# SPRING WHEAT VARIETY PERFORMANCE SUMMARY IN MONTANA

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## INTRODUCTION

The agronomic characteristics of spring wheat varieties recently evaluated by the Montana Agricultural Experiment Station are compared in this publication with other varieties commonly grown in the state. The objective of this summary is to help farmers select the varieties which will perform best in their area. In this bulletin we use a comparable average to evaluate variety performance. Varieties recommended for production in the respective districts of Montana are designated by an *****. A brief description of each variety is given which may include a variety's particular advantages or disadvantages. The information was extracted from data collected and analyzed from the Advanced Spring Wheat and Statewide Durum Wheat nurseries. These reports are prepared by research personnel of the Montana Agricultural Experiment Station. Where available, up to ten years (1992-2001) of yield data are shown for the varieties. In some years data are not available because of hail, frost, or other unavoidable causes.

The comparable average for spring wheat is calculated by using an "actual check mean" from a group of long term varieties including; Newana, Fortuna, Lew, Hi-Line, Amidon and McNeal. Variety means are adjusted through multiplying the actual check mean by the percentage of individual variety means compared to the check mean for the same years tested; therefore these averages are directly comparable among each other.

In order to compare the yield of each variety with the average yield of the check varieties, a completed equation is shown for illustration. Using a comparable average, all varieties are then directly comparable to the 10 year average for the base average of six varieties. All varieties are then directly comparable to each other when in the same nursery.

Illustration of Formula: (Scholar -- 7 years at Sidney-irrigated, page 12)

Check Varieties 10 Year Average = 70.16
Check Varieties Average Yield for last 7 years = 66.51
Variety (Scholar) in question: Average Yield for last 7 years = 68.28

$$\frac{\textit{Scholar 7 year average yield}}{\textit{Check varieties 7 year average yield}} \text{ or } \frac{68.28}{66.51} = 1.026 \ (102.6\%)$$

To convert Scholar yield to the 10 year comparable average:

102.6% (Scholar) x 70.16 (Check varieties 10 yr. avg.) = 71.98 or 72.0 bu/A for Scholar

The comparable averages for the durum wheats were calculated by using Vic as a single check variety.

Since soft white spring wheats were not grown in our advanced nurseries since 1997, we have included comparable averages using 1988-1997 data.

The more years of production data available for any particular variety, the more reliable is the "comparable average figure." Averages using less than three years data may be unreliable in predicting future performance, and have been omitted from the tables.

## SPRING WHEAT PRODUCTION AND CULTURAL PRACTICES

Montana's spring wheat acreage during the past five years has ranged from 65 to 75 percent of the total wheat acreage planted. In 2001 it was 66 percent of the total wheat acreages.[1] The spring wheat crop includes hard red spring and soft white spring classes. Durum acreage ranged from 4 percent in 1996 up to ~10 percent in 2001. Nationally, in 2001, Montana ranked second among the spring wheat and durum producing states. North Dakota is number one.

The trend in Montana spring wheat production is toward higher yielding types being utilized in an alternate crop-fallow system. The wheat stem sawfly, wheat stem rust and leaf diseases including Septoria, remain a threat to wheat growers in areas across Montana, and require the planting of resistant varieties.

The saline seep problem in the Northern Plains prompts the adoption of a flexible cropping system to more fully utilize stored ground water and growing season rainfall. Recropping requires the planting of earlier-maturing varieties and the application of higher fertilizer rates initially for highest yields.

Montana has been recognized for its production of high quality bread wheat. This reputation is essential in maintaining domestic and foreign markets. The export trade in recent years has accounted for about three-fourths of our wheat market.

Hard red spring wheat is grown in all areas of the state, with most of the acreage on dryland. The largest concentration of acreage is found along the northern tier of counties, east of the Continental Divide. The highest producing counties in 2000 were Valley, Roosevelt and Hill. Less than three percent of the acreage is planted on irrigated land, but this amount is increasing.

Durum wheat is grown on dryland, principally in Sheridan, Roosevelt, Daniels and Valley counties in northeastern Montana and in Pondera County.

Soft white spring wheat production is not large, but is found in District 1 and in the southwest counties of District 2.

The following seeding rates and dates are general. The heavier seeding rate, where indicated, is applicable to plump seed of high test weight or seed having a kernel size larger than normal for most other varieties. Fortuna is an example. The lighter rates are for seed whose test weight is below normal for wheat.

| Crop | Average No. seeds/lb | Dryland (lbs) | Irrigated (lbs) | Seeding Date |
|---|---|---|---|---|
| Spring Wheat | 15,000 | 45 - 60 (15 – 21 seeds/sq ft) | 75 - 90 (26– 30 seeds/sq ft) | April 1or as soon as seedbed can be prepared. |
| Durum Wheat | 11,000 | 60 - 65 (15 - 16 seeds/sq ft) | 75 - 90 (19 - 23 seeds/sq ft) | Same |

Research on seed size at the Montana Agricultural Experiment Station has shown that spring wheat seed that will pass through 5/64$^{th}$ screen is low yielding. The benefit of seed sizing is greater seedling vigor.

*The map on the cover shows the districts in the state for purposes of reference for specific areas of adaptation.*

[1] Montana Agricultural Statistics, 2001 . Montana Agricultural Statistics Service, Helena, MT (October 2001).

# VARIETY TESTING PROCEDURES

## Locations

In 2001, the Advanced Spring Wheat nursery was planted at 10 Montana sites; including, Bozeman (dryland and irrigated), Kalispell (high rainfall), Havre (dryland), Sidney (dryland and irrigated), Huntley (dryland and irrigated), Moccasin (dryland) and Conrad (dryland). The Montana statewide durum nursery was planted at Bozeman (dryland), Havre (dryland), Sidney (dryland and irrigated), Huntley (dryland), Moccasin (fallow and recrop) and Conrad (dryland and irrigated). See page 26 for Research Center locations, soil types and miscellaneous nursery management information.

## Experimental Design and Data Collection

Varieties that are either currently recommended, widely grown, recently released or owned (and entered on a fee basis) by private companies are evaluated for agronomic performance in the Advanced Spring Wheat and Statewide Durum nurseries. Also evaluated in these nurseries are experimental breeding lines to be tested against the check varieties. The nurseries are randomized separately for each location tested for good statistical analysis.

Agronomic data is collected throughout the growing season; including, heading date, plant height, lodging, disease and insect reactions. Experimental plots are then trimmed, measured and harvested with small plot combines. The grain is then weighed for yield and test weight. Entries are bulked over reps and submitted to the Cereal Quality Lab at MSU, Bozeman for protein, milling, baking and Asian noodle quality evaluation as needed. Data is then analyzed and summarized for each location and overall comparisons are made to determine which varieties and/or experimental lines look promising for Montana producers. When sufficient data is collected and analyzed, promising varieties and/or lines may be submitted to the MAES wheat variety release and recommendation committee.

# WHEAT RECOMMENDATION PROCEDURE FOLLOWED BY THE MAES

Recommendation of spring wheat varieties is determined on a yearly basis by the Montana Agricultural Experiment Station (MAES) Wheat Variety Release Committee. This 15 member committee is composed of two wheat breeders, one cereal quality scientist, one plant pathologist, one entomologist, one extension specialist, one representative of Foundation Seed Stocks, six Research Center agronomists, one Montana Wheat and Barley Committee member and one representative of the Montana Seed Growers Association.

A variety is eligible for recommendation when a minimum of 16 location-years of performance data is obtained from the MAES statewide spring wheat performance trials. Test results must indicate that the variety is equal to or superior in overall merit to specified check cultivars and has end-use quality equal to or exceeding currently recommended varieties. For varieties originating from private companies, recommendation is considered at the request of the company when adequate data is available.

Recommendations of varieties are considered on a case by case basis. Yield performance of a variety is an important criteria, but also considered are test weight, grain protein content, disease and pest resistance and end-use quality data. In general, yield needs to be at least equal to currently recommended varieties in a particular district, unless the variety is being recommended for a specific purpose; such as, sawfly resistance. For example, Fortuna is not competitive in the absence of wheat stem sawfly and is recommended in Districts 1-5 for sawfly areas only.

If a serious defect in the variety is identified during performance testing, the variety will not be recommended. Examples of defects resulting in non-recommendation include: high probability of low test weight, low grain protein, low baking quality, etc.
Lack of variety recommendation by MAES may occur due to a decision by the originating company not to test the variety in statewide performance trials. In this case the lack of recommendation is due to inadequate or no data rather than a specific varietal defect.

# SPRING WHEAT VARIETIES

## Agronomic Characteristics

| Variety | Origin | Year Released | Milling[1/] | Baking[1/] | Plant Height | Maturity | Lodging | Shattering |
|---|---|---|---|---|---|---|---|---|
| **HARD RED:** | | | | | | | | |
| **Amidon** | North Dakota | 1988 | 5 | 4 | Tall | Medium | M | M |
| Ernest | North Dakota | 1995 | 5 | 4 | Tall | Medium | M[2/] | M |
| Fortuna | North Dakota & Montana | 1966 | 5 | 4 | Tall | Medium | M[2/] | S |
| Lew | Montana | 1976 | 5 | 5 | Tall | Mid-Late | M[2/] | - |
| Scholar | Montana | 1998 | 5 | 4 | Med-Tall | Mid-Late | M [2/] | R |
| Reeder | North Dakota | 1999 | 4 | 4 | Semidwarf | Med-early | MR | - |
| Conan | Western Plant Breeders | 1997 | 3 | 3 | Semidwarf | Medium | R | - |
| Express | Western Plant Breeders | 1991 | 4 | 4 | Semidwarf | Medium | R | - |
| Fergus | Western Plant Breeders | 1994 | 3 | 5 | Semidwarf | Medium | R | R |
| Grandin | North Dakota | 1989 | - | - | Semidwarf | Medium | MR | R |
| Hank | Western Plant Breeders | 1999 | 3 | 5 | Semidwarf | Early | R | R |
| Hi-Line | Montana | 1992 | 3 | 5 | Semidwarf | Medium | R | R |
| Len | North Dakota | 1979 | 5 | 5 | Semidwarf | Mid-Late | R | M |
| McNeal | Montana | 1995 | 3 | 5 | Semidwarf | Mid-Late | R | R |
| Newana | Montana | 1976 | 2-3 | 5 | Semidwarf | Mid-Late | R | R |
| WestBred 926 | Western Plant Breeders | 1987 | 4 | 5 | Semidwarf | Early | R | M |
| WestBred 936 | Western Plant Breeders | 1992 | 4 | 4 | Semidwarf | Early | R | - |
| **SOFT WHITE:** | | | | | | | | |
| Penawawa | Washington & Oregon | 1985 | - | - | Short | Medium | - | - |
| Vanna | Western Plant Breeders | 1994 | - | - | Semidwarf | Mid-Late | R | - |

[1/] Superior = 5, Inferior = 1
[2/] Weak under irrigation
Legend: R = Resistant , MR = Moderately Resistant, MS = Moderately Susceptible, S = Susceptible, T = Tolerant, - = unknown

# SPRING WHEAT VARIETIES

## Insect and Disease Reaction

| Variety | Sawfly | Smut | | Stripe Rust | Leaf Rust | Stem Rust | Leaf Spot Complex |
|---|---|---|---|---|---|---|---|
| | | Common | Loose | | | | |
| **HARD RED:** | | | | | | | |
| Standard: | | | | | | | |
| Amidon | MR | - | - | R | R | R | M |
| Ernest | R | - | - | R | R | R | R |
| Fortuna | R | S | - | MR | R | R | S |
| Lew | R | - | R | MR | R | R | MR |
| Scholar | MR | - | - | MS | MR | R | - |
| Semidwarf: | | | | | | | |
| Express | S | - | - | R | R | - | MR |
| Fergus | S | - | - | MS | MS | MR | MS |
| Grandin | S | - | - | MS | R | R | M |
| Hank | S | - | - | R | R | R | - |
| Hi-Line | S | - | - | MS | S | R | M |
| Len | S | - | - | R | R | R | MS |
| McNeal | S | - | - | MS | MS | MR | R |
| Newana | S | MS | R | MS | S | R | M |
| Reeder | S | - | - | MS | MR | R | MR |
| WestBred 926 | S | - | - | R | R | R | M |
| WestBred 936 | S | - | - | R | S | R | M |
| **SOFT WHITE:** | | | | | | | |
| Penawawa | S | S | - | R | S | R | MR |
| Vanna | S | - | - | MS | MS | R | R |

Legend: R = Resistant , MR = Moderately Resistantt, MS = Moderately Susceptible, S = Susceptible, T = Tolerant , - = unknown

## DURUM VARIETIES

| Variety | Origin | Year Released | Maturity | Plant Height | Stripe Rust | Leaf Rust | Stem Rust | Leaf Spot Complex |
|---|---|---|---|---|---|---|---|---|
| | | **Agronomic Characteristics** | | | **Disease Reaction** | | | |
| Belzer | North Dakota | 1997 | Medium | Medium | - | R | R | - |
| Ben | North Dakota | 1996 | Medium | Medium | MS | R | R | R |
| Kyle | Canada | 1984 | Medium | Tall | - | MR | R | - |
| Lloyd | North Dakota | 1983 | Medium | Semidwarf | MS | MR | R | S |
| Lebsock | North Dakota | 1999 | Medium | Medium | - | R | R | - |
| Maier | North Dakota | 1999 | Med-late | Medium | - | R | R | - |
| Medora | Canada | 1982 | Mid-Early | Tall | MS | R | MR | - |
| Monroe | North Dakota | 1985 | Early | Tall | MS | R | R | - |
| Mountrail | North Dakota | 1999 | Late | Medium | - | R | R | - |
| Munich | North Dakota | 1995 | Medium | Medium | - | R | R | - |
| Plaza | North Dakota | 1999 | Late | Semidwarf | - | R | R | - |
| Plenty | Canada | 1990 | Late | Tall | - | R | R | - |
| Renville | North Dakota | 1988 | Medium | Tall | - | R | R | - |
| Sceptre | Canada | 1986 | Mid-Early | Medium | S | - | R | - |
| Utopia | World Wide Wheat | 1996 | Early | Semidwarf | - | - | - | - |
| Vic | North Dakota | 1979 | Mid-Early | Tall | MR | MR | R | MR |
| Ward | North Dakota | 1972 | Mid-Early | Tall | MS | R | R | S |
| WestBred Laker | Western Plant Breeders | 1989 | Mid-Early | Semidwarf | MS | R | R | T |

Legend: R = Resistant, T = Tolerant, MR = Moderately Resistant, MS = Moderately Susceptible, S = Susceptible, - = Unknown

**NURSERY MANAGEMENT INFORMATION FOR THE 2001 ADVANCED SPRING WHEAT NURSERY**

| DISTRICT | Bozeman irrigated 2 | Bozeman dryland 2 | Havre 5 | Sidney dryland 6 | Sidney irrigated 6 | Kalispell 1 | Moccasin 4 | Huntley dryland 3 | Huntley irrigated 3 | Conrad dryland 5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Location: | | | | | | | | | | |
| Latitude °N | 45° 41’ | 45° 41’ | 48° 30’ | 47° 40’ | 47° 40’ | 48° 10’ | 47° 03’ | 45° 55’ | 45° 55’ | 48° 18.4’ |
| Longitude °W | 111° 00’ | 111° 00’ | 109° 48’ | 104° 08’ | 104° 08’ | 114° 15’ | 109° 57’ | 108° 15’ | 108° 15’ | 111° 55.5’ |
| Elevation (ft) | 4772 | 4772 | 2689 | 2200 | 1950 | 2890 | 4300 | 3200 | 3200 | 3700 |
| Precipitation: | | | | | | | | | | |
| Avg. moisture (in.)[1] | 16.16 | 16.16 | 11.67 | 13.91 | 13.91 | 19.84 | 15.34 | 13.24 | 13.24 | 11.50 |
| 2001 moisture (in.) | 13.40 | 13.40 | 8.46 | 22.18 | 18.40 | 15.73 | 10.60 | 13.57 | 13.57 | 7.42 |
| Moisture (Apr.-July) | 7.71 | 7.71 | 4.8 | 16.2 | 12.71 | 7.39 | 7.29 | 8.91 | 8.91 | 4.8 |
| Irrigation water applied (in.) | 7.00 | 0.00 | 0.00 | 0.00 | 3.00 | 0.00 | 0.00 | 0.00 | 8.65 | 0.00 |
| Previous Crop: | | | | | | | | | | |
| 1998 | Winter wheat | Winter wheat | Fallow | Sm.grains | Safflower | alfalfa | - | - | - | - |
| 1999 | Oats | Oats | Barley | Safflower | Durum | alfalfa | - | - | - | - |
| 2000 | fallow | fallow | Fallow | Fallow | Sugar beets | alfalfa | fallow | fallow | Sugar beets | Fallow |
| Soil Type: | | | | | | | | | | |
| Series | Amsterdam | Amsterdam | Telstad-Joplin | Williams | Savage | Creston | Judith-Danvers | Fort Collins | Fort Collins | Scobey |
| Texture[2] | SiL | SiL | CL | CL | SiC | SiL | CL | SiL | SiL | CL |
| Fertilization: | | | | | | | | | | |
| Available N (lb/ac) | 160 | 160 | | 163 | 17 | | | | | 51 |
| Applied N-P-K (actual lb/ac) | 50/0/0 | 50/0/0 | 70/40/25 | 0/0/0 | 75 (lb.N) | 91/52/60 | 77 (lb.N) | 100 (lb.N) | 100 (lb.N) | 60/31/0 |
| Planting date | 4/12/01 | 4/18/01 | 4/29/01 | 4/26/01 | 5/9/01 | 4/25/01 | 4/18/01 | 3/21/01 | 4/6/01 | 4/25/01 |
| Harvest date | 8/21/01 | 8/10/01 | 8/15/01 | 8/15/01 | 8/14/01 | 8/23/01 | 8/13/01 | 8/1/01 | 8/13/01 | 8/8/01 |

[1] Moisture September- August, Sidney is October- September

[2] C= clay, L= loam, Sa=sand, Si=silt or silty, F=fine and VF=veryfine

## ADDITIONAL DESCRIPTIVE INFORMATION ON SPRING WHEAT VARIETIES

### ***Hard Red Spring Wheats***

**AMIDON** - An awned, standard height hard red spring wheat cooperatively developed and released by North Dakota Agricultural Experiment Station and United States Department of Agriculture (USDA) in 1988. It was developed from the cross SU-28-1*2/3/Lew//Tioga*2/ RL6043 and tested as ND606. It is similar to Stoa in heading date and plant height with a tendency to greater lodging. It is resistant to leaf rust and stem rust, with a leaf spotting rating better than Stoa and Len. Shattering resistance and test weight have been rated as satisfactory. Amidon has been yielding consistently more than Stoa when yields were below 30 bu/A. Amidon has exhibited an intermediate level of stem solidness. Amidon has a higher protein than Newana, and overall milling and baking qualities are equal to or better than Newana. The kernel characteristics do not meet spring wheat classing requirements of the Federal Grain Inspection Service.

**CONAN** - Developed and released by Western Plant Breeders in 1999. Conan was selected from the cross WestBred Rambo x WestBred 906R. Conan is a sawfly tolerant, white chaffed, semidwarf, hard red spring wheat. The spike is mid-dense, strap shaped and awned. The seeds are elliptical with rounded cheeks. The brush is long and collared. Conan is similar to WestBred Rambo in yield, but is 2 to 4 days earlier, .5 to .9 percentage points higher in protein, and has good milling and baking qualities. Conan is resistant to the prevalent races of stripe rust and leaf rust, and has shown good tolerance to Septoria and Tan spot. This variety is protected under the Plant Variety Protection Act.

**ERNEST** - Developed from the cross ND 622*2/Cutless, made by the North Dakota Agricultural Experiment Station and released in 1995. Ernest is an awned, white chaffed, standard height, solid stemmed hard red spring wheat. It is resistant to wheat stem sawfly, prevalent races of leaf rust and stem rust. This variety is protected under the Plant Variety Protection Act and can only be sold or advertised by variety name as a class of certified seed.

**EXPRESS** - Developed from the cross of Veery/BH1146 by Western Plant Breeders. It is a semidwarf, hard red spring wheat released in 1991. Some plants in the population may average 3-5 inches taller than the average plant height of the field. The spike is awned, white chaffed with glumes being long, oblique shouldered and acuminate beaks. The kernels are red, elliptical shaped, long brush and rounded cheeks. Express is resistant to leaf rust, stripe rust, powdery mildew and Septoria tritici. This variety is protected under the Plant Variety Protection Act and can only be sold or advertised by variety name as a class of certified seed.

**FERGUS** - Developed and released by Western Plant Breeders in 1994. It was selected from a male-sterile facilitated, recurrent selection population. Fergus is a red chaffed, semidwarf, hard red spring wheat. The spike is awned, lax, and oblong. The glumes are red, long and wide, with narrow square shoulders. The beaks are narrow, mid-short, and the apex is acuminate. Fergus has purple leaf auricles with pubescent hairs. The stems and leaves have a waxy bloom. Seeds are mid-long, mid-wide, elliptical with rounded cheeks. Seed crease is mid-wide and shallow. The kernel has a mid-sized germ and mid-long brush with no collar. Fergus has a variant of tall spikes, one to two spikes taller than the normal stand height at a ratio of three per 10,000 plants. This variety is protected under the Plant Variety Protection Act.

**FORTUNA** - Developed from the cross, Rescue-Chinook x (Frontana x Kenya 58-Newthatch), made at North Dakota Agricultural Experiment Station with the Crops Research Division of USDA cooperating. A joint North Dakota-Montana release was made in 1966. Fortuna is beardless with white chaff and straw. It is a solid-stemmed variety, resistant to the wheat stem sawfly. Fortuna is susceptible to Septoria and black chaff fungus. It is a relatively high yielding variety with superior milling properties, and has acceptable baking properties.

**GRANDIN** - developed from the cross of Len//Butte*2/ND507/3/ND593 cooperatively by the North Dakota Agricultural Experiment Station and Agricultural Research Service, USDA. It was released in 1989. Grandin is an awned, semidwarf hard red spring wheat. Grandin is susceptible to wheat stem sawfly.

**HANK** – Developed by Western Plant Breeders and released in 2000. Hank was derived from the cross of WestBred 926/WestBred 936. Hank is an early maturing white chaffed, awned, semi-dwarf hard red spring wheat. Seed of Hank is elliptical and long with rounded cheeks. The brush is large with long hair and the crease is medium in depth and width. Hank is resistant to stem rust, leaf rust, stripe rust and powdery mildew and has shown good tolerance to Dry Land Root Rot. Hank has good straw strength and is tolerant to shattering. Hank is tolerant to races of the Hessian fly found in the PNW region. Hank is susceptible to damage by the wheat stem sawfly. Hank is tolerant to the wild oat herbicide 'Avenge'. The milling and baking qualities of Hank are acceptable. Hank is protected under the Plant Variety Protection Act (Certificate # 200000191).

**HI-LINE** - Developed from the cross MT 7336/Shortana, made cooperatively by the Montana Agricultural Experiment Station and the Agricultural Research Service, USDA. It was released in March 1992. Hi-Line is a semidwarf, hard red spring wheat. The variety is white chaffed, white strawed, hollow stemmed with an awned spike. The glumes are glabrous and may vary in color from white to tan. Its kernels are red, ovate, and short with a mid-length brush. The spike tends to nod slightly at maturity. Hi-Line is resistant to lodging. Under some climatic conditions a few spikes will elongate 2-5 inches above the overall field height. Hi-Line is resistant to prevalent races of stem rust found in Montana. It is susceptible to leaf rust and stripe rust. The milling and baking quality of this variety is acceptable to industry.

**LEN** - Developed from the cross, ND 499/3/Justin/RL 4205//Wisconsin 261, cooperatively by the North Dakota Agricultural Experiment Station and Agricultural Research Service, USDA, and released in 1979. Len is an awned, semidwarf, hard red spring wheat. It is resistant to lodging with a maturity similar to Olaf. Len is susceptible to stripe rust, but resistant to leaf rust and stem rust under Montana conditions. The milling and baking qualities of this variety are equal to Fortuna and Lew.

**LEW** - Developed from a cross, Fortuna/S62-85. The original selections were made at the North Dakota Agricultural Experiment Station. The Agricultural Research Service, USDA, cooperated in its development. Lew was released in 1976 by the Montana Agricultural Experiment Station with the ARS, USDA, cooperating. It is adapted to the sawfly areas of northeast Montana. Lew is a beardless, hard red spring wheat with white straw and chaff, and a solid stem. It is resistant to the wheat stem sawfly. It carries resistance to loose smut, stripe rust, leaf rust and stem rust, but is moderately susceptible to Septoria. Lew has a yield and test weight advantage over Tioga. Its milling and baking qualities are superior to Tioga and Fortuna.

**McNEAL** - Developed from the cross RS6880/Glenman made by the Montana Agricultural Experiment Station. It was released in March 1995. McNeal is a semidwarf, hard red spring wheat with red chaff and tan straw. The spike is awned and mid-dense. The glumes are reddish brown with some white on the outer edges of the lemma and palea. Kernels are red, ovate, medium length with a short brush. The cheeks are slightly rounded with a medium crease. Under Montana growing conditions McNeal is moderately resistant to lodging. It is moderately resistant to prevalent races of stem rust and wheat streak mosaic virus. McNeal is moderately susceptible to leaf rust and stripe rust. It is susceptible to Russian wheat aphid and the wheat stem sawfly. Under some climatic conditions one white chaffed plant per 2,000 plants may appear in the field. McNeal's milling and baking qualities are acceptable by industry.

**NEWANA** - Developed from the cross, Sheridan/3/Norin 10/Brevor 14//5*Centana, made at the Montana Agricultural Experiment Station by personnel of the Agricultural Research Service, USDA. The initial release of Newana was made in 1976. It is adapted for dry and irrigated land in all districts of Montana. It is a bearded, semidwarf hard red spring wheat variety with white straw and chaff. It is resistant to loose smut and stem rust, with moderate resistance to stripe rust. Newana is moderately susceptible to Septoria but is susceptible to leaf rust. Its baking quality is superior and its milling quality is satisfactory, but has somewhat low flour yield.

**REEDER -** Developed by the North Dakota Agricultural Experiment Station, the cross involved a relative of 'Stoa', a NDSU experimental line and germplasm from a breeding program in Brazil. Reeder was released in 1999. Reeder is an awned, semidwarf hard red spring wheat. Reeder yields well especially in northeastern Montana and western North Dakota. Reeder has resistance to the upper midwest races of stem and leaf rust. Milling and baking qualities are acceptable. This variety is protected under the Plant Variety Protection Act and can only be sold or advertised by variety name as a class of certified seed.

**SCHOLAR** - Developed from the cross, MT8808/'Marberg', made by the Montana Agricultural Experiment Station. Scholar was released in 1998. It is a good yielding hard red spring wheat with moderate resistance to the wheat stem sawfly. Scholar is awned with white chaff and straw and is intermediate in height. Scholar has good resistance to Septoria and stem rust, is moderately resistant to leaf rust, and moderately susceptible to stripe rust. Scholar has good milling and baking qualities. This variety is protected under the Plant Variety Protection Act.

**WESTBRED 926** - Developed by Western Plant Breeders from a recurrent selection population. It is a semidwarf hard red spring wheat similar to WestBred 906R. WestBred 926 was released in 1987. The spike is awned, white chaffed, slightly longer and more oblong than WestBred 906R. The kernel is red, ovate, with medium length brush, and rounded cheeks. It is resistant to stem rust and powdery mildew.

**WESTBRED 936** - Developed from a male-sterile facilitated, recurrent selection population, "906 alpha-84" by Western Plant Breeders. It is a semidwarf, hard red spring wheat released in 1992. The spike is awned, white chaffed, oblong and lax. The glumes are long and wide, with narrow elevated shoulders. The beak is very long, narrow and the apex is acuminate. The kernels are mid-long, mid-wide and ovate with rounded cheeks. The crease is shallow, mid-wide and the germ is mid-sized. The brush is long with no collar. WestBred 936 is resistant to stem rust and stripe rust. This variety is protected under the Plant Variety Protection Act.

## ***Soft White Spring Wheats***

**PENAWAWA** - Developed from the cross of Potam 70/Fielder, jointly by the Agricultural Research Service, USDA, and Washington Agricultural Experiment Station. It was released in 1985. Penawawa is a soft, white, semidwarf spring wheat, awned, white-chaffed variety. The spikes are erect, semilax, oblong in shape, with medium long awns. The kernels are mid-sized, soft, white, mid-long and ovate with a large brush and ovate germ. Penawawa is resistant to stripe rust, leaf rust and stem rust. It is moderately susceptible to mildew and susceptible to common bunt. It is also susceptible to hessian fly. Industry has accepted Penawawa as having satisfactory quality for milling and pastry.

**VANNA** - Developed and released by Western Plant Breeders in 1993. Vanna is a semidwarf, soft white spring wheat. It is white chaffed with a lax, strap-shaped, awned spike. Leaf sheaths have a waxy bloom. Auricles are purple and slightly hairy. The glumes are long, mid-wide, shoulders are square and the beak is acuminate. Kernels are mid-long, mid-wide, ovated and have round cheeks. The brush is long and does not have a collar. The kernel crease is narrow and shallow, germ is mid-sized. Vanna is resistant to the prevalent races of stripe and leaf rust in the Pacific Northwest. In northern Idaho it shows susceptibility to the Hessian fly. Vanna has a variant of approximately one tall head (one head taller than the normal field) at a ratio of one per 10,000 plants. This variety is protected under the Plant Variety Protection Act.

## ***Durum Wheats***

**BEN** - Developed from the cross of D8024/Monroe by the North Dakota Agricultural Experiment Station. Ben is a high-yielding, high-test weight, stiffed-strawed variety. It is a day length-sensitive durum. Ben has long erect spikes, is awned, mid-dense and oblong. Ben is a medium tall, medium maturing variety. It has three per 10,000 plants which are taller than the average height of the crop. Depending on the environment Ben may have one per 1000 bronze-colored chaffed plants in a field. Ben is resistant to stem rust, leaf rust and tan spot. It is moderately resistant to Fusarium head blight. Ben is protected under the Plant Variety Protection Act of 1994 and can only be sold or advertised by variety name as a class of certified seed.

**KYLE** - Developed from the cross of Wakooma/2/(DT322, Blue Giant/4*Lakota)/3/Wakooma/2/ (DT320, Blue Giant/2*Lakota) by Agriculture Canada Research Station, Swift Current, Saskatchewan. It was released in 1984. Kyle has a white glumed, glabrous spike, with long spreading awns that turn black at maturity. It has medium-sized kernels. Kyle is resistant to prevalent races of leaf and stem rust. It is moderately susceptible to tan spot and septoria leaf spot and susceptible to loose smut.

**LEBSOCK** – Lebsock was released in 1999 by the North Dakota Agricultural Experiment Station. It has good yield, high test weight and a high semolina extract. Lebsock is a stiff- strawed durum with medium height and maturity with day length sensitivity. It is resistant to stem and leaf rust and moderately resistant to Tan spot and Fusarium head blight. This variety is protected under the Plant Variety Protection Act and can only be sold or advertised by variety name as a class of certified seed.

**LLOYD** - Developed from the cross of Cando/Edmore by the North Dakota Agricultural Experiment Station in cooperation with the Agricultural Research Service, USDA. It was released in 1983. It is a semidwarf spring durum. The spike has white awns and glumes. Lloyd is resistant to most stem rust races, moderately resistant to leaf rust and black point, and moderately susceptible to stripe rust. It has satisfactory milling characteristics and a strong gluten similar to Vic. Spaghetti made from Lloyd has significantly greater firmness when cooked compared to Cando durum.

**MAIER** – The North Dakota Agricultural Experiment Station released Maier durum wheat in 1999. Maier is a late maturing, stiff-strawed, day length sensitive durum with a medium height. Maier has a good semolina extraction with strong gluten. Maier is resistant to stem and leaf rust diseases. This variety is protected under the Plant Variety Protection Act and can only be sold or advertised by variety name as a class of certified seed.

**MEDORA** - Developed from the cross of Ward/Macoun by Agriculture Canada Research Station, Winnipeg, Manitoba, Canada. It was released in 1982. It is a spring durum wheat. The spike is awned and white chaffed, tapered, mid-long, mid-dense and erect. The glumes are glabrous, narrow, mid-long and mid-wide. The shoulder is square to elevated, beak mid-wide, short and acuminate. The kernels are hard amber, mid-sized, mid-wide, medium to short and ovate. The cheeks are angular, crease mid-wide, mid-deep, with mid-sized brush and mid-long hairs. The germ is oval, mid-sized to large. Medora is distributed by SeCan Association, Ottawa, Ontario, Canada.

**MONROE** - Developed from the cross of (D6771/Rugby)/Vic by the North Dakota Agriculture Experiment Station. It was released in 1985. It is early maturing with white chaff. The kernels are large. Monroe is resistant to prevalent races of stem rust and moderately resistant to prevalent races of leaf rust. The combination of earliness and high yield makes Monroe well suited for growing in all durum areas of the state.

**MOUNTRAIL** – Developed from the cross D8479/Renville made by the North Dakota Agricultural Experiment Station which was released in 1999. Mountrail is a medium height, late maturing, stiff-strawed , day-length sensitive durum wheat. It is resistant to both leaf and stem rusts, but only moderately resistant to Tan spot and Fusarium head blight. Mountrail has a high semolina extract with strong gluten. This variety is protected under the Plant Variety Protection Act and can only be sold or advertised by variety name as a class of certified seed.

**MUNICH** - Developed from the cross D8030/D8016 by the North Dakota Agricultural Experiment Station and released in 1995. It is a day length sensitive durum wheat. Munich is a strong gluten durum variety. It is resistant to leaf rust and stem rust. It has a moderate resistance to scab. This variety is protected under the Plant Variety Protection act and can only be sold or advertised by variety name as a class of certified seed.

**PLAZA** – Derived from the cross, DT606/D8291, and released in 1999 by the North Dakota Agricultural Experiment Station. It is a late maturing semi-dwarf durum. Plaza has an average protein with strong gluten. It is resistant to leaf and stem rusts. This variety is protected under the Plant Variety Protection Act and can only be sold or advertised by variety name as a class of certified seed.

**PLENTY** - Developed from the cross of (Vic/Wascana//Hercules/DT 310) by University of Saskatchewan, Saskatoon, Saskatchewan and released in 1990.

**RENVILLE** - A durum wheat variety developed from the cross of Rolette/Vic by the North Dakota Agricultural Experiment Station in cooperation with the United States Department of Agriculture and released in 1988. Renville has yielded significantly more than Vic in North Dakota trials. The plant height is similar to Vic, however lodging may occur under high moisture and high fertility conditions. The maturity is later than Vic and similar to Lloyd. Test weight has been good, with kernel weight less than Vic and Monroe, but similar to Cando. Renville has shown good resistance to stem rust and leaf rust. Milling characteristics are good, the gluten is strong, and spaghetti color and cooking characteristics are acceptable.

**UTOPIA -** Utopia was derived from exploitation of a "one irrigation" low input Male Sterile Facilitate Recurrent Selection population established at the University of Arizona, Mesa Experimental Station in 1982. Utopia is a semi-dwarf spring durum. Spikes are mid-dense, slightly tapered and incline at a 15 degree angle. At maturity, the stem and spike are white to tan with black awns. Glumes are large, long and glabrous with rounded to elevated shoulders. Seeds of Utopia are yellow amber, large, long, elliptical with shallow creases and rounded cheeks. Breeder seed will be maintained by World Wide Wheat, L.L.C. Utopia is protected under the Plant Variety Protection Act and can only be sold or advertised by variety name as a class of certified seed.

**VIC** - Developed from the cross, Edmore/Ward, by the North Dakota Agricultural Experiment Station cooperatively with Agricultural Research, Science and Education Administration, USDA. This variety was released to growers in 1979. It is a standard height, day length-sensitive spring durum. It has white awns and glumes. Vic is resistant to stem rust and moderately resistant to leaf rust and blackpoint. The milling, processing and cooking properties of this variety are satisfactory.

**WARD** - Developed from the cross, Langdon/3/Ld 357//CI 7780/Ld 362/4/Br 180/Wells. It was developed by the North Dakota Agricultural Experiment Station in cooperation with the Agricultural Research Service, USDA. Ward was released in 1972. It is an awned variety with yellow glumes, with high yield potential, good straw and disease resistance and a low incidence of leaf spotting. According to North Dakota its quality characteristics are satisfactory.

**WESTBRED LAKER** - Developed by Western Plant Breeders from a three-way composite cross of Mexicali, WestBred 1000D and Calvin, crossed with a combination of ten Italian and CIMMYT lines. Registered seed was released in 1986. This variety is day length sensitive, semidwarf, spring durum. The spikes are awned, erect, dense and oblong. It is white chaffed and white awned. The kernels are amber, hard, long, elliptical, with rounded cheeks and a shallow, narrow crease. The germ is mid-sized, brush small, short, without a collar. WestBred Laker is resistant to prevalent races of leaf and stem rust. It has moderate tolerance to *Septoria tritici* and tan spot, but is moderately susceptible to stripe rust. Its sedimentation and semolina evaluations are acceptable to industry. WestBred Laker is protected under the Plant Variety Protection Act and can only be sold or advertised by variety name as a class of certified seed.

* The asterisk is used as a part of the formulation to indicate the number of backcrosses of parents constituting the variety.

## PLANT VARIETY PROTECTION (PVP)

The developer of a new distinct variety may obtain protection (essentially a patent) for that variety if he/she chooses to do so, provided the variety meets the requirements of the Plant Variety Protection Act of 1970. This Act permits the owner or developer of a variety to prohibit others from selling, sexually multiplying, using for propagation for seed, or using to produce a hybrid, seed of his variety.

Two options, for plant variety protection, are available to the developer of the variety. Under the first option, the developer of the variety or his/her agent may sell either certified or uncertified seed of the variety. If the developer of the variety has reason to believe that anyone is infringing on his/her rights, he/she may resort to civil action.

The other option ("certification option") for protecting a variety utilizes the provision of Title V of the Federal Seed Act. A variety protected in this manner may be sold by variety name only as a class of certified seed.

It is the responsibility of the seller to inform the buyer if the variety is protected. Each container of seed sold should be labeled with a tag indicating the type of protection which the owner has. Under the first option, the label will state: "Unauthorized Propagation Prohibited - U.S. Protected Variety."

If the owner of the variety has chosen the other option for variety protection, the label will state, "Unauthorized Propagation Prohibited - To be Sold by Variety Name Only as a Class of Certified Seed - U.S. Protected Variety."

PLEASE NOTE: Varieties protected under the 1994 PVP act no longer can be sold without permission of the variety owner (the farmer exemption has been excluded)'

A complete listing of all protected varieties is available in the "Official Journal of the Plant Variety Protection Office" which may be obtained upon request from:

Plant Variety Protection Office
Warehouse Division, AMS
U.S. Dept. of Agriculture
National Agricultural Library
Beltsville, MD 20705
Phone: (301) 504-5518
Internet: http://www.ams.usda.gov/science/pvpo/pvp.htm

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