots received 30 lbs P₂O₅/ acre as 11-52-0 applied with seed and the irrigated and dryland areas received 300 and 100 lbs N/acre, respectively. Soils were sampled initially for water, nitrate-N, and Cd 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 Table 1d. Planting date was April 30 for both plot areas. Plots were harvested with a small plot combine on August 22 for irrigated and August 7 for dryland. Grain samples were weighed and tested for Cd content. Plot size was 5 rows wide (12 inch spacing) and 25 feet long for the dryland and 12 feet by 4 rows wide for the irrigated.

Results: This year Cl had no effect on yield or Cd content of durum. The Cd durum test was not sensitive enough, so the grain Cd results should be interpreted with caution.

Table 9s. Soil test results. Western Triangle Ag. Research Center. 2007.

Irrigated					
Test (0-6")	OM, %	pH	P, ppm	K, ppm	Salts, mhos/cm
Value	2.2	8.1	18	340	0.32
Depth	0-1'	1-2'	2-3'	3-4'	4-5'
Nitrate N, lbs/ac	49	22	8	7	10
Cd, ppm	0.06	0.02	0.01	0.01	0.04
Spray Date*	6/10				
Dryland					
Test (0-6")	OM, %	pH	P, ppm	K, ppm	Salts, mhos/cm
Value	2.2	7.9	20	290	0.4
Depth	0-1'	1-2'	2-3'	3-4'	4-5'
Nitrate N, lbs/ac	38	15	6	7	9
Cd, ppm	0.05	0.01	0.02	0.01	0.02

* Bronate Advanced @ 1.6 pt/a tank mixed with Axial @ 8.2 oz/a.

Table 10s. Effect of chloride and variety on yield and Cadmium content of dryland spring durum. Western Triangle Ag. Research Center. 2007.

Variety	Cl Rate	Grain yield	Test Weight	Cadmium Content
	lbs/ac	bu/ac	lb/bu	ppm
Alzada	0	36.0	57.3	ND
Alzada	15	32.3	57.6	ND
Alzada	30	35.9	57.4	ND
Strongfield	0	33.2	55.6	ND
Strongfield	15	31.8	56.8	ND
Strongfield	30	34.8	56.6	ND
Variety Summary				
Alzada		34.8 a	57.3 a	0.3 a
Stronfield		33.4 a	56.7 a	0.2 a
Chloride Summary				
0		35.4 a	56.8 a	0.2 a
15		32.4 a	57.3 a	0.3 a
30		34.9 a	56.8 a	0.3 a
Linear contrast p-value		0.722	0.208	ND
Quadratic cont. p-value		0.141	0.237	ND
Statistical Summary				
Mean		34.1	57.0	0.2
CV (%)		11.9	1.2	49.4
Interaction p-value		0.887	0.398	0.664-

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

Table 11s. Effect of chloride and variety on yield and Cadmium content of irrigated spring durum. Western Triangle Ag. Research Center. 2007.

Variety	Cl Rate	Grain yield	Test Weight	Cadmium Content
	lbs/ac	bu/ac	lb/bu	ppm
Alzada	0	85.5	60.0	ND
Alzada	15	85.8	60.3	ND
Alzada	30	82.3	59.8	ND
Strongfield	0	96.0	61.8	ND
Strongfield	15	94.3	61.3	ND
Strongfield	30	96.5	61.5	ND
Variety Summary				
Alzada		84.5 a	60.0 b	0.4 a
Strongfield		95.5 a	61.6 a	0.2 b
Chloride Summary				
0		90.6 a	60.7 a	0.3
15		89.9 a	60.9 a	0.3
30		89.5 a	60.8 a	0.3
Linear contrast p-value		0.594	0.383	ND
Quadratic cont. p-value		0.978	0.999	ND
Statistical Summary				
Mean		90.0	60.8	0.3
CV (%)		5.6	0.8	18.6
Interaction p-value		0.529	0.466	0.456

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

Title: Dryland Spring Pea Variety Performance Trial.

Year: 2007.

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 re-crop conditions.

Procedures: Plots were planted re-crop into barley stubble with a five-row no-till plot drill with 12" row spacing. Seeding rate was about five seeds/ft². Peas were inoculated with a liquid inoculum. P fertilizer (30 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 11s.

Table 11s. Dryland spring pea performance nursery located at Western Triangle Agricultural Research Center, Conrad, MT. 2007.

Variety	Seed Yield
Cruiser	902 a
BL 29	850 a
BL 27	823 a
Durango	802 a
102	758ab
BL 40	673 ab
BL 89C	585 b

Summary Statistics

Experimental Means	770
Error Mean Square	106
P-Value	0.0075
C.V. 1: (s/mean)*100	13.7
LSD (0.05)	157

Notes:

Planted: 4/27

Previous Crop: Barley

Harvested: 7/21

Growing Season ppt: 2.91"

Title: Effect of Nitrogen on Spring Wheat Varieties

Year: 2007

Locations: Western Triangle Ag. Research Center
Ethridge area (Griffin farm)
Sunburst area (Karst farm)
Joplin area (Moog farm)
Cut Bank area (Bradley farm)

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

Objectives: To compare the response of new spring wheat varieties to nitrogen (N) fertilization in the Western Triangle area.

Procedures: Nitrogen fertilizer was applied to Choteau, Corbin, McNeal, Nick, and Vida spring wheat at the following locations: Cut Bank, Ethridge, Joplin, Sunburst, and WTARC. At the WTARC location, Outlook wheat was added, and N rates were based on preplant soil tests at all locations. All of the wheat varieties were hard red except Nick, which is a soft white. 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 P₂O₅/ acre as 0-45-0 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 Table 1w 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.

Results: Results for a dry and hot 2007 growing season are shown in Tables 14s thru 19s. Grain yield and protein content are about what one would expect from a dry and hot season: low variable yields, high protein content, and lower test weights. As the result, very little differences were noted in grain yields; however, the soft white variety did have lower protein content.

Table 12s. Site characteristics and soil test results by location. Western Triangle Ag. Research Center. 2007.

Site Characteristics						
Character	Cut Bank	Ethridge	Joplin	Sunburst	WTARC i	WTARC
Planting Date	April 26	April 16	May 1	April 27	April 28	April 30
Harvest Date	August 16	July 30	August 6	August 14	August 22	August 7
Previous Crop	Chem. Fallow	Chem. Fallow	Chem. Fallow	Barley, no-till	Conv. Fallow	Conv. Fallow
Growing Season Precipitation (inches)	1.6	1.2	2.9	2.3	3.2	3.0
Spray Date	6/4	6/1**	6/4***	6/4	6/10	6/5
Soil Test Results						
Test	Cut Bank	Ethridge	Joplin	Sunburst	WTARC i	WTARC
pH	6.9	8.0	7.8	6.6	8.1	7.9
O.M. (%)	2.8	2.4	1.6	2.8	2.2	2.2
P (ppm)	38	13	16	29	18	20
K (ppm)	491	477	454	414	340	290
EC (mmhos/cm)	0.26	0.31	0.25	0.25	0.32	0.4
NO ₃ -N (0-3', lb/ac)	70	101	96	20	78	59

ND=Not determined. **=Bronate Advanced @ 1.6 pt/a tank mixed with Axial @ 8.2 oz/a and Headline @ 9 oz/a. *=Soil sample to two feet depth. **Farmer sprayed with Axial, Clarity, and Ally @ labeled rates. ***Farmer sprayed with Bronate Advanced @ 1 pt/a.

Table 13s. Effect of nitrogen and variety on agronomic characteristics of dryland spring wheat. Cut Bank location. Western Triangle Ag. Research Center. 2007.

Variety	N Rate	Grain yield	Grain Protein	Test Weight
	lbs/ac	bu/ac	%	lb/bu
Choteau	0	25.5	14.5	56.0
Choteau	50	25.0	15.3	54.0
Choteau	100	26.3	16.8	53.5
Choteau	150	29.3	17.0	54.5
Corbin	0	28.3	14.9	55.8
Corbin	50	26.0	17.2	53.3
Corbin	100	26.0	17.9	53.0
Corbin	150	26.0	18.5	53.0
McNeal	0	26.8	13.8	55.0
McNeal	50	29.0	16.0	53.3
McNeal	100	19.3	16.8	53.3
McNeal	150	31.3	16.8	53.3
Nick	0	26.8	13.6	53.8
Nick	50	26.8	14.8	51.8
Nick	100	28.0	15.4	52.3
Nick	150	28.5	15.6	52.8
Vida	0	26.0	14.3	54.5
Vida	50	29.3	15.7	54.3
Vida	100	28.8	16.9	53.3
Vida	150	28.8	16.7	54.3
Variety Summary				
Choteau		26.5 a	15.9 b	54.5 a
Corbin		26.6 a	17.1 c	53.8 ab
McNeal		29.1 a	15.8 b	53.7 b
Nick		27.5 a	14.9 a	52.6 c
Vida		28.2 a	15.9 b	54.1 ab
Nitrogen Summary				
0		26.7 a	14.2 a	55.0 a
50		27.2 a	15.8 b	53.3 b
100		27.7 ab	16.8 c	53.1 b
150		28.8 b	16.9 c	53.6 b
Linear contrast p-value		0.002	0.001	0.001
Quadratic cont. p-value		0.561	0.001	0.001
Statistical Summary				
Mean		27.6	15.9	53.7
CV (%)		7.6	4.2	1.7
Interaction p-value		0.112	0.381	0.338

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

Table 14s. Effect of nitrogen and variety on agronomic characteristics of dryland spring wheat. Ethridge location. Western Triangle Ag. Research Center, 2007.

Variety	N Rate	Grain yield	Grain Protein	Test Weight
	lbs/ac	bu/ac	%	lb/bu
Choteau	0	21.5	12.2	59.0
Choteau	30	25.3	14.1	60.3
Choteau	60	25.5	14.8	59.8
Choteau	90	25.0	15.4	59.8
Corbin	0	24.5	11.7	61.3
Corbin	30	27.3	13.3	60.8
Corbin	60	28.0	14.4	59.8
Corbin	90	27.0	15.2	59.3
McNeal	0	24.5	11.8	58.0
McNeal	30	25.0	13.5	57.3
McNeal	60	27.0	15.1	57.5
McNeal	90	24.5	15.2	56.8
Nick	0	30.5	10.1	58.5
Nick	30	31.5	11.8	57.8
Nick	60	33.0	12.8	58.5
Nick	90	32.8	13.3	58.5
Vida	0	24.8	11.2	59.0
Vida	30	27.5	13.4	58.0
Vida	60	28.0	14.4	56.0
Vida	90	26.5	15.0	56.3
Variety Summary				
Choteau		24.1 a	14.1c	59.7 b
Corbin		26.7 b	13.6 cb	60.3 b
McNeal		25.3 ab	13.9 cb	57.4 a
Nick		31.9 c	12.0 a	58.3 a
Vida		26.7 b	13.5 b	57.3 a
Nitrogen Summary				
0		25.2 a	11.4 a	59.2 c
30		27.3 cb	13.2 b	58.8 bc
60		28.3 c	14.3 c	58.3 ab
90		27.0 b	14.8 d	58.1 a
Linear contrast p-value		0.001	0.001	0.001
Quadratic cont. p-value		0.001	0.001	0.685
Statistical Summary				
Mean		26.9	13.4	58.6
CV (%)		6.2	3.7	1.4
Interaction p-value		0.780	0.888	0.001

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

Table 15s. Effect of nitrogen and variety on agronomic characteristics of dryland spring wheat. Joplin location. Western Triangle Ag. Research Center. 2007.

Variety	N Rate	Grain yield	Grain Protein	Test Weight
	lbs/ac	bu/ac	%	lb/bu
Choteau	0	26.3	16.5	56.0
Choteau	30	26.3	17.2	54.8
Choteau	60	25.0	17.4	55.0
Choteau	90	26.3	17.6	54.3
Corbin	0	28.3	17.7	55.3
Corbin	30	28.5	18.2	54.5
Corbin	60	28.3	19.0	53.8
Corbin	90	25.3	19.2	53.5
McNeal	0	28.3	16.9	53.8
McNeal	30	29.5	17.9	53.3
McNeal	60	28.3	18.8	52.3
McNeal	90	31.0	18.7	52.8
Nick	0	36.0	14.0	55.8
Nick	30	35.8	15.0	53.8
Nick	60	34.0	15.5	53.3
Nick	90	33.0	15.5	53.5
Vida	0	33.5	15.8	55.5
Vida	30	34.3	16.4	55.0
Vida	60	31.3	17.4	53.8
Vida	90	32.3	17.4	53.5
Variety Summary				
Choteau		25.9	17.2 cb	55.1 a
Corbin		27.6	18.5 d	54.3 a
McNeal		29.3	18.1 cd	53.0 a
Nick		34.7	15.0 a	54.1 a
Vida		32.8	16.7 b	54.4 a
Nitrogen Summary				
0		30.5 a	16.2 a	55.3 a
30		30.8 a	17.0 b	54.2 b
60		29.4 a	17.6 c	53.6 c
90		29.7 a	17.7 c	53.6 c
Linear contrast p-value		0.051	0.000	0.000
Quadratic cont. p-value		0.832	0.000	0.017
Statistical Summary				
Mean		30.1	17.1	54.2
CV (%)		6.8	2.3	1.5
Interaction p-value		0.262	0.566	0.752

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

Table 16s. Effect of nitrogen and variety on agronomic characteristics of dryland spring wheat. Sunburst location. Western Triangle Ag. Research Center. 2007.

Variety	N Rate	Grain yield	Grain Protein	Test Weight
	lbs/ac	bu/ac	%	lb/bu
Choteau	0	17.3	12.0	61.3
Choteau	70	34.0	13.1	58.5
Choteau	140	28.8	15.2	58.0
Choteau	210	28.8	15.5	58.3
Corbin	0	20.0	11.3	62.3
Corbin	70	36.8	13.1	59.3
Corbin	140	38.3	15.9	57.3
Corbin	210	36.5	16.4	57.0
McNeal	0	15.0	12.0	60.0
McNeal	70	33.0	13.5	56.8
McNeal	140	32.5	15.2	56.3
McNeal	210	33.3	15.4	56.8
Nick	0	19.8	10.1	60.0
Nick	70	37.0	11.8	57.5
Nick	140	37.8	13.3	57.3
Nick	210	30.8	13.5	58.0
Vida	0	18.8	11.1	61.0
Vida	70	34.3	12.5	59.0
Vida	140	39.8	14.2	57.8
Vida	210	31.5	14.6	57.3
Variety Summary				
Choteau		27.2 a	14.0 c	59.0 a
Corbin		32.9 a	14.2 c	58.9 a
McNeal		28.4 a	14.0 c	57.4 b
Nick		31.3 a	12.1 a	58.2 ab
Vida		31.1 a	13.1 b	58.8 a
Nitrogen Summary				
0		18.1 a	11.3 a	60.9 a
70		35.0 c	12.8 b	58.2 b
140		35.5 c	14.8 c	57.3 c
210		32.2 b	15.1 d	57.4 c
Linear p-value		0.001	0.001	0.001
Quadratic cont. p-value		0.001	0.001	0.001
Statistical Summary				
Mean		30.2	13.5	58.5
CV (%)		12.0	3.1	1.0
Interaction p-value		0.121	0.002	0.001

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

Table 17s. Effect of nitrogen and variety on agronomic characteristics of dryland spring wheat. WTARC-Dryland. Western Triangle Ag. Research Center. 2007.

Variety	N Rate	Grain yield	Grain Protein	Test Weight
	lbs/ac	bu/ac	%	lb/bu
Choteau	0	34.0	15.1	59.5
Choteau	50	33.3	14.6	58.3
Choteau	100	32.0	15.8	58.5
Choteau	150	32.8	15.6	57.8
Corbin	0	37.0	14.5	60.0
Corbin	50	35.8	15.4	58.3
Corbin	100	37.5	15.6	58.8
Corbin	150	37.0	15.2	58.0
McNeal	0	34.8	14.5	57.5
McNeal	50	36.8	14.7	57.0
McNeal	100	34.0	15.5	56.0
McNeal	150	36.8	15.2	56.5
Nick	0	37.3	13.0	57.5
Nick	50	38.3	13.5	57.0
Nick	100	40.8	14.0	57.3
Nick	150	39.8	13.4	57.5
Outlook	0	34.8	14.4	58.3
Outlook	50	36.5	14.9	56.8
Outlook	100	35.8	15.2	56.8
Outlook	150	34.3	14.6	55.5
Vida	0	36.3	13.4	58.8
Vida	50	38.0	14.2	58.0
Vida	100	36.3	14.9	57.3
Vida	150	36.0	14.3	57.0
Variety Summary				
Choteau		33.1 a	15.3 c	58.5 a
Corbin		36.7 a	15.2 c	58.8 a
McNeal		35.6 a	15.0 c	56.8 a
Nick		38.9 a	13.5 a	57.4 a
Outlook		35.3 a	14.8 bc	56.9 a
Vida		36.6 a	14.2 ab	57.7 a
Nitrogen Summary				
0		35.8 a	14.2 a	58.6 a
50		36.3 a	14.6 ab	57.5 b
100		36.0 a	15.2 c	57.5 b
150		36.1 a	14.7 bc	57.1 b
Linear contrast p-value		0.769	0.004	0.000
Quadratic cont. p-value		0.595	0.012	0.098
Statistical Summary				
Mean		36.1	14.6	57.7
CV (%)		9.0	5.6	4.63
Interaction p-value		0.911	0.980	0.354

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

Table 18s. Effect of nitrogen and variety on agronomic characteristics of spring wheat. WTARC-irrigated location. Western Triangle Ag. Research Center. 2007.

Variety	N Rate	Grain yield	Grain Protein	Test Weight
	lbs/ac	bu/ac	%	lb/bu
Choteau	0	67.8	12.2	61.5
Choteau	100	81.5	14.4	60.5
Choteau	200	83.5	15.3	60.8
Choteau	300	72.5	15.6	59.8
Corbin	0	67.5	11.3	63.0
Corbin	100	74.8	13.7	61.8
Corbin	200	94.0	14.7	62.0
Corbin	300	89.0	14.9	60.8
McNeal	0	55.8	11.5	60.8
McNeal	100	73.5	13.7	61.0
McNeal	200	67.5	14.9	60.3
McNeal	300	73.0	15.0	59.8
Nick	0	65.3	9.3	60.8
Nick	100	79.5	11.3	61.5
Nick	200	90.3	12.1	62.0
Nick	300	88.3	12.3	61.3
Outlook	0	54.0	11.7	60.0
Outlook	100	56.5	13.5	60.1
Outlook	200	63.0	14.8	59.3
Outlook	300	67.0	15.0	59.0
Vida	0	68.5	12.6	60.3
Vida	100	77.8	14.0	58.8
Vida	200	72.8	15.0	58.0
Vida	300	71.0	15.1	57.8
Variety Summary				
Choteau		76.3 ab	14.4 c	60.5 b
Corbin		81.2 a	13.7 b	61.8 a
McNeal		67.3 cd	13.8 b	60.3 b
Nick		80.8 a	11.3 a	61.4 a
Outlook		60.1 d	13.7 b	59.5 c
Vida		72.5 bc	14.2 cb	58.7 d
Nitrogen Summary				
0		63.1 a	11.4 a	61.0 a
100		73.9 b	13.5 b	60.6 b
200		78.5 c	14.5 c	60.2 c
300		76.7 bc	14.6 c	59.7 d
Statistical Summary				
Linear contrast p-value		0.000	0.000	0.000
Quadratic cont. p-value		0.000	0.274	0.000
Mean		73.0	60.4	60.4
CV (%)		7.7	0.82	0.7
Interaction p-value		0.001	0.000	0.001

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