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Montana Agricultural Experiment Station

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Submitted by

Dr. Gregory D. Kushnak, Superintendent & Crop Scientist

and

Dr. Grant D. Jackson, Soil Scientist

Montana State University

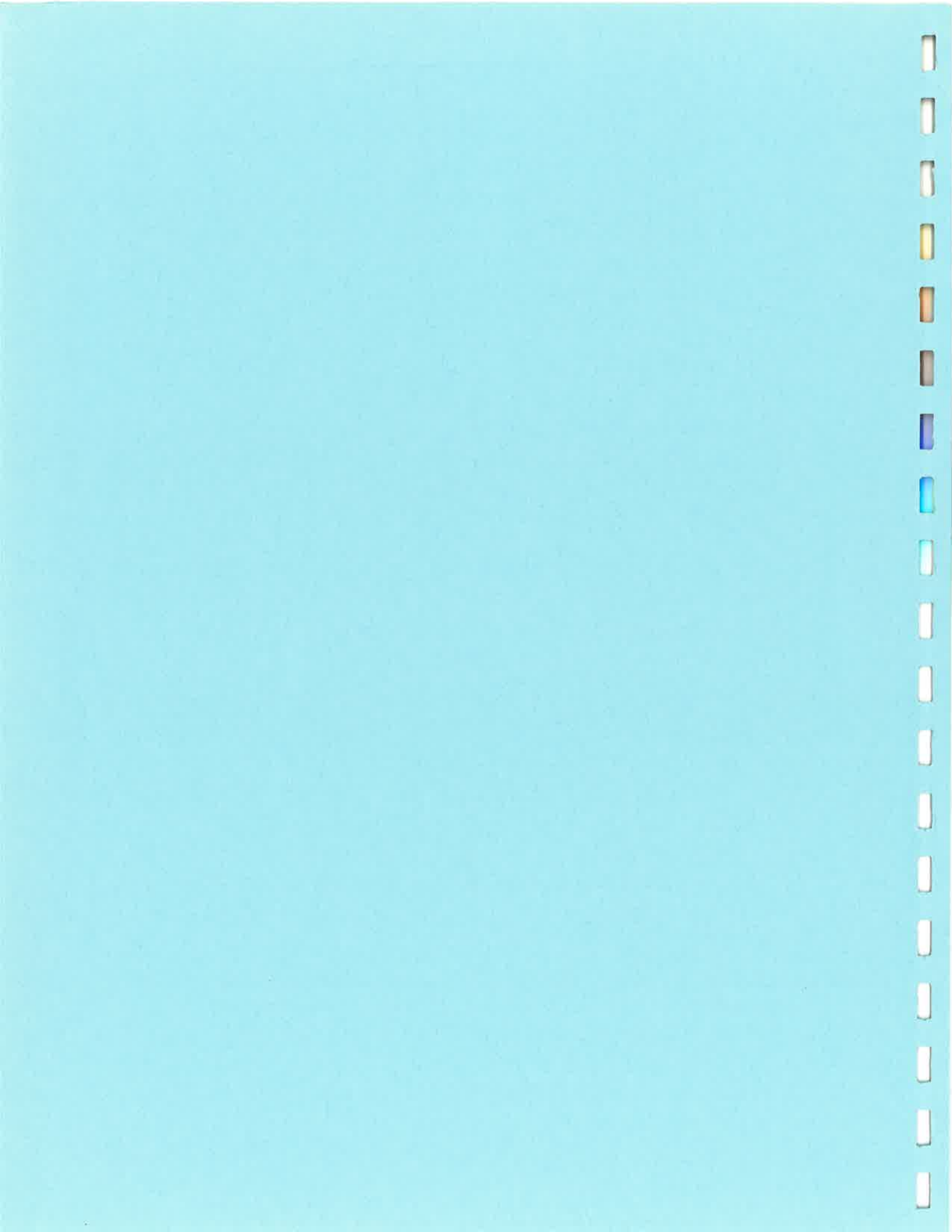


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Climatic summary for the 1997 calendar year at the Western Triangle Research Center, Conrad, MT.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total or average
Precipitation (inches)													
Current Year	0.18	0.26	0.32	0.72	3.03	2.53	1.04	1.02	0.73	0.28	0.48	0.00	10.59
Average 13 yr	0.22	0.21	0.56	0.90	2.10	2.63	1.61	1.48	1.43	0.52	0.35	0.19	12.20
Mean Temperature (°F)													
Current Year	15.8	29.1	31.2	36.1	52.5	61.2	65.5	67.6	58.9	44.5	31.4	28.4	43.5
Average 12 yr	22.4	22.9	33.9	43.5	53.1	60.7	65.3	65.3	57.2	45.2	30.2	24.3	43.7
Last killing frost in Spring													
1997													May 19 (27°)
Average													May 15
First killing frost in Fall													
1997													Sep 19 (30°)
Average													Sep 21
Frost free period (days)													
1997													124
Average													128.5
Maximum summer temperature													93° (Aug 5)
Minimum winter temperature													- 30° (Jan 13, 1997)

Summary of climatic data by month for the 1996-97 crop year (Sept - August) at the Western Triangle Research Center, Conrad, MT.

	Sep 1996	Oct 1996	Nov 1996	Dec 1996	Jan 1997	Feb 1997	Mar 1997	Apr 1997	May 1997	June 1997	July 1997	Aug 1997	Total or Average
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Precipitation (inches)

Current year	1.79	0.37	0.43	0.76	0.18	0.26	0.32	0.72	3.03	2.53	1.04	1.02	12.45
Average 13 yr	1.49	0.54	0.34	0.21	0.22	0.21	0.56	0.90	2.10	2.63	1.61	1.48	12.29

Mean Temperature (°F)

Current year	52.8	42.4	18.1	17.4	15.8	29.1	31.2	36.1	52.5	61.2	65.5	67.6	40.8
Average 12 yr	57.0	45.3	30.1	18.9	22.4	22.9	33.9	43.5	53.1	60.7	65.3	65.3	43.2

Last killing frost in Spring

1997	May 19 (27°)
Average	May 15

First killing frost in Fall

1997	Sept. 19 (30°)
Average	Sept. 21

Frost free period (days)

1997	124
Average	128.5

Maximum summer temperature----- 93° (Aug 5)

Minimum winter temperature----- -30° (Jan. 13, 1997)

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.

Quality ratings: 4 = good; 3 = average; 2 = poor; 1 = very poor.

Abilene (AgriPro NA 362-5, 1987): Low winter-hardiness (2). Very short semidwarf. Early maturity. Yield ranked low at Conrad 1988. Adapted north of Ks/Okla borders and Texas panhandle. Susceptible to Hessian fly. Quality = 2.5.

Agassiz (ND, 1983): Recommended for District 6 only to replace Froid (Eastern Montana). High winterhardiness (4), slightly less than Roughrider. Tall very weak straw, lodges bad. Long coleoptile. Medium late maturity. Shatter resistance fairly good. Low yield, high protein. Quality = 3.

Akron (CO, 1994): Tested in 1996. Winterhardiness probably poor. Medium coleoptile.

Alliance (Nebr, 1993): Developed for dryland in Nebraska panhandle. Winter hardiness better than Vona, but still may be marginal for Montana. Short coleoptile. Early maturing, low test weight.

Arapaho (Nebr, 1989): Winterhardiness medium (3). Medium-short height with long coleoptile and moderate straw strength. Early heading. Heterozygous (mixed) resistance to Great Plains strain of Hessian fly, moderate tolerance to Cephalosporium stripe. Medium yield, low test weight.

Archer (NAPB): Winterhardiness less than Centurk, but greater than Vona (probably should classify as a 2). Not widely adapted for Montana. Short straw and good lodging resistance. Early maturity. Good shatter resistance. Sometimes can have test weight problems due to its massive tillering. Low protein.

Blizzard (ID 0297) (Idaho/Oregon/USDA): Probably similar to Weston for winterhardiness which is not very high (2-3). Long coleoptile. Snow mold resistance, for high elevation areas under snow. Better dwarf bunt resistance than Weston or Manning. Tough to thresh; lots of spikelets in grain sample. High protein.

Bighorn (Hybritech Intl, 1985): Winterhardiness somewhat tender in Triangle area. Short straw. Medium coleoptile. Medium early maturity. Susceptible to stem rust but resistant to dwarf smut. Fairly good yield. Protein is medium.

Bonneville (ID, 1994): Tested in 1996. Long coleoptile.

Centurk (Nebr, 1971): Medium low winterhardiness (2), less than Redwin and Tiber. Medium stiff straw. Long coleoptile. Early maturity, which sometimes allows escape from sawfly. High yield. Very susceptible to yellow berry expression under low nitrogen conditions. Medium-low protein.

Cheyenne: Medium winterhardiness. Tall straw. Medium maturity. Medium to high yield, shatters bad -(see 'Cree' for an improvement). High protein.

Chisolm (Oklahoma): Winterhardiness equal or less than Cimmaron (low).

Cimmaron (Oklahoma): Awnless (awnletted), red head. Winterhardiness adequate for Kansas, Nebraska, and Colorado. Stiff-straw semidwarf. Hard to thresh due to very stiff straw.

Cree (MSU, 1983): Shatter resistant version of Cheyenne. Identical to Cheyenne in other respects except has red head and brown chaff. Winterhardiness medium (3). Tall straw. Medium maturity and highly vulnerable to sawfly. Medium to high yield. High protein. Seed supply no longer maintained.

Crimson (SD89153, 1997): TAM105/Winoka. Very long coleoptile.

Dawn (S.Dak.): Fair winterhardiness, greater than Hawk. Medium short height, good lodging resistance. Early maturity. Quality is fair.

Dynamic I & II (Russia): Intro, Big Sky Seeds. Tested in 1996. Beardless. Long and medium coleoptile, respectively.

Eklund (private var.- eastern Mta grower): Beardless. High winterhardiness (4 or 5). Medium-short height. Medium maturity. Medium shatter resistance.

Elkhorn (ND, 1994): Good winter hardiness (4). Medium height and straw strength. Long coleoptile. Medium-late maturity. Quality = 3.

Erhardt (MT8719, MSU, 1996): White chaff. Good winterhardiness (4), equal to Roughrider. Five inches shorter than Roughrider and 3 inches shorter than Rocky. Strong straw, much better lodging resistance than Roughrider, and somewhat better than Rocky & Neeley, but not as strong as McGuire or Tiber. Medium coleoptile. Medium maturity, 2 days later than Judith & Rocky, one day earlier than Tiber, 2 days earlier than Neeley. Resistant to stem rust & leaf spot complex. Susceptible to WSMV, stripe rust, dwarf bunt, RWA & sawfly. Hetero (mixed) resist to GP Hessian fly. Yield 19% higher than Roughrider, and 5% lower than Tiber, Neeley & Rocky unless the latter three suffer winter injury. Moderately susceptible to shatter. Higher test wt than Roughrider, Judith & Neeley, and similar to Tiber & Rocky. High protein (similar to Redwin) & excellent quality. Intended to replace Roughrider, Agassiz and Seward in NE Montana.

Froid: High winterhardiness (5). Low yield and tall weak straw.

Garland (UT, 1994): Tested in 1996. Very short straw, shorter than Norwin. Short coleoptile. Powdery mildew & dwarf bunt resistant.

Halt (Colorado, 1994): Winterhardiness (2). Short semidwarf. Medium coleoptile. Early maturing. Has Russian wheat aphid resistance.

Hawk (AgriPro): Winterhardiness moderate to poor, probably less than Centurk. Short straw & good lodging resistance. Medium coleoptile. Early maturity. Sometimes yields high, but not consistently. Adapted to Southern Great Plains.

Hill-81 (Oregon): Soft White. Compared to other soft-white wheats, winter-hardiness is good, but still may be risky for Triangle area. Good straw strength.

Ike (Kansas, 1993): Tall semidwarf. Medium coleoptile. Very early heading (2 days earlier than Rocky). Resistant to stem & leaf rust, and Hessian fly.

Judith (MT 8039, MSU, 1989): Winterhardiness = 3, higher than Rocky and Cheyenne, and equal to Redwin. Low vernalization requirement. Medium short straw; straw less stiff than Neeley, Tiber and Redwin; but stiffer than Rocky and Centurk. Short coleoptile. Heading slightly later than Rocky, but earlier than Tiber. However, it had more sawfly damage than Rocky & Tiber at the Knees plot in 1991. Stripe and stem rust resistant. Yields fair to good, sometimes equal to Rocky and Tiber. Medium shatter resistance. Test weight is sometimes low, and may be a problem. Protein is medium: equal to Tiber, greater than Centurk, and less than Redwin. Quality = 3.

Jules (Colorado, 1992): Winterhardiness medium low (2). Semidwarf with better straw strength than Lamar. Short coleoptile. Early maturity (like Rocky). Resistant to stem rust; some tolerance to wheat streak mv. Better yield than Lamar. High yield in 1994 and 1995. Medium to low test weight.

Karl 92 (Kansas, 1992): Poor winterhardiness. Early maturing. Low yield.

Kestrel (Sask, Can, 1993): Winterhardy and high yielding in Canada (hardiness = 5, similar to Norstar). Shorter straw & slightly better lodging resistance than Norstar. Short coleoptile. Medium late; three days earlier than Norstar (similar maturity as Redwin). Probably will not tolerate drought stress very well. Very susceptible to physiological leaf spot. Susceptible to stem, stripe, & leaf rust. Higher yield than Norstar. Test weight and protein less than Norstar (very low). Dockage for low protein is almost certain with this variety.

Lamar (Colorado, 1988): Very poor winterhardiness (1-2). Medium height with weak straw. Long coleoptile. Very early heading. Adapted to severe low moisture conditions of Colorado. Heterogeneous reaction to Great Plains biotype of Hessian fly. Shattered in 1993. Medium yield. High test weight.

Manning (Utah): Poor winterhardiness (1-2). Medium short; good straw strength. Medium coleoptile. Adapted to deep snow areas; resistant to dwarf bunt and moderately tolerant to snow mold.

McGuire (MT88046, MSU, 1996): Red chaff. Winterhardiness intermediate (3), similar to Neeley & Judith. Height 2 inches shorter than Neeley & Judith. Long coleoptile. Good lodging resistance, similar to Tiber & Redwin and superior to Neeley & Rocky. Very early maturity, 1 to 2 days earlier than Rocky. Resistant to stem rust. Susceptible to stripe rust, dwarf bunt, WSMV, RWA and sawfly. Low to medium yield; similar to Redwin and 7bu/a lower than Neeley. Test weight intermediate, similar to Rocky. Has the highest protein and baking quality of any winter wheat tested in our lab. Very high protein, 1% higher than Redwin. Possibly useful for specialty markets.

Meridian (Idaho, 1991): Poor winterhardiness (2). Good straw strength; developed for irrigated conditions in Idaho. Medium coleoptile. Very late maturity (several days later than Neeley). Too late in maturity for satisfactory performance in the Triangle area; needs long, moist growing season. Moderate resistance to stripe rust, snow mold and dwarf bunt. Susceptible to stem rust. Yields rank from low to very high depending on year. Medium to low test weight. Low to very low protein.

Minter: High winterhardiness (4-5). Medium height and maturity. Low yield. Good shatter resistance.

Morgan (Sask & WPB, S89-142): Norstar/Archer. Good winterhardiness. Height similar to Rocky. Very short coleoptile. Slightly later maturity than Rocky, 3 days later to head. Yield avgs 4 bu less than Rocky. Protein equal or slightly higher than Rocky.

MT 8713 (MSU): Experimental; sister selsn of Erhardt with similar traits, but much shorter. Very good winterhardiness (similar to Norwin). Three inches taller than Norwin and 7" shorter than Redwin. Lodging resistance similar to Norwin. Early to medium maturity: 1-2 days later than Rocky & Judith. Stem rust resistant. Moderate yield, 2 bu/a higher than Norwin. Higher test wt than Norwin. Adequate quality and 1% higher protein than Norwin. Potential replacement for Norwin, but will not be released unless there is interest in another Norwin type.

Neeley (Idaho): Winterhardiness medium to high (3); greater than Cheyenne, but less than Winalta. Medium short straw, slightly less stiff than Redwin and Tiber. Long coleoptile. Medium-late maturity, making it highly vulnerable to sawfly. Susceptible to stem rust. Very high yielder in good years, but does poor if stressed for moisture. Good shatter resistance. Protein & quality are erratic, ranging from low to high; apparently more sensitive to Nitrogen deficiency.

Nekota (Nebr & SD, 1994): Tested in 1996. Semidwarf. Medium coleoptile. Supposedly early.

Niobrara (Nebr & SD, 1994): Tested in 1996. Semidwarf. Medium coleoptile. Moderately early.

Norstar (Canada, 1977): Maximum Winterhardiness (5). Very tall straw, poor lodging resistance. Long coleoptile. Late maturity. Susceptible to stem rust & leaf spot. Low yield. Medium to low shatter resistance (head shattering occurred at Conrad in 1980). Protein medium-low; lower than Roughrider. Quality = 3.

Norwin (MSU, 1984): Winterhardiness = 5 (high). Licensed in Canada. Very short semidwarf straw, but not a tripledwarf. Too short for dryland. Very short coleoptile. Medium maturity. Severe Pseudomonas bacterial leaf blight symptoms. Medium yield. Good shatter resistance. Protein medium to low. Quality = 2.

Nuwest (MT 7811) (MSU, WPB, 1994): Hard white winter wheat for specialty markets. Winterhardness equals Tiber & Redwin (3). 1 or 2 inches shorter than Rocky. Stiffer straw than Neeley & Rocky. Very short coleoptile, 30% shorter than Rocky & Neeley. Two days later than Rocky, 3 days earlier than Neeley. Resistant to stem rust but susceptible to stripe rust, dwarf bunt, and WSMV. Susceptible to sawfly, RWA, and Hessian fly. Medium high yield and well adapted to Montana. Yield about 3% less than Neeley, 1% less than Rocky, & equal to Tiber. Test weight 1 lb/bu lower than Rocky & Tiber, but 1 lb/bu higher than Judith. Medium resistance to preharvest sprouting - hard whites tend to sprout as they lack the polyphenolic cpds that occur in the bran of red wheat. But sprouting is usually not a problem for hard whites in Montana (In 1993, everything sprouted - red or white). Contains 1 red kernel/1000. Protein medium to high, about 0.5% less than Redwin. Good quality.

Promontory (Utah, 1990): Red head. Winter hardiness probably poor (2). Medium short, strong straw, good lodging resistance. Short coleoptile. Medium-late maturity. Excellent stripe rust & dwarf smut resistance; susceptible to stem rust. Yield and test weight higher than Manning. Protein medium low.

Pronghorn (Nebr, SD & Wyo, 1995): Probably poor WH. Tall straw. Long coleoptile.

Quantum 542 (Hybritech, 1988): An F₁ hybrid; needs new seed each year. Planting F₂ (second generation) seed may result in yield reduction and development of ergot due to sterility in a small percentage of florets (ms ratio less than 3:1). F₁ vs F₂ tests in 1992 indicated a 12% yield reduction from planting 2nd generation seed. Winterhardness is fairly good (3), but less than Winalta. Medium short height, but taller than 547, giving an advantage in dry conditions. Lodging resistance equal to Rocky. Long coleoptile. Early maturity like Rocky. Susceptible to stem rust. High yield. Protein as good as Rocky (medium low). Recommended in 1991 for districts 2,3,4, & 5 (but not for dwarf smut areas).

Quantum 547 (Hybritech, 1994): F₁ hybrid. Tested as XNH1609 in 1993-94. Winterhardness = 3. Shorter straw than 542, giving an advantage in high rainfall areas. Short coleoptile. Yielded higher than Neeley in 1994 & 1995. Quality may be marginal.

Quantum 555 (Hybritech): F₁ hybrid (see Q 542). Awnletted. Good winterhardness. Semidwarf. Excellent straw strength. Intended for irrigated only. Two days later than Centurk. According to Hybritech, adapted to Montana.

Quantum 566 (Hybritech, 1994): F₁ hybrid. Tested as XNH1727 in 1994. Short coleoptile. Late maturing; mainly intended for eastern Montana & South Dakota. Yielded higher than Neeley in 1994 & 1995.

Ram (NAPB): Winterhardness less than Centurk (low). Tall semidwarf with good straw strength. Early maturity (similar to the Centurk-type wheats). Adapted to Southern Great Plains. Susceptible to Hessian fly. Medium-low test weight.

Rampart (MTS92042, MSU, 1996): Sawfly resistant (sister line to Vanguard). Red chaff, upright head. May have some improvements over Vanguard for yield, stem solidness, and quality. Equal or marginally better winterhardness than Vanguard (1.5 to 2) but slightly less than Rocky. Should not be grown in areas where high levels of winterhardness are needed, unless protected by stubble. Height 1 inch shorter than Judith & Neeley. Very long coleoptile. Matures 1 day later than Judith & Rocky, 2 days earlier than Neeley. Some resistance to stem rust, and some tolerance to wheat streak mv. Yield averages 6% higher than Vanguard; and 4% less than Rocky in the absence of sawflies, but equal to Rocky under heavy sawfly conditions. Does not seem as prone to shatter as Vanguard. Good test weight, protein and quality.

Rawhide (Nebraska): Not tested in Montana. For Southern Plains.

Readymade (W188) (Canada, 1994): Selection from Redwin by Agr Canada at Lethbridge. Winter hardiness (3), yield and maturity similar to Redwin. Medium-short height, stiff straw. Long coleoptile. Had similar leaf spot problems as Redwin at Conrad 1992, and is susceptible to leaf & stem rust. Head color same as Redwin; but stems are yellow, whereas Redwin stems are mixture of red and yellow. Redwin has a mix of small spring wheat-like seeds with large seeds. Readymade is all large seed that grade properly under the Canadian system. Slightly lower protein, and larger

kernels than Redwin.

Redwin (MSU, 1979): Red head. Winterhardness = 3, greater than Cheyenne but slightly less than Winalta. Medium short height. Very stiff straw, (along with Tiber, is among the stiffest available among Mta wheats). Long coleoptile. Medium-late maturity, medium yield. Very susceptible to leaf spot fungi and bacterial leaf blight. Good shatter resistance. Yields similar to Winalta. Tiber and Readymade were selected from Redwin. Redwin is among the highest protein winter wheats.

Rita (SD, 1980): Fair winterhardness. Medium height, stiff straw. Early maturity. Quality = 3.

Rio Blanco (NAPB): Not tested in Montana. For Southern Plains.

Rocky (Agripro, 1978): A selection from Centurk for soil borne mosaic resistance. Medium low winterhardness (2), less than Redwin and Tiber. Medium stiff straw, medium height. Long coleoptile. Early maturity, which sometimes allows escape from sawfly. High yield. Very susceptible to yellow berry expression under low Nitrogen conditions. Rocky is lower quality than Centurk. Medium protein.

Rose (SD, 1981): Fair WH. Short stiff straw. Early mat. Quality = 2.

Roughrider (ND, 1975): Good winter hardiness (5). Tall, but more lodging resistant than Winalta. Long coleoptile. Medium-late maturity. For Eastern Montana. Susceptible to leaf spot diseases. Heterogeneous for GP biotype Hessian fly. Low yield. Has a shatter problem in the Triangle area. Protein slightly greater than Winalta (high).

Seward (ND, 1987): Winterhardness of Winalta (4). Medium height and is shorter and stiffer than Winalta (about like Rocky). Good lodging resistance. Medium late maturity. Susceptible to leaf rust & leaf spot. Low yield at Conrad. Medium shatter resistance. Low protein & poor quality (2).

Sierra (Agripro): Short, stiff straw for irrigated lodging resistance. Higher yield & lower protein than Tomahawk.

Siouxland (S.Dak or Neb, 1984): Winterhardness not adequate for Triangle area of Montana. Early maturity. Sticky dough problems, and could damage our market quality image. Quality = 2.

Tam 107 (Texas): Red head. Winterhardness medium to low. Short straw. Early maturing. Moderate resistance to wheat curl mite infestation, and thus may be able to escape wheat streak mosaic virus. However, wheat streak symptoms were observed on Tam 107 at Conrad in 1993 (average level).

Tandem (SD 89119, 1997). Brule/Agate. Very long coleoptile.

Thunderbird (Agripro): Winterhardness may be low, less than Centurk. Short straw with good lodging resistance. Long coleoptile. Early maturity.

Tiber (MSU, 1988): Dark Red head, (darker than redwin); blackish red in years of favorable moisture. This trait makes Tiber popular for wheat weaving and other crafts. Winterhardness comparable to Redwin (3), greater than Cheyenne, and slightly lower than Winalta. Medium short height with good lodging resistance. Stiff straw - stiffer than Judith, but not quite as stiff as Redwin. Straw stiffness 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. Long coleoptile. Medium maturity, slightly earlier than Redwin, but still late enough to be sawfly vulnerable. Much greater tolerance to leaf spot diseases than Redwin. Susceptible to stem rust. Among highest yielders. Equal, or sometimes 1 bushel less than Neeley. Higher yielding and more tillers than Redwin. Good shatter resistance. Protein is medium: higher than Rocky, and similar to Neeley; 1/2% less than Redwin. Good milling and baking quality.

Tomahawk (Agripro): No Montana data, but probably similar to Rocky in most agronomic traits. Short, stiff straw for good irrigated lodging resistance. Lower yield and higher protein than Sierra.

Vanguard (MTSF2238) (MSU, 1995): Sawfly resistant. (Lew/Tiber//Redwin cross). Good stem solidness. White chaff, nodding head. Winterhardiness slightly less than Rocky (1.5 to 2, marginal to poor). Straw slightly stiffer and 1 inch shorter than Rocky, but moderately susceptible to lodging under high-yield conditions. Heterogeneous for height. 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. Yield is 8-12% lower than Rocky and 5% less than Redwin; but under heavy sawfly infestation, yield was equal to Rocky and Tiber, and greater than Neeley and Judith. May have a tendency to shatter. Test weight = Rocky. Protein high (similar to Redwin); 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.

Vista (Nebr, 1992): Winterhardiness (3). Semidwarf. Very short coleoptile. Early heading. Resistance to Hessian fly, leaf rust & stem rust. Medium to low yield.

Vona (Colorado): Winterkilled fairly often in Triangle area tests, but yields high if it survives without injury. Short stiff straw. Very early maturity if not winter-injured. Poor milling and baking quality.

Warrior (Nebr): Tall straw and medium maturity. Yields lower than Cree. Medium shatter resistance. May be resistant to the Great Plains strain of Hessian fly. High protein. Seed supply no longer available.

Weston (Idaho): Winter killed at Moccasin in 1989, winterhardiness poor (2). Tall straw, lodges. Dwarf smut resistant, but less than Blizzard. Moderate snowmold tolerance. Low to medium yield.

Winalta: Good winterhardiness (4). Tall weak straw. Medium yield. Good shatter resistance. High protein. Redwin and Tiber offer improvements.

Winoka: Similar to Winalta, but slightly earlier to mature.

Wings (Private variety): Winterhardiness less than Centurk. Sister to Vona, but a little more winterhardiness. Early maturity.

Winridge (MSU, 1981): Winterhardiness 2 (medium low), similar to Centurk but less than Cheyenne. Medium height with stiff straw. Very long coleoptile. Medium late maturity, and therefore highly vulnerable to sawfly. For dwarf smut areas. Medium to high yield. Good shatter resistance. Low test weight and protein. Quality = 1.

Yuma (Colorado, 1991): Winter hardiness somewhat poor (2). Semidwarf. Early maturing. Very short coleoptile. Some tolerance to wheat streak mv. Good yield & test weight potential if not winter-injured. Very low protein.

Table 1 **Dryland Winter Wheat variety trial grown north of Conrad, 1997. Mont. Agr. Expt. Sta., Western Triangle Ag. Research Center, Conrad, MT.**

Variety	Yield bu/ac	Test wt. lbs/bu.	Plant hgt. inches	Head date	Spring survival class <u>1</u> /	% protein
QUANTUM 542	83.5	62.5	34	167	3	11.1
OSPREY	82.9	62.2				10.2
QUANTUM 566	81.7	62.7	33	167		10.6
W96-504	80.1	63.9	34	168		10.6
YUMA	79.4	62.1	30	167	2	11.1
PRONGHORN	79.2	63.4	37	164		11.7
VISTA	79.2	62.9	29	164	3	11.2
NIOBRARA	78.9	61.6	32	164		10.6
ALLIANCE	78.9	62.8	32	164		10.2
W96-509	78.3	63.5	35	166		11.3
AKRON	78.3	63.1	32	167		10.6
CENTURK	77.2	63.1	37	167	2	11.6
MT 91192	77.1	60.5	33	170		11.4
RAMPART **	76.6	62.1	33	168	2	12.5
W96-482	76.5	62.9	30	165		11.3
JULES	76.3	59.5	30	168	2	11.2
PROMONTORY	76.3	62.2	32	169	2	10.6
ROCKY	76.1	63.4	35	167	2	11.3
MT 9441	76.1	61.4	34	169		11.6
MT 9432	75.8	62.9	37	169		12.0
JUDITH	75.6	60.0	34	168	3	11.9
MORGAN	75.5	62.2	34	170		11.4
MT9524	75.3	62.9	37	168		11.6
KESTREL	75.0	60.6	36	171	5	10.7
NEELEY	74.6	61.5	34	169	3	11.7
TIBER	74.4	61.2	39	169	3	11.4
MANNING	74.3	61.2	32	166	2	10.6
HALT ***	74.2	62.8	29	164	2	12.1
ND9272	73.9	62.1	34	167		11.6
VANGUARD **	73.8	62.2	34	168	2	12.2
CW91-406	73.7	62.3				11.3
SD89119	73.7	62.0	30	167		13.1
MT9514	73.6	61.6	35	170		10.7

(Continued on next page)

(Dryland Winter Wheat, continued)

Variety	Yield bu/ac	Test wt. lbs/bu.	Plant hgt. inches	Head date	Spring survival class <u>1/</u>	% protein
QUANTUM 1824	73.6	61.1	29	167		12.3
BIGHORN	73.1	61.9	29	168		11.0
NWCINC12	73.1	62.4	36	170		10.6
NUWEST *	72.3	60.8	36	165	3	11.9
NEKOTA	72.3	63.1	30	164		12.0
WINRIDGE	72.2	59.3	37	170	2	11.4
BLIZZARD	72.0	61.7	37	171	2-3	12.3
ERHARDT	71.4	63.4	34	168	4	12.7
SD89153	71.3	63.2	33	167		11.7
BZ92712A	70.2	62.4	30	168		11.7
BONNEVILLE	60.0	62.7	40	173		12.9
MT 9222	69.8	61.9	34	167		12.0
ND9257	69.4	61.9	35	170		11.9
ELKHORN	68.5	62.2	40	170	4	12.5
S86-1533	66.9	60.5	32	168		11.7
NORWIN	66.0	62.2	27	169	5	11.6
ROUGH RIDER	65.2	62.3	41	170	5	12.3
AGASSIZ	64.5	62.5	40	169	4	12.9
REDWIN	61.8	57.7	37	169		13.0
NORSTAR	60.2	62.4	42	173	5	12.5
MCGUIRE	60.1	61.7	33	166	3	13.1

Cooperator: Western Triangle Ag. Research Center.
 Location: Ten miles north of Conrad, Pondera County.
 Fertilizer: 100# 11-51-0 with the seed, + 60# N broadcast.
 Previous crop: Fallow.
 Date seeded: Sept. 10, 1996.
 Date harvested: Aug. 13, 1997.
 Rainfall: From April 1 to harvest was 7.41 inches.
1/ = Spring survival class: 5=best; 1=very low; based
 several location-years of observation.
 * = Hard white wheat.
 ** = Sawfly resistant variety. (Sawflies were not a problem in 1997)
 *** = Russian wheat aphid resistant.
 Yield experimental mean: 73.70
 Error degrees of freedom: 106
 F test for var. = 2.20, C.V. 2 = 4.77, LSD (0.05) = 9.86

Table 2 **Dryland Winter Wheat variety trial grown north of Conrad, 1997. Mont. Agr. Expt. Sta., Western Triangle Ag. Research Center, Conrad, MT.**
(abbreviated list)

Variety	Yield bu/ac	Test wt. lbs/bu.	Plant hgt. inches	Head date	Spring survival class <u>1</u> /	% protein
QUANTUM 542	83.5	62.5	34	167	3	11.1
OSPREY	82.9	62.2				10.2
QUANTUM 566	81.7	62.7	33	167		10.6
YUMA	79.4	62.1	30	167	2	11.1
PRONGHORN	79.2	63.4	37	164		11.7
VISTA	79.2	62.9	29	164	3	11.2
NIOBRARA	78.9	61.6	32	164		10.6
ALLIANCE	78.9	62.8	32	164		10.2
AKRON	78.3	63.1	32	167		10.6
CENTURK	77.2	63.1	37	167	2	11.6
RAMPART **	76.6	62.1	33	168	2	12.5
JULES	76.3	59.5	30	168	2	11.2
PROMONTORY	76.3	62.2	32	169	2	10.6
ROCKY	76.1	63.4	35	167	2	11.3
JUDITH	75.6	60.0	34	168	3	11.9
MORGAN	75.5	62.2	34	170		11.4
KESTREL	75.0	60.6	36	171	5	10.7
NEELEY	74.6	61.5	34	169	3	11.7
TIBER	74.4	61.2	39	169	3	11.4
MANNING	74.3	61.2	32	166	2	10.6
HALT ***	74.2	62.8	29	164	2	12.1
VANGUARD **	73.8	62.2	34	168	2	12.2
BIGHORN	73.1	61.9	29	168		11.0
NUWEST *	72.3	60.8	36	165	3	11.9
NEKOTA	72.3	63.1	30	164		12.0
WINRIDGE	72.2	59.3	37	170	2	11.4
BLIZZARD	72.0	61.7	37	171	2-3	12.3

(continued on next page)

(Dryland Winter Wheat abbreviated list, continued)

Variety	Yield bu/ac	Test wt. lbs/bu.	Plant hgt. inches	Head date	Spring survival class <u>1/</u>	% protein
ERHARDT	71.4	63.4	34	168	4	12.7
BONNEVILLE	60.0	62.7	40	173		12.9
ELKHORN	68.5	62.2	40	170	4	12.5
NORWIN	66.0	62.2	27	169	5	11.6
ROUGH RIDER	65.2	62.3	41	170	5	12.3
AGASSIZ	64.5	62.5	40	169	4	12.9
REDWIN	61.8	57.7	37	169		13.0
NORSTAR	60.2	62.4	42	173	5	12.5
MCGUIRE	60.1	61.7	33	166	3	13.1

Cooperator: Western Triangle Ag. Research Center.
 Location: Ten miles north of Conrad, Pondera County.
 Fertilizer: 100# 11-51-0 with the seed, + 60# N broadcast.
 Previous crop: Fallow.

Date seeded: Sept. 10, 1996.

Date harvested: Aug. 13, 1997.

Rainfall: From April 1 to harvest was 7.41 inches.

1/ = Spring survival class: 5=best; 1=very low; based
 several location-years of observation.

* = Hard white wheat.

** = Sawfly resistant variety. (Sawflies were not a problem in 1997)

*** = Russian wheat aphid resistant.

Yield experimental mean: 73.70

Error degrees of freedom: 106

F test for var.: 2.20

C.V. 2 : 4.77

LSD (0.05) : 9.86

Table 3 **Five-year summary for Winter Wheat varieties grown near Conrad, MT. 1993 - 1994 - 1995 - 1996 - 1997. Mont. Agr. Expt. Station, Western Triangle Ag. Research Center, Conrad, MT.**

5 - year comparable average					
Variety	Yield bu\ac	Test wt. lbs\bu.	Plant hgt. inches	Head date	% Protein 1/
QUANTUM 566	76.4	61.8	33.1	171	11.3
JULES	75.2	60.9	31.5	170	10.3
ALLIANCE	74.7	61.9	32.0	167	10.6
PROMONTORY	71.8	61.6	32.0	170	10.7
KESTREL	71.3	60.2	36.7	174	10.0
QUANTUM 542	70.3	61.9	35.9	171	11.6
MANNING	70.4	60.2	31.8	171	10.9
NEELEY	68.7	60.9	35.0	175	11.0
VISTA	68.1	61.8	29.7	167	11.5
YUMA	67.9	61.7	30.7	169	10.8
BIGHORN	67.9	61.4	29.2	173	11.2
BLIZZARD	67.9	60.8	37.8	177	11.9
ROCKY	67.2	62.2	34.5	171	11.2
NUWEST	** 67.0	60.6	35.6	172	11.4
WINRIDGE	66.9	59.2	37.1	176	10.7
CENTURK	66.3	62.0	35.2	169	11.3
RAMPART	* 66.2	61.6	34.0	173	12.4
JUDITH	66.2	59.7	34.3	172	11.3
NORWIN	65.0	61.6	27.9	175	11.3
HALT	64.7	61.3	27.7	168	11.9
TIBER	63.5	61.0	37.8	174	11.1
ERHARDT	62.6	62.0	33.3	172	12.7
VANGUARD	* 59.1	61.5	34.1	172	12.5
REDWIN	58.0	60.2	35.9	174	12.5
MCGUIRE	56.2	61.8	33.2	169	13.1
NORSTAR	54.2	60.9	43.7	179	12.0
AGASSIZ	53.5	61.3	40.5	175	12.4
ROUGH RIDER	50.4	61.6	40.1	174	12.5

Cooperator: Conrad Research Center.

Location: Ten miles north of Conrad, MT. (Pondera County)

1/ = Proteins based on four years of data. (1993-95-96-1997)

* = Sawfly resistant varieties.

** = Hard white wheat, (MT 7811).

Table 4 **Dryland Winter Wheat** variety trial grown near the Knees, 1997. Mont. Agr. Expt. Station, Western Triangle Ag. Res. Center, Conrad, MT.

Variety	Yield bu/ac	Test wt. lbs/bu.	Plant hgt. inches	Spring survival class <u>1</u> /	% protein
MT 9432	44.9	57.6	33.0		14.7
CENTURK	44.2	59.0	32.5	2	14.0
NUWEST *	43.5	57.4	29.0	3	14.8
TIBER	42.8	58.3	31.5		14.8
ROCKY	41.7	59.7	31.5	2	13.7
VANGUARD **	41.4	57.9	28.0	1.5	15.0
MT 9222	41.3	56.2	30.0		14.7
MT 91192	40.7	56.6	26.0		15.0
KESTREL	39.9	57.3	32.0	5	14.1
RAMPART **	39.5	58.3	29.0	1.5	14.9
HYBRITECH 542	39.0	57.9	33.0	3	14.1
YUMA	38.6	57.9	27.0	2	12.9
HAWK	38.5	57.5	26.5	2-3	13.9
AGASSIZ	38.5	58.3	35.5	4	13.9
JUDITH	38.2	56.0	29.5	3	15.2
BIGHORN	37.5	59.1	25.0		14.5
ALLIANCE	36.6	57.4	28.0		13.3
MCGUIRE	35.4	57.5	29.0	3	15.3
PROMONTORY	34.8	58.1	29.5	2	13.9
NORSTAR	34.4	58.2	35.0	5	15.6
NEELEY	34.3	57.4	30.5	3	15.1
REDWIN	30.6	53.6	29.0	3	15.7
ERHARDT	30.1	56.2	27.5	4	16.1
MANNING	29.4	54.9	29.5	2	14.4

Cooperator: Dan Picard.

Location: Thirty miles east of Brady, Chouteau County.

Fertilizer: 100# 11-51-0 with the seed, + 60# N AA-N.

Rainfall: From May 21 to harvest was 3.5 inches.

Previous crop: Fallow.

Date seeded: Sept. 11, 1996.

Date harvested: July 28, 1997.

1/ = Spring survival class: 5=best; 1=very low; based on several location-years of observation.

Yield experimental mean: 38.16

Error degrees of freedom: 46

F test for var. = 2.82, C.V. 2 = 6.7, LSD (0.05) = 7.28

* = Hard white wheat.

** = Sawfly resistant varieties.

Table 5 Five-year summary on dryland Winter Wheat varieties grown under heavy sawfly infestation near the Knees. 1990 - 1991 - 1993 - 1996 - 1997. Mont. Agr. Expt. Sta., Western Tri. Ag. Research Center, Conrad, MT.

Variety	5 - year comparable average			
	Yield bu/ac	Test wt. lbs/bu.	Plant hgt. inches	% Protein
ROCKY	49.4	59.2	33.7	13.7
VANGUARD *	49.4	58.5	32.0	14.4
RAMPART *	47.8	58.8	32.6	14.4
CENTURK	45.3	58.8	33.3	13.7
TIBER	44.8	59.1	33.3	14.0
QUANTUM 542	44.7	58.5	35.5	13.5
YUMA	41.7	58.7	29.3	12.4
BIGHORN	41.1	59.2	28.1	13.7
HAWK	40.8	59.1	28.7	14.1
NUWEST **	40.8	57.0	32.3	14.2
KESTREL	40.7	57.0	36.6	13.4
NEELEY	39.4	57.7	32.1	13.7
MCGUIRE	39.1	58.5	31.5	14.9
REDWIN	38.1	58.0	32.8	14.6
AGASSIZ	37.8	57.7	37.7	14.2
JUDITH	37.6	56.3	33.9	14.4
ERHARDT	36.6	57.8	30.7	15.3
NORSTAR	33.9	58.7	39.0	14.7
MANNING	31.3	56.4	31.6	13.6
PROMONTORY	30.6	59.4	32.8	13.3

Cooperator: Dan Picard.

Location: Thirty miles east of Brady.

(Chouteau County)

* = Sawfly resistant varieties.

** = Hard white wheat, (MT 7811).

Spring Wheat Variety Notes & Comments

Western Triangle Agricultural Research Center, Conrad MT

Far-Go herbicide tolerance:

Most Tolerant: Bergen, Bronze Chief, Butte-86, Dalen, Ernest, Fortuna, Glenman, Grandin, Gus, Kodiak, Len, Marshall, McNeal, NK 751, Pioneer 2398, Pioneer 2731, Rambo, Stoa, Vanna, Westbred 926 & 936.

Least Tolerant: Alex, Amidon, Borah, Border, Centennial, Ellar, Era, Erik, Express, Fergus, Fremont, Hiline, Kulm, Lew, Newana, Pondera, Pioneer 2375, Russ, Sharp, Sonja, Sprite, Teal, Waldron.

How to plant is just as important as what to plant. For best results plant with a hoe drill rather than a double-disc drill. A hoe drill moves the Far-Go treated soil out and away from the seed row so at normal planting depths the seed will go under the treated layer, where it's less susceptible to injury. If using a disc drill, choose tolerant varieties. Seeding depth should be 1.5 to 2 inches. Run tillage equipment 3" deep or less which will incorporate Far-Go at 1.5" deep. Weather and soil type are also important. Cold, wet weather can delay the wheat's emergence and increase its chance of damage from the Far-Go in the soil. Wait until soil temps are warmer and increase seeding rate by 10% if planting less tolerant varieties. If the soil is light and has little organic matter, injury to the spring wheat is more likely.

Cereal Quality Ratings: 5 = superior; 3 = average; 2 = poor; 1 = very poor.

Sawfly Resistant Hard Red Spr Wheat Varieties

(Resistance among varieties ranges from low to high; none have total resistance)

Amidon (ND606, ND, 1988): Bearded. Medium tall; lodges worse than Fortuna; weak broken stems. Partial sawfly resistance (30% less solid than Fortuna); sawfly resistance not sufficient for severely infested areas. Medium-late; same maturity as Lew, slightly later than Pondera. Moderately susceptible to septoria. Has shown good tolerance to wheat streak mv (3 on scale of 1-3). Susceptible to Septoria. Yield and test weight is medium to high. Slightly higher yield than Lew. Does well in dry areas. High protein like Fortuna. Quality = 4.5.

Border, Westbred (WPB, 1994): Bearded semidwarf. Solid stem in some years, moderate sawfly resistance (about like Rambo). Early maturity (4 days earlier than Fortuna). May be tough to thresh. Susceptible to leaf rust. Medium yield and protein. Quality = 5.

Cutless (ND): Bearded. Tall-semidwarf; poor lodging resistance. Very good sawfly resistance (slightly more so than Fortuna). Moderately susceptible to septoria. Among lowest yielders. Medium test weight. Protein high.

Eatonia (Ag Canada Sask; Agripro): Tall; straw strength poor, slightly less than Leader. Greater sawfly resistance than Leader. Maturity similar to leader. Better resistance to common root rot than Leader. Larger kernels and 3% higher yield than Leader (Leader has low yield).

Ernest (ND677) (ND, 1995): Bearded. Tall, weak straw. Sawfly resistance fairly good (slightly less than Lew, Fortuna & Cutless). Moderately late maturing (like Amidon). Tolerant to Far-go. Resistant to prevalent races of leaf & stem rust. Yield slightly less than Amidon, but greater than Lew, Fortuna and Cutless. High protein and test weight, greater than Amidon. Quality = 4.5.

Fortuna (ND): Beardless, tall. Very good sawfly resistance. Early maturing. Tolerant to Fargo. Very susceptible to septoria. Medium to low yield. Somewhat susceptible to shattering. High test weight and protein. Quality = 4.5.

Glenman (MSU, 1985): Beardless semidwarf, poor lodging resistance, (weak straw for a semidwarf). Sawfly resistance has been very good in Triangle area tests (better than Amidon & Rambo), but the variety tends to produce some hollow stems under certain conditions, especially at Bozeman. Thus, it is rated "moderately" resistant (27% less solid than Fortuna). Medium-late maturity. Fair tolerance to wheat streak mv (2.5 on scale of 1-3). High yield; higher than Lew most years, and about equal to Rambo. Hard to thresh. Low test weight and protein (1% < Lew, 2% < Fortuna). Quality = 2 (poor).

Lancer (Sask. Canada): Beardless. Tall; tangled lodging mess due to weak straw. Fairly good sawfly resistance. Among lowest yielders and seldom a protein advantage over Lew and Fortuna. Test weight medium-low.

Leader (Canada): Tall. Fairly good sawfly resistance. Among lowest yielders. Seldom a protein advantage over Lew and Fortuna.

Lew (MSU, 1976): Beardless. Tall; medium weak straw. Good sawfly resistance (10 to 15% less than Fortuna, but 22% more resistant than Amidon). Medium late mat. 3 days later than Fortuna. Susceptible to Fargo. Avenge herbicide cannot be used. Septoria tolerance moderate. Average yield similar to Fortuna. Better shatter resistance than Fortuna. Medium to high test weight. Medium protein, less than Fortuna. Quality = 5.

MT9433: Medium tall, but slightly shorter than Fortuna. Partial resistance to sawfly (like Amidon). Good yield and agronomics. Possibly will be named and released in 1999 or 2000.

Rambo, Westbred (WPB, 1986): Bearded. Semidwarf; short stiff straw, but medium lodging resistance. Partial sawfly resistance (36% less solid than Fortuna). Threshes easily. May have more tolerance to septoria than Fortuna, but is still moderately susceptible. High yield, similar to Glenman. Test weight high. Medium-low protein similar to Glenman, but 1% lower than Lew and 2% lower than Fortuna.

Shoofly (private var.): Bearded semidwarf with short stiff straw. Slightly shorter than Rambo, thus may be a little too short for dryland. Good stem solidness. Severe physiological leaf spotting in 1995.

Tioga (ND): Beardless. Tall; susceptible to lodging. Good sawfly resistance. Septoria tolerant. Low yield. Good shatter resistance. Medium test weight, high protein.

Hollow-Stem, Sawfly Susceptible Hard Red Spr Wheat Varieties

Alex (ND, 1981): Beardless tall; medium lodging. Medium-late mat. Good shatter resistance. Good test weight and medium-high protein. Quality = 3.

Barrie (Canada): Height and lodging resistance medium. Good test weight and high protein at Conrad 1997, but reportedly low elsewhere.

Bergen (Agripro, 1991): Bearded semidwarf for Minnesota. Stiff straw, good lodging resistance. Medium-late maturity. Tends to shatter. Tolerant to Septoria. Medium test weight, medium-low protein. Quality = 2.

Bronze Chief (GP Seed & Research Inc, 1985): Bearded semidwarf. Very low yield and tough threshability. Very high protein. Used in specialty milling market at Three Forks, MT.

Butte 86 (ND): Bearded. Medium tall, medium straw strength. Early maturity. Septoria susceptible. Low yield. Medium test weight, med-high protein. Quality = 3.

Copper (Idaho): Bearded semidwarf. Straw weaker than Pondera and 906R. Late maturity. Intended to replace McKay (higher quality) in Idaho, but acreage was less than expected. Test weight and protein is 1% less than Pondera.

Dalen (Agripro, 1991): Bearded semidwarf; stiff straw. Medium early maturity. Tolerant to Far-go. Shatter susceptible. Protein medium to low. Quality = 2.

Express, Westbred (WPB, 1991): Bearded semidwarf with very strong straw. Medium maturity. Reported to be tolerant to Avenge herbicide, but very susceptible to FarGo. Resistant to Septoria. Among highest yielders when tested at Conrad 1993. Medium protein, similar to Glenman. Quality = 4.

Fergus, Westbred (WPB, TR983239): Red chaff. Bearded semidwarf. Good straw strength, same height as Newana. Medium early maturity, 4 days earlier than Newana and 3 days earlier than McNeal. Similar to WB926, but is shatter resistant, and susceptible to dryland root rot. Slightly susceptible to Fargo. Moderate resistance to stripe & stem rust. More suited for dryland (while 936 is better for irrigated). Protein slightly less than McNeal, but 1% higher than Newana. Quality = 4.

Fjeld (Agripro): Short stiff straw. Medium maturity. Medium yield. Low test weight and protein.

Glupro (ND, 1995): Bearded. Tall, weak straw. Late maturity. Medium protein. Quality = 4. Not tested at Conrad.

Grandin (ND, 1989): Bearded semidwarf; good lodging resistance. Maturity similar to Pondera (medium-early). Moderately susceptible to leaf spot. Yields less than Pondera and Hi-Line. Medium high protein. Quality = 5. To replace Stoa in North Dakota.

Gus (ND, 1989): Bearded semidwarf for high yield areas of Eastern Montana. Good lodging resistance. Medium-late maturity (like Newana). Susceptible to leaf rust. Lower yield than Pondera and Hi-Line. Very high protein. Quality = 5.

Hamer (Agripro, 1995): Bearded. Semidwarf; strong straw. Med-late maturity. Test wt & protein are medium. Quality = 2.

MS - PK
Hi-Line (MT8402) (MSU, 1991): Bearded. Semidwarf; strong straw; better lodging resistance than McNeal. Height is 1 inch shorter than Pondera & McNeal. Hi-Line contains a small percentage of tall plants, giving the variety a ragged appearance. This trait is probably due to an unstable chromosome carrying the semidwarf gene, and it may not be possible to purify the variety for uniform height. Medium maturity; 3 days earlier than Newana and McNeal (maturity similar to Lew & Pondera). Fair tolerance to wheat streak mv (2.5 on scale of 1-3). Susceptible to leaf rust. Hi-Line yields greater than Newana on dryland, but similar to Newana on irrigated. Hi-Line yields similar to Pondera on dryland, but is 3 bu/a better than Pondera on irrigated. Test weight slightly higher than Newana, and slightly less than Pondera. High protein; similar to Pondera, higher than Newana and McNeal. Quality = 4.

Kamut (T. polonicum 4x): Polish wheat: about like durum; seeds larger than durum. 4 to 6" taller than Fortuna, too tall for irrigation. Four days later to mature than Pondera. Claimed to have non-allergenic gluten. 1% more protein than Pondera. For pasta & cereal products.

Keene (ND): Possible replacement for Amidon in North Dakota.

Kodiak Dwarf (GP Seed & Research Inc): Triple Dwarf (10" shorter than Newana; 18" shorter than Fortuna. Very low yield.

Krona (Agripro, 1991): Bearded Semidwarf. Strong straw, good lodging resistance. Late maturity. Moderate resistance to Septoria. High yield, low protein. Quality = 2.

Kulm (ND, 1994): Bearded. Med-tall, good straw strength. Early maturing. Fairly high protein. Quality = 4. Intended to replace Butte-86 in N Dakota in areas where early maturity is desired.

Lars (Agripro, 1995): Bearded semidwarf. Short stiff straw. Med-late maturity. High yield under good growing conditions. Low protein.

Len (ND, 1979): Bearded semidwarf. Straw not as stiff as Newana. Medium maturity. Tolerant to septoria. Yields similar to Pondera and Hi-Line. Good shatter resistance. Good test weight. High protein, but slightly less than Hi-Line

& Pondera. Quality = 5.

Marshall (Minn): Bearded semidwarf; good lodging resistance. High yield and test weight on irrigated. Low protein. Irrigation only.

McKay (Idaho): Bearded semidwarf. Very late maturing. High yield if water lasts, otherwise low yield. Lower quality than Copper.

McNeal (MT8849, MSU, 1994): Red chaffed. Bearded semidwarf but slightly taller and more uniform height than Hiline. Good lodging resistance, but lodged more than Hiline in the high rainfall year of 1995. Medium maturity, slightly earlier than Newana and slightly later than Hiline. Fair tolerance to wheat streak mv (2.5 on scale of 1-3). Higher yield than Hiline. Not as tough to thresh as Pondera and Glenman, but may have a tendency toward toughness. Test weight about equal to Newana & Hiline, but 1#/bu less than Pondera. Very good quality with high protein and loaf volume. Quality = 4.

Minnproe (Minn) - Bearded semidwarf. Short, stiff straw. Medium maturity. Low test weight; medium protein.

Minto (Can, 1991) - Beardless. Tall; weak straw. Med-late maturity. Low test weight, medium protein.

Newana (MSU, 1976) - Bearded semidwarf. Good lodging resistance. Medium-late maturity, 3 days later than Pondera and Hi-Line. Very susceptible to sawfly. Tolerant to septoria. Very Good yield on irrigation; medium on dryland. Yields similar to Hi-Line on irrigation, but has less protein than Hi-Line. Yields lower than Hi-Line on dryland. Good shatter resistance. Protein medium. Quality = 3.

Nomad, Westbred (WPB): Beardless semidwarf, good lodging resistance. Medium-early maturity, medium test weight (but higher than Glenman), medium protein.

Norak (NAPB).

Nordic: Tall-semidwarf; straw and protein are marginal for high yield, irrigation areas.

Norlander (Agripro, 1995): Bearded semidwarf. Medium strong straw. Early maturing. Intended for eastern Montana. High yield under good conditions. Medium protein. Quality = 2.

Olaf (ND): Bearded semidwarf. Medium lodging. Septoria leaf blotch tolerant. Medium-low yield. Medium to low shatter resistance. Medium high protein, but most of it is concentrated in the bran, resulting in low flour protein.

Pioneer 2369 (ND, 1993): Bearded semidwarf, good lodging resistance. High yield and test weight on irrigated. Protein medium. (All pioneer materials turned over to NDSU).

Pioneer 2371 (ND, 1991): Bearded semidwarf, strong straw. Medium maturity. Medium protein. Quality = 3.

Pioneer 2370 (ND, 1990): Bearded semidwarf, strong straw. Medium maturity. Medium protein. Quality = 2.5.

Pioneer 2375 (ND, 1990): Bearded semidwarf, medium straw strength. Med-early maturity. Medium yield on dryland, high on irrigated. Medium to high protein, depending on level of N fertilizer. Protein response to fertilizer was higher than for other varieties in 1995. Quality = 2.5.

Pioneer 2398 (ND, 1995): Bearded semidwarf with shorter and stronger straw than 2375. Medium late maturity (similar to Amidon). Low protein. Quality = 2.

Pondera (MSU): Bearded semidwarf with good lodging resistance. Medium-early maturity, 3 days earlier than Newana. Sawfly susceptible. Tolerant to septoria. Good on irrigation or dryland. High yield and test weight. Higher protein than Newana. Replaced by Hi-Line on recommended list.

Prospect (SD): Bearded semidwarf. Medium lodging. Medium maturity. Low yield. High test weight and protein.

Probrand 751 (NK): Bearded semidwarf. Short stiff straw. High yield on irrigated. For irrigation only. Good shatter resistance. Low test weight and protein.

Russ (SD, 1995): Bearded tall; weak straw. Medium maturity. Medium protein.

Sonja (Agripro, 1992): Bearded semidwarf; short strong straw and very good lodging resistance. Medium late maturity. Good leaf disease resistance, but very susceptible to Fusarium head blight. High yield under irrigated conditions. Protein is medium.

Stoa (ND, 1984): Bearded med-tall height; medium straw strength. Med-late maturity; later to mature than Pondera and Grandin. Poor yield in triangle area. Lew and Pondera compete with it quite well in Triangle area. To be replaced in ND by Grandin. Medium protein. Quality = 3.

Success (Cenex): Semidwarf with medium lodging resistance. Late maturity. Medium high yield with irrigation. Low test weight and protein.

Teal (Sask Can, 1991): Beardless tall. Medium straw strength. Med-late maturity. High protein.

Telemark (Agripro): Semidwarf with short stiff straw. Medium early maturity. Good yield with irrigation. Good protein.

Thatcher: Beardless tall. Very low yield. Used as quality check.

Trenton (ND673; ND, 1995): Bearded tall. Medium straw strength. Hollow stem, sawfly susceptible. Med-late maturity. High protein. Quality = 2.5.

Vance (Minn): Bearded semidwarf. Medium test weight, low protein.

Vandal (Idaho): For irrigated only.

Wampum (Minn): Bearded semidwarf. Very susceptible to rust. Very high yield on irrigated. Low protein.

Westbred - See also Border, Express, Fergus, Nomad, Rambo.

Westbred 926R (WPB, 1987): Bearded semidwarf. Good straw strength; 2 inches shorter than Newana, and 4 inches shorter than McNeal. Earlier maturity than Newana, 4 days earlier than McNeal. Susceptible to Avenge herbicide; good tolerance to FarGo. Has some resistance to Washington race of Hessian fly. Fairly good tolerance to dryland root rot. Among highest yielders. Tendency to shatter. Test weight similar to McNeal and slightly less than Newana. Protein higher than Newana and similar to McNeal. See also Fergus & WB-936. Quality = 4.5.

Westbred 936 (WPB): Bearded semidwarf for irrigated only. 936 is stiffer strawed than 926; 3 inches shorter than Newana and 5 inches shorter than McNeal. Four days earlier than Newana, 3 days earlier than McNeal. Reportedly tolerant to Avenge herbicide; fairly good tolerance to FarGo. Does not have Hessian fly or dryland root rot resistance, thus 926 is preferred in those areas. More susceptible to dryland root rot than 926 and Fergus (although IMZ helps to control root rot). Moderate resistance to stem rust, resistant to stripe rust. Susceptible to leaf rust and Septoria. Shatter resistant. Possible replacement for 906 and 926. Superior to 906 and 926 as an irrigated variety. (Tested as ph986-61 in 1992). Has low test weight on dryland. Protein appears good, 1.5% higher than Newana and 0.4% higher than McNeal. Quality = 4.

Wheaton (Minn): Bearded semidwarf. Short stiff straw, good lodging resistance. High yield with irrigation. Good shatter resistance. Low test weight and protein.

Hard White Spring Wheat

For specialty market. Protein of hard white will probably need to be at least 14% to meet market standards. In order to be officially classified as Hard White by U.S. Grain Standards, the developer/owner of the variety must petition for classification. Hard whites 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.

Genesis (Canada): Hard white. Not tested in Montana.

Golden 86 (GP Seed & Research Inc, 1986): Owned by a commercial milling and baking firm north of Three Forks, Montana. A high quality hard white for specialty markets. Yielded more than Klasic, but less than Tanager (1 year), and 1.5 to 2% higher protein than Tanager and Klasic.

HY 413 (Agripro/AgCan): Hard white. Some stem solidness, but not a lot. May have quality problems.

Klasic (NK): Hard white. Bearded semidwarf. Very short straw. Adapted to California. Not well adapted to Triangle area: low yield & protein.

Tanager "S" (CIMMYT): Hard white. Very high yield (steep BYX).

Soft White Spr Wheat

Reed, AC (Alberta, Can.): Soft white. Good lodging resistance. Two days earlier maturity than Fielder. Resistant to prevalent races of stripe rust. Higher yield than Fielder. Moderate shatter resistance. Higher milling & baking quality than Fielder. Adapted to irrigated regions of southern Alberta.

Fielder: Soft white. Bearded semidwarf, stiffer straw than Fieldwin. Highly susceptible to stripe rust and can lose 40% yield.

Owens (Idaho/Oregon): Soft white. Bearded semidwarf. Med-late maturity, earlier than Waverly and Treasure, but still may be too late for dryland in most years. Stripe rust resistant. Medium test weight.

Penawawa (Wash/Oregon): Soft white. Bearded semidwarf; shorter and stiffer straw than Owens. Later to mature than Owens. Lower test weight than Owens. Replacement for Owens?.

Sprite (WPB): Soft white.

SWS-52 (Canada): Soft white. Much better lodging resistance than Owens, but 5-6 days later than Owens and Fielder. Resistant to stripe rust (like Owens).

Treasure: Soft white. Bearded semidwarf. Late maturing. Yields higher than Owens on irrigated; and also on dryland in years of favorable moisture.

Vanna (WPB, 1994): Soft white. Bearded semidwarf; good straw strength; one inch taller than Penawawa, same height as Owens. Two days later maturing than Owens and Penawawa, but has reasonable tolerance to dryland conditions. Stripe rust resistant. Higher yield than Owens. Yield and test wt similar to Penawawa. About 1% lower protein than Penawawa.

Waverly: Soft white. Bearded semidwarf. Late maturing.

Durum

Durum quality scale: 4 = good; 3 = average; 2 = poor; 1 = very poor. 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. Cool-climate areas are traditionally the good quality durum areas, as durum kernels tend to get flinty in hot areas. However, current research is underway to determine if new higher quality varieties can do well enough in hot areas.

Belzer (ND): Tall, moderate susceptible to lodging. Late maturity. Large kernels, medium protein. Quality = 4.

Ben (ND, 1997): Medium height, strong straw. Medium maturity. Large kernel size, high protein. Quality = 4.

Cando (ND, 1975): Very short semidwarf. Very high lodging resistance. Med-late maturity. For irrigation or favorable moisture. Not suited for dry conditions. Septoria susceptible. High yield and good shatter resistance. Medium maturity. Small kernel size and medium test weight. Weak gluten; quality = 2.

Cortez (WPB): Short stiff straw. Early maturity. Medium kernel size, high protein.

Coulter (Canada): Black-bearded, but blackness disappears upon ripening.

Crosby (ND, 1973): Tall. Medium lodging resistance on dryland. Medium maturity. Good shatter resistance. Test weight medium to high. Quality = 2.

Dressler (Agripro): Medium height, moderate susceptible to lodging. Medium maturity. Good test weight and large kernel size. High protein. Quality = 4.

Fiord (Agripro, 1986): Tall. Good lodging resistance. Susceptible to Septoria. Medium yield.

Golden Ball (Canada): Black-bearded. An old variety; seed may be hard to find. for wheat weaving.

Kyle (Canada, 1984): Very tall weak straw, poor lodging resistance. Very late maturing. Medium test weight, large kernel size. High protein. Strong gluten; quality = 4.

Laker, Westbred (WPB, 1985): Tall-semidwarf, midway between standard height and semidwarf. Better height choice for all around production, not as short as Lloyd and Cando. Stiff straw, medium lodging resistance. Medium maturity. Often had leaf-spot diseases while other entries did not. High yield. High test weight, medium kernel size. Protein medium. Strong gluten; quality = 3.

Lloyd (ND, 1983): Very short, stiff straw; very high lodging resistance. Too short for dry conditions. For irrigation or favorable moisture. Too short for dry conditions. Medium maturity. Susceptible to Septoria. High yield and good shatter resistance. Test weight is medium low. Medium kernel size, low protein. Strong gluten; quality = 3.

Medora (Manitoba Can, 1983): Tall, with poor lodging resistance. Dryland only, medium maturity. Good yield on dryland, better than Monroe. Test weight medium to high. Very large kernel size, high protein. Strong gluten; quality = 4.

Melita (Canada): Tall straw, moderately susceptible to lodging. Large kernels, medium protein. Quality = 4.

Monroe (ND, 1985): Tall, medium lodging resistance for dryland. Early maturity, dryland only. Medium test weight, large kernel size. Medium high protein. Strong gluten; quality = 4.

Munich (ND, 1995): Medium height, strong straw. Med-late maturity. Higher yield than Renville, Sceptre and Medora. Medium kernel size and protein. Strong gluten; quality = 4.

Pelissier (Canada): Black-bearded. Wheat weaving.

Plenty (Canada, 1990): Very tall weak straw; lodges easily. Late maturing. High yield. Medium test weight, large kernel size, high protein. Strong gluten; quality = 4.

Regold, Westbred (WPB): (Originally named Regal). Tall straw, susceptible to lodging. For dryland areas of Montana and North Dakota. Resistant to Septoria and most races of leaf & stem rust. Medium yield and test weight. Med-low protein. Good semolina color and strong gluten.

Renville (ND, 1988): Tall, lodges bad; thus, even though it yields good on irrigation, its weak straw renders it unsuitable for irrigation. Has a niche in the low yield/low rainfall areas. Med-late maturity, one day later than Vic. Medium test weight, kernel size and protein. Strong gluten; quality = 4.

Rolette (ND): Tall, but good lodging resistance. Early maturing. Susceptible to leaf spot diseases. Low yield. Good shatter resistance and test weight. Good quality.

Rugby (ND, 1973): Tall, weak straw. Medium maturity. Moderately susceptible to septoria. Good shatter resistance. Medium test weight and kernel size. Weak gluten, poor quality (2).

Sceptre (Sask. Can): Tall to medium height, but fairly stiff straw. Taller than Laker, but shorter than Medora and other standard height varieties. Medium maturity. Susceptible to leaf rust. High yield. Strong gluten; quality = 4.

Stockholm (Agripro): Semidwarf (short like Lloyd and Cando); very stiff straw. Medium-early maturity. High yield (Similar to Lloyd, and higher than Fjord). Protein medium to low. Quality = 3.

Vic (ND, 1979): Tall weak straw. Medium-early maturity. Susceptible to leaf rust and leaf spotting diseases; highly susceptible to WSMV. Low to medium yield. Good shatter resistance. High test weight, large kernel size, medium high protein. Strong gluten; quality = 4.

Voss (Agripro, 1994): Semidwarf; very stiff straw. Latest maturing of all entries in 1995 at Conrad. Medium kernel size, low protein. Quality = 3. Intended to replace Stockholm.

Ward (ND, 1972): Tall, with only fair lodging resistance for dryland. Medium maturity. Tolerant to septoria. Test weight medium. Good shatter resistance. Weak gluten; quality = 2.

Spring Triticale

Test weight of triticale = approximately 50 lbs/bu. Proteins were less than Newana wheat, but slightly higher than barley. Triticale seeding rate should be 20% higher than wheat.

Assume that all triticales have a potential ergot problem!

Carman (Canada): Shorter straw than Welsh triticale, but still tall. Early maturing (similar to Newana wheat in maturity) by triticale standards. Among the best choices for dryland. High protein.

Juan (Calif): Too late to mature, resulting in low yield & T.W. some yrs.

Karl (N. Dakota): A semidwarf; thus, easier to manage than taller & later varieties (similar height as Newana wheat). Early maturing (similar to Newana wheat in maturity) by triticale standards. Among the best choices for dryland. High yield & protein.

Kramer (N. Dakota): A semidwarf, but slightly taller than Newana wheat and Karl triticale. Kramer is medium height, while Karl and Newana are short. Very early maturity by triticale standards. Good yield.

Marval (S. Dak): Medium maturity. Low yield on dryland in some years.

T-54, T-59, T-61 (Saskatchewan): Very late maturity. Look like wheat, and have test weights nearly equal to wheat.

Wapiti (Canada): Tall weak straw. Late maturity. High yield. To replace Carman and Welsh.

Welsh (Canada): Late maturing, may be discontinued.

Whitman (Wash): Too late to mature, resulting in low yield & test weight in some years.

Relative maturities and heights for triticale:

Newana wheat	very early	short
Kramer	very early	med short
Carman	early	med. tall

Karl	early	short
Marval	medium	very tall
Welsh	medium late	tall

Beagle	late	tall
Wapiti	late	med. tall
Sunland	very late	med. tall

T-54	very late	tall
T-61	very late	tall
Juan	extreme late	tall
Whitman	extreme late	tall

Winter Triticale

Decade (Canada): Shorter than most other winter triticales, but still as tall as some of the taller winter wheats; earlier and higher yield and shorter strawed than Wintari. Thus Decade may be the better choice. May have a head snap problem.

Flora: Short strawed (like Rocky w.wht.) and good yield, but had very low test weight. Survived winter of 1989 OK, but winterhardiness is questionable. Straw breakage observed in 1988.

Grace: Poor winterhardiness (May be a spring type). Stem-breakage and crinkle-joint.

Wintari (Canada): Very tall and late maturing.

VTO numbers from 1988: winter types according to WSU.

Table 6

Advanced Yield Dryland Spring Wheat variety trial grown north of Conrad, 1997. Montana Agr. Expt. Station, Western Triangle Ag. Research Center, Conrad, MT.

Variety	Yield bu/ac	Test weight lbs/bu	Plant hgt. inches	Head date	% protein
N93-0136	76.5	62.6	-	-	10.5
SONJA	74.1	62.9	-	-	12.0
AC BARRIE	70.9	62.9	-	-	13.1
WESTBRED 936	70.9	61.9	29	186	12.2
PENAWAWA (s. white)	69.5	60.7	31	190	9.9
VANNA (s. white)	68.1	59.9	29	190	10.4
D91-1551	67.9	63.3	-	-	12.0
MT 9558	67.4	61.9	32	190	11.6
NORLANDER	66.6	62.6	-	-	12.9
MT 9433 *	66.4	62.2	38	190	12.1
MCNEAL	66.0	59.9	33	188	12.3
MT 9662	65.6	62.2	30	191	10.4
MSFRS SELECTION	65.6	62.4	30	186	12.7
MT 9628	65.5	62.8	34	187	12.7
LEN	65.2	61.5	32	190	12.8
MT 9541	64.9	62.7	31	187	12.7
WESTBRED EXPRESS	64.2	62.3	30	187	11.9
TRENTON	64.2	62.9	40	188	12.4
MT 9607	63.9	64.1	39	187	12.8
MT 9410	63.9	63.5	38	186	12.0
AMIDON *	63.7	61.5	39	190	12.5
LEW *	63.6	62.8	43	192	11.8
BZ992632	63.0	61.9	34	187	11.7
MT 9508	62.5	62.9	32	187	13.2
THATCHER	62.5	61.2	43	189	12.1
MT 9660	62.4	61.8	33	188	12.2
MT 9631	61.7	62.9	38	190	12.4
GRANDIN	61.5	62.5	36	188	12.2
MT 9453	60.7	62.0	36	189	12.7
MT 9539	60.6	62.1	30	189	11.8
MT 9609	60.3	61.7	36	187	12.9
FERGUS	60.1	62.1	32	188	12.5
MT 9675	60.0	60.3	34	192	11.3

(Continued on next page)

(Advanced Yield Spring Wheat, continued)

Variety		Yield bu/ac	Test weight lbs/bu	Plant hgt. inches	Head date	% protein
MT 9644		59.9	62.9	41	190	11.8
NEWANA		59.9	61.5	30	192	11.4
MT 9667		59.6	62.5	37	188	12.7
FORTUNA	*	59.6	63.2	41	188	12.5
MT 9565		59.5	63.0	38	186	12.2
WESTBRED 926		59.2	61.4	30	185	12.8
HI-LINE		59.1	62.7	33	186	12.6
MT 9627		59.0	63.2	32	189	11.9
MT 9653		58.5	61.7	38	191	13.0
MT 9513		58.2	62.4	32	188	12.2
MT 9507		57.9	63.6	34	186	13.2
MT 9603		57.6	62.7	39	189	12.5
ERNEST	*	56.7	62.8	38	189	12.8
MT 9602		56.5	62.0	37	188	13.3
GLENMAN	*	56.1	59.8	34	189	12.2
MT 9553		55.6	62.7	30	187	12.4
MT 9542		55.1	61.7	32	189	11.7
MT 9668		54.6	62.1	35	188	12.4
MT 9619		52.9	62.7	39	190	12.5
BZ992588		50.4	61.5	29	189	12.8
MT 9608		50.1	61.4	37	189	13.0

Cooperator: Western Triangle Ag. Research Center.
 Location: Ten miles north of Conrad, MT. (Pondera County)
 Fertilizer: 100# 11-52-0 with the seed, + 60# N actual
 topdressed after seeding.
 Previous crop: Fallow.
 Date seeded: May 5, 1997.
 Date harvested: August 27, 1997.
 Rainfall: From seeding to harvest was 7.44 inches.
 * = Sawfly resistant varieties. (Amidon and MT 9433 have partial
 resistance)
 Yield experimental mean: 61.96
 Error degrees of freedom: 106.00
 F test for var: 2.18
 C.V. 2: 5.88
 LSD (0.05): 10.21

Table 7

Advanced Yield Dryland Spring Wheat variety trial grown north of Conrad, 1997. Montana Agr. Expt. Station, Western Triangle Ag. Research Center, Conrad, MT.

(*abbreviated list*)

Variety		Yield bu/ac	Test weight lbs/bu	Plant hgt. inches	Head date	% protein
WESTBRED 936		70.9	61.9	29	186	12.2
PENAWAWA	(s. white)	69.5	60.7	31	190	9.9
VANNA	(s. white)	68.1	59.9	29	190	10.4
MT 9433	*	66.4	62.2	38	190	12.1
MCNEAL		66.0	59.9	33	188	12.3
LEN		65.2	61.5	32	190	12.8
WESTBRED EXPRESS		64.2	62.3	30	187	11.9
TRENTON		64.2	62.9	40	188	12.4
AMIDON	*	63.7	61.5	39	190	12.5
LEW	*	63.6	62.8	43	192	11.8
THATCHER		62.5	61.2	43	189	12.1
GRANDIN		61.5	62.5	36	188	12.2
FERGUS		60.1	62.1	32	188	12.5
NEWANA		59.9	61.5	30	192	11.4
FORTUNA	*	59.6	63.2	41	188	12.5
WESTBRED 926		59.2	61.4	30	185	12.8
HI-LINE		59.1	62.7	33	186	12.6
ERNEST	*	56.7	62.8	38	189	12.8
GLENMAN	*	56.1	59.8	34	189	12.2

Cooperator: Western Triangle Ag. Research Center.

Location: Ten miles north of Conrad, MT. (Pondera County)

Fertilizer: 100# 11-52-0 with the seed, + 60# N actual
topdressed after seeding.

Previous crop: Fallow.

Date seeded: May 5, 1997.

Date harvested: August 27, 1997.

Rainfall: From seeding to harvest was 7.44 inches.

* = Sawfly resistant varieties. (Amidon and MT 9433 have partial resistance)

Yield experimental mean: 61.96

Error degrees of freedom: 106.00

F test for var: 2.18

C.V. 2: 5.88

LSD (0.05): 10.21

Table 8 **Five-year summary for dryland Spring Wheat varieties** grown near **Conrad, MT.** 1993 - 1994 - 1995 - 1996 - 1997. Mont. Agr. Expt. Station, Western Triangle Ag. Research Center, Conrad, MT.

Variety	5 - year comparable average				
	Yield bu/ac	Test wt. lbs/bu.	Plant hgt. inches	Head date	% Protein
PENAWAWA (s. white)	77.5	59.6	31.7	187	10.0
VANNA (s. white)	71.1	58.8	32.2	188	10.5
WESTBRED 936	66.3	59.2	29.3	184	13.4
GLENMAN *	66.1	58.7	34.5	188	12.3
MCNEAL	66.0	59.4	33.8	187	13.0
WESTBRED 926	65.1	60.2	32.1	183	13.0
WESTBRED EXPRESS	64.8	60.0	28.9	187	12.6
NEWANA	64.8	58.7	32.4	189	12.4
HI-LINE	62.7	61.2	31.4	185	13.3
ERNEST *	62.0	60.9	39.5	186	13.6
FERGUS	61.7	59.9	33.0	185	13.0
LEW *	61.0	61.3	41.2	190	12.8
AMIDON *	60.9	60.0	39.7	188	12.5
TRENTON	60.3	60.2	41.8	186	13.2
FORTUNA *	59.8	61.7	41.3	187	13.1
LEN	59.3	59.5	33.1	188	13.7
THATCHER	55.5	58.9	43.4	188	12.6

Cooperator: Western Triangle Agricultural Research Center.
 Location: Ten miles north of Conrad, MT. (Pondera County)
 * = Sawfly resistant varieties. (Amidon has partial resistance)

Table 9

Irrigated Spring Wheat variety trial grown north of Conrad, 1997. Mont. Agr. Expt. Station. Western Triangle Ag. Research Center, Conrad, Montana.

Variety	Yield bu/ac	Test wt. lbs/bu.	Plant hgt. inches	% protein
MTHW9420	97.0	63.5	32	12.3
N93-0136	95.4	63.6	34	11.0
VANNA (s. white)	94.8	62.9	33	10.6
SONJA	94.0	64.6	30	12.1
MTHW9520	93.9	62.4	38	11.9
D91-1551	92.4	64.0	38	12.8
FERGUS	91.9	62.9	33	12.9
WESTBRED EXPRESS	91.8	62.7	30	12.5
WESTBRED 936	91.7	62.6	30	14.1
NORLANDER	89.0	62.9	34	13.4
GLENMAN *	86.6	62.6	35	12.5
MCNEAL	85.6	62.2	33	14.0
HI-LINE	84.6	64.1	32	13.7
PIONEER 2375	84.5	64.0	32	13.6
WESTBRED 926	83.8	63.4	31	13.6
ERNEST *	83.4	63.6	40	15.1
GRANDIN	82.9	63.8	34	13.9
NEWANA	82.6	62.2	32	11.8
AC BARRIE	80.5	63.2	39	15.2
LEN	79.7	62.0	30	13.5
MT 9433 *	79.3	63.4	36	13.7
MT 9508	78.4	63.8	37	14.2
STOA	78.0	61.3	36	14.6
AMIDON *	75.5	62.3	36	14.1
FORTUNA *	75.2	64.2	39	14.0
LEW *	74.0	64.1	42	13.8
RAMBO *	73.4	60.6	28	12.7
TRENTON	69.1	63.3	43	14.6

(Continued on next page)

(Irrigated Spring Wheat, continued)

Cooperator: Western Triangle Ag. Research Center.
Location: Ten miles north of Conrad, MT. (Pondera County)
Fertilizer: 100# 11-52-0 with the seed, + 70# N topdressed.
Previous crop: Fallow.
Date seeded: May 5, 1997.
Date harvested: September 2, 1997.
* = Sawfly resistant varieties. (Amidon and MT 9433 have partial
resistance.) (Also, most experimental lines are resistant).
Yield experimental mean: 84.59
Error degrees of freedom: 54.00
F test for var: 3.31
C.V. 2: 5.00
LSD (0.05): 12.00

Table 10 Five-year summary for Irrigated Spring Wheat varieties grown north of Conrad, MT. 1991 - 1993 - 1994 - 1996 - 1997. Mont. Agr. Expt. Station, Western Triangle Ag. Research Center, Conrad, MT.

Variety	5 - year comparable average				
	Yield bu/ac	Test wt lbs/bu	Plant hgt. inches	Head date @	% Protein
WESTBRED 936	81.1	62.2	30.5	182	11.5
WESTBRED EXPRESS	79.5	62.4	29.8	183	11.2
GLENMAN *	75.9	62.6	35.7	186	10.7
MCNEAL	75.0	62.4	34.6	186	11.5
RAMBO *	74.9	60.1	32.3	188	10.7
NEWANA	74.2	61.9	34.3	188	10.9
HI-LINE	73.3	63.1	32.9	184	11.8
WESTBRED 926	71.7	62.2	32.3	181	11.9
GRANDIN	68.8	62.7	36.3	184	12.4
AMIDON *	68.7	61.4	40.0	185	11.8
LEN	65.7	61.9	33.3	183	12.4
ERNEST *	64.8	62.2	40.7	183	13.0
LEW *	62.8	63.5	42.5	187	11.4
FORTUNA *	62.7	63.5	41.3	185	11.9
STOA	62.1	61.4	38.7	185	12.0
TRENTON	58.9	62.4	44.2	183	11.8

Cooperator: Western Triangle Ag. Research Center.

Location: Ten miles north of Conrad, MT. (Pondera County)

* = Sawfly resistant varieties. (Amidon and Rambo have partial resistance.)

@ = Head dates based on four years. (1991-1993-1994-1996)

Table 11 **Dryland Spring Wheat** variety trial grown near
Choteau, 1997. Mont. Agr. Expt. Sta., Western
Triangle Ag. Research Center, Conrad, MT.

Variety		Yield bu/ac	Test wt. lbs/bu.	Plant hgt. inches	% protein
VANNA	(s. white)	67.7	58.6	33	11.0
MCNEAL		66.0	59.7	35	13.5
WESTBRED	936	65.9	59.1	31	13.9
FERGUS		65.4	60.2	34	13.4
WESTBRED	926	65.0	60.1	32	14.1
MTHW9420		64.5	59.9	32	12.4
NEWANA		64.1	57.3	31	12.7
HI-LINE		63.5	60.6	32	13.3
WESTBRED	EXPRESS	63.3	59.2	30	12.7
MTHW9520		62.0	57.7	32	12.8
MT	9508	61.9	61.6	33	13.7
MT	9433	61.4	60.9	40	13.9
PIONEER	2375	61.4	62.3	36	13.2
GLENMAN	*	61.3	58.8	34	12.7
GRANDIN		60.7	59.8	36	14.5
FORTUNA	*	59.1	61.9	41	14.1
LEN		58.8	60.0	37	14.1
ERNEST	*	57.3	62.1	39	14.4
RAMBO	*	56.7	57.0	31	13.4
STOA		56.1	59.8	39	14.4
AMIDON	*	53.6	59.9	41	13.8
TRENTON		51.5	60.6	42	14.7
LEW	*	44.5	61.2	40	13.8

Cooperator: Roy Inbody.

Location: Twelve miles northeast of Choteau. (Teton County)

Fertilizer: 100 # 11-52-0 with the seed, + 60 #N actual liquid.

Previous crop: Fallow.

Date seeded: May 8, 1997.

Date harvested: August 26, 1997.

Rainfall: From seeding to harvest was 6+ inches.

* = Sawfly resistant varieties. (Amidon and Rambo have partial resistance.) (Also, most experimental lines are resistant).

Yield experimental mean: 60.50

Error degrees of freedom: 44.00

F test for var: 4.25

C.V. 2: 4.32

LSD (0.05): 7.45

Table 12 **Five-year summary for Dryland Spring Wheat varieties grown near Choteau, MT. 1993 - 1994 - 1995 - 1996 - 1997. Mont. Agr. Expt. Station, Western Triangle Ag. Research Center, Conrad, MT.**

Variety	5 - year comparable average			
	Yield bu/ac	Test wt. lbs/bu.	Plant hgt. inches	% Protein
GLENMAN *	56.6	57.0	32.2	13.5
NEWANA	56.5	55.0	30.4	13.6
MCNEAL	55.8	57.1	32.2	14.4
HI-LINE	55.2	59.5	29.6	14.4
WESTBRED 936	54.0	58.1	28.4	14.9
RAMBO *	52.9	57.1	29.6	13.7
FORTUNA *	51.0	60.0	37.6	15.0
WESTBRED 926	50.6	57.9	29.4	15.0
GRANDIN	50.5	58.6	33.4	15.1
WESTBRED EXPRESS	48.8	58.5	27.2	13.9
LEW *	48.7	59.2	37.2	14.6
ERNEST *	48.6	60.7	36.3	15.4
LEN	48.0	57.8	32.2	14.8
AMIDON *	47.9	57.7	36.6	14.5
STOA	47.1	58.1	35.8	15.0
TRENTON	46.4	59.6	38.9	15.4

Cooperator: Roy Inbody in 1994 - 1995 - 1996 - 1997, and Rick Corey in 1993.

Location: Northeast of Choteau, MT. (Teton County)

* = Sawfly resistant varieties. (Amidon and Rambo have partial resistance.)

Table 13 **Dryland Spring Wheat** variety trial grown near Oilmont, 1997. Mont. Agr. Expt. Sta., Western Triangle Ag. Research Center, Conrad, MT.

Variety		Yield bu/ac	Test wt. lbs/bu.	Plant hgt. inches	% protein
MT 9508		37.2	58.1	31	14.0
WESTBRED 936		36.2	54.2	28	15.0
MT 9433		36.1	58.5	35	13.9
MCNEAL		35.5	54.2	30	14.1
MTHW9420		35.5	52.6	30	14.3
WESTBRED 926		34.9	53.0	30	15.7
PIONEER 2375		34.9	55.8	34	13.5
WESTBRED EXPRESS		34.8	53.1	28	14.6
HI-LINE		34.6	54.0	28	14.1
GLENMAN	*	34.3	54.6	29	12.8
GRANDIN		33.9	53.8	33	14.2
AMIDON	*	33.9	56.2	37	14.2
FERGUS		33.6	53.3	29	15.8
NEWANA		33.2	53.8	28	14.2
FORTUNA	*	33.0	57.2	37	13.8
VANNA	(s. white)	32.3	48.2	30	12.7
TRENTON		31.5	54.3	37	14.2
LEW	*	31.1	55.2	36	14.5
STOA		30.6	53.9	33	15.2
LEN		30.0	51.4	30	14.8
MTHW9520		29.8	52.8	31	15.4
RAMBO	*	28.4	53.4	29	15.5
ERNEST	*	28.2	54.5	34	15.9

Cooperator: Terry Alme.

Location: Eight miles east of Oilmont. (Toole County)

Fertilizer: 100# 11-52-0 with the seed.

Previous crop: Fallow.

Date seeded: April 28, 1997.

Date harvested: August 18, 1997.

Rainfall: From May 21 to harvest was 2.7 inches.

* = Sawfly resistant varieties. (Amidon and Rambo have partial resistance.) (Also, most experimental lines are resistant).

Yield experimental mean: 33.19

Error degrees of freedom: 44.00

F test for var: 4.54

C.V. 2: 3.59

LSD (0.05): 3.40

Table 14 **Five-year summary for dryland Spring Wheat varieties grown near Oilmont, MT. 1993 - 1994 - 1995 - 1996 - 1997. Mont. Agr. Expt. Station, Western Triangle Ag. Research Center, Conrad, MT.**

Variety	5 - year comparable average			
	Yield bu/ac	Test wt. lbs/bu.	Plant hgt. inches	% Protein
WESTBRED 936	41.9	55.8	25.9	14.9
MCNEAL	41.8	55.0	30.8	14.7
WESTBRED EXPRESS	40.6	56.6	25.3	13.9
GLENMAN *	40.1	55.2	30.4	13.1
HI-LINE	39.5	55.8	28.8	14.8
WESTBRED 926	39.0	55.9	29.0	14.7
GRANDIN	37.8	55.5	32.4	15.1
NEWANA	37.3	55.5	28.6	13.0
AMIDON *	36.9	57.3	35.8	14.2
ERNEST *	36.5	57.9	34.8	14.7
LEW *	36.4	57.3	35.0	14.6
LEN	35.4	55.5	31.4	14.7
FORTUNA *	35.2	58.5	36.0	13.7
RAMBO *	34.4	57.2	29.2	14.2
STOA	34.4	55.7	34.6	14.7
TRENTON	32.7	56.8	37.5	14.1

Cooperator: Terry Alme.

Location: Eight miles east of Oilmont, MT. (Toole County)

* = Sawfly resistant varieties. (Amidon and Rambo have partial resistance.)

Table 17 **Dryland Durum variety trial grown north of Conrad, 1997. Mont. Agr. Expt. Sta., Western Triangle Ag. Research Center, Conrad, MT.**

Variety	Yield bu/ac	Test wt. lbs/bu.	Plant hgt. inches	Head date	% Protein
MCNEAL (wheat)	55.9	60.9	30	189	13.1
PLENTY	55.7	61.1	36	189	12.9
VOSS	54.4	62.3	27	189	13.3
WPB1	54.1	61.0	29	187	13.4
933	54.0	60.7	28	188	13.5
DURFORT	53.1	61.5	24	188	13.2
DRESSLER	52.8	62.0	37	189	13.4
MUNICH	52.4	61.9	31	190	12.8
KYLE	51.4	61.0	38	192	13.4
KRONOS	51.0	60.7	27	187	13.1
GOLD CUP	50.2	64.2	29	188	13.6
BEN	50.0	62.4	34	190	13.6
LLOYD	48.9	62.4	27	190	12.9
LAKER	48.0	62.2	30	192	12.5
MEDORA	47.0	61.7	38	189	13.8
VIC	46.6	61.0	36	190	13.8
MONROE	46.3	61.2	37	186	13.9
WARD	45.5	61.5	37	187	14.0
RENVILLE	43.6	60.8	33	189	13.5

Cooperator: Western Triangle Ag. Research Center.
 Location: Ten miles north of Conrad, MT. (Pondera County)
 Fertilizer: 100# 11-51-0 with the seed, + 60# N actual
 topdressed after planting.
 Previous crop: Fallow
 Date seeded: May 5, 1997.
 Date harvested: August 27, 1997.
 Rainfall: From seeding to harvest was 7.7 inches.
 Yield experimental mean: 50.39
 Error degrees of freedom: 38.00
 F test for var.: 1.45
 C.V. 2: 5.99
 LSD (0.05): 8.64

Table 18 **Five-year summary for Dryland Durum varieties grown north of Conrad, MT. 1991 - 1993 - 1994 - 1995 - 1997. Mont. Agr. Expt. Station, Western Triangle Ag. Research Center, Conrad, MT.**

Variety	5 - year comparable average				
	Yield bu/ac	Test wt lbs/bu	Plant hgt. inches	Head date	% Protein
VOSS	68.1	61.4	28.9	185	12.2
LLOYD	66.4	59.1	28.4	187	11.2
LAKER	65.3	60.4	32.8	188	11.7
RENVILLE	63.1	60.6	39.4	186	12.5
KYLE	63.0	60.8	44.1	188	12.2
PLENTY	61.5	61.0	40.5	186	11.9
MONROE	57.3	61.1	38.8	183	12.8
MEDORA	56.4	61.4	39.6	185	12.6
VIC	54.1	60.9	40.2	186	12.3
WARD	53.0	61.0	40.3	186	12.5

Cooperator: Western Triangle Ag. Research Center.
 Location: Ten miles north of Conrad, MT. (Pondera County)

Table 19 Irrigated Durum variety trial grown north of Conrad, 1997. Montana Agr. Experiment Station, Western Triangle Ag. Research Center, Conrad, MT.

Variety	Yield bu/ac	Test wt. lbs/bu.	Plant hgt. inches	% Protein
VOSS	99.3	63.8	28	12.0
DURFORT	92.7	62.9	25	11.7
933	91.1	63.2	27	12.3
GOLD CUP	89.6	65.5	30	11.7
LAKER	89.2	62.9	29	11.7
DRESSLER	89.0	63.7	39	13.1
WPB1	88.6	62.9	30	12.8
MUNICH	87.9	63.4	31	12.8
MCNEAL (wheat)	86.5	62.8	32	13.2
KYLE	85.9	63.3	40	13.0
LLOYD	84.5	64.1	25	11.3
KRONOS	84.4	63.2	25	12.8
PLENTY	84.4	63.3	39	12.8
BEN	84.3	63.8	38	13.2
RENVILLE	80.7	63.0	37	13.2
VIC	80.0	63.1	38	13.3
WARD	76.9	63.3	36	13.4
MEDORA	73.5	63.1	37	13.9
MONROE	71.7	63.0	35	13.1

Cooperator: Western Triangle Ag. Research Center.
 Location: Ten miles north of Conrad, MT. (Pondera County)
 Fertilizer: 100# 11-51-0 with the seed, + 70# N actual
 topdressed after planting.
 Previous crop: Fallow
 Date seeded: May 6, 1997.
 Date harvested: September 4, 1997.
 Rainfall: From seeding to harvest was 7.81 inches.
 Yield experimental mean: 85.98
 Error degrees of freedom: 38.00
 F test for var.: 2.66
 C.V. 2: 5.15
 LSD (0.05): 12.68

Table 20 **Five-year summary for Irrigated Durum varieties grown north of Conrad, MT. 1991 - 1993 - 1994 - 1995 - 1997. Mont. Agr. Expt. Station, Western Triangle Ag. Research Center, Conrad, MT.**

Variety	5 - year comparable average				
	Yield bu/ac	Test wt lbs/bu	Plant hgt. inches	Head date @	% Protein
VOSS	81.8	62.6	30.3	185	10.7
LAKER	75.8	61.9	31.8	185	10.7
LLOYD	75.3	61.4	28.8	185	10.4
RENVILLE	70.2	61.4	41.6	185	11.3
PLENTY	69.9	62.3	41.2	185	11.4
VIC	66.2	62.3	38.2	184	12.0
WARD	63.4	62.3	38.6	183	12.1
KYLE	63.0	61.9	46.2	185	11.9
MEDORA	62.9	62.6	40.8	184	12.2
MONROE	61.2	62.0	39.4	181	11.8

Cooperator: Western Triangle Ag. Research Center.
 Location: Ten miles north of Conrad, MT. (Pondera County)
 @ = Head dates based on four years. (1991-1993-1994-1995)

Idagold (Coors): 2-row feed. Late maturing. Lower irrigated yield than Galena at Conrad 1993. May be marketed by WPB??

Karla (Idaho): 6-row feed. Tall, but fairly good lodging resistance. Medium-high yield. Low test weight on dryland. Rejected for malt.

Kimberly (Idaho): 2-row. Poor lodging resistance. Later to mature than Harrington. Slightly lower yield than Harrington in dry conditions, but slightly higher in moist conditions.

Klages (ID): 2-row malt. Late maturity; for irrigation or high rainfall only. Replaced on contracted acres by Harrington, BA 1202, etc.

Lamont (ID): 2-row feed. Rejected by AMBA. (74Ab10167).

Lewis (MSU): 2-row feed. Similar yield to Gallatin but not as stiff strawed. Higher yield than Clark and Klages. Lewis (and Gallatin) are good for both dry and wet conditions. Rejected by AMBA due to flavor.

Logan (ND, 1995): 2-row feed. Medium height & straw strength. Medium maturity.

Manley (TR 409) (Canada): 2-row. Slightly stiffer strawed and three days later than Harrington, (approx. Klages maturity); longer shelf life than Harrington - does not lose its germination as bad. May replace Harrington in Canada; but only in high rainfall, stripe rust areas.

Medallion, Westbred (WPB): 6-row feed. Semidwarf with very stiff straw, but can be lodged in very high yield conditions (see WB 501, which reportedly "cannot" be lodged). Very high yield at Conrad 1993 under high rainfall conditions. Not intended for dryland as test weight may drop unless high rainfall.

Meltan (Wash): 2-row. Short stiff straw; very good lodging resistance. Late maturing irrigated type.

Menuet (Netherlands): Marketed by Cenex. 2-row feed. Short stiff straw.

Merlin, Westbred (WPB): Waxy seed, semidwarf. Better yield and lodging resistance than Waxbar, but quality not accepted by Japan markets yet.

Morex (Minn, 1978): 6-row malt. Tall; medium straw strength. Early maturity. Shatters readily - swathing advised.

Nancy (Wash): 2-row. Short stiff straw; very good lodging resistance. Late maturing irrigated type.

Nebula (WPB): 6-row feed. Short stiff straw. Late maturity. Low test weight.

Piroline: 2-row. Medium yield, except during drought years it yielded high relative to most varieties.

Prowashonupana (line 3) (MSU): 2-row hullless. Does not have soluble B-glucon unless they can find a way to steam process it out. Potential specialty market.

Robust (Mn, 1983): 6-row malt per ND AMBA list; but not Montana's, in order to keep Montana clear for Morex. Tall; medium straw strength. Medium maturity. The 1992 Robust crop in Minnesota did not malt due to dormancy for unknown reasons. Growers therefore switched to 'Stander' in 1993.

Russell (Idaho): 6-row (tested in 83-85 as ID 789009). Greater yield and plump, but less protein than Morex and Robust. Shatters; swathing advised.

Shonkin (MSU): Waxy 2-row hulless. Stands up better than Wanubet, but has weak straw and low yield. Heads slightly later than Hector. Up to 10% or more of the grain may not thresh free from the hulls. Shonkin is LR 247 from Wanubet (a separate variety from Wanubet) and is a "clean seed" source of Wanubet to allow a more pure line. Special use, with no recommendation.

Sissy, Westbred (WPB): 2-row feed. Intended for irrigated/high rainfall.

Stander (M-64, Minn, 1993): 6-row malt for upper Midwest. Med-short straw, stiffer than other 6-row malt types. Medium-late maturity. Better yield stability and kernel-plump than Excel.

Stark (ND 9866, ND, 1991): 2-row feed. Medium height; weak straw. Med-late maturity. Medium to high yield. Related to Bowman; but yields higher than Bowman except in extremely dry conditions. Probably not as drought tolerant as Bowman. Birds selectively damaged this variety 2 years in a row.

Steptoe (Wash): 6-row feed. Among the highest yielders on irrigation or dryland. Very low test weight dryland.

Targhee(78-Ab10099) (Id/Wash/Ore): 2-row feed. Two inches shorter than Hector, but straw too weak for irrigated. Lower test weight and yield than Hector.

Triumph: 2-row. Malt type in Europe, but does not fit USA malt requirements (germinates too slow). Very high yields on irrigation, but very late to mature, and thus not recommended except for "lower Yellowstone valley type" of growing season.

Wanubet (MSU, 1990): Waxy 2-row hulless. The B-glucan line that will most likely be industrialized. Weak straw and low yield (70% of Hector or Gallatin). Med-late mat. Up to 10% or more of the seed may not thresh free from the hulls.

Waxbar, Westbred (WPB): Waxy barley grown under contract in 1994 & 1995 for export to Japan. Standard height and fairly late to mature. See Merlin.

Westford, Westbred (WPB): 6-row hooded hay barley. Maturity considerably later than Horsford and Whitford, allowing for greater forage production. Seed yield low (similar to Horsford). Hay yields considerably higher than Horsford. Hooded barleys are sometimes vulnerable to ergot, but the amount is slight. Caution should be taken to avoid high nitrate levels when using any small grain as a forage. Test forage for nitrate before the crop is harvested.

Westbred 501 (WPB): 6-row feed. Very stiff straw (supposedly doesn't lodge). Marketed mainly in Idaho.

Table 21 **Dryland Intrastate Barley** variety trial grown north of Conrad, 1997. Mont. Agr. Expt. Station, Western Triangle Ag. Research Center, Conrad, MT.

Variety	Yield bu/ac	Test weight lbs/bu	Plant hgt. inches	% Plump	% Thin	Head date	% Protein
WPB BZ 594-19	114.2	53.6	35	98	1	189	9.8
MT930204	108.7	53.1	34	97	1	185	10.0
GS 1750	107.3	49.5	31	87	4	190	10.0
Baronesse	106.4	52.8	29	93	2	188	10.4
MTLB 13	104.7	54.0	32	96	1	187	11.3
MTLB 5	102.1	53.2	36	83	5	189	11.0
MT950155	101.8	50.7	33	92	2	187	10.5
MT950151	101.5	53.0	36	94	2	186	11.0
MT950156	99.9	51.3	29	89	3	186	10.6
MT940214	99.9	53.1	34	93	2	186	10.3
MT950170	99.6	53.9	30	97	1	186	10.5
MT940053	98.5	53.8	30	79	6	190	11.2
MTLB 6	98.4	53.6	35	93	1	186	11.2
MT940177	98.4	53.8	36	98	1	187	10.3
MT886610	98.2	52.3	32	87	4	188	10.5
AC 96/1114	97.5	49.4	33	95	1	191	10.6
MT950201	97.4	49.5	33	89	2	185	10.5
MT950035	97.2	53.7	34	96	1	187	10.1
Stark	97.2	53.8	36	99	1	185	11.1
MT950186	96.3	54.5	35	96	1	188	10.4
MT950102	96.2	51.6	33	92	7	190	10.7
MT920053	95.6	52.7	34	91	2	188	10.8
MT950064	95.4	50.7	29	88	4	190	11.3
MT950168	95.0	53.3	34	98	1	190	10.2
MT950175	95.0	53.3	33	92	2	190	11.1
MT950185	94.9	54.3	36	98	1	186	11.1
MTLB 32	94.7	51.9	32	67	10	190	10.8
MT920161	94.7	51.7	34	89	3	187	11.3
MT920201	94.5	53.5	31	96	1	191	10.8
MT920059	94.5	52.4	34	86	4	188	10.9
MT940196	94.3	52.2	35	93	2	187	10.9
Busch Agr 1202	94.2	49.7	34	89	2	187	11.4
MT950031	93.8	52.9	37	83	5	188	10.8

(Continued on next page)

(Dryland Intrastate Barley, Continued)

Foster (6-row)	93.8	50.8	37	96	1	185	10.4
MT950091	93.8	51.5	31	75	6	190	11.1
Gallatin	93.6	53.4	33	87	3	188	10.6
MT920073	93.6	51.4	29	85	5	186	11.4
MT910189	93.4	53.0	32	95	2	185	10.6
MTLB 57	93.0	49.3	31	68	10	188	10.7
H3860224	92.4	53.1	34	96	1	189	11.2
Lewis	92.2	51.7	33	78	6	188	11.5
H1851195	92.2	51.6	33	90	2	189	11.7
MT940121	92.0	51.8	31	90	3	191	10.6
Chinook	91.7	52.5	32	83	5	189	11.6
MT940082	91.1	54.8	31	93	2	189	12.0
MT940071	91.0	54.7	30	96	1	188	12.1
2B925550	90.8	48.6	32	78	7	191	11.6
Stander	90.7	50.8	34	92	2	185	11.0
MT950154	90.7	53.9	36	90	2	189	10.9
MT910150	90.6	53.4	35	87	4	187	11.3
MT950081	90.5	53.1	31	96	1	189	11.0
MTLB 30	90.1	51.8	31	73	8	191	11.6
MTLB 48	89.4	47.1	29	42	27	191	10.7
MT930169	88.7	51.7	34	75	8	189	10.6
MT950121	88.3	52.0	31	92	2	189	11.8
MT940013	88.1	51.0	32	88	4	187	10.8
MT940087	88.0	53.4	33	92	2	191	11.6
MTLB 2	87.0	52.9	33	90	2	190	11.4
Logan	86.9	53.3	34	98	1	184	11.8
Harrington	85.1	49.4	31	92	2	191	10.2
MT940218	84.7	50.7	31	84	5	187	10.9
MT920041	84.0	51.6	34	86	3	190	11.2
BA 2B91-4947	80.9	46.3	33	78	9	190	11.3
2B945337	76.5	48.8	30	70	9	187	12.5

Cooperator: Western Triangle Ag. Research Center.
 Location: Ten miles north of Conrad, MT. (Pondera County)
 Fertilizer: 100# 11-52-0 with the seed, + 60# N topdressed.
 Previous crop: Fallow.
 Date seeded: May 5, 1997. Date harvested: Aug. 20, 1997.
 Rainfall: From seeding to harvest was 7.14 inches.
 Yield exp. mean: 94.26, Error degrees of freedom: 126.0
 F test for var.: 1.97, C.V. 2: 4.85, LSD (0.05): 12.80

Table 22 **Dryland Intrastate Barley variety trial grown north of Conrad, 1997. Mont. Agr. Expt. Station, Western Triangle Ag. Research Center, Conrad, MT.**
(*Abbreviated list*)

Variety	Yield bu/ac	Test weight lbs/bu	Plant hgt. inches	% Plump	% Thin	Head date	% Protein
Baronesse	106.4	52.8	29	93	2	188	10.4
Stark	97.2	53.8	36	99	1	185	11.1
Bush Ag. 1202	94.2	49.7	34	89	2	187	11.4
Foster (6-row)	93.8	50.8	37	96	1	185	10.4
Lewis	92.2	51.7	33	78	6	188	11.5
Chinook	91.7	52.5	32	83	5	189	11.6
Stander	90.7	50.8	34	92	2	185	11.0
Logan	86.9	53.3	34	98	1	184	11.8
Harrington	85.1	49.4	31	92	2	191	10.2

Cooperator: Western Triangle Ag. Research Center.
 Location: Ten miles north of Conrad, MT. (Pondera County)
 Fertilizer: 100# 11-52-0 with the seed, + 60# N topdressed.
 Previous crop: Fallow.
 Date seeded: May 5, 1997. Date harvested: Aug. 20, 1997.
 Rainfall: From seeding to harvest was 7.14 inches.
 Yield exp. mean: 94.26
 Error degrees of freedom: 126.00
 F test for var.: 1.97
 C.V. 2: 4.85
 LSD (0.05): 12.80

Table 23

Five-year summary for Dryland Barley varieties grown north of Conrad, MT. 1993 - 1994 - 1995 1996 - 1997. Mont. Agr. Expt. Station, Western Triangle Ag. Research Center, Conrad, MT.

5 - year comparable average

Variety	Yield bu/ac	Test weight lbs/bu	Plant hgt. inches	% Plump	% thin	Head date	% Protein
BARONESSE	105.1	52.7	30	89	4	187	10.1
MT 8886610	98.2	52.7	34	88	4	185	10.1
LEWIS	96.9	53.2	35	89	4	187	10.5
GALLATIN	96.8	53.3	34	91	3	186	10.2
STARK	95.5	53.9	35	96	1	183	10.4
BA 1202	91.4	50.8	35	88	4	186	10.8
CHINOOK	91.1	52.3	34	86	5	186	10.8
HARRINGTON	90.0	51.1	35	87	4	187	10.1
FOSTER	86.5	51.4	36	96	1	183	9.9
LOGAN	85.9	53.2	33	95	2	182	10.8
STANDER	85.0	52.0	35	95	2	184	10.5

Cooperator: Western Triangle Ag. Research Center.
Location: Ten miles north of Conrad, MT. (Pondera County)

Table 24 Irrigated Intrastate Barley variety trial grown north of Conrad, 1997. Mont. Agr. Expt. Station, Western Triangle Ag. Research Center, Conrad, MT.

Variety	Yield bu/ac	Test weight lbs/bu	Plant hgt. inches	% Plump	% Thin	% Protein
Nebula	142.3	47.3	25	96	2.0	9.8
AC 96/1114	124.2	51.3	34	98	.5	10.2
GS 1750	123.8	50.6	30	96	1.0	8.6
WPB BZ 594-19	120.6	53.8	32	98	.5	8.5
Baronesse	119.9	53.6	32	97	1.0	9.4
H3860224	119.5	52.9	32	97	1.0	9.1
MTLB 5	118.6	53.6	35	95	2.0	9.5
MT950102	117.4	53.1	32	98	1.0	10.0
Coors C22	116.1	51.1	28	98	1.0	9.1
MTLB 13	115.8	52.4	33	93	3.0	9.8
Stander (6-row)	114.9	51.9	39	97	.5	9.7
Stark	114.7	52.8	37	96	2.0	10.9
MTLB 6	114.6	52.3	28	95	1.0	10.4
MT950156	113.6	52.5	33	95	2.0	9.3
MT950064	113.5	52.3	30	90	4.0	9.8
MTLB 32	113.2	53.2	30	92	2.0	9.0
MTLB 30	113.2	53.9	35	97	.5	10.1
MT940053	113.0	55.3	33	96	2.0	9.9
Busch Agr 1202	112.1	51.4	37	97	1.0	9.9
Gallatin	111.4	53.8	34	95	2.0	9.3
MT950155	111.1	52.7	30	98	.5	9.9
MTLB 2	110.8	53.3	33	98	.5	10.6
MT940214	110.6	52.8	30	97	1.0	9.2
MT950081	110.5	53.6	33	99	.5	9.4
Logan	110.1	52.8	38	95	2.0	10.3
MT920053	110.0	53.4	38	95	2.0	10.6
H1851195	109.7	51.9	33	97	1.0	10.1
MT930204	109.6	53.1	34	96	1.0	9.9
MT920059	109.5	53.9	40	96	1.0	9.9
MT950186	109.2	55.3	33	98	.5	9.8
BA2B91-4947	108.3	46.8	31	77	7.0	9.1
Lewis	108.3	54.2	36	98	1.0	10.4
MT940121	107.7	53.2	32	99	.5	9.5

(Continued on next page)

(Irrigated Intrastate Barley, Continued)

MTLB 48	107.2	49.6	32	76	9.0	10.4
MT940177	106.6	52.3	34	94	2.0	10.2
MT940082	106.2	54.8	34	96	2.0	11.7
MT886610	106.1	53.1	35	93	2.0	8.8
Galena	105.7	51.5	33	96	1.0	9.0
MT920201	105.6	52.0	32	92	2.0	9.9
MT950154	105.0	55.0	37	99	.5	10.3
2B925550	105.0	50.6	32	89	3.0	9.6
2B945337	104.5	51.0	37	93	3.0	10.0
Moravian 14	104.3	53.8	27	94	3.0	9.9
MT940013	103.5	51.6	33	94	2.0	9.5
MT950091	102.4	53.1	30	96	1.0	9.8
MT940218	102.0	53.3	31	97	1.0	9.6
MT910150	101.1	53.1	27	96	1.0	11.1
MT920161	100.9	53.4	36	95	2.0	11.3
MTLB 57	100.4	53.8	32	96	2.0	10.2
MT920073	100.1	54.4	31	99	.5	10.8
MT920041	98.8	52.5	33	95	2.0	10.2
MT940196	98.8	52.5	33	98	.5	10.1
MT950170	98.4	53.0	29	96	3.0	9.2
MT930169	98.3	52.7	37	94	2.0	9.7
MT940087	98.3	54.1	34	98	1.0	10.1
MT950175	98.2	54.2	30	90	1.0	10.1
MT950168	97.4	52.8	33	99	.5	9.1
MT910189	97.3	51.7	30	95	2.0	8.6
MT940071	97.1	54.7	33	97	2.0	11.6
MT950121	96.1	51.4	32	98	.5	11.1
Foster (6-row)	95.6	50.6	34	97	.5	9.4
MT950151	95.0	53.0	34	92	4.0	10.3
Harrington	93.1	49.6	34	89	4.0	9.6
Chinook	88.8	51.2	30	90	3.0	10.6

Cooperator: Western Triangle Ag. Research Center.
 Location: Ten miles north of Conrad, MT. (Pondera County)
 Fertilizer: 100# 11-52-0 with the seed, + 70# N topdressed.
 Previous crop: Fallow.
 Date seeded: May 6, 1997. Date harvested: Aug. 25, 1997.
 Rainfall: From seeding to harvest was 7.47 inches.
 Yield exp. mean = 107.73, Error degrees of freedom = 126.00
 F test for var. = 4.43, C.V. 2 = 3.98, LSD (0.05) = 11.99

Table 25 **Irrigated Intrastate Barley** variety trial grown north of Conrad, 1997. Mont. Agr. Expt. Station, Western Triangle Ag. Research Center, Conrad, MT.
(*Abbreviated list*)

Variety	Yield bu/ac	Test weight lbs/bu	Plant hgt. inches	% Plump	% Thin	% Protein
Nebula	142.3	47.3	25	96	2.0	9.8
Baronesse	119.9	53.6	32	97	1.0	9.4
Stander (6-row)	114.9	51.9	39	97	.5	9.7
Stark	114.7	52.8	37	96	2.0	10.9
Busch Agr 1202	112.1	51.4	37	97	1.0	9.9
Gallatin	111.4	53.8	34	95	2.0	9.3
Logan	110.1	52.8	38	95	2.0	10.3
Lewis	108.3	54.2	36	98	1.0	10.4
Galena	105.7	51.5	33	96	1.0	9.0
Moravian 14	104.3	53.8	27	94	3.0	9.9
Foster (6-row)	95.6	50.6	34	97	.5	9.4
Harrington	93.1	49.6	34	89	4.0	9.6
Chinook	88.8	51.2	30	90	3.0	10.6

Cooperator: Western Triangle Ag. Research Center.
 Location: Ten miles north of Conrad, MT. (Pondera County)
 Fertilizer: 100# 11-52-0 with the seed, + 70# N topdressed.
 Previous crop: Fallow.
 Date seeded: May 6, 1997. Date harvested: Aug. 25, 1997.
 Rainfall: From seeding to harvest was 7.47 inches.
 Yield exp. mean = 107.73
 Error degrees of freedom = 126.00
 F test for var. = 4.43
 C.V. 2 = 3.98
 LSD (0.05) = 11.99

Table 26 **Five-year summary for Irrigated Barley varieties grown north of Conrad, MT. 1993 - 1994 - 1995 1996 - 1997. Mont. Agr. Expt. Station, Western Triangle Ag. Research Center, Conrad, MT.**

Variety	5 - year comparable average						
	Yield bu/ac	Test weight lbs/bu	Plant hgt. inches	% Plump	% thin	Head date *	% Protein **
BARONESSE	113.9	53.8	31	97	1	186	8.2
GALENA	104.6	52.0	31	96	1	190	8.4
GALLATIN	101.1	53.7	35	95	2	183	8.5
STARK	98.1	54.0	36	96	2	182	9.5
MT 886610	96.8	53.1	34	94	2	184	8.3
BA 1202	95.3	52.5	35	97	1	186	9.1
STANDER	94.8	52.3	37	97	1	182	8.6
MORAVIAN 14	94.4	54.5	27	97	3	181	8.8
LEWIS	93.2	54.4	35	96	2	185	9.0
LOGAN	91.7	53.2	35	96	1	180	9.2
HARRINGTON	87.2	52.2	35	93	2	186	8.5
FOSTER	85.5	51.6	34	97	1	181	8.7
CHINOOK	80.1	52.2	32	91	3	185	9.3

Cooperator: Western Triangle Ag. Research Center.
 Location: Ten miles north of Conrad, MT. (Pondera County)
 * = Head date based on four years only. (1993-94-95-96)
 ** = Proteins based on four years only. (1993-94-95-97)

Table 27 **Dryland Barley** variety trial grown northeast of Choteau, 1997. Mont. Agr. Expt. Sta., Western Triangle Ag. Research Center, Conrad, MT.

Variety	Yield bu/ac	Test wt. lbs/bu.	Plant hgt. inches	% Plump	% Thin	% Protein
Steptoe (6-row)	116.3	46.8	39	92	3	9.8
Stander (6-row)	107.2	50.1	39	89	3	11.4
Foster (6-row)	106.9	49.9	39	95	1	11.3
Stark	104.7	53.3	38	98	1	12.4
Chinook	104.2	52.6	37	91	2	12.5
H3860224	104.1	52.6	38	93	2	12.7
H1851195	103.9	52.4	37	96	1	13.0
MT886610	102.5	51.9	39	79	9	12.3
Baronesse	100.8	50.9	35	87	4	12.8
Gallatin	100.4	51.9	37	84	5	12.3
Targhee	100.4	51.1	36	88	5	12.3
Bowman	99.3	52.8	38	98	1	12.5
Lewis	98.4	53.3	36	89	3	13.0
Harrington	96.6	50.3	38	84	4	12.5
Logan	94.2	52.7	36	98	1	12.1
Hector	92.9	51.7	39	87	5	12.8

Cooperator: Roy Inbody.

Location: Twelve miles northeast of Choteau. (Teton Co.)

Fertilizer: 100# 11-52-0 with the seed, + 60#N actual liquid.

Previous crop: Fallow.

Date seeded: May 8, 1997.

Date harvested: August 18, 1997.

Rainfall: From May 21 to harvest was 6+ inches.

Yield experimental mean: 102.04

Error degrees of freedom: 30.00

F test for var.: 3.41 ----- C.V. 2: 2.99 ----- LSD (0.05): 8.82

Table 28

Five-year summary for Dryland Barley varieties grown near Choteau, MT. 1993 - 1994 - 1995 - 1996 - 1997. Mont. Agr. Expt. Sta., Western Triangle Ag. Research Center, Conrad, MT.

5 - year comparable average

Variety	Yield bu/ac	Test wt. lbs/bu.	Plant hgt. inches	% Plump	% thin	% Protein
STARK	91.6	53.0	32.6	93	2	11.9
BARONESSE	91.4	51.5	29.8	78	6	12.3
STEPTOE	90.3	45.4	31.4	80	7	10.5
LEWIS	87.0	52.6	32.0	79	6	12.3
TARGHEE	86.6	51.0	31.2	83	6	12.0
MT 886610	85.9	51.6	32.7	73	9	12.2
CHINOOK	85.7	51.5	31.0	73	9	12.2
HECTOR	85.1	51.9	34.8	79	7	12.3
GALLATIN	85.1	51.7	32.6	79	7	12.1
H1851195	85.1	51.4	32.5	87	3	12.6
H3860224	83.7	51.4	31.6	85	4	12.3
BOWMAN	82.9	52.1	32.2	94	2	12.1
STANDER	79.4	48.7	34.1	85	5	11.4
HARRINGTON	78.3	50.4	32.2	77	7	12.1

Cooperator: Roy Inbody in 1994 - 1995 - 1996 - 1997, and Rick Corey in 1993.

Location: Northeast of Choteau. (Teton County)

Table 29 Dryland Barley variety trial grown east of Oilmont, 1997. Mont. Agr. Expt. Sta., Western Triangle Ag. Research Center, Conrad, MT.

Variety	Yield bu/ac	Test wt. lbs/bu.	Plant hgt. inches	% Plump	% Thin	% Protein
Stark	70.1	48.0	32	44	30	12.9
Bowman	64.0	49.9	32	87	11	12.5
Logan	62.7	48.1	30	71	15	12.1
Chinook	62.2	47.1	31	28	43	12.8
Steptoe (6-row)	61.0	34.9	33	9	54	10.9
Foster (6-row)	60.5	41.9	32	23	38	11.9
Lewis	59.4	47.1	32	36	40	13.7
H1851195	58.1	44.9	31	20	43	13.9
Gallatin	57.3	44.3	33	9	55	12.8
H3860224	54.0	45.2	31	18	55	14.3
Hector	53.9	45.2	33	25	49	13.9
Baronesse	53.7	43.9	26	11	62	13.9
MT886610	54.0	44.2	31	28	48	14.4
Harrington	53.6	43.7	30	15	61	14.7
Targhee	52.7	42.5	31	10	62	13.7
Stander (6-row)	47.5	43.0	31	27	36	13.9

Cooperator: Terry Alme.

Location: Eight miles east of Oilmont, MT. (Toole County)

Fertilizer: 100# 11-52-0 with the seed.

Previous crop: Fallow.

Date seeded: April 28, 1997.

Date harvested: August 7, 1997.

Rainfall: From May 29 to harvest was 2.7 inches.

Yield experimental mean: 57.76

Error degrees of freedom: 30

F test for var.: 3.20 ----- C.V. 2: 5.40 ----- LSD (0.05): 9.01

Table 30

Five-year summary for Dryland Barley varieties grown near Oilmont, MT. 1993 - 1994 - 1995 - 1996 - 1997. Mont. Agr. Expt. Sta., Western Triangle Ag. Research Center, Conrad, MT.

Variety	5 - year comparable average					
	Yield bu/ac	Test wt. lbs/bu.	Plant hgt. inches	% Plump	% thin	% Protein
BARONESSE	66.2	47.8	26.2	45	38	13.3
CHINOOK	64.3	47.5	29.2	44	40	13.2
BOWMAN	63.4	48.3	31.0	72	16	12.1
STARK	61.9	47.7	30.8	52	31	12.4
STEPTOE	61.3	39.1	28.6	41	39	11.0
H3860224	60.8	48.9	28.9	45	35	13.8
HECTOR	60.8	47.2	32.0	46	36	12.9
H1851195	60.6	46.9	29.9	44	35	13.0
LEWIS	60.1	48.2	31.2	49	36	12.6
TARGHEE	60.1	46.6	29.9	41	41	12.8
MT 886610	58.1	46.9	29.4	44	39	13.9
GALLATIN	57.8	47.0	31.2	42	42	12.6
HARRINGTON	57.7	47.5	28.8	46	37	13.5
STANDER	56.4	47.7	29.5	68	22	12.6

Cooperator: Terry Alme.

Location: Eight miles east of Oilmont, MT.

(Toole County)

Table 31 **Dryland Barley variety trial grown north of
Cut Bank, 1997. Mont. Agr. Expt. Sta., Western
Triangle Ag. Research Center, Conrad, MT.**

Variety	Yield bu/ac	Test wt. lbs/bu.	Plant hgt. inches	% Plump	% Thin	% Protein
Chinook	76.0	48.5	34	44	28	14.7
Logan	70.5	47.8	38	65	14	14.3
Stark	70.2	48.4	36	59	16	14.9
Bowman	66.8	47.5	35	78	7	13.5
Gallatin	66.7	47.6	34	37	34	14.9
H1851195	61.3	46.4	37	48	22	16.6
Baronesse	60.7	44.5	28	24	48	15.5
Lewis	57.4	47.1	33	27	46	16.1
Stander (6-row)	55.1	42.3	34	23	42	14.9
Foster (6-row)	54.4	40.1	36	19	46	14.1
Harrington	53.7	43.2	31	21	50	16.5
Steptoe (6-row)	52.3	35.2	35	12	57	12.9
Targhee	51.2	43.3	36	20	50	16.5
Hector	50.5	45.7	33	38	33	14.8
H3860224	48.7	44.9	33	26	42	17.1
MT886610	46.1	44.0	33	21	53	16.6

Cooperator: Don Bradley.
 Location: Fifteen miles north of Cut Bank, MT. (Glacier Co.)
 Fertilizer: 100# 11-52-0 with seed, and 60# N-urea topdressed.
 Rainfall: 6+ inches from seeding to harvest.
 Previous crop: Fallow.
 Date seeded: April 28, 1997.
 Date harvested: August 20, 1997.
 Yield experimental mean: 58.85
 Error degrees of freedom: 30.00
 F test for var: 4.49 ----- C.V. 2: 7.16 ----- LSD (0.05): 12.17

Table 32 **Five-year summary for Dryland Barley varieties grown near Cut Bank, MT. 1993 - 1994 - 1995 - 1996 - 1997. Mont. Agr. Expt. Sta., Western Triangle Ag. Research Center, Conrad, MT.**

Variety	5 - year comparable average					
	Yield bu/ac	Test wt. lbs/bu.	Plant hgt.* inches	% Plump	% thin	% Protein
H1851195	63.2	50.1	32.3	83	7	10.8
BARONESSE	61.1	50.1	25.9	74	12	9.6
TARGHEE	58.7	49.2	30.7	68	14	10.3
CHINOOK	58.6	51.1	29.1	76	10	9.7
STEPTOE	57.2	42.9	28.1	68	16	9.4
STARK	56.0	52.4	30.3	86	5	10.3
GALLATIN	54.1	51.0	28.7	77	9	9.7
MT 886610	53.9	50.4	30.1	73	14	10.0
HARRINGTON	53.5	49.7	28.6	74	12	9.9
H3860224	53.1	50.1	27.1	73	11	10.8
LEWIS	52.9	51.2	29.0	75	12	10.1
HECTOR	52.7	50.2	29.2	73	12	10.0
BOWMAN	52.3	51.7	29.5	93	2	10.1
STANDER	51.7	48.4	28.3	63	12	10.3

Cooperator: Don Bradley.

Location: Fifteen miles north of Cut Bank. (Glacier County)

* = Plant height averages based on four years only. (1994-1995-1996-1997)

Title: Small grain variety performance under no-till conditions.

Year: 1997.

Location: Western Triangle Research Center, Conrad, MT.

Personnel: Gregory D. Kushnak, Research Center, Conrad; Luther Talbert and Tom Blake, MSU Dept Plant, Soil & Environ Sci.

Objectives: Identify small grain varieties which are adapted to no-till conditions.

Methods: Spring wheat and barley varieties were no-till planted into barley stubble at right angles to the previous crop. Crop history for the site was barley in 1996, fallow in 1995, and barley in 1994. Planting was accomplished with a double-disk no-till plot planter constructed by our Research Center Staff. Row space was 12 inches. Fertilizer included 100 pounds/acre ammonium phosphate (11-52-0) and 100 pounds/acre actual nitrogen top-dressed as urea. Roundup herbicide was used for preplant weed & volunteer control. Hoelon and Bronate herbicides were used for wild oat and broadleaf control, respectively.

Results: Data for 1997, along with 5-year averages, are presented in Tables 1 and 2 for spring wheat, and Tables 3 and 4 for barley. Rainfall was timely and well distributed over the growing season, resulting in good crop performance for recrop conditions.

The ranking of varieties for yield under these no-till conditions is similar to that of our trials on fallow. The no-till conditions at Conrad have been relatively disease-free and non-stressed for moisture over the past five years.

Future Plans: Continue the no-till continuous-crop variety evaluations in efforts to include seasons of disease and environmental stress.

Table 33 **Dryland Recrop No-till Spring Wheat variety trial** grown north of Conrad, 1997. Mont. Agr. Expt. Station. Western Triangle Ag. Research Center, Conrad, Montana.

Variety		Yield bu/ac	Test wt. lbs/bu.	Plant hgt. inches	% protein
VANNA	(s. white)	58.8	60.0	29	11.1
RAMBO	*	54.6	62.7	31	12.4
STOA		53.6	61.5	33	13.3
FERGUS		53.1	62.3	31	13.4
WESTBRED EXPRESS		53.0	61.4	28	13.4
NEWANA		52.9	62.2	36	12.4
MCNEAL		52.8	61.0	35	13.3
TRENTON		52.5	62.8	28	13.9
PIONEER 2375		50.9	62.2	30	13.3
LEN		50.8	61.7	37	13.3
WESTBRED 936		50.8	60.6	27	14.1
AMIDON	*	50.6	60.7	30	13.1
GLENMAN	*	50.5	60.1	28	12.4
HI-LINE		50.4	62.6	32	13.5
MTHW9420		50.3	62.1	27	13.0
MTHW9520		49.3	60.6	28	12.7
LEW	*	49.3	61.7	31	13.2
WESTBRED 926		48.2	61.8	30	13.8
MT 9433		48.0	62.4	32	13.3
FORTUNA	*	47.7	62.2	37	13.1
MT 9508		47.3	62.6	32	14.5
ERNEST	*	47.0	62.6	35	14.4
GRANDIN		47.0	62.7	35	13.9

Cooperator: Western Triangle Ag. Research Center.
 Location: Ten miles north of Conrad, MT. (Pondera County)
 Fertilizer: 100# 11-52-0 with the seed, + 100# N topdressed.
 Previous crop: Barley.
 Date seeded: May 5, 1997.
 Date harvested: September 2, 1997.
 Rainfall: From seeding to harvest was 7.7 inches.
 * = Sawfly resistant varieties. (Amidon and Rambo have partial resistance.) (Also, most experimental lines are resistant).
 Yield experimental mean: 50.84
 Error degrees of freedom: 44.00
 F test for var: 1.26
 C.V. 2: 4.98
 LSD (0.05): 7.22

Table 34 Five-year summary for No-till Recrop Spring Wheat varieties grown near Conrad, MT. 1993 - 1994 - 1995 - 1996 - 1997. Mont. Agr. Expt. Station, Western Triangle Agr. Research Center, Conrad, MT.

Variety	5 - year comparable average			
	Yield bu/ac	Test wt lbs/bu	Plant hgt. @ inches	% Protein
GLENMAN *	48.5	58.0	29.3	11.1
WESTBRED 936	48.2	58.2	26.6	12.2
RAMBO *	47.8	57.5	29.3	11.2
WESTBRED EXPRESS	47.0	59.0	26.3	12.1
AMIDON *	46.2	58.8	34.8	12.2
WESTBRED 926	45.8	58.2	29.3	11.9
NEWANA	44.7	59.1	30.5	11.2
HI-LINE	44.6	60.3	29.5	11.9
MCNEAL	43.9	58.2	31.5	12.2
STOA	43.6	58.8	34.8	11.7
ERNEST *	43.4	60.0	36.0	12.3
LEN	43.2	58.1	31.3	12.4
TRENTON	42.0	59.5	30.9	12.3
GRANDIN	41.5	59.4	32.8	12.4
FORTUNA *	41.2	60.1	36.0	12.3
LEW *	40.8	59.7	35.3	11.6

Cooperator: Western Triangle Agricultural Research Center.

Location: Ten miles north of Conrad, MT. (Pondera County)

* = Sawfly resistant varieties. (Amidon and Rambo have partial resistance)

@ = Plant heights based on four years average. (1994 - 1995 - 1996 - 1997)

Table 35 **Dryland Recrop No-till Barley** variety trial grown north of Conrad, 1997. Mont. Agr. Expt. Station, Western Triangle Ag. Research Center, Conrad, MT.

Variety	Yield bu/ac	Test weight lbs/bu	Plant hgt. inches	% Plump	% Thin	% Protein
Steptoe (6-row)	84.5	48.3	30	92	3	9.2
Stander (6-row)	83.6	51.0	32	84	5	11.3
Foster (6-row)	83.2	49.2	32	91	3	10.7
Baronesse	82.9	51.3	27	90	4	11.3
Logan	79.0	52.8	31	92	3	11.6
Stark	78.2	53.0	29	97	1	11.2
H1851195	77.0	50.4	31	92	3	12.0
H3860224	75.7	51.9	33	89	3	12.3
Harrington	75.0	49.8	28	85	6	11.5
Bowman	74.4	52.6	29	95	1	11.9
Gallatin	74.2	52.1	28	81	6	11.1
MT886610	72.7	50.9	30	83	7	11.6
Hector	72.2	51.4	30	83	7	11.8
Lewis	71.5	51.6	28	85	5	12.3
Targhee	70.5	50.2	30	84	7	11.7
Chinook	67.7	49.4	29	67	14	12.5

Cooperator: Western Triangle Ag. Research Center.
 Location: Ten miles north of Conrad, MT. (Pondera County)
 Fertilizer: 100# 11-52-0 with the seed, + 100# N actual
 topdressed after planting.
 Previous crop: Barley.
 Method of seeding: Double-disc drill.
 Date seeded: May 5, 1997.
 Date harvested: August 20, 1997.
 Rainfall: From seeding to harvest was 7.14 inches.
 Yield experimental mean: 76.38
 Error degrees of freedom: 30.00
 F test for var.: 3.92 ----- C.V. 2: 3.39 ----- LSD (0.05): 7.47

Table 36 **Five-year summary for Recrop Dryland No-Till Barley varieties grown north of Conrad, MT. 1993 - 1994 - 1995 - 1996 - 1997. Mont. Agr. Expt. Station, Western Triangle Agr. Res. Center, Conrad, MT.**

5 - year comparable average						
Variety	Yield bu/ac	Test weight lbs/bu	Plant hgt.* inches	% Plump	% thin	% Protein

BARONESSE	78.2	51.1	26.5	84	5	9.9
H1851195	70.4	49.1	30.9	88	3	10.6
STANDER	69.7	49.5	30.0	80	6	9.9
STEPTOE	69.6	45.8	28.5	81	7	9.5
H3860224	69.2	50.9	31.2	86	3	10.4
GALLATIN	66.6	50.5	28.3	83	5	10.0
MT 886610	64.3	49.7	30.5	75	9	10.1
HARRINGTON	63.4	48.7	27.8	81	6	9.9
STARK	63.2	51.9	28.8	91	3	10.4
HECTOR	62.6	49.8	30.2	76	8	10.5
BOWMAN	62.5	51.1	28.5	92	2	10.8
TARGHEE	62.2	47.9	29.3	74	12	10.3
LEWIS	60.9	50.7	28.0	81	6	10.5
CHINOOK	58.7	49.2	28.5	71	10	10.7

Cooperator: Western Triangle Ag. Research Center.
 Location: Ten miles north of Conrad, MT. (Pondera County)
 * = Plant hgt. averages based on four years only. (94-95-96-97)

Title: Effect of boron and phosphorus on irrigated alfalfa.

Year: 1997

Location: 4 J Farms (Paul Jones), east of Ledger.

Personnel: Grant Jackson and Becky Murphy, Western Triangle Ag. Research Center, Conrad, MT 59425.

Objectives: 1) To predict the response of alfalfa to boron fertilization using soil and/or tissue tests; (2) and prepare a final report at conclusion of the project addressing the above objective.

Procedures: Nine fertilizer treatments and blanket applications of 10 lbs. Zn, and 30lbs. K/ac were applied to an existing alfalfa stand on April 18, 1997. The field plot design was a 3 x 3 factorial (0, 40, and 80 lbs. P₂O₅, 0, 1, and 2 lbs. B/ac) with four replicates. Plot size was 6 x 15 feet. A two-foot wide, flail chopper was used for the first cutting. A three-foot Jari mower was used for cuts two and three. After weighing, plot samples were sub-sampled for nutrient and water analysis. Harvest dates were June 18 for Cut 1, August 5 for Cut 2, and September 24 for Cut 3. The plot area was soil sampled prior to fertilizer application. The cultivar was. Fertilizer materials were treble super phosphate, potassium chloride, zinc sulfate, and Granubor (14.3 % B). Irrigation water was sampled on July 25.

Results: The yield data are summarized in Table 1s. The average yield for three cuttings was 6.1 tons/ac. Even though the P and B treatments were based on the initial soil tests, no response to either P or B was detected. Soil and irrigation water analyses are shown in Table 1s. Note the increase in B with soil depth, which probably explains the lack of B yield response. A composite soil sample of all the 0, 40 and 80 lbs. P₂O₅/ac treatments was taken on October 7. The results were 9.5, 16.9, and 18 ppm for the 0, 40 and 80 lbs. P₂O₅/ac treatments.

Table 1s. The effect of Phosphorus and Boron on irrigated alfalfa quality and yield. Experiment located east of Ledger, MT. Western Triangle Ag. Research Center, Conrad, MT. 1997.

Entry	Treatment		Yield ¹			
	P ₂ O ₅ ---(lbs/ac)---	B	1st Cut	2nd Cut	3rd Cut	Total
			------(T/ac)-----			
9	80	2	1.58	2.84	1.85	6.26
6	80	1	1.39	2.70	1.89	5.97
3	80	0	1.62	2.68	1.99	6.29
8	40	2	1.33	2.78	1.82	5.94
5	40	1	1.74	2.66	2.03	6.43
2	40	0	1.47	2.66	1.86	5.99
7	0	2	1.52	2.75	1.85	6.13
4	0	1	1.33	2.89	1.87	6.09
1	0	0	1.62	2.71	1.85	6.18
			Summary Statistics			
Experimental Means			1.51	2.74	1.89	6.14
Error Mean Square			0.027	0.061	0.013	0.151
P-value			0.0175	0.8855	0.1738	0.6641
Standard Error			0.165	0.248	0.113	0.389
Standard Error of the Mean			0.083	0.124	0.056	0.195
C.V. 1: (s/mean)*100			10.93	9.03	5.96	6.34
LSD (0.05)			0.24	NS	NS	NS
			Phosphorus Summary			
80			1.53	2.74	1.91	6.17
40			1.51	2.70	1.91	6.12
0			1.49	2.78	1.85	6.13
LSD (0.05)			NS	NS	NS	NS
			Boron Summary			
2			1.48	2.79	1.84	6.11
1			1.49	2.75	1.93	6.16
0			1.57	2.68	1.90	6.15
LSD (0.05)			NS	NS	NS	NS
Interaction P-value			0.003	0.790	0.146	0.264

¹ Yields based on 12% moisture

Growing season ppt. = Additional moisture from irrigation = 18.0"

Harvest dates for first, second, and third cuttings = June 18, Aug. 5, and Sept. 24, respectively.

Table 1s. Continued

Soil Tests:

O.M. = 2.25%, pH = 8.0

Depth (ft.)	B	Cl	NH ₄ -N (lbs/ac)	NO ₃ -N	SO ₄ -S
0-1	0.35	12.3	13.2	31.7	143.5
1-2	0.38	14.2	7.0	7.8	245.9
2-3	0.42	35.0	15.0	3.3	727.9
3-4	0.78	143.5	7.1	2.6	1293.6
4-5	1.08	410.0	7.6	2.2	4335.2

Element (0-6")	Amount (ppm)
P	13.8
Zn	0.48
Mn	5.85
K	234
Cu	0.9
Fe	6.86
B	0.41

Irrigation Water Analysis:

pH = 8.3

EC (mmhos/cm) = 0.65

TDS (mg/L) = 442.0

TSS (mg/L) = 8.0

Element or Ion	Amount (ppm)
B	0.089
Ca	45.0
Cl	4.08
Cu	< 0.01
K	2.8
Mg	34.0
Mn	0.03
Na	38.3
P	0.19
S	45.5
Zn	< 0.01
HCO ₃ ⁻	248.0
CO ₃ ⁼	< 1.0

Title: Effects of nitrogen, phosphorus, potassium, and chloride on grain yield and quality of spring barley.

Year: 1997

Locations: 1. Bruce Bradley Farm, north of Cut Bank,
2. Don Bradley Farm, northeast of Cut Bank.

Personnel: Grant Jackson and Becky Murphy, Western Triangle Ag. Research Center, Conrad, MT 59425.

Objectives: To determine spring barley yield and protein response to N fertilizer and N soil tests; to determine spring barley response to P fertilizer and P soil tests; survey spring barley response to K and Cl fertilization; and at the end of project (three growing seasons) prepare yield, protein, and N and P fertilizer prediction models or equations using the soil tests and climatic information.

Procedures: Fourteen fertilizer treatments were applied broadcast while planting (P fertilizer was placed with the seed). Plots were seeded with a double disc plot planter (12" row spacing). Plot size was 6 x 20 feet with four replications. Plots were harvested with a small plot combine.

Results: The data are summarized in Tables 2s (B. Bradley) and 3s (D. Bradley). All barley response parameters, yield, test weight, plump, thins, and protein responded to N except yield at the northeast location. The northeast location had too much initial nitrate-N for a significant yield response. The north location had optimum yield at the 40 N rate. When added to the initial nitrate-N soil test (0-3'), the optimum yield was produced with 98 lbs. N/ac or 1.2 lbs. of N/bu. The responses to P, K, or Cl were all non-significant.

Preplant and post-harvest soil nitrate-N levels are shown in Figs. 1 and 2. Soil nitrate-N levels were all below preplant levels, however, the northeast location had accumulations from the two highest N rates. The post-harvest, nitrate-N levels for the optimum fertilizer rates (40 N for the north Cut Bank and 0 N for northeast Cut Bank) were negligible.

Preplant and post-harvest soil ammonium-N levels are presented in Figs. 3 and 4. These data make little sense, and probably explain why ammonium-N is not used for predicting N fertilizer response.

Preplant and post-harvest soil water content data are shown in Figs. 5 and 6. These data show barley using water to at least 3 feet at about 1.5 inches of water/foot of soil.

Table 2s. The effect of N, P, K and Cl on spring barley yield and quality. Experiment located north of Cut Bank, MT. Western Triangle Ag. Research Center, Conrad, 1997.

No.	N	Treatment			Grain Yield (bu/ac)	Test			
		P ₂ O ₅ (lbs/acre)	K	Cl		Weight (lbs/bu)	Plump %	Thin %	Protein %
12	120	50	30	30	81.60	46.40	54.27	17.90	12.89
8	120	25	30	30	81.00	47.33	63.57	13.77	12.87
4	120	0	30	30	83.00	46.03	62.17	13.53	13.18
11	80	50	30	30	81.40	48.07	70.30	10.03	11.34
14	80	50	30	0	82.80	48.90	66.53	10.90	11.50
13	80	50	0	30	84.83	48.73	67.83	10.37	11.37
7	80	25	30	30	81.50	48.00	67.43	10.77	11.73
3	80	0	30	30	77.33	47.13	69.57	10.60	11.74
10	40	50	30	30	81.27	50.10	86.03	3.97	9.03
6	40	25	30	30	77.57	50.80	86.90	3.43	8.84
2	40	0	30	30	82.00	50.00	83.93	5.33	9.29
9	0	50	30	30	66.10	51.73	91.93	2.13	7.31
5	0	25	30	30	60.20	51.93	92.70	1.77	7.44
1	0	0	30	30	69.17	51.20	92.57	2.00	7.64

Statistical Table

Experimental Means	77.84	49.03	75.41	8.32	10.44
Error Mean Square	21.75	0.887	31.28	6.04	0.307
P-value	0.0000	0.0000	0.0000	0.0000	0.0000
Standard Error	4.66	0.942	5.59	2.46	0.554
Standard Error of the Mean	2.69	0.544	3.23	1.42	0.320
C.V. 1: (s/mean)*100	5.99	1.92	4.28	17.05	5.31
LSD (0.05)	7.83	1.58	9.39	4.12	0.930

Nitrogen Summary

120	81.87	46.59	60.00	15.07	12.98
80	80.61	47.90	68.41	10.6	11.63
40	80.28	50.30	85.62	4.24	9.05
0	65.16	51.62	92.40	1.97	7.46
LSD (0.05)	9.02	1.08	7.99	3.47	0.662

Phosphorus Summary

50	77.99	49.20	75.11	8.61	10.16
25	75.07	49.52	77.65	7.43	10.22
0	77.88	48.59	77.06	7.87	10.46
LSD (0.05)	NS	NS	NS	NS	NS
Interaction P-value	0.9334	0.8308	0.9168	0.8328	0.9957

Variety: Harrington

Planted: 5/1/97

Harvested: 8/20/97

Previous Crop: Fallow

Soil Tests:

O.M. = 2.45%, pH = 8.0

Depth (ft.)	Cl	NH ₄ -N	NO ₃ -N	SO ₄ -S
		(lbs/ac)		
0-1	6.6	10.5	31.8	136.7
1-2	10.2	15.9	17.4	49.5
2-3	6.1	17.6	9.1	102.8
3-4	9.6	22.4	4.0	4122.2

Element (0-6")	Amount (ppm)
P	12.3
Zn	0.64
Mn	6.23
K	302
Cu	1.62
Fe	9.09
B	0.28

Table 3s. The effect of N, P, K and Cl on spring barley yield and quality. Experiment located north east of Cut Bank, MT. Western Triangle Ag. Research Center, Conrad, 1997.

Entry	N	Treatment			Grain Yield (bu/ac)	Test			
		P ₂ O ₅ (lbs/acre)	K	Cl		Weight (lbs/bu)	Plump %	Thin %	Protein %
12	120	50	30	30	59.21	42.45	20.13	53.85	16.05
8	120	25	30	30	62.99	43.28	28.18	46.75	15.48
4	120	0	30	30	60.10	42.33	23.30	49.40	15.39
11	80	50	30	30	66.42	43.10	23.70	46.03	15.13
14	80	50	30	0	62.56	43.08	25.60	44.42	14.72
13	80	50	0	30	61.15	43.35	27.90	47.50	14.93
7	80	25	30	30	62.06	43.65	32.05	41.28	14.51
3	80	0	30	30	67.91	43.45	34.38	36.83	14.18
10	40	50	30	30	65.33	43.63	36.80	34.15	13.58
6	40	25	30	30	64.99	45.40	45.35	32.17	13.54
2	40	0	30	30	58.79	43.10	29.72	44.78	13.91
9	0	50	30	30	65.00	45.80	56.55	21.30	11.72
5	0	25	30	30	65.24	46.10	49.80	26.42	12.24
1	0	0	30	30	68.66	45.73	53.25	23.77	12.30
					Statistical Table				
Experimental Means					63.60	43.89	34.76	39.19	14.12
Error Mean Square					37.22	2.24	123.83	64.13	0.899
P-value					0.4331	0.0040	0.0001	0.0001	0.0000
Standard Error					6.10	1.50	11.13	8.01	0.948
Standard Error of the Mean					3.05	0.749	5.56	4.00	0.474
C.V. 1: (s/mean)*100					4.80	1.71	16.01	10.22	3.36
LSD (0.05)					NS	2.14	15.92	11.45	1.36
					Nitrogen Summary				
120					60.77	42.68	23.87	50.00	15.64
80					64.45	43.42	30.72	41.36	14.54
40					63.04	44.04	37.29	37.03	13.68
0					66.30	45.88	53.20	23.83	12.09
LSD (0.05)					NS	1.89	12.88	10.69	1.29
					Phosphorus Summary				
50					63.23	43.76	34.80	38.82	14.07
25					63.82	44.61	38.84	36.66	13.94
0					63.87	43.65	35.16	38.69	13.95
LSD (0.05)					NS	NS	NS	NS	NS
Interaction P-value					0.734	0.980	0.792	0.656	0.962

Variety: Harrington
 Planted: 5/1/97
 Harvested: 8/20/97
 Previous Crop: Fallow

Growing Season ppt. = 6+ "

Soil Tests:

O.M. = 2.27%, pH = 8.0

Depth (ft.)	Cl	NH ₄ -N	NO ₃ -N	SO ₄ -S
		(lbs/ac)		
0-1	8.9	6.6	82.8	98.3
1-2	7.4	6.9	39.9	78.7

Element (0-6")	Amount (ppm)
P	15.6
Zn	0.33
Mn	6.53
K	272
Cu	1.13
Fe	6.63
B	0.3

Fig. 1. Preplant and Post-harvest Soil Nitrate-N in Barley.

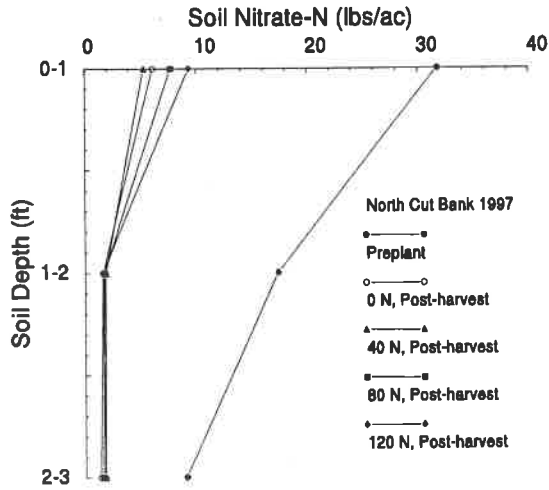


Fig. 2. Preplant and Post-harvest Soil Nitrate-N in Barley.

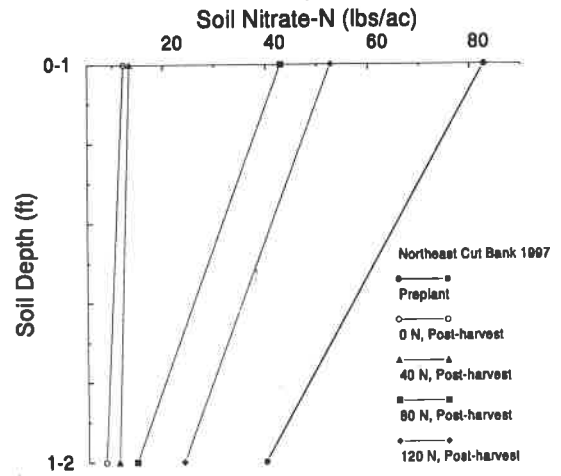


Fig. 3. Preplant and Post-harvest Soil Ammonium-N in Barley.

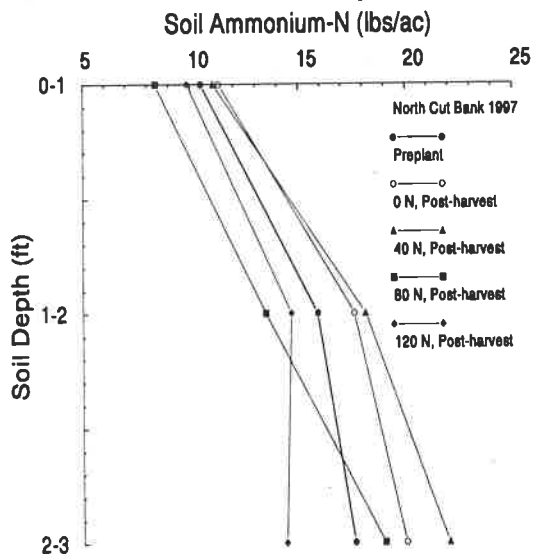


Fig. 4. Preplant and Post-harvest Soil Ammonium-N in Barley.

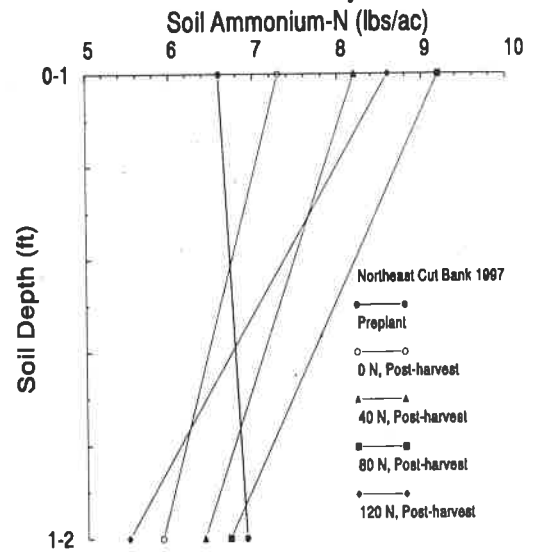


Fig. 5. Preplant and Post-harvest Soil Water in Barley.

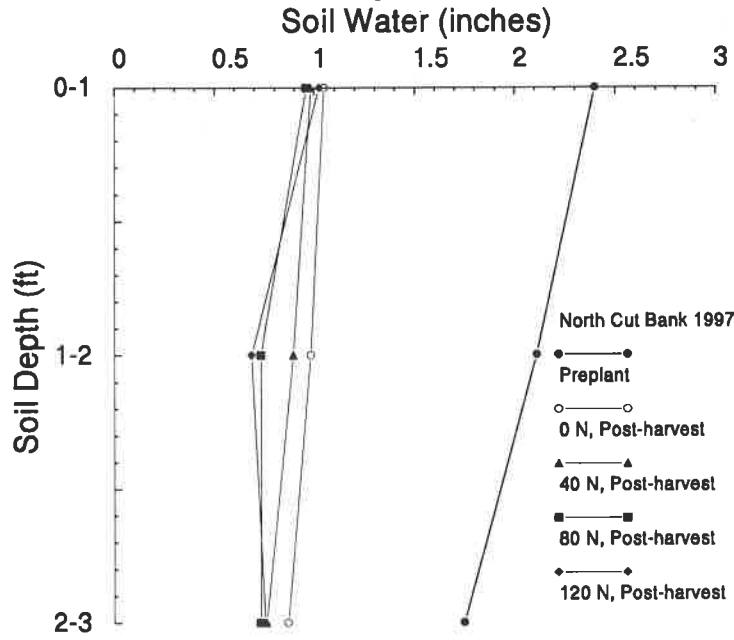
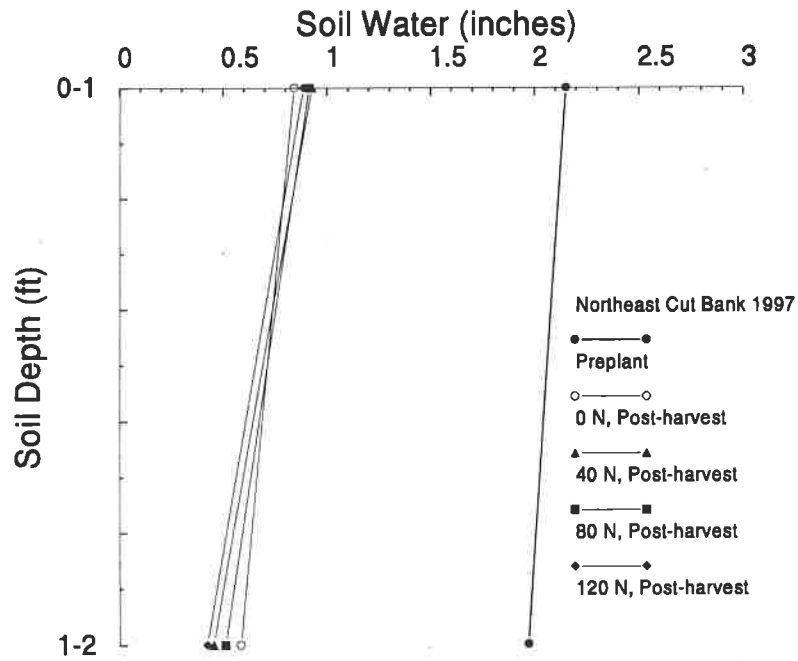


Fig. 6. Preplant and Post-harvest Soil Water in Barley.



Title: Effect of nitrogen and phosphorus on no-till spring canola yield and quality.

Year: 1997

Location: Don Bradley Farm, northeast of Cut Bank.

Personnel: Grant Jackson and Becky Murphy, Western Triangle Ag. Research Center, Conrad, MT 59425.

Objectives: To determine the relationship of canola seed yield and quality to N and P fertilization and N and P soil tests.

Procedures: Plots were seeded in field previously in barley, no-till with a 4-row, 12 inch spaced, double disk planter. Plot area was sprayed with Roundup prior to planting. Treatments of 0, 50, 100, and 150 lbs N/a in a factorial arrangement with 0, 25, and 50 lbs P₂O₅/a were applied with four replicates. The plot area received 30 lbs K and 20 lbs S/a. Fertilizers were applied broadcast except for P which was placed with the seed. Planting rate was 5 lbs/a. Plots were harvested with a Hege combine.

Results: Yields (Table 4s) were about half of the anticipated yield goal and were suppressed by hot, dry weather during flowering and pod set. Also drought conditions during pod fill contributed to the low yields. Nitrogen response was very small, and P depressed seed yields.

Table 4s. The effect of N and P on no-till spring canola yield and quality. The experiment was located north east of Cut Bank. Western Triangle Ag. Research Center, Conrad, MT. 1997.

Entry	Treatment		Seed Yield (lbs/ac)	Oil Yield (lbs/bu)	Oil Content %
	N	P ₂ O ₅ (lbs/acre)			
12	150	50	957.1	289.0	32.43
8	150	25	1135.0	347.7	32.94
4	150	0	1126.0	350.1	33.35
11	100	50	968.5	296.3	32.89
7	100	25	1188.0	370.0	33.45
3	100	0	1261.0	400.3	34.11
10	50	50	1074.0	344.7	34.47
6	50	25	1225.0	397.4	34.88
2	50	0	1225.0	395.6	34.7
9	17	50	921.6	301.3	35.15
5	17	25	1139.0	379.9	35.92
1	17	0	1267.0	427.5	36.32

Statistical Table

Experimental Means	1124.0	358.3	34.22
Error Mean Square	13862	1410.1	0.5824
P-value	0.0007	0.0000	0.0000
Standard Error	117.7	37.55	0.763
Standard Error of the Mean	58.87	18.78	0.382
C.V. 1: (s/mean)*100	5.24	10.48	2.23
LSD (0.05)	169.4	53.85	1.09

Nitrogen Summary

150	1073.0	328.9	32.91
100	1139.0	355.6	33.49
50	1175.0	379.2	34.68
0	1109.0	369.6	35.80
LSD (0.05)	97.8	32.28	0.618

Phosphorus Summary

50	980.4	307.8	33.74
25	1172.0	373.8	34.29
0	1220.0	393.4	34.62
LSD (0.05)	84.7	27.95	0.535
Interaction P-value	0.660	0.528	0.848

Variety: Hysyn 110
Planted: 5/13/97
Harvested: 8/13/97
Previous Crop: Barley

Oil content and oil yield reported on a dry weight basis.
Growing Season ppt:
Herbicide: Preplant Roundup
Fertilizer: 30 lbs/ac of K as KCl and 20 lbs/ac of S as (NH₄)₂SO₄
applied to each plot.

Soil Tests:

O.M. = 2.64%, pH = 7.6

Depth (ft.)	Cl	NH ₄ -N (lbs/ac)	NO ₃ -N
0-1	9.7	38.5	13.8
1-2	6.0	17.8	2.4
2-3	8.9	17.2	2.6
3-4	31.2	14.8	6.4
4-5	88.8	11.6	20.8

Element (0-6")	Amount (ppm)
P	11.9
Zn	0.72
Mn	10.8
K	480
Cu	1.95
Fe	23.32
B	0.29

Title: Canola variety evaluations.

Year: 1997

Location: Western Triangle Ag. Research Center, north of Conrad.

Personnel: Grant Jackson and Becky Murphy, Western Triangle Ag. Research Center, Conrad, MT 59425,

Objectives: To evaluate the performance of canola varieties or hybrids.

Procedures: Varieties and were entered by several companies this year. Both the irrigated and dryland nurseries were planted no-till. The dryland nursery was planted with a 6-row planter, and the irrigated nursery was planted with a 4-row planter. Plots were swathed with a Swift swather and threshed with a Hege combine. Other details are included with the data.

Results: The data are summarized in Table 5s and 6s. Yields of the irrigated nursery (Table 5s) were very disappointing and highly variable, while the dryland yields were excellent. Yields were affected by Black Leg infection, lack of precipitation after planting, hot temperatures during flowering and pod development, and a windy growing season. The dryland nursery was planted about $\frac{1}{4}$ inch deeper than the irrigated. The dryland nursery had emerged before the first significant precipitation that occurred just before Memorial Day, while the irrigated nursery did not emerge until after the Memorial Day, weekend storm.

Table 5s. Irrigated no-till Canola variety trial located at Western Triangle Ag. Research Center, Conrad, MT. 1997.

Entry	Variety	Seed Yield ¹ (lbs/ac)	Black Leg Rating ²	Oil Yield ³ (lbs/bu)	Oil Content ^{1,3} %
9	Quantum	1833.0	1.50	720.4	39.18
2	YA 307	1808.0	2.75	733.2	40.67
17	Eagle	1791.0	2.50	721.6	40.32
14	Hyola 420	1767.0	2.00	696.8	39.54
19	Integra 97-1	1710.0	2.00	655.5	38.33
16	Advantage	1689.0	1.00	623.8	37.09
13	Hyola 401	1602.0	3.25	617.7	38.55
7	ACS H2	1457.0	1.75	563.3	38.66
11	Princeton	1410.0	2.50	551.2	39.17
20	Integra 97-2	1388.0	0.50	497.8	35.82
15	Hyola 304	1215.0	4.25	451.3	36.97
6	J 594	1150.0	3.25	460.4	39.17
12	Westar	1066.0	4.00	420.9	38.34
5	SCHP 006	988.2	0.50	336.6	33.68
10	Parkland	921.8	4.50	348.3	37.26
8	Fairview	896.8	4.75	337.3	37.53
4	SCHP 007	856.9	2.25	297.9	34.88
1	CID 4477	845.9	3.25	315.3	36.67
18	Chinook	670.3	5.00	242.3	35.67
3	CID 44223	549.1	4.25	208.6	35.59

Statistical Table

Experimental Means	1281.0	2.79	490.00	37.65
Error Mean Square	0.1565E+0	0.842	24188	1.896
P-value	0.0000	0.0000	0.0000	0.0000
Standard Error	395.6	0.918	155.50	1.38
Standard Error of the Mean	197.8	0.459	77.76	0.689
C.V. 1: (s/mean)*100	30.88	32.92	31.74	3.66
LSD (0.05)	560.2	1.30	220.2	1.95

Correlation between yield and black leg rating = -0.5109 (P<0.0001)

Planted: 5/7/97

Growing season ppt. = 7.45"

Swathed: 8/20/97

Additional moisture from irrigation = 6.0"

Threshed: 8/26/97

Fertilizer: 156-25-30

Previous crop: Barley stubble, burned

Herbicide: Stinger and Poast, preplant Roundup

¹ Data should be interpreted with caution since black leg infection was not uniform. Seedling emergence was highly erratic and stand was not fully developed until about June 1.

² 0 = no apparent infection, 5 = stems rotten, highly susceptible - ratings conducted on August 12, 1997 by Dr. Chris Onstad, Toole County Extension Agent.

³ Oil yield and oil content reported on a dry weight basis.

Soil Tests:

O.M. = 2.6%, pH = 7.6

Depth (ft.)	Cl	NH ₄ -N	NO ₃ -N	SO ₄ -S
	----- (lbs/ac) -----			
0-1	11.0	8.3	8.7	84.8
1-2	8.7	7.6	5.4	189.3
2-3	9.5	9.4	0.7	2325.8
3-4	10.4	11.6	2.6	5750.0
4-5	21.2	13.4	6.2	6796.0

Element (0-6")	Amount (ppm)
P	30.1
Zn	0.55
Mn	7.31
K	380
Cu	1.29
Fe	12.03
B	0.32

Table 6s. Dryland no-till Canola variety trial located at Western Triangle Ag. Research Center, Conrad, MT. 1997.

Entry	Variety	Seed Yield (lbs/ac)	Black Leg Rating ¹	Oil Yield ² (lbs/bu)	Oil Content ² %
6	CL 2020	2298.0	0.75	871.3	37.88
5	Quantum	2188.0	0.00	827.2	37.70
12	ACS H2	2128.0	1.00	846.1	39.74
11	Hyola 308	2122.0	0.50	792.7	37.26
3	Westar	2090.0	2.25	819.0	39.19
1	Parkland	1979.0	2.00	783.3	39.58
7	Princeton	1946.0	1.75	755.7	38.76
8	CL 2070	1896.0	1.25	725.3	38.05
2	Fairview	1887.0	1.50	733.7	38.86
4	Oscar	1885.0	0.25	674.8	35.73
9	Hudson	1813.0	0.50	708.8	39.09
10	Hysyn 110	1667.0	0.75	634.1	37.95
Statistical Table					
Experimental Means		1992.0	1.04	764.4	38.32
Error Mean Square		46761.0	0.8864	7841.9	0.5349
P-value		0.0132	0.0320	0.0155	0.0000
Standard Error		216.2	0.942	88.55	0.731
Standard Error of the Mean		108.1	0.471	44.28	0.366
C.V. 1: (s/mean)*100		10.86	90.38	11.59	1.91
LSD (0.05)		311.1	1.35	127.4	1.05

Planted: 5/7/97

Swathed: 8/20/97

Threshed: 8/26/97

Previous crop: Barley

Growing season ppt. = 7.45"

Fertilizer: 100-25-30

Herbicide: Preplant = Roundup, Postplant = Stinger and Poast.

¹ 0 = no apparent infection, 5 = stems rotten, highly susceptible - ratings conducted on August 12, 1997 by Dr. Chris Onstad, Toole Country Extension Agent.

² Oil yield and oil content reported on a dry weight basis.

Soil Tests:

O.M. = 2.24%, pH = 7.6

Depth (ft.)	Cl	NH ₄ -N	NO ₃ -N	SO ₄ -S
		----- (lbs/ac) -----		
0-1	8.0	28.8	17.8	61.2
1-2	6.8	20.2	6.2	87.6
2-3	7.2	16.6	2.6	386.0
3-4	7.4	21.4	3.0	500.4
4-5	10.0	24.4	4.0	1649.8

Element (0-6")	Amount (ppm)
P	14.3
Zn	0.57
Mn	21.9
K	386
Cu	1.87
Fe	10.77
B	0.46

Title: Effect of phosphorus and sulfur on seed yield and quality of no-till lentil and pea.

Year: 1997

Location: Ray Ramberg Farm, north of Inverness.

Personnel: Grant Jackson and Becky Murphy, Western Triangle Ag. Research Center, Conrad, MT 59425.

Objectives: To determine the effects of P and S fertilization and soil tests on pea and lentil seed yield and rotation benefits.

Procedures: Red Chief lentil and Carrera yellow pea were planted no-till in an area previously in spring wheat. Nitrogen, P, K, Cl, and S treatments are shown in Tables 7s and 8s. The plot area was sprayed with Roundup prior to planting. No other chemicals were used during the growing season. Planting rate was 7 seeds/ft². Phosphorus fertilizer was applied with the seed. All other fertilizers were broadcast after planting because the transmission driving the fertilizer spreader cones broke. Both crops were swathed with a small plot swather and threshed with a Hege combine. Whole plants from 1 ft² were harvested for yield and analyzed for N, P, and S. Plots were swathed because maturity differences from weed competition and fertilizer treatments. Seed was cleaned, weighed, and analyzed for N, P, and S. Stover (residue) nutrient content was calculated by subtracting whole plant nutrient content from the seed nutrient content.

Results: Spring lentil data are summarized in Table 7s, and spring pea data are summarized in Table 8s. Seed yields were low due to the lack of moisture during the growing season and severe competition from weeds. Weed competition was initiated by soil compaction when the fertilizers were broadcast at planting. Note the yield differences between the control, entry 14, and all other treatments. The control plot was not compacted like all the others. In spite of the low yields and high variability, both pea and lentil had significant P responses. The amount of N, P, and S being returned (stover nutrient content) to the cropping system is very interesting due to the lack of precipitation.

Table 7s. The effect of P and S on yield and quality of no-till lentil. Experiment located north of Inverness, MT.
Western Triangle Ag. Research Center, Conrad, MT, 1997.

Entry	Treatment					Seed Yield (lbs/acre)	Whole Plant Yield (lbs/acre)	Stover Nutrient Content		
	N	P ₂ O ₅	K	Cl	S			N	P	S
----- (lbs/acre) -----										
12	8.5	40	0	68	30	232.5	2792.0	63.82	7.01	39.23
9	8.5	40	68	68	30	250.8	2435.0	49.74	5.79	42.40
10	0	40	68	68	30	143.2	1288.0	27.68	2.87	27.08
11	8.5	40	68	0	30	228.0	2416.0	50.84	5.26	42.01
6	8.5	40	68	68	15	242.4	2126.0	41.18	4.80	34.52
3	8.5	40	68	68	0	197.0	2130.0	43.66	5.25	36.41
13	8.5	40	0	0	0	181.6	2274.0	50.78	5.37	23.75
8	8.5	20	68	68	30	194.5	2536.0	49.46	5.14	25.81
5	8.5	20	68	68	15	204.5	2100.0	39.53	4.73	27.95
2	8.5	20	68	68	0	158.4	2319.0	49.10	5.17	18.95
7	8.5	0	68	68	30	114.1	2120.0	43.12	5.05	19.03
4	8.5	0	68	68	15	92.4	1703.0	39.19	4.01	19.20
1	8.5	0	68	68	0	97.8	1784.0	43.02	4.45	14.22
14	0	0	0	0	0	341.4	1909.0	35.97	3.22	40.57
						Summary Statistics				
Experimental Means						191.3	2138.0	44.79	4.87	29.37
Error Mean Square						3071.7	0.246E+06	186.75	1.99	116.18
P-value						0.0005	0.1021	0.3506	0.1463	0.0256
Standard Error						55.42	495.6	13.67	1.41	10.78
Standard Error of the Mean						32.00	286.1	7.89	0.814	6.22
C.V. 1: (s/mean)*100						28.97	23.18	30.51	28.97	21.19
LSD (0.05)						93.0	NS	NS	NS	18.09
						Phosphorus Summary				
40						215.1	2187.0	45.47	5.11	34.09
20						185.8	2318.0	46.03	5.01	24.24
0						142.0	1890.0	40.60	4.30	21.87
LSD (0.05)						NS	NS	NS	NS	11.91
						Sulfur Summary				
30						174.1	2296.0	46.86	5.14	27.51
15						179.8	1977.0	39.97	4.51	27.22
0						189.1	2123.0	45.27	4.77	25.48
LSD (0.05)						NS	NS	NS	NS	NS
Interaction P-value						0.1537	0.9699	0.9847	0.9114	0.5646

Variety: Redchief

Planted: 4/29/97

Swathed: 7/24/97

Threshed: 7/29/97

Growing Season ppt. = 4.5"

Previous Crop: Spring Wheat

Soil Tests:

O.M. = 1.36%, pH = 7.3

Depth (ft.)	Cl	NH ₄ -N	NO ₃ -N	SO ₄ -S
----- (lbs/ac) -----				
0-1	12.7	5.1	15.2	111.5
1-2	12.5	3.7	8.4	180.4
2-3	53.1	9.6	13.5	2316.0
3-4	70.8	15.6	24.8	4641.0

Element Amount
(0-6") (ppm)

P	9.5
Zn	0.48
Mn	9.8
K	342.0
Cu	0.91
Fe	10.6
B	0.39

Table 7s. Continued

Entry	Treatment										Total Nutrient (lbs)						Percent Nutrient (%)					
	N	P ₂ O ₅	K	Cl	S	Whole Plant			Seed			Whole Plant			Seed							
						N	P	S	N	P	S	N	P	S	N	P	S					
12	8.5	40	0	68	30	73.01	8.02	39.67	9.20	1.01	0.44	2.43	0.263	0.179	3.92	0.431	0.190					
9	8.5	40	68	68	30	59.05	6.87	42.88	9.31	1.08	0.48	2.15	0.254	0.176	3.71	0.431	0.193					
10	0	40	68	68	30	33.28	3.48	27.35	5.60	0.62	0.28	2.31	0.244	0.206	3.91	0.426	0.193					
11	8.5	40	68	0	30	59.97	6.30	42.49	9.13	1.04	0.48	2.27	0.239	0.196	4.00	0.456	0.211					
6	8.5	40	68	68	15	50.45	5.88	35.00	9.27	1.09	0.48	2.15	0.247	0.153	3.80	0.446	0.196					
3	8.5	40	68	68	0	51.45	6.15	36.79	7.79	0.90	0.38	2.24	0.265	0.195	3.94	0.456	0.193					
13	8.5	40	0	0	0	57.77	6.21	24.10	6.99	0.83	0.35	2.33	0.250	0.136	3.86	0.463	0.190					
8	8.5	20	68	68	30	56.62	5.98	26.19	7.16	0.84	0.38	2.03	0.223	0.141	3.68	0.433	0.194					
5	8.5	20	68	68	15	47.58	5.60	28.32	8.04	0.87	0.36	2.06	0.243	0.143	3.88	0.433	0.183					
2	8.5	20	68	68	0	55.39	5.89	19.24	6.29	0.73	0.29	2.22	0.236	0.125	3.94	0.446	0.182					
7	8.5	0	68	68	30	47.59	5.55	19.25	4.47	0.50	0.22	2.12	0.248	0.178	3.88	0.446	0.196					
4	8.5	0	68	68	15	42.74	4.43	19.38	3.55	0.42	0.18	2.28	0.251	0.202	3.98	0.434	0.185					
1	8.5	0	68	68	0	46.79	4.88	14.39	3.78	0.44	0.16	2.54	0.256	0.155	3.81	0.438	0.165					
14	0	0	0	0	0	49.69	4.69	41.18	13.72	1.48	0.61	2.24	0.211	0.125	4.03	0.432	0.180					
Summary Statistics																						
Experimental Means						52.24	5.71	29.73	7.45	0.85	0.36	2.24	0.245	0.165	3.88	0.441	0.189					
Error Mean Square						189.27	2.01	118.07	5.41	0.066	0.012	0.080	0.001	0.001	0.041	0.001	0.000					
P-value						0.2349	0.0903	0.0247	0.0012	0.0016	0.0007	0.7428	0.4760	0.0653	0.6698	0.9289	0.0673					
Standard Error						13.76	1.42	10.87	2.33	0.257	0.108	0.282	0.025	0.035	0.202	0.029	0.013					
Standard Error of the Mean						7.94	0.818	6.27	1.34	0.148	0.063	0.163	0.015	0.023	0.116	0.017	0.007					
C.V. 1: (s/mean)*100						26.33	24.80	21.10	31.22	30.37	29.80	12.61	10.32	21.35	5.20	6.63	6.79					
LSD (0.05)						NS	NS	18.24	3.90	0.431	0.182	NS	NS	NS	NS	NS	NS					
Phosphorus Summary																						
40						53.80	6.08	34.51	8.33	0.964	0.421	2.24	0.252	0.169	3.86	0.447	0.195					
20						53.20	5.82	24.58	7.17	0.811	0.343	2.11	0.234	0.136	3.83	0.437	0.186					
0						46.19	4.93	22.14	5.59	0.628	0.261	2.26	0.244	0.173	3.92	0.438	0.185					
LSD (0.05)						NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS					
Sulfur Summary																						
30						53.5	5.90	27.84	6.65	0.761	0.339	2.15	0.240	0.169	3.81	0.439	0.196					
15						46.9	5.30	27.57	6.95	0.792	0.340	2.17	0.247	0.166	3.89	0.438	0.188					
0						52.8	5.62	25.82	7.48	0.850	0.346	2.30	0.243	0.144	3.92	0.447	0.182					
LSD (0.05)						NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS					
Interaction P-value						0.9990	0.9892	0.5535	0.3021	0.3447	0.3436	0.6366	0.8433	0.4783	0.6268	0.6333	0.6197					

Table 8s. The effect of P and S on yield and quality of no-till yellow pea. Experiment located north of Inverness, MT. Western Triangle Ag. Research Center, Conrad, MT, 1997.

Entry	Treatment					Seed Yield (lbs/acre)	Whole Plant Yield (lbs/acre)	Nutrient Remaining		
	N	P ₂ O ₅	K	Cl	S			N	P	S
----- (lbs/acre) -----										
12	8.5	40	0	68	30	927.0	5085.0	91.84	8.59	9.33
9	8.5	40	68	68	30	889.9	4250.0	81.80	7.60	8.60
10	0	40	68	68	30	1046.0	2822.0	52.92	4.33	5.11
11	8.5	40	68	0	30	833.8	3310.0	62.79	5.37	6.03
6	8.5	40	68	68	15	1057.0	3278.0	60.45	5.64	5.09
3	8.5	40	68	68	0	867.7	3163.0	69.33	5.20	4.50
13	8.5	40	0	0	0	856.4	4593.0	95.65	6.29	4.34
8	8.5	20	68	68	30	894.1	4258.0	86.90	6.29	6.16
5	8.5	20	68	68	15	875.7	3945.0	81.81	6.68	7.24
2	8.5	20	68	68	0	714.2	3021.0	56.05	4.88	5.91
7	8.5	0	68	68	30	601.2	2918.0	62.59	5.27	5.82
4	8.5	0	68	68	15	559.9	3697.0	73.32	6.81	5.91
1	8.5	0	68	68	0	659.7	3863.0	78.36	6.45	5.71
14	0	0	0	0	0	1047.0	3347.0	67.89	4.67	3.62

Summary Statistics						
Experimental Means		845.0	3682.0	72.98	6.00	5.95
Error Mean Square		53879.0	0.237E+07	1300.7	10.90	11.29
P-value		0.0624	0.6771	0.8739	0.9009	0.5923
Standard Error		232.1	1540.0	36.07	3.30	3.36
Standard Error of the Mean		116.1	769.90	18.03	1.65	1.68
C.V. 1: (s/mean)*100		27.47	41.82	49.42	54.99	56.42
LSD (0.05)		NS	NS	NS	NS	NS

Phosphorus Summary						
40		947.9	3674.0	71.76	5.95	5.59
20		828.0	3741.0	74.92	5.95	6.44
0		671.5	3407.0	69.68	5.88	5.47
LSD (0.05)		238.4	NS	NS	NS	NS

Sulfur Summary						
30		806.5	3681.0	73.94	6.01	6.42
15		831.0	3640.0	71.86	6.38	6.08
0		809.8	3502.0	70.56	5.39	5.00
LSD (0.05)		NS	NS	NS	NS	NS
Interaction P-value		0.2845	0.6628	0.5717	0.9354	0.8084

Variety: Carrera Yellow Pea
 Planted: 4/29/97
 Swathed: 7/24/97
 Threshed: 7/29/97
 Growing Season ppt: 4.5"
 Previous Crop: Spring Wheat

Soil Tests:
 O.M. = 1.36%, pH = 7.3

Depth (ft.)	Cl	NH ₄ -N	NO ₃ -N	SO ₄ -S
----- (lbs/ac) -----				
0-1	12.7	5.1	15.2	111.5
1-2	12.5	3.7	8.4	180.4
2-3	53.1	9.6	13.5	2316.0
3-4	70.8	15.6	24.8	4641.0

Element (0-6")	Amount (ppm)
P	9.5
Zn	0.48
Mn	9.8
K	342.0
Cu	0.91
Fe	10.6
B	0.39

Table 8s. Continued.

Entry	Treatment					Total Nutrient (lbs)						Percent Nutrient (%)						
	N	P ₂ O ₅	K	Cl	S	Whole Plant		Seed		Whole Plant		Seed		Whole Plant		Seed		
	(lbs/acre)	(lbs/acre)	(lbs/acre)	(lbs/acre)	(lbs/acre)	N	P	S	N	P	S	N	P	S	N	P	S	
12	8.5	40	0	68	30	122.1	11.55	10.98	30.22	2.95	1.65	2.033	0.193	0.183	3.228	0.321	0.1765	
9	8.5	40	68	68	30	110.6	10.52	10.22	28.82	2.93	1.63	2.085	0.206	0.200	3.220	0.324	0.180	
10	0	40	68	68	30	87.1	7.72	6.97	34.22	3.38	1.85	2.285	0.202	0.181	3.248	0.318	0.174	
11	8.5	40	68	0	30	90.1	8.03	7.50	27.38	2.65	1.48	2.185	0.211	0.195	3.283	0.320	0.176	
6	8.5	40	68	68	15	96.0	9.19	6.95	35.58	3.55	1.88	2.205	0.210	0.166	3.338	0.332	0.174	
3	8.5	40	68	68	0	99.5	8.18	6.01	30.20	2.98	1.53	2.450	0.210	0.156	3.483	0.347	0.180	
13	8.5	40	0	0	0	125.0	9.36	5.79	29.30	3.08	1.45	2.315	0.174	0.106	3.385	0.352	0.164	
8	8.5	20	68	68	30	116.6	9.17	7.72	29.75	2.88	1.58	2.280	0.176	0.148	3.348	0.321	0.177	
5	8.5	20	68	68	15	110.7	9.74	8.86	28.90	3.05	1.60	2.283	0.204	0.178	3.278	0.356	0.186	
2	8.5	20	68	68	0	78.7	7.43	7.16	22.70	2.53	1.25	2.068	0.199	0.172	3.170	0.355	0.176	
7	8.5	0	68	68	30	82.2	7.25	6.94	19.60	1.98	1.13	2.265	0.202	0.196	3.270	0.335	0.185	
4	8.5	0	68	68	15	92.3	8.73	6.87	18.97	1.95	0.95	2.238	0.202	0.166	3.360	0.340	0.168	
1	8.5	0	68	68	0	100.3	8.62	6.78	22.02	2.15	1.05	2.240	0.185	0.142	3.308	0.329	0.159	
14	0	0	0	0	0	102.1	7.69	5.21	34.22	3.03	1.58	2.300	0.173	0.119	3.275	0.283	0.150	
Summary Statistics																		
Experimental Means						101.0	8.80	7.42	27.99	2.79	1.47	2.321	0.1961	0.1647	3.299	0.3309	0.1731	
Error Mean Square						1285.5	9.99	10.70	66.94	0.572	0.176	0.063	0.001	0.002	0.025	0.001	0.0003	
P-value						0.7970	0.8333	0.4987	0.1030	0.1114	0.0807	0.6719	0.2836	0.0788	0.4760	0.1701	0.2167	
Standard Error						35.85	3.16	3.27	8.18	0.757	0.419	0.250	0.024	0.042	0.159	0.032	0.017	
Standard Error of the Mean						17.93	1.58	1.64	4.09	0.378	0.210	0.125	0.012	0.021	0.079	0.016	0.009	
C.V. 1: (s/mean)*100						35.51	35.93	44.07	29.23	27.12	28.54	5.61	12.38	25.60	4.82	9.61	9.82	
LSD (0.05)						NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	
Phosphorus Summary																		
40						103.6	9.14	7.26	31.83	20.60	1.67	2.25	0.202	0.162	3.34	0.334	0.174	
20						102.0	8.78	7.91	27.12	2.82	1.48	2.21	0.193	0.166	3.27	0.344	0.179	
0						91.9	8.04	6.60	22.23	2.17	1.13	2.58	0.194	0.164	3.31	0.327	0.169	
LSD (0.05)						NS	NS	NS	8.23	0.83	0.45	NS	NS	NS	NS	NS	NS	
Sulfur Summary																		
30						100.4	8.63	7.86	26.50	2.61	1.45	2.23	0.194	0.178	3.29	0.326	0.180	
15						99.7	9.22	7.56	27.82	2.85	1.48	2.24	0.205	0.170	3.33	0.343	0.176	
0						97.4	8.11	6.35	26.86	2.71	1.35	2.24	0.190	0.144	3.30	0.337	0.167	
LSD (0.05)						NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	
Interaction P-value						0.3557	0.8382	0.6893	0.1698	0.3334	0.2174	0.0907	0.5774	0.0973	0.0424	0.1696	0.2815	

Title: Spring pea variety evaluation.

Year: 1997

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

Personnel: Grant Jackson and Becky Murphy, Western Triangle Ag. Research Center, Conrad, MT 59425.

Objectives: To evaluate spring pea varieties under no-till, dryland conditions.

Procedures: Plots were planted no-till into barley stubble with a six-row, no-till, plot planter. Field area was sprayed with Roundup, preplant. Grassy weeds were controlled with Poast. Plot size was 6 x 20 feet with six rows and 12" between each row. Plots were threshed with a Hege combine without swathing. Planting rate was 7 seeds/ft².

Results: The data are summarized in Table 9s. Yields should be interpreted with caution because large seeded varieties were not planted deep enough and did not come up until after significant rainfall about three weeks after planting.

Table 9s. Dryland no-till spring pea performance nursery located at Western Triangle Ag. Research Center, Conrad, MT. 1997.

Entry	Variety	Seed Yield (lbs/ac)
1	Austrian Winter Pea	2860.0
3	Arvika	2458.0
11	Trapper Yellow Pea	2232.0
9	SHS 14101 Yellow Pea	1851.0
12	Grande Yellow Pea	1702.0
7	Baroness	1525.0
6	Profi	1488.0
5	Promar	1426.0
8	SHS 110401 Green Pea	1189.0
2	Majoret	1150.0
10	Carrera Yellow Pea	1087.0
4	Carneval	1033.0

Summary Statistics	
Experimental Means	1667.0
Error Mean Square	99294.0
P-value	0.0000
Standard Error	315.1
Standard Error of the Mean	181.9
C.V. 1: (s/mean)*100	18.91
LSD (0.05)	533.6

Planted: 5/5/97

Threshed: 8/26/97

Previous crop: Barley

Growing season ppt. = 7.45"

Fertilizer: 60lbs 11-52-0 with the seed, 30 lbs K/ac as KCl broadcast.

Herbicide: Preplant with Roundup.

Soil Tests:

O.M. = 1.36%, pH = 7.3

Depth (ft.)	Cl	NH ₄ -N	NO ₃ -N	SO ₄ -S
	----- (lbs/ac) -----			
0-1	8.0	28.8	17.8	61.2
1-2	6.8	20.2	6.2	87.6
2-3	7.2	16.6	2.6	386.0
3-4	7.4	21.4	3.0	500.4
4-5	10.0	24.4	4.0	1649.8

Element (0-6")	Amount (ppm)
P	14.3
Zn	0.57
Mn	21.9
K	386.0
Cu	1.87
Fe	10.77
B	0.46

Title: Effect of nitrogen and phosphorus on yield and quality of spring wheat and durum.

Year: 1997.

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

Personnel: Grant Jackson and Becky Murphy, Western Triangle Ag. Research Center, Conrad, MT 59425.

Objectives: To evaluate the effect N and P have on yield and quality in spring wheat and durum.

Procedures: Plots were planted with a four-row planter with one-foot spacing. Phosphorus fertilizer was applied with the seed while all other fertilizers were applied broadcast after planting. Other cultural practices are summarized with the data.

Results: The data are summarized in Table 10s. Yields are very similar for Spectre durum and McNeal spring wheat, however, McNeal had slightly high protein. Both varieties had similar increases in yield and protein due to N, and both varieties had similar yield increases due to 25 P₂O₅ and yield decreases due to 50 P₂O₅. See Figs. 7 to 10. High P fertilizer added to soils with very high P soil tests (in this case 33 ppm) often reduces yield. These data indicate that durum response to fertilization is very similar to spring wheat.

Table 10s. The effect of N and P on spring wheat and durum yield and quality. Experiment located at Western Triangle Ag. Research Center, Conrad, MT, 1997.

No.	Treatment		Crop	Grain Yield (bu/ac)	Test Weight (lbs/bu)	Protein %
	N	P ₂ O ₅ (lbs/ac)				
1	150	50	Durum	62.63	60.76	14.55
2	150	25	Durum	75.23	61.54	12.50
3	150	0	Durum	66.92	60.96	13.63
4	100	50	Durum	62.69	60.85	13.50
5	100	25	Durum	72.92	62.74	11.10
6	100	0	Durum	71.14	61.94	11.88
7	50	50	Durum	64.75	62.16	11.00
8	50	25	Durum	73.22	63.02	10.27
9	50	0	Durum	61.55	62.29	10.40
10	11	50	Durum	61.60	63.44	8.85
11	5.5	25	Durum	63.35	63.51	7.73
12	0	0	Durum	58.27	63.42	8.20
13	150	50	Spring Wt.	65.54	60.89	13.25
14	150	25	Spring Wt.	79.07	61.92	13.02
15	150	0	Spring Wt.	64.11	60.95	13.48
16	100	50	Spring Wt.	64.67	61.12	13.10
17	100	25	Spring Wt.	77.05	62.35	12.13
18	100	0	Spring Wt.	66.33	61.34	12.77
19	50	50	Spring Wt.	66.76	62.37	11.43
20	50	25	Spring Wt.	68.65	62.90	10.32
21	50	0	Spring Wt.	63.52	61.80	11.18
22	11	50	Spring Wt.	60.55	62.76	10.32
23	5.5	25	Spring Wt.	65.49	62.88	10.15
24	0	0	Spring Wt.	53.87	62.83	9.20
				Summary Statistics		
Experimental Means				66.24	62.11	11.41
Error Mean Square				66.34	0.846	0.9204
P-value				0.0066	0.0000	0.0000
Standard Error				8.15	0.92	0.96
Standard Error of the Mean				4.07	0.46	0.48
C.V. 1: (s/mean)*100				12.29	1.48	4.20
LSD (0.05)				11.48	1.30	1.35
				Variety Summary		
Durum (Sceptre)				66.19	62.22	11.13
Spring Wheat (McNeal)				66.30	62.01	11.70
LSD (0.05)				NS	NS	0.39

Table 10s. Continued

	Grain Yield (bu/ac)	Test Weight (lbs/bu)	Protein %
Nitrogen Summary			
150	68.92	61.17	13.40
100	69.13	61.72	12.41
50	66.41	62.42	10.77
0	60.52	63.14	9.08
LSD (0.05)	4.69	0.53	0.55
Phosphorus Summary			
50	63.65	61.79	12.00
25	71.87	62.61	10.90
0	63.21	61.94	11.34
LSD (0.05)	4.06	0.46	0.48
Interaction P-value	0.4593	0.4057	0.6153

Notes:

Varieties:

Durum = Sceptre

Spring Wheat = McNeal

Seeding Date: 5/5/97

Harvest Date: 9/3/97

Growing Season ppt: 7.45"

Planting Rate: 20 seeds/ft²

Previous Crop: Fallow

Fertilizer: N applied as urea (broadcast) and P applied with the seed. 30 lbs K/ac as KCl applied to all plots (broadcast). Note: broadcast treatments applied 5/8/97.

Herbicide: Bronate @ 1pt/ac

Soil Tests:

O.M. = 2.6%, pH = 8.0

Depth (ft.)	Cl	NH ₄ -N	NO ₃ -N	SO ₄ -S
	----- (lbs/ac) -----			
0-1	9.9	8.9	34.3	159.0
1-2	12.9	9.7	14.4	172.0
2-3	8.1	10.1	4.8	215.0
3-4	11.7	9.6	4.0	1223.0

Element (0-6")	Amount (ppm)
P	33
Zn	0.5
Mn	7.5
K	376
Cu	1.7
Fe	9.3
B	0.3

Fig. 7. The effect of N and P on Durum Yields.

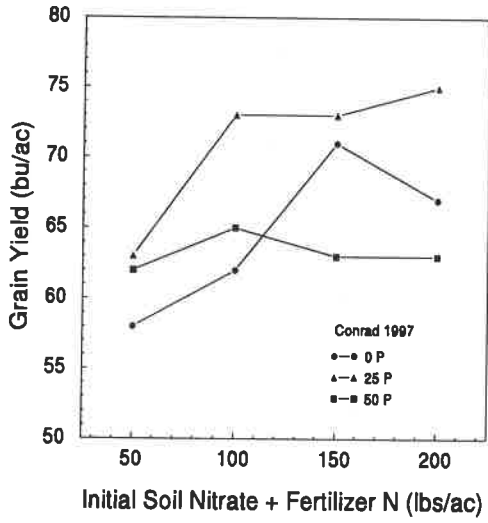


Fig. 8. The effect of N and P on Spring Wheat Yields.

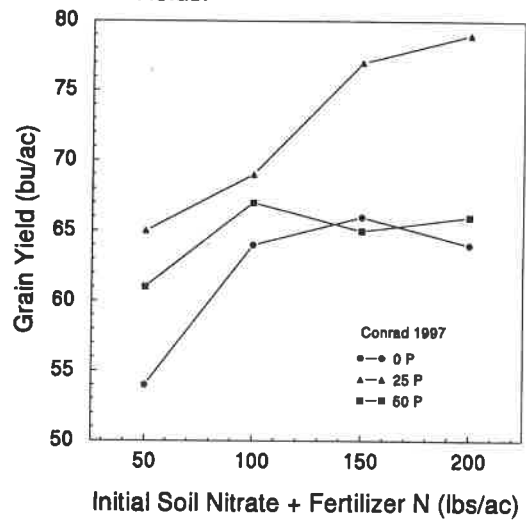


Fig. 9. The effect of N and P on Durum Protein.

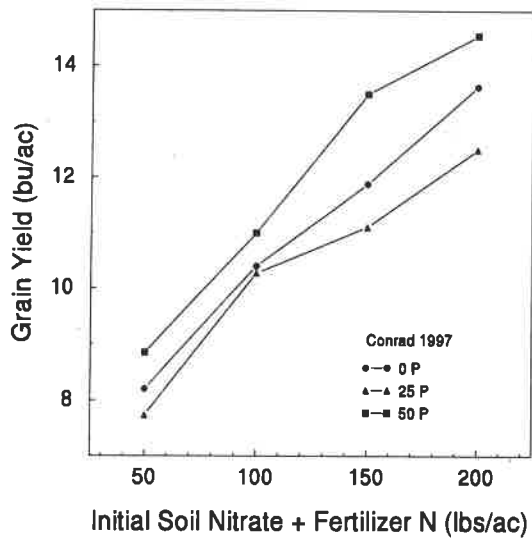
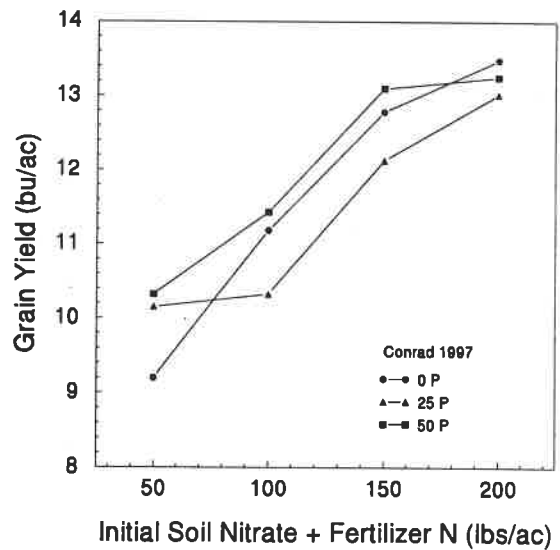


Fig. 10. The effect of N and P on Spring Wheat Protein.



Title: The effect of Stimulate, Stand, and Nitrate Balancer on spring wheat yield and quality.

Year: 1997.

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

Personnel: Grant Jackson and Becky Murphy, Western Triangle Ag. Research Center, Conrad, MT 59425.

Objectives: To evaluate the effect Stimulate, Stand, and Nitrate Balancer on spring wheat yield and quality.

Procedures: Plots were planted with a four-row planter with one-foot spacing. Phosphorus fertilizer was applied with the seed while all other fertilizers were applied broadcast after planting. Other cultural practices are summarized with the data.

Results: The data are summarized in Table 11s and 12s. These products did not affect spring wheat yield or quality this year. Note the significant yield increase due to potash by comparing entries 1 and 4, Table 12s.

Table 11s. The effect of Stimulate and Stand on spring wheat yield and quality. Experiment located at Western Triangle Ag. Research Station, Conrad, MT 1997.

Entry	Treatment	Grain Yield (bu/ac)	Test Weight (lbs/bu)	Protein %
1	Stimulate	82.30	63.27	12.75
6	Stimulate+N (3.7 lbs N/ac)	91.25	64.10	12.30
2	Stimulate+Stand+N (3 gal/ac)	86.30	63.27	12.60
3	Stand + N (3 gal/ac)	85.78	63.30	12.57
4	N only (3.7 lbs N/ac)	83.05	63.42	12.82
5	check	89.58	64.10	12.30
		Statistical Summary		
Experimental Means		86.38	63.58	12.56
Error Mean Square		32.70	0.319	0.1144
P-value		0.2430	0.1251	0.1951
Standard Error		5.72	0.565	0.338
Standard Error of the Mean		2.86	0.283	0.169
C.V. 1: (s/mean)*100		6.62	0.889	2.69
LSD (0.05)		NS	NS	NS

Stimulate is a product of Stoller Enterprises and was applied to the seed at the rate of 3 oz/cwt.

Stand is a product of NuChem Agricultural Chemicals and Fertilizers and contains 12 - 1 - 2 - 2Ca - 1Mg - 0.1Zn - 9.8Cl.

Variety: McNeal @ 20 seeds/ft²

Planting Date: 5/5/97

Harvest Date: 9/3/97

Previous Crop: Fallow

Fertilizer: 11-52-0 with the seed, 100 lbs N/ac as urea and 30 lbs K/ac as KCl topdressed 5/8/97.

Stand and N applied 6/3/97 at the 2 to 3 G.S. Feekes Scale.

N fertilizer was liquid 28-0-0.

Growing Season ppt: 7.45"

Soil Tests:

O.M. = 2.6%, pH = 8.0

Depth (ft.)	Cl	NH ₄ -N	NO ₃ -N	SO ₄ -S
		(lbs/ac)		
0-1	9.9	8.9	34.3	159.0
1-2	12.9	9.7	14.4	172.0
2-3	8.1	10.1	4.8	215.0
3-4	11.7	9.6	4.0	1223.0

Element (0-6")	Amount (ppm)
P	33
Zn	0.5
Mn	7.5
K	376
Cu	1.7
Fe	9.3
B	0.3

Table 12s. The effect of Nitrate Balancer on spring wheat yield and quality. Experiment located at Western Triangle Ag. Research Station, Conrad, MT 1997.

Entry	Treatment	Grain Yield (bu/ac)	Test Weight (lbs/bu)	Protein %
2	Check 2	89.58	64.10	12.30
4	1.0 gal/ac Nitrate Balancer	84.75	63.92	12.45
3	0.5 gal/ac Nitrate Balancer	84.05	62.80	12.60
1	Check 1*	76.13	62.35	12.58
Statistical Summary				
Experimental Means		83.63	63.29	12.48
Error Mean Square		43.14	1.31	0.186
P-value		0.0956	0.1548	0.7523
Standard Error		6.57	1.14	0.432
Standard Error of the Mean		3.28	0.572	0.216
C.V. 1: (s/mean)*100		7.86	1.81	3.46
LSD (0.05)		NS	NS	NS

Nitrate Balancer is a product of Stoller Enterprises, Inc. and contains B and Mo as active ingredients.

Variety: McNeal

Planting Date: 5/5/97

Harvest Date: 9/3/97

Fertilizer: 11-52-0 with the seed, 100 lbs N/ac as urea and 30 lbs K/ac as KCl topdressed 5/8/97.

*Note exception: (Check 1 was not fertilized with K).

Treatments applied 6/27/97 when flag leaves about 1/2 emerged.

Previous crop: Fallow

Seeding Rate: 20 seeds/ft²

Growing Season ppt: 7.45"

Soil Tests:

O.M. = 2.6%, pH = 8.0

Depth (ft.)	Cl	NH ₄ -N	NO ₃ -N	SO ₄ -S
	----- (lbs/ac) -----			
0-1	9.9	8.9	34.3	159.0
1-2	12.9	9.7	14.4	172.0
2-3	8.1	10.1	4.8	215.0
3-4	11.7	9.6	4.0	1223.0

Element (0-6")	Amount (ppm)
P	33
Zn	0.5
Mn	7.5
K	376
Cu	1.7
Fe	9.3
B	0.3

Title: Timing, rate, and source of N topdressing for protein enhancement in wheat.

Year: 1997.

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

Personnel: Mal Wescott (PI), Grant Jackson, and Becky Murphy, Western Triangle Ag. Research Center, Conrad, MT 59425.

Objectives: To identify optimum rates, sources of N topdressing for grain yield and protein enhancement in a system of moderate initial N fertilization followed with topdressing based on plant diagnosis.

Procedures: McNeal spring wheat was planted with three initial N rates (including soil nitrate-N and N fertilizer), 100, 250 and 400 lbs N/acre. Urea was applied broadcast after planting, in a split block design with four replications. One hundred lbs of 11-52-0/acre was applied with the seed, and 30 lbs K applied broadcast. Each N rate was split into plots which received 20 or 40 lbs of N/acre, topdressed with three N sources, urea, ammonium nitrate, and liquid 28-0-0. The topdressed N was applied at tillering and heading. The dry fertilizer was applied by hand, liquid fertilizer was applied by hand using a small sprayer. Plots were sprinkler irrigated the day of or after treatment. The oldest leaves were sampled at tillering and flag leaves were sampled at heading for TKN analysis before fertilizer was applied. At grain maturity plots were sub-sampled for total plant N determination, and when ripe, grain was mechanically harvested for grain yield and protein determination. Post-harvest soil samples for nitrate-N were collected on the urea topdressed plots.

Results: The data are summarized in Table 13s. Treatments without topdressing, entry 14, 13, 27, and 41, were included with the experiment this year. Comparisons of these data take some time. It is apparent that topdressing increased yields only at the 100 N rate, similar to last year. Adding 40 N to the 100 N initial treatment at jointing increased protein to 13.6 % and at heading to 13.9 %. This was a very efficient treatment this year. At higher initial N rates, 250 and 400, protein was not increased or increased only slightly by topdressing additional N. The high initial N rate did not increase yield or protein. Special note: the N treatments were not added after flowering. Heading occurs when 50 % of the heads have emerged from the boot, and flowering occurs several days later. The recommendation of 3 lbs of N/bu for 14% protein was easily met this year. Nitrogen sources did not effect yield or protein.

Table 13s. The effect of timing, rate and source of nitrogen application on irrigated spring wheat yields and quality. The experiment was located at Western Triangle Ag. Research Center, Conrad, MT 1997.

Entry	Initial N Rate (lb/ac)	-----Top Dressing-----		Grain Yield (bu/ac)	Test Weight (lb/bu)	Grain Protein (%)	Protein Yield (lb/ac)	
		Time	N rate (lb/ac)					Source
36	400	Heading	40	an	89.38	63.52	14.45	775.0
40	400	Heading	40	lq	86.81	63.55	14.52	755.9
32	400	Heading	40	ur	84.89	63.70	14.65	745.7
34	400	Heading	20	an	86.21	63.20	14.35	742.0
38	400	Heading	20	lq	85.53	63.75	14.60	748.1
30	400	Heading	20	ur	89.10	63.82	14.60	780.2
35	400	Jointing	40	an	87.98	63.67	13.30	699.4
39	400	Jointing	40	lq	84.58	63.62	14.40	730.6
31	400	Jointing	40	ur	83.57	63.75	14.65	733.7
33	400	Jointing	20	an	85.67	63.52	14.50	745.7
37	400	Jointing	20	lq	84.84	63.77	14.60	742.5
29	400	Jointing	20	ur	83.93	63.47	14.73	741.8
22	250	Heading	40	an	85.60	63.30	14.48	743.3
26	250	Heading	40	lq	81.09	63.42	14.80	718.6
18	250	Heading	40	ur	84.82	63.70	14.80	752.4
20	250	Heading	20	an	85.55	63.70	14.45	741.8
24	250	Heading	20	lq	87.17	63.52	14.57	762.5
16	250	Heading	20	ur	82.75	63.60	14.50	719.8
21	250	Jointing	40	an	86.82	64.07	14.45	752.3
25	250	Jointing	40	lq	89.13	63.80	14.42	771.0
17	250	Jointing	40	ur	84.54	63.80	14.70	745.6
19	250	Jointing	20	an	88.33	63.82	14.50	767.9
23	250	Jointing	20	lq	85.95	63.57	14.38	741.2
15	250	Jointing	20	ur	86.38	63.80	14.50	751.4
8	100	Heading	40	an	89.49	63.92	13.88	744.3
12	100	Heading	40	lq	87.46	63.97	14.05	737.4
4	100	Heading	40	ur	87.61	63.50	13.68	718.2
6	100	Heading	20	an	81.44	63.82	13.47	656.7
10	100	Heading	20	lq	84.77	63.85	13.20	669.4
2	100	Heading	20	ur	84.93	64.17	13.50	688.2
7	100	Jointing	40	an	87.46	63.77	13.68	717.0
11	100	Jointing	40	lq	86.13	63.80	13.65	705.1
3	100	Jointing	40	ur	87.56	63.45	13.52	710.1
5	100	Jointing	20	an	87.49	64.22	13.25	695.3
9	100	Jointing	20	lq	87.79	63.77	13.15	691.7
1	100	Jointing	20	ur	88.13	63.65	12.65	669.5
41	400	-	0	-	86.10	63.77	14.50	748.7
27	250	-	0	-	89.86	63.65	14.52	783.0
13	100	-	0	-	81.06	64.10	12.25	596.3
14	0	-	0	-	47.08	63.62	10.13	288.2

Table 13s. Continued

	Grain Yield (bu/ac)	Test Weight (lb/bu)	Grain Protein (%)	Protein Yield (lb/ac)
Nitrogen Rate (lb/ac)				
Initial Nitrogen Rate Summary				
400	86.04	63.63	14.45	745.3
250	86.00	63.67	14.54	750.1
100	86.25	63.85	13.38	692.2
0	47.08	63.62	10.13	288.2
LSD (0.5)	3.39	NS	0.35	31.1
Timing				
Timing of Top Dressing Summary				
Jointing	86.46	63.74	14.06	728.4
Heading	85.81	63.67	14.25	733.3
LSD (0.5)	NS	NS	NS	NS
Nitrogen Rate (lb/ac)				
Top Dressing N Rate Summary				
40	86.38	63.69	14.23	736.4
20	85.89	63.73	14.08	725.3
LSD (0.5)	NS	NS	NS	NS
Nitrogen Source				
Nitrogen Source Summary				
Ammonium Nitrate (an) 33-0-0	86.78	63.71	14.06	731.7
Liquid (lq) 28-0-0	85.93	63.70	14.20	731.2
Urea (ur) 46-0-0	85.68	63.70	14.21	729.7
LSD (0.5)	NS	NS	NS	NS

Variety: McNeal @ 25 seeds/ft (100 lbs/acre).

Planting Date: 5/6/97

Harvest Date: 9/3/97

Previous Crop: Barley stubble, burned.

Fertilizer: Variable - 50- 30

Herbicide: Preplant roundup

Growing Season ppt: 7.45"

Irrigation Dates: 6/17/97, 7/11/97, and 7/28/97 for 6" additional moisture.

Soil Tests:

O.M. = 2.6%, pH = 7.6

Depth (ft.)	Cl	NH ₄ -N	NO ₃ -N	SO ₄ -S
	----- (lbs/ac) -----			
0-1	11.0	8.3	8.7	84.8
1-2	8.7	7.6	5.4	189.3
2-3	9.5	9.4	0.7	2325.8
3-4	10.4	11.6	2.6	5750.0
4-5	21.2	13.4	6.2	6796.0

Element (0-6")	Amount (ppm)
P	30.1
Zn	0.55
Mn	7.31
K	380
Cu	1.29
Fe	12.03
B	0.32