# FORTYSEVENTH ANNUAL REPORT
# 1995

**Northwestern Agricultural Research Center**
**of the**
**Agricultural Experiment Station**
**Montana State University**

**4570 Montana 35**
**Kalispell, MT 59901**

**Prepared by**

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**Compiled by Elaine M. Scott, Administrative Support**

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# DISTRIBUTION OF THE 1995 NORTHWESTERN AGRICULTURAL RESEARCH CENTER REPORT

COPIES

1 Plant & Soil Science Department

4 Research Center Staff, N.W. Agricultural Research Center

11 County Extension Agents in Northwestern Montana

| | |
|---|---|
| Deer Lodge | - Barbara Andreozzi |
| Flathead | - Cheryl Weatherell |
| Granite | - Dan Lucas |
| Lake | - Jack Stivers |
| Lincoln | - Mike McCurry |
| Mineral | - Kevin Chamberlain |
| Missoula | - Gerald Marks |
| Powell | - David Streufert |
| Ravalli | - G. Rob Johnson |
| Sanders | - John Halpop |
| Flathead Reservation | - Joel Clairmont |

1 Agricultural Stabilization and Conservation, Kalispell

1 Flathead Chapter Future Farmers of America

1 Soil Conservation Service, Kalispell

4 Feed/Seed/Fertilizer Dealers

Equity Supply Co., Kalispell
Farmers Union Ex., Kalispell
Westland Seeds, Inc., Ronan
Lake Glacier View Farm, Ronan

1 MSU Western Agricultural Research Center

## ADMINISTRATION 750

The Administration Project at the Northwestern Agricultural Research Center includes expenses for the overall operation of the center, personnel and office equipment purchased.

**Full Time Staff Members** — **Years in Service**

Leon E. Welty - Supt. & Prof. Agronomy (Began January 1973) . . . . . 22

Robert N. Stougaard - Assistant Professor, Weed Science . . . . . 4
(Began November 1991)

Todd K. Keener - Ag Research Spec. II (Began March 1978) . . . . . 17

Gary R. Haaven - Ag Research Spec. I (Began April 1982) . . . . . 13

Louise S. Prestbye - Ag Research Spec. I (Began May 1983) . . . . . 12

Elaine M. Scott - Administrative Support (Began August 1990) . . . . . 5

James Bates - Farm/Ranch Hand III (Began June 1993-resigned March 1995)

Paul P. Koch - Farm/Ranch Hand III (Began May 1995) . . . . . 7 mos.

Vern R. Stewart - Professor Emeritus

**Part Time Employees**:

Paul Ausenhus (June 19 through August 25)

John Scott (March 20 through April 20)

Bryan Wunsch (April 10 through April 21)

Lester Bevan (April 25 through May 5)

Jim Troyer (May 17 through June 23)

Carl Simon (June 26 through July 21)

Sarah Gunderson (July 25 through November 30)

**Student Employees**:

Gail Sharp (January 1 through September 8)

Lisa Johnson (May 17 through August 23)

Dana Wittinger (May 18 through December 10)

Patrick Edwards (June 12 through August 25)

Seth Majors (July 24 through August 25)

Julie Spencer (August 2 through August 8)

## GENERAL FARM 751

The General Farm Project (751) supports all research projects. This includes items purchased and used in the total research program. The following were leased in 1995:

| | |
|---|---|
| John Deere 6400 tractor | $ 2,322.10 |
| John Deere 870 tractor | $ 1,211.86 |

## PHYSICAL PLANT 752

The Physical Plant Project (752) includes the maintenance of buildings and grounds at the Northwestern Agricultural Research Center.

| | |
|---|---|
| Purchase of above ground fuel storage tanks | $10,820.00 |
| Removal of underground fuel tanks | $ 3,870.00 |

## FORAGE INVESTIGATION 755

The Forage Investigation Project (755) includes research related to all types of forage for feed from seeding to data collection to publications.

| | |
|---|---|
| Purchase of computer for Ag Research Specialist | $ 3,281.23 |

## PROFESSIONAL & CLIENTELE PRESENTATIONS 1995

| Date | Activity | Who | Where |
|---|---|---|---|
| 1/12 | Advisory Committee | Welty Stougaard | Missoula |
| 1/19 | MIRC | Welty | Las Vegas, NV |
| 2/13 | Mint Advisory Committee | Welty Stougaard | NWARC |
| 2/14 | Mint Growers Association | Welty Stougaard | Kalispell |
| 2/15 | MT Wheat & Barley | Stougaard | Bozeman |
| 2/28 | Producers | Welty Stougaard | Stevensville |
| 3/2 | Producers | Welty Stougaard | Creston |
| 3/7 | Producers | Welty Stougaard | Hot Springs |
| 3/8 | Producers | Welty Stougaard | Ronan |
| 3/9 | Producers | Welty Stougaard | Drummond |
| 3/22 | Pea & Lentil Meeting | Stougaard | Kalispell |
| 3/28 | Flathead Conservation District | Stougaard | Kalispell |
| 4/17 | Bissell School Students Tour | Welty | Kalispell |
| 4/22 | Producers | Welty | Polson |
| 5/2 | Noxious Weed Trust Fund | Stougaard | Billings |
| 5/1 | Producers - Tour mint farms | Welty | Kalispell |
| 5/12 | Area Business People | Welty | NWARC |
| 6/1 | Mint propagators-Tour | Welty | NWARC |
| 6/28 | Brazilean Scientists - Tour | Welty Stougaard | NWARC |
| 7/3 | Mint Oil Buyers - Tour | Welty | NWARC |
| 7/7 | Research Center Faculty - Tour | Welty Stougaard | NWARC |
| 7/18 | Field Day - Tour | Welty Stougaard | NWARC |
| 7/19 | Field Day - Corvallis | Welty | WARC |
| 7/20 | Mint Tour | Welty Stougaard | NWARC |
| 9/11 | Michigan Mint Producers - Tour | Welty Stougaard | NWARC |
| 10/9 | Mint Adv. Committee | Welty Stougaard | NWARC |
| 10/12 | Project Review - Forages | Welty | Bozeman |
| 10/13 | Project Review - Small Grain & Weeds | Stougaard | Bozeman |
| 12/7 | Project Review - Mint | Welty | NWARC |

# CLIMATOLOGICAL DATA
# NORTHWESTERN AGRICULTURAL RESEARCH CENTER
## Kalispell, MT

In general the 1994-95 weather was similar to the normal climate patterns of previous years. Though the overall rainfall was greater than average there had been a very dry summer and fall that delayed winter wheat seeding and emergence. Spring and summer weather were cooperative concerning farming practices. June was the month of extremes with 4 inches of snow on the 6th and a total precipitation of 5.63" for the month. It was a good growing season for cereals and high yields were experienced in most crop types.

Total precipitation for the 1994-95 season was 22.64 inches, 2.93" (15%) higher than the long term average. The most pronounced moisture factor occurred in September with only .46" of precipitation. This left seedbeds dry for fall planting and, in cases as the winter wheat variety trials, irrigation was necessary for seedling emergence. Favorable moisture in October aided in establishing winter wheat seedlings for the winter as well as recharging the soil profile. Winter wheat emergence was later and subsequently seedlings were smaller going into the winter. Precipitation amounts were average except for June which had 194% normal rainfall. Some grain was lodged as a result but the effected acreage was minimal. Foliar diseases were observed on both winter and spring cereals and were probably enhanced by this wet period combined with cooler temperatures. A four inch snowfall on June sixth contributed to moderate lodging in half of the winter wheat varieties. The majority of the wheat stood up after a few days except for Rocky which remained partially lodged through the season ( this could account for lower yields ). Irrigation was minimal for the season compared to last year. Late summer and fall precipitation was sufficient for good yields and harvest procedures were not impeded. Lower than normal rainfall in September of 1995 caused some concern of dry seedbeds but precipitation at the end of the month aided in establishing the fall cereals.

The longest period of continuous snow cover was 24 days from December 29 through January 21. There were other short periods of snow cover that contributed to a total of 50 snow days. As normal the snow cover days occurred mainly in January and February when the majority of extreme cold temperatures were experienced. There were a couple cold periods when the winter wheat fields were open but winter kill was not significant except in the sensitive variety McDermid. The greatest snow depth of eight inches was recorded in February.

Temperatures did not vary significantly throughout the season but were slightly warmer in the fall and winter and cooler in the spring. Temperatures increases in the spring were not as great as previous years and growing degree units were lower than normal for May through August. The frost free period was five days longer than the long term average with the first killing frost being on September 21.

Following is a list of tables giving a complete description of the weather for the crop year (September 1994 through August 1995) and 1995 (January through December).

Table 1. Summary of climatic data by months for 1994-95 crop year (September through August) and averages for the period 1949-94 at the Northwestern Agricultural Research Center, Kalispell, MT.

Table 2. Summary of temperature data at the Northwestern Agricultural Research Center on a crop year basis, September 1, 1949 through August 31, 1995. (Average)

Table 3. Summary of temperature data at the Northwestern Agricultural Research Center on a crop year basis, September 1, 1949 through August 31, 1995. (Maximum)

Table 4. Summary of temperature data at the Northwestern Agricultural Research Center on a crop year basis, September 1, 1949 through August 31, 1995. (Minimum)

Table 5. Summary of precipitation records at the Northwestern Agricultural Research Center on a crop year basis, September 1, 1949 through August 31, 1995.

Table 6. Precipitation by day for crop year September 1, 1992 through August 31, 1995, Northwestern Agricultural Research Center, Kalispell, MT.

Table 7. Frost free period at the Northwestern Agricultural Research Center from 1950 through 1995.

Table 8. Temperature extremes at the Northwestern Agricultural Research Center, Kalispell, MT from 1950-1995.

Table 9. Summary of temperature records at the Northwestern Agricultural Research Center, January 1950 through December 1995.

Table 10. Summary of precipitation records at the Northwestern Agricultural Research Center, Kalispell, MT, January 1950 through December 1995.

Table 11. Summary of growing degree day (GDD) data at the Northwestern Agricultural Research Center, Kalispell, MT, May 1, 1949 through October 31, 1995.

Table 1. Summary of climatic data by months for 1994–95 crop year (September thru August) and averages for the period 1949–95 at the Northwestern Agricultural Research Center, Kalispell, MT.

| ITEM | Sept. 1994 | Oct. 1994 | Nov. 1994 | Dec. 1994 | Jan. 1995 | Feb. 1995 | Mar. 1995 | Apr. 1995 | May 1995 | June 1995 | July 1995 | Aug. 1995 | Total or Average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Precipitation (inches) | | | | | | | | | | | | | |
| Current Year | 0.46 | 2.12 | 1.89 | 1.07 | 1.17 | 0.90 | 2.33 | 2.25 | 1.44 | 5.63 | 1.91 | 1.47 | 22.64 |
| Avg. 1949 to 1994–95 | 1.56 | 1.35 | 1.53 | 1.61 | 1.49 | 1.15 | 1.16 | 1.47 | 2.28 | 2.89 | 1.66 | 1.56 | 19.71 |
| Mean Temperature (F) | | | | | | | | | | | | | |
| Current Year | 56.3 | 42.8 | 29.7 | 27.1 | 23.6 | 33.7 | 33.1 | 42.6 | 51.6 | 56.3 | 63.1 | 59.5 | 43.3 |
| Avg. 1949 to 1994–95 | 53.5 | 43.3 | 32.5 | 25.4 | 22.4 | 27.7 | 33.9 | 43.3 | 51.8 | 58.3 | 63.9 | 62.9 | 43.2 |

Last killing frost in spring

1995 — May 27 (32 degrees F)
Avg. 1949–95 — May 25

First killing frost in fall

1995 — September 21 (22 degrees F)
Avg. 1949–95 — September 14

Frost Free Period

1995 — 117 days
Avg. 1949–95 — 112 days

Growing Degree Days (base 50):

May 1 – Oct. 31, 1995
Avg. 1949–95

Maximum summer temperature — 88 degrees F on August 6, 1995

Minimum winter temperature — –11 degrees F on January 4, 1995

In this summary 32 degrees is considered a killing frost.

Table 2. Summary of temperature data at the Northwestern Agricultural Research Center on a crop year basis, September 1, 1949 thru August 31, 1995.

Average temperature by month and year
Degrees Fahrenheit

| YEAR | SEPT. | OCT. | NOV. | DEC. | JAN. | FEB. | MAR. | APR. | MAY | JUNE | JULY | AUG. | MEAN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1949–50 | 54.1 | 41.5 | 38.5 | 25.0 | 4.2 | 25.6 | 31.2 | 41.9 | 49.7 | 57.0 | 64.0 | 62.5 | 41.3 |
| 1950–51 | 53.8 | 45.9 | 31.5 | 29.5 | 20.2 | 27.7 | 27.0 | 42.1 | 50.0 | 54.2 | 64.7 | 60.4 | 42.3 |
| 1951–52 | 50.6 | 40.8 | 30.8 | 16.9 | 18.0 | 26.6 | 29.3 | 45.8 | 52.4 | 56.7 | 61.8 | 62.8 | 41.0 |
| 1952–53 | 56.0 | 45.5 | 30.4 | 27.6 | 36.0 | 32.9 | 37.2 | 41.2 | 49.5 | 54.6 | 64.3 | 63.1 | 44.9 |
| 1953–54 | 56.1 | 46.2 | 37.0 | 31.3 | 21.1 | 31.2 | 29.6 | 40.8 | 52.5 | 54.9 | 63.4 | 60.1 | 43.7 |
| 1954–55 | 52.9 | 41.5 | 38.8 | 28.8 | 25.7 | 22.1 | 24.5 | 39.1 | 47.7 | 58.8 | 62.7 | 62.2 | 42.1 |
| 1955–56 | 52.5 | 44.6 | 23.5 | 21.8 | 23.3 | 20.9 | 31.5 | 44.2 | 54.0 | 59.0 | 64.8 | 62.0 | 41.8 |
| 1956–57 | 55.2 | 44.1 | 30.9 | 28.5 | 10.2 | 23.4 | 33.3 | 43.7 | 55.6 | 59.7 | 65.4 | 62.4 | 42.7 |
| 1957–58 | 55.8 | 41.4 | 32.1 | 32.4 | 29.1 | 30.4 | 32.2 | 43.6 | 59.6 | 62.3 | 65.2 | 67.9 | 46.0 |
| 1958–59 | 55.5 | 44.6 | 32.8 | 28.2 | 24.7 | 23.1 | 35.3 | 45.2 | 48.1 | 59.9 | 64.5 | 61.0 | 43.6 |
| 1959–60 | 53.0 | 43.9 | 25.5 | 27.6 | 19.4 | 25.2 | 32.3 | 44.3 | 50.6 | 59.6 | 68.8 | 60.6 | 42.6 |
| 1960–61 | 55.0 | 45.2 | 34.4 | 24.9 | 27.8 | 37.0 | 38.3 | 42.0 | 52.6 | 64.7 | 66.2 | 67.8 | 46.3 |
| 1961–62 | 49.6 | 42.3 | 28.2 | 23.6 | 17.4 | 25.7 | 30.9 | 47.2 | 51.5 | 58.6 | 62.1 | 62.1 | 41.6 |
| 1962–63 | 54.7 | 44.7 | 38.0 | 32.5 | 11.8 | 33.1 | 38.7 | 43.2 | 51.4 | 59.4 | 63.0 | 64.9 | 44.6 |
| 1963–64 | 58.7 | 47.4 | 35.8 | 24.0 | 28.5 | 28.3 | 30.6 | 42.8 | 51.1 | 58.7 | 64.3 | 58.9 | 44.1 |
| 1964–65 | 51.2 | 43.7 | 33.7 | 22.1 | 30.2 | 28.7 | 28.6 | 45.2 | 50.6 | 57.6 | 64.6 | 63.6 | 43.3 |
| 1965–66 | 46.4 | 47.6 | 35.0 | 28.8 | 26.3 | 27.7 | 34.5 | 42.9 | 54.3 | 56.0 | 64.5 | 61.7 | 43.8 |
| 1966–67 | 59.3 | 43.4 | 33.4 | 30.2 | 31.0 | 33.2 | 32.9 | 40.6 | 52.2 | 59.4 | 66.1 | 67.2 | 45.7 |
| 1967–68 | 61.0 | 45.9 | 33.8 | 25.2 | 23.3 | 32.8 | 41.2 | 42.0 | 49.8 | 59.0 | 64.6 | 61.3 | 45.0 |
| 1968–69 | 53.8 | 42.9 | 33.4 | 19.9 | 13.1 | 24.0 | 29.6 | 47.1 | 53.9 | 58.8 | 62.3 | 63.6 | 41.9 |
| 1969–70 | 56.0 | 40.0 | 35.2 | 27.7 | 21.9 | 29.9 | 32.8 | 40.2 | 53.2 | 62.0 | 64.8 | 62.6 | 43.9 |
| 1970–71 | 48.7 | 40.1 | 31.3 | 26.2 | 23.6 | 29.9 | 33.2 | 43.6 | 52.5 | 54.9 | 61.9 | 68.2 | 42.8 |
| 1971–72 | 49.5 | 40.4 | 34.1 | 22.2 | 17.0 | 27.3 | 38.5 | 40.6 | 51.9 | 59.3 | 61.5 | 65.9 | 42.4 |
| 1972–73 | 50.2 | 40.3 | 33.7 | 19.9 | 20.7 | 27.8 | 37.7 | 42.2 | 51.5 | 57.5 | 65.1 | 64.5 | 42.6 |
| 1973–74 | 53.3 | 44.1 | 29.3 | 30.8 | 21.0 | 32.3 | 33.6 | 42.7 | 48.0 | 61.5 | 64.8 | 61.6 | 43.6 |
| 1974–75 | 52.8 | 43.6 | 34.8 | 30.1 | 21.5 | 21.5 | 29.9 | 37.6 | 48.6 | 55.9 | 69.1 | 59.8 | 42.1 |
| 1975–76 | 52.1 | 42.9 | 35.4 | 27.5 | 27.7 | 29.9 | 31.0 | 43.4 | 51.9 | 54.5 | 63.4 | 61.3 | 43.4 |
| 1976–77 | 55.2 | 42.4 | 33.1 | 28.6 | 20.0 | 30.9 | 34.4 | 45.0 | 49.7 | 61.5 | 62.6 | 62.8 | 43.9 |
| 1977–78 | 51.7 | 42.5 | 30.4 | 22.0 | 21.6 | 26.1 | 34.3 | 43.7 | 48.1 | 59.1 | 63.4 | 60.3 | 41.9 |
| 1978–79 | 53.7 | 43.7 | 27.2 | 18.8 | 4.1 | 24.9 | 34.7 | 42.3 | 51.5 | 59.4 | 65.0 | 65.4 | 40.9 |
| 1979–80 | 56.9 | 46.6 | 30.7 | 33.0 | 16.3 | 29.0 | 32.6 | 47.1 | 54.8 | 56.9 | 63.5 | 58.6 | 43.8 |
| 1980–81 | 54.1 | 45.3 | 35.8 | 32.2 | 30.1 | 31.3 | 38.5 | 44.5 | 52.5 | 53.8 | 62.8 | 66.4 | 45.6 |
| 1981–82 | 55.3 | 43.2 | 36.0 | 27.0 | 21.6 | 24.5 | 37.5 | 39.4 | 49.8 | 59.8 | 61.1 | 63.0 | 43.2 |
| 1982–83 | 53.4 | 41.0 | 29.1 | 25.9 | 30.3 | 33.8 | 37.9 | 42.4 | 51.9 | 57.6 | 59.6 | 65.4 | 44.0 |
| 1983–84 | 50.4 | 42.9 | 36.6 | 11.1 | 27.6 | 32.4 | 38.3 | 42.2 | 48.7 | 56.4 | 65.3 | 64.6 | 43.0 |
| 1984–85 | 49.5 | 40.0 | 32.6 | 20.6 | 19.2 | 19.0 | 30.8 | 44.8 | 53.7 | 57.6 | 68.3 | 60.2 | 41.4 |
| 1985–86 | 47.8 | 40.8 | 18.6 | 18.3 | 25.4 | 25.6 | 40.6 | 43.8 | 53.7 | 63.9 | 59.9 | 66.1 | 42.0 |
| 1986–87 | 50.2 | 43.0 | 30.3 | 24.9 | 22.2 | 27.9 | 35.0 | 47.8 | 55.6 | 61.6 | 62.9 | 59.8 | 43.4 |
| 1987–88 | 56.1 | 43.3 | 35.3 | 25.4 | 20.5 | 30.3 | 37.8 | 45.7 | 51.4 | 60.9 | 63.7 | 63.9 | 44.5 |
| 1988–89 | 53.4 | 43.4 | 36.3 | 23.3 | 27.5 | 12.4 | 28.8 | 44.2 | 49.6 | 59.8 | 65.4 | 61.9 | 42.2 |
| 1989–90 | 52.7 | 42.7 | 35.8 | 25.3 | 30.5 | 24.5 | 34.8 | 45.2 | 49.8 | 57.2 | 65.2 | 64.8 | 44.0 |
| 1990–91 | 59.1 | 41.9 | 36.1 | 16.5 | 18.3 | 34.6 | 32.8 | 42.4 | 50.3 | 55.1 | 64.0 | 65.2 | 43.0 |
| 1991–92 | 54.4 | 40.6 | 32.1 | 29.3 | 28.7 | 34.5 | 39.7 | 45.1 | 53.5 | 55.5 | 61.2 | 61.8 | 44.7 |
| 1992–93 | 51.1 | 44.7 | 33.1 | 19.4 | 14.7 | 18.4 | 33.7 | 43.6 | 56.0 | 56.5 | 56.6 | 59.7 | 40.6 |
| 1993–94 | 51.4 | 44.4 | 25.0 | 27.4 | 32.9 | 20.6 | 37.5 | 45.4 | 54.0 | 57.3 | 66.4 | 63.0 | 43.8 |
| 1994–95 | 56.3 | 42.8 | 29.7 | 27.1 | 23.6 | 33.7 | 33.1 | 42.6 | 51.6 | 56.3 | 63.1 | 59.5 | 43.3 |
| MEAN | 53.5 | 43.3 | 32.5 | 25.4 | 22.4 | 27.7 | 33.9 | 43.3 | 51.8 | 58.3 | 63.9 | 62.9 | 43.2 |

Mean temperature for all years = 43.2

Table 3. Summary of temperature data at the Northwestern Agricultural Research Center on a crop year basis, September 1, 1949 thru August 31, 1995.

Average maximum temperature by month and year
Degrees Fahrenheit

| YEAR | SEPT. | OCT. | NOV. | DEC. | JAN. | FEB. | MAR. | APR. | MAY | JUNE | JULY | AUG. | MEAN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1949–50 | 71.4 | 52.4 | 45.7 | 32.1 | 14.4 | 34.6 | 38.4 | 52.3 | 63.1 | 70.1 | 78.6 | 79.5 | 52.7 |
| 1950–51 | 70.9 | 55.8 | 38.2 | 36.3 | 28.7 | 36.6 | 37.3 | 57.9 | 63.2 | 66.6 | 82.4 | 77.0 | 54.2 |
| 1951–52 | 64.2 | 47.5 | 37.2 | 23.6 | 25.9 | 35.7 | 39.5 | 61.8 | 65.7 | 70.2 | 79.2 | 79.5 | 52.5 |
| 1952–53 | 73.4 | 62.6 | 40.6 | 33.2 | 41.3 | 39.1 | 46.8 | 51.5 | 62.5 | 66.8 | 83.3 | 79.5 | 56.7 |
| 1953–54 | 72.3 | 61.0 | 45.6 | 36.7 | 29.1 | 38.4 | 40.0 | 51.0 | 67.2 | 67.0 | 80.1 | 74.4 | 55.2 |
| 1954–55 | 66.4 | 53.4 | 45.9 | 34.9 | 31.8 | 31.2 | 33.9 | 48.1 | 60.5 | 74.7 | 76.9 | 82.4 | 53.3 |
| 1955–56 | 67.6 | 55.5 | 30.8 | 29.2 | 30.7 | 30.1 | 39.7 | 57.4 | 67.5 | 73.3 | 81.2 | 77.8 | 53.4 |
| 1956–57 | 71.0 | 53.7 | 37.6 | 35.5 | 19.0 | 33.2 | 43.3 | 55.3 | 70.2 | 72.4 | 82.1 | 80.0 | 54.4 |
| 1957–58 | 74.3 | 50.5 | 40.1 | 38.5 | 33.7 | 37.9 | 43.5 | 54.4 | 77.5 | 75.7 | 80.8 | 85.5 | 57.7 |
| 1958–59 | 69.7 | 57.9 | 39.6 | 34.1 | 31.8 | 31.9 | 43.9 | 57.9 | 61.5 | 74.3 | 83.2 | 76.3 | 55.2 |
| 1959–60 | 64.0 | 53.6 | 33.9 | 33.3 | 27.5 | 34.1 | 43.4 | 56.1 | 63.0 | 74.8 | 88.7 | 74.1 | 53.9 |
| 1960–61 | 72.1 | 57.8 | 41.1 | 29.8 | 35.0 | 43.1 | 48.2 | 51.6 | 65.3 | 82.0 | 83.7 | 86.3 | 58.0 |
| 1961–62 | 62.3 | 53.3 | 35.1 | 30.4 | 26.0 | 33.4 | 40.5 | 60.7 | 62.7 | 74.2 | 79.2 | 77.5 | 52.9 |
| 1962–63 | 71.7 | 54.7 | 43.8 | 37.9 | 19.9 | 41.4 | 48.9 | 55.7 | 67.1 | 71.8 | 79.6 | 82.5 | 56.3 |
| 1963–64 | 74.6 | 59.4 | 43.4 | 30.2 | 35.1 | 37.7 | 39.7 | 53.3 | 63.5 | 71.4 | 80.3 | 72.9 | 55.1 |
| 1964–65 | 63.9 | 55.0 | 41.0 | 28.9 | 35.1 | 36.9 | 41.0 | 57.6 | 64.3 | 71.4 | 80.8 | 77.1 | 54.4 |
| 1965–66 | 57.5 | 61.1 | 42.6 | 35.4 | 31.8 | 35.3 | 45.4 | 54.8 | 69.8 | 69.1 | 81.2 | 78.4 | 55.2 |
| 1966–67 | 74.9 | 55.1 | 41.1 | 35.8 | 36.7 | 40.9 | 41.3 | 52.6 | 66.0 | 73.3 | 84.8 | 87.2 | 57.5 |
| 1967–68 | 78.9 | 55.8 | 41.3 | 30.8 | 31.5 | 40.8 | 52.6 | 54.2 | 63.4 | 72.2 | 82.7 | 75.7 | 56.7 |
| 1968–69 | 65.9 | 53.1 | 40.6 | 27.3 | 20.8 | 32.5 | 40.9 | 59.5 | 68.7 | 72.0 | 78.9 | 83.0 | 53.6 |
| 1969–70 | 70.4 | 49.7 | 43.0 | 32.8 | 28.5 | 36.2 | 42.5 | 49.7 | 67.9 | 75.5 | 79.1 | 80.9 | 54.7 |
| 1970–71 | 62.5 | 52.2 | 40.0 | 34.1 | 30.6 | 38.6 | 41.6 | 56.2 | 66.4 | 67.3 | 78.0 | 87.5 | 54.6 |
| 1971–72 | 64.2 | 53.1 | 41.2 | 30.9 | 27.1 | 35.9 | 47.9 | 51.7 | 64.7 | 72.4 | 76.9 | 83.3 | 54.1 |
| 1972–73 | 64.0 | 51.3 | 41.4 | 28.6 | 30.6 | 38.5 | 47.7 | 53.8 | 65.8 | 69.6 | 83.7 | 83.2 | 54.9 |
| 1973–74 | 67.6 | 56.3 | 36.8 | 36.5 | 28.5 | 39.6 | 43.5 | 53.1 | 59.2 | 76.2 | 80.3 | 77.6 | 54.6 |
| 1974–75 | 70.9 | 61.4 | 43.2 | 37.4 | 32.0 | 31.5 | 39.4 | 48.1 | 61.2 | 68.5 | 85.5 | 73.0 | 54.3 |
| 1975–76 | 69.4 | 52.3 | 40.4 | 35.1 | 36.2 | 37.6 | 40.1 | 54.3 | 66.2 | 66.3 | 79.0 | 74.4 | 54.3 |
| 1976–77 | 73.2 | 57.7 | 42.1 | 36.1 | 28.0 | 39.1 | 42.7 | 60.2 | 61.9 | 77.0 | 76.6 | 77.4 | 56.0 |
| 1977–78 | 64.7 | 55.4 | 38.5 | 29.4 | 28.8 | 35.5 | 45.5 | 54.3 | 58.1 | 72.6 | 77.5 | 74.2 | 52.9 |
| 1978–79 | 65.7 | 59.2 | 35.9 | 28.2 | 13.7 | 33.2 | 45.3 | 52.5 | 64.3 | 73.9 | 81.5 | 82.8 | 53.0 |
| 1979–80 | 74.1 | 59.5 | 37.8 | 39.2 | 25.2 | 35.9 | 40.8 | 60.4 | 66.9 | 69.0 | 77.0 | 73.2 | 54.9 |
| 1980–81 | 66.9 | 59.0 | 43.9 | 39.2 | 34.0 | 38.9 | 49.7 | 54.8 | 63.3 | 63.8 | 78.1 | 85.0 | 56.4 |
| 1981–82 | 70.8 | 54.1 | 44.9 | 34.2 | 29.7 | 33.3 | 45.8 | 50.5 | 62.5 | 74.3 | 75.0 | 80.6 | 54.6 |
| 1982–83 | 69.2 | 53.2 | 36.9 | 33.0 | 36.8 | 42.2 | 47.5 | 55.2 | 66.4 | 70.6 | 73.1 | 82.9 | 55.6 |
| 1983–84 | 65.1 | 56.0 | 43.7 | 19.9 | 34.6 | 40.8 | 46.8 | 54.2 | 60.4 | 69.1 | 82.8 | 83.3 | 54.7 |
| 1984–85 | 63.9 | 52.2 | 40.4 | 28.2 | 25.3 | 29.1 | 42.7 | 56.8 | 68.7 | 73.2 | 88.0 | 75.0 | 53.6 |
| 1985–86 | 60.4 | 51.3 | 26.7 | 25.2 | 34.0 | 36.6 | 51.6 | 55.1 | 66.1 | 78.5 | 73.0 | 84.1 | 53.6 |
| 1986–87 | 59.9 | 54.3 | 38.0 | 30.9 | 29.5 | 34.2 | 43.4 | 61.3 | 67.9 | 75.7 | 76.5 | 74.9 | 53.9 |
| 1987–88 | 73.5 | 59.9 | 43.0 | 32.6 | 29.0 | 39.3 | 46.1 | 58.5 | 63.8 | 74.1 | 79.5 | 82.6 | 56.8 |
| 1988–89 | 69.0 | 62.0 | 42.7 | 30.3 | 35.3 | 21.8 | 36.1 | 56.6 | 61.1 | 72.6 | 81.6 | 75.0 | 53.7 |
| 1989–90 | 68.5 | 54.0 | 42.4 | 30.5 | 36.4 | 33.9 | 44.8 | 57.3 | 60.5 | 68.9 | 79.7 | 79.5 | 54.7 |
| 1990–91 | 77.9 | 53.0 | 43.8 | 24.1 | 25.6 | 42.5 | 41.6 | 54.0 | 61.7 | 65.5 | 78.2 | 81.6 | 54.1 |
| 1991–92 | 70.9 | 56.1 | 38.6 | 33.7 | 35.1 | 42.7 | 52.7 | 57.7 | 67.7 | 67.8 | 73.1 | 78.0 | 56.2 |
| 1992–93 | 64.9 | 57.4 | 38.0 | 27.2 | 22.4 | 27.0 | 43.7 | 52.8 | 69.7 | 67.8 | 66.2 | 73.8 | 50.9 |
| 1993–94 | 66.6 | 56.8 | 33.5 | 33.3 | 38.9 | 30.2 | 48.9 | 57.4 | 66.7 | 70.5 | 83.0 | 85.0 | 55.9 |
| 1994–95 | 74.0 | 54.1 | 36.4 | 33.1 | 29.3 | 43.3 | 42.9 | 52.7 | 63.9 | 67.6 | 75.5 | 74.1 | 53.9 |
| MEAN | 68.6 | 55.5 | 40.0 | 32.1 | 29.8 | 36.1 | 43.7 | 55.1 | 64.9 | 71.6 | 79.7 | 79.3 | 54.7 |

Mean temperature for all years = 54.7

Table 4. Summary of temperature data at the Northwestern Agricultural Research Center on crop year basis September 1, 1949 through August 31, 1995.

Average minimum temperature by month and year
Degrees Fahrenheit

| YEAR | SEPT. | OCT. | NOV. | DEC. | JAN. | FEB. | MAR. | APR. | MAY | JUNE | JULY | AUG. | MEAN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1949–50 | 36.7 | 35.0 | 31.2 | 17.8 | −6.0 | 16.6 | 23.9 | 31.5 | 36.3 | 43.9 | 49.4 | 45.5 | 30.2 |
| 1959–51 | 36.6 | 36.0 | 24.8 | 22.6 | 11.7 | 18.8 | 16.6 | 26.2 | 36.7 | 41.7 | 46.9 | 43.7 | 30.2 |
| 1951–52 | 37.0 | 34.0 | 24.4 | 10.1 | 10.0 | 17.4 | 19.1 | 29.8 | 39.1 | 43.1 | 44.3 | 46.1 | 29.5 |
| 1952–53 | 38.6 | 28.3 | 20.2 | 21.9 | 30.6 | 26.7 | 27.5 | 30.9 | 36.5 | 42.3 | 45.3 | 46.7 | 33.0 |
| 1953–54 | 39.8 | 31.4 | 28.4 | 25.9 | 13.1 | 24.0 | 19.2 | 30.6 | 37.7 | 42.8 | 46.7 | 45.7 | 32.1 |
| 1954–55 | 39.3 | 29.5 | 31.6 | 22.7 | 19.5 | 13.0 | 15.0 | 30.0 | 34.9 | 42.8 | 48.5 | 42.0 | 30.7 |
| 1955–56 | 37.3 | 33.6 | 16.1 | 14.4 | 15.9 | 11.7 | 23.3 | 30.9 | 40.5 | 44.7 | 48.2 | 46.1 | 30.2 |
| 1956–57 | 39.4 | 34.4 | 24.2 | 21.5 | 1.4 | 13.6 | 23.2 | 32.0 | 40.9 | 47.0 | 48.7 | 44.8 | 30.9 |
| 1957–58 | 37.2 | 32.3 | 24.1 | 26.2 | 24.5 | 22.8 | 20.9 | 32.8 | 41.7 | 48.8 | 49.5 | 50.3 | 34.3 |
| 1958–59 | 41.2 | 31.2 | 26.0 | 22.2 | 17.5 | 14.2 | 26.6 | 32.4 | 34.7 | 45.4 | 45.8 | 45.6 | 31.9 |
| 1959–60 | 42.0 | 34.1 | 17.0 | 21.8 | 11.2 | 16.3 | 21.1 | 32.4 | 38.1 | 44.3 | 48.8 | 47.0 | 31.2 |
| 1960–61 | 37.9 | 32.5 | 27.6 | 19.9 | 20.6 | 30.9 | 28.4 | 32.3 | 39.8 | 47.4 | 48.7 | 49.2 | 34.6 |
| 1961–62 | 36.8 | 31.2 | 21.2 | 16.8 | 8.7 | 17.9 | 21.2 | 33.7 | 40.3 | 43.0 | 45.0 | 46.6 | 30.2 |
| 1962–63 | 37.6 | 34.6 | 32.2 | 27.1 | 3.7 | 24.7 | 28.4 | 30.6 | 35.7 | 47.0 | 46.4 | 46.9 | 32.9 |
| 1963–64 | 42.7 | 35.3 | 28.1 | 17.7 | 21.8 | 18.9 | 21.4 | 32.2 | 38.6 | 46.0 | 48.3 | 44.9 | 33.0 |
| 1964–65 | 38.4 | 32.3 | 26.4 | 15.3 | 25.3 | 20.4 | 16.2 | 32.7 | 36.9 | 43.8 | 48.4 | 50.0 | 32.2 |
| 1965–66 | 35.2 | 34.0 | 27.4 | 22.1 | 20.8 | 20.0 | 23.6 | 30.9 | 38.7 | 42.8 | 47.7 | 45.0 | 32.4 |
| 1966–67 | 43.6 | 31.7 | 25.6 | 24.6 | 25.3 | 25.5 | 24.5 | 28.6 | 38.4 | 45.4 | 47.4 | 47.2 | 34.0 |
| 1967–68 | 43.1 | 35.9 | 26.3 | 19.4 | 15.0 | 24.8 | 29.7 | 29.8 | 36.1 | 45.7 | 46.4 | 46.8 | 33.3 |
| 1968–69 | 41.7 | 32.6 | 26.1 | 12.5 | 5.4 | 15.4 | 18.2 | 34.6 | 39.0 | 45.5 | 45.7 | 43.5 | 30.0 |
| 1969–70 | 41.6 | 30.3 | 27.4 | 22.6 | 15.3 | 23.4 | 23.0 | 30.7 | 38.5 | 48.2 | 50.5 | 44.3 | 33.0 |
| 1970–71 | 34.9 | 27.9 | 22.5 | 18.3 | 16.5 | 21.0 | 24.8 | 31.0 | 38.6 | 42.3 | 45.7 | 48.8 | 31.0 |
| 1971–72 | 34.7 | 27.6 | 26.9 | 13.5 | 7.7 | 18.6 | 29.0 | 29.0 | 39.2 | 46.3 | 45.8 | 48.5 | 30.6 |
| 1972–73 | 36.4 | 29.2 | 25.9 | 11.1 | 11.0 | 17.4 | 27.8 | 29.6 | 36.4 | 44.4 | 46.5 | 45.8 | 30.1 |
| 1973–74 | 38.9 | 32.0 | 21.8 | 25.2 | 13.5 | 25.1 | 23.6 | 32.4 | 36.7 | 46.9 | 49.5 | 45.6 | 32.6 |
| 1974–75 | 34.7 | 25.7 | 26.3 | 22.9 | 10.9 | 11.5 | 20.4 | 27.1 | 36.1 | 43.3 | 52.7 | 46.5 | 29.8 |
| 1975–76 | 34.7 | 33.4 | 30.3 | 20.0 | 19.1 | 22.2 | 22.0 | 32.4 | 37.6 | 42.6 | 47.8 | 48.3 | 32.5 |
| 1976–77 | 37.2 | 27.2 | 24.1 | 21.1 | 12.0 | 22.6 | 26.1 | 29.9 | 37.4 | 46.0 | 48.5 | 48.2 | 31.7 |
| 1977–78 | 38.6 | 29.5 | 22.2 | 14.6 | 14.5 | 16.7 | 23.2 | 33.1 | 38.1 | 45.6 | 49.2 | 46.4 | 31.0 |
| 1978–79 | 41.7 | 28.3 | 18.4 | 9.3 | −5.6 | 16.5 | 24.0 | 32.1 | 38.7 | 44.9 | 48.5 | 48.0 | 28.7 |
| 1979–80 | 39.7 | 33.7 | 23.6 | 26.8 | 7.5 | 22.1 | 24.5 | 33.7 | 42.7 | 44.7 | 50.0 | 44.0 | 32.8 |
| 1980–81 | 41.3 | 31.6 | 27.7 | 25.1 | 26.2 | 23.8 | 27.2 | 34.2 | 41.7 | 43.7 | 47.6 | 47.8 | 34.8 |
| 1981–82 | 39.7 | 32.2 | 27.0 | 19.8 | 13.5 | 15.7 | 29.2 | 28.4 | 37.2 | 45.3 | 47.3 | 45.4 | 31.7 |
| 1982–83 | 37.6 | 28.8 | 21.4 | 18.7 | 23.7 | 25.3 | 28.4 | 29.5 | 37.5 | 44.7 | 46.1 | 48.0 | 32.5 |
| 1983–84 | 35.6 | 29.7 | 29.5 | 2.4 | 20.6 | 24.0 | 29.9 | 30.2 | 37.1 | 43.6 | 47.8 | 46.0 | 31.4 |
| 1984–85 | 35.2 | 27.7 | 24.7 | 13.0 | 13.2 | 9.0 | 18.8 | 32.7 | 38.7 | 42.0 | 48.5 | 45.5 | 29.1 |
| 1985–86 | 35.2 | 30.2 | 10.6 | 11.4 | 16.9 | 14.5 | 29.6 | 32.5 | 41.3 | 49.3 | 46.8 | 48.1 | 30.5 |
| 1986–87 | 40.5 | 31.6 | 22.6 | 18.8 | 14.9 | 21.6 | 26.6 | 34.2 | 43.3 | 47.4 | 49.4 | 44.7 | 33.0 |
| 1987–88 | 38.7 | 26.5 | 27.6 | 18.1 | 11.5 | 21.3 | 29.5 | 33.0 | 39.0 | 47.7 | 47.9 | 45.2 | 32.2 |
| 1988–89 | 38.6 | 32.9 | 29.8 | 16.3 | 19.7 | 2.9 | 21.4 | 31.8 | 38.1 | 46.9 | 49.3 | 48.7 | 31.4 |
| 1989–90 | 36.9 | 31.3 | 29.3 | 20.1 | 24.7 | 15.2 | 24.7 | 33.2 | 39.1 | 45.4 | 50.6 | 50.0 | 33.4 |
| 1990–91 | 40.4 | 30.9 | 28.4 | 8.8 | 11.0 | 26.6 | 24.0 | 30.8 | 39.0 | 44.7 | 49.8 | 48.8 | 31.9 |
| 1991–92 | 37.9 | 25.1 | 25.6 | 25.0 | 22.4 | 26.3 | 26.8 | 32.6 | 39.2 | 43.2 | 49.3 | 45.7 | 33.3 |
| 1992–93 | 37.4 | 32.0 | 28.1 | 11.6 | 7.0 | 9.8 | 23.8 | 34.5 | 42.3 | 45.2 | 47.0 | 45.6 | 30.4 |
| 1993–94 | 36.3 | 32.0 | 16.6 | 21.5 | 27.0 | 11.0 | 26.2 | 33.4 | 41.3 | 44.1 | 49.8 | 48.3 | 32.3 |
| 1994–95 | 38.6 | 31.6 | 23.0 | 21.1 | 17.9 | 24.2 | 23.4 | 32.5 | 39.3 | 45.1 | 50.8 | 45.0 | 32.7 |
| MEAN | 38.4 | 31.2 | 24.9 | 18.7 | 15.4 | 19.2 | 24.0 | 31.5 | 38.6 | 45.0 | 48.0 | 46.6 | 31.8 |

Mean temperature for all years = 31.8

Table 5. Summary of precipitation records at the Northwestern Agricultural Research Center on a crop year basis, September 1, 1949 through August 31, 1995.

| | Total precipitation in inches by month and year | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| YEAR | SEPT. | OCT. | NOV. | DEC. | JAN. | FEB. | MAR. | APR. | MAY | JUNE | JULY | AUG. | MEAN |
| 1949–50 | 1.03 | 1.05 | 1.67 | 0.92 | 2.62 | 1.13 | 2.31 | 0.84 | 0.15 | 3.90 | 3.12 | 0.75 | 19.49 |
| 1950–51 | 0.52 | 2.30 | 1.16 | 2.48 | 0.94 | 1.29 | 0.62 | 2.32 | 3.77 | 2.26 | 1.03 | 2.86 | 21.55 |
| 1951–52 | 1.49 | 5.62 | 1.01 | 3.31 | 1.03 | 0.98 | 0.97 | 0.17 | 1.32 | 3.95 | 0.56 | 0.69 | 21.10 |
| 1952–53 | 0.13 | 0.05 | 0.60 | 0.98 | 1.84 | 1.14 | 0.98 | 2.07 | 2.00 | 3.31 | T | 1.62 | 14.72 |
| 1953–54 | 0.71 | 0.03 | 0.87 | 1.30 | 2.65 | 0.79 | 0.83 | 0.79 | 1.52 | 2.98 | 2.91 | 3.79 | 19.17 |
| 1954–55 | 1.09 | 0.54 | 1.00 | 0.43 | 1.00 | 1.31 | 0.44 | 0.82 | 1.18 | 1.86 | 3.08 | 0.00 | 12.75 |
| 1955–56 | 1.64 | 1.89 | 1.97 | 2.38 | 1.76 | 1.53 | 0.87 | 1.28 | 1.06 | 4.20 | 2.13 | 3.21 | 23.92 |
| 1956–57 | 1.16 | 1.10 | 0.53 | 0.96 | 1.47 | 1.14 | 0.75 | 1.22 | 1.75 | 2.51 | 0.52 | 0.78 | 13.89 |
| 1957–58 | 0.10 | 1.59 | 0.96 | 1.76 | 1.56 | 2.67 | 0.97 | 1.47 | 2.20 | 2.56 | 0.84 | 0.58 | 17.26 |
| 1958–59 | 1.99 | 1.16 | 2.90 | 2.77 | 1.95 | 1.33 | 0.75 | 1.62 | 4.10 | 1.75 | T | 0.91 | 21.23 |
| 1959–60 | 4.22 | 3.36 | 4.32 | 0.34 | 1.67 | 1.10 | 1.01 | 1.23 | 3.27 | 0.69 | 0.13 | 2.43 | 23.77 |
| 1960–61 | 0.55 | 1.44 | 1.72 | 1.24 | 0.65 | 1.46 | 1.96 | 2.26 | 4.02 | 1.45 | 0.76 | 0.64 | 18.15 |
| 1961–62 | 3.40 | 1.22 | 1.77 | 2.09 | 1.33 | 1.15 | 1.59 | 0.96 | 2.59 | 1.15 | 0.11 | 0.72 | 18.08 |
| 1962–63 | 0.58 | 1.85 | 1.31 | 0.91 | 1.69 | 1.21 | 0.85 | 1.07 | 0.57 | 5.00 | 1.44 | 2.10 | 18.58 |
| 1963–64 | 1.46 | 0.75 | 0.95 | 1.70 | 1.46 | 0.41 | 1.57 | 0.87 | 3.33 | 3.86 | 3.01 | 1.64 | 21.01 |
| 1964–65 | 2.27 | 0.85 | 1.62 | 3.62 | 2.25 | 0.64 | 0.24 | 2.55 | 0.81 | 2.30 | 1.15 | 4.74 | 23.04 |
| 1965–66 | 1.72 | 0.21 | 1.31 | 0.55 | 1.42 | 0.67 | 0.53 | 0.76 | 1.18 | 6.57 | 2.49 | 1.64 | 19.05 |
| 1966–67 | 0.79 | 1.34 | 3.33 | 1.68 | 1.50 | 0.62 | 1.27 | 0.99 | 1.30 | 2.53 | 0.02 | 0.01 | 15.38 |
| 1967–68 | 0.91 | 1.88 | 0.62 | 1.16 | 0.79 | 1.15 | 0.68 | 0.57 | 3.92 | 2.22 | 1.00 | 3.42 | 18.32 |
| 1968–69 | 4.51 | 2.39 | 1.59 | 3.12 | 3.05 | 0.75 | 0.69 | 1.39 | 1.19 | 5.21 | 0.70 | 0.09 | 24.68 |
| 1969–70 | 1.54 | 1.90 | 0.31 | 1.14 | 3.10 | 0.89 | 1.49 | 0.76 | 1.97 | 4.37 | 3.08 | 0.44 | 20.99 |
| 1970–71 | 1.79 | 1.38 | 1.75 | 0.99 | 1.84 | 0.77 | 0.69 | 0.58 | 2.45 | 4.42 | 1.31 | 1.11 | 19.08 |
| 1971–72 | 0.94 | 0.87 | 1.70 | 1.62 | 1.10 | 1.65 | 2.11 | 0.95 | 1.48 | 3.28 | 1.77 | 0.98 | 18.45 |
| 1972–73 | 1.38 | 1.84 | 0.80 | 2.19 | 0.52 | 0.56 | 0.70 | 0.45 | 1.13 | 2.14 | 0.01 | 0.63 | 12.35 |
| 1973–74 | 1.37 | 1.41 | 2.95 | 1.94 | 1.35 | 1.32 | 1.40 | 3.36 | 1.82 | 1.80 | 1.01 | 0.62 | 20.35 |
| 1974–75 | 0.80 | 0.12 | 1.10 | 1.31 | 1.56 | 1.08 | 1.50 | 1.27 | 1.50 | 1.40 | 1.08 | 4.26 | 16.98 |
| 1975–76 | 1.18 | 2.96 | 0.85 | 1.39 | 0.91 | 1.12 | 0.34 | 1.92 | 1.90 | 2.49 | 1.49 | 3.42 | 19.97 |
| 1976–77 | 0.96 | 0.62 | 0.73 | 0.86 | 0.83 | 0.71 | 1.40 | 0.41 | 2.90 | 0.52 | 3.60 | 1.50 | 15.04 |
| 1977–78 | 2.84 | 0.56 | 1.62 | 4.10 | 2.15 | 0.99 | 0.72 | 2.54 | 3.56 | 2.63 | 3.90 | 3.34 | 28.95 |
| 1978–79 | 1.90 | 0.15 | 0.96 | 0.91 | 1.70 | 1.45 | 0.82 | 2.33 | 2.67 | 1.23 | 0.40 | 1.79 | 16.31 |
| 1979–80 | 1.03 | 1.75 | 0.50 | 1.03 | 1.53 | 2.03 | 0.97 | 1.88 | 5.48 | 3.89 | 1.08 | 2.45 | 23.62 |
| 1980–81 | 1.20 | 0.83 | 0.78 | 2.58 | 1.81 | 1.85 | 2.17 | 1.75 | 3.86 | 4.70 | 1.17 | 0.96 | 23.66 |
| 1981–82 | 0.77 | 0.56 | 1.49 | 1.91 | 2.38 | 1.48 | 1.16 | 1.60 | 1.25 | 2.41 | 2.06 | 1.17 | 18.24 |
| 1982–83 | 2.37 | 0.75 | 1.39 | 1.60 | 0.93 | 0.85 | 1.71 | 2.41 | 1.20 | 2.96 | 3.66 | 1.16 | 20.99 |
| 1983–84 | 1.70 | 1.13 | 1.96 | 2.57 | 0.80 | 2.19 | 1.81 | 1.93 | 2.91 | 2.07 | 0.31 | 0.55 | 19.93 |
| 1984–85 | 2.15 | 2.25 | 1.40 | 1.29 | 0.31 | 1.28 | 0.90 | 1.31 | 2.81 | 1.89 | 0.35 | 1.62 | 17.56 |
| 1985–86 | 5.35 | 1.55 | 1.61 | 0.51 | 2.39 | 2.33 | 0.50 | 1.34 | 2.92 | 1.83 | 2.09 | 0.81 | 23.23 |
| 1986–87 | 3.63 | 0.80 | 1.78 | 0.63 | 0.38 | 0.46 | 3.47 | 1.15 | 1.89 | 1.95 | 4.85 | 0.98 | 21.97 |
| 1987–88 | 0.81 | 0.12 | 0.91 | 1.18 | 0.98 | 1.03 | 0.77 | 1.36 | 3.60 | 1.98 | 1.07 | 0.13 | 13.94 |
| 1988–89 | 2.30 | 0.62 | 1.39 | 1.69 | 1.39 | 1.48 | 2.29 | 1.09 | 2.70 | 2.05 | 2.70 | 3.69 | 23.39 |
| 1989–90 | 1.50 | 2.29 | 3.75 | 1.92 | 0.96 | 1.00 | 1.76 | 1.63 | 3.74 | 2.68 | 2.34 | 2.44 | 26.01 |
| 1990–91 | T | 2.32 | 1.37 | 2.60 | 1.41 | 0.41 | 0.72 | 1.21 | 2.72 | 5.36 | 0.77 | 1.15 | 20.04 |
| 1991–92 | 0.80 | 0.75 | 2.26 | 0.58 | 1.17 | 0.61 | 0.83 | 1.18 | 1.65 | 5.34 | 2.24 | 0.94 | 18.35 |
| 1992–93 | 1.21 | 1.07 | 2.37 | 1.53 | 1.68 | 0.60 | 0.73 | 3.77 | 2.22 | 4.00 | 7.00 | 1.19 | 27.37 |
| 1993–94 | 1.54 | 0.83 | 1.23 | 1.27 | 1.43 | 1.49 | 0.11 | 2.01 | 1.79 | 2.59 | 0.10 | 0.23 | 14.62 |
| 1994–95 | 0.46 | 2.12 | 1.89 | 1.07 | 1.17 | 0.90 | 2.33 | 2.25 | 1.44 | 5.63 | 1.91 | 1.47 | 22.64 |
| MEAN | 1.56 | 1.35 | 1.52 | 1.61 | 1.49 | 1.15 | 1.16 | 1.47 | 2.28 | 2.95 | 1.66 | 1.56 | 19.76 |

Mean precipitation for all crop years = 19.76

Table 7. Frost free period at the Northwestern Agricultural Research Center from 1950 thru 1995.

| YEAR | DATE LAST FREEZE | TEMPERATURE DEGREE F | DATE FIRST FREEZE | TEMPERATURE DEGREES F | FROST FREE SEASON |
|---|---|---|---|---|---|
| 1950 | June 10 | 32 | Sept. 11 | 29 | 93 |
| 1951 | June 1 | 29 | Sept. 15 | 29 | 106 |
| 1952 | June 14 | 32 | Sept. 8 | 29 | 86 |
| 1953 | May 23 | 32 | Sept. 16 | 31 | 116 |
| 1954 | May 29 | 31 | Sept. 30 | 26 | 124 |
| 1955 | May 25 | 28 | Sept. 13 | 31 | 111 |
| 1956 | May 3 | 26 | Sept. 2 | 32 | 122 |
| 1957 | May 23 | 30 | Sept. 9 | 30 | 109 |
| 1958 | May 14 | 31 | Sept. 27 | 31 | 136 |
| 1959 | June 11 | 32 | Aug. 30 | 30 | 80 |
| 1960 | June 18 | 32 | Sept. 6 | 32 | 80 |
| 1961 | May 6 | 32 | Sept. 12 | 29 | 129 |
| 1962 | May 30 | 32 | Sept. 3 | 25 | 96 |
| 1963 | May 22 | 28 | Sept. 18 | 32 | 119 |
| 1964 | May 25 | 26 | Sept. 11 | 28 | 109 |
| 1965 | June 7 | 30 | Sept. 6 | 31 | 91 |
| 1966 | May 18 | 26 | Sept. 30 | 28 | 135 |
| 1967 | May 26 | 28 | Sept. 23 | 32 | 120 |
| 1968 | May 20 | 32 | Sept. 21 | 32 | 124 |
| 1969 | June 13 | 28 | Sept. 6 | 32 | 85 |
| 1970 | May 11 | 32 | Sept. 10 | 31 | 122 |
| 1971 | July 7 | 32 | Sept. 14 | 28 | 69 |
| 1972 | May 4 | 32 | Sept. 12 | 32 | 131 |
| 1973 | May 22 | 31 | Sept. 2 | 31 | 103 |
| 1974 | May 18 | 31 | Sept. 2 | 30 | 107 |
| 1975 | May 25 | 32 | Sept. 12 | 32 | 110 |
| 1976 | May 21 | 30 | Sept. 8 | 30 | 110 |
| 1977 | May 16 | 29 | Sept. 27 | 28 | 133 |
| 1978 | May 23 | 31 | Sept. 17 | 28 | 116 |
| 1979 | May 30 | 31 | Oct. 1 | 32 | 123 |
| 1980 | June 4 | 32 | Sept. 24 | 31 | 111 |
| 1981 | May 5 | 28 | Sept. 24 | 25 | 142 |
| 1982 | May 30 | 31 | Sept. 15 | 23 | 108 |
| 1983 | May 15 | 31 | Sept. 6 | 31 | 114 |
| 1984 | June 2 | 32 | Sept. 13 | 30 | 103 |
| 1985 | May 13 | 26 | Sept. 7 | 32 | 117 |
| 1986 | May 16 | 31 | Sept. 7 | 31 | 114 |
| 1987 | May 22 | 28 | Sept. 17 | 29 | 117 |
| 1988 | May 3 | 30 | Sept. 12 | 30 | 131 |
| 1989 | May 21 | 32 | Sept. 9 | 29 | 110 |
| 1990 | May 10 | 31 | Oct. 6 | 24 | 149 |
| 1991 | May 27 | 32 | Sept. 19 | 32 | 115 |
| 1992 | May 17 | 30 | Aug. 24 | 32 | 99 |
| 1993 | May 4 | 32 | Sept. 13 | 29 | 132 |
| 1994 | April 30 | 31 | Sept. 12 | 32 | 135 |
| 1995 | May 27 | 32 | Sept. 21 | 22 | 117 |
| Mean for years | May 24 | 30 | Sept. 14 | 30 | 112 |

Table 8. Temperature extremes at the Northwestern Agricultural Research Center, Kalispell, MT from 1950–95.

| | MINIMUM | | MAXIMUM | |
|---|---|---|---|---|
| YEAR | DATE | TEMPERATURE DEGREES F | DATE | TEMPERATURE DEGREES F |
| 1950 | Jan. 30 | −40 | Aug. 31 | 88 |
| 1951 | Jan. 28 | −25 | Aug. 2 | 92 |
| 1952 | Jan. 1 | −14 | Aug. 31 | 90 |
| 1953 | Jan. 6 | 8 | July 12 | 97 |
| 1954 | Jan. 20 | −32 | July 6 | 90 |
| 1955 | Mar. 5 | −20 | June 22 | 96 |
| 1956 | Feb. 16 | −25 | July 22 | 90 |
| 1957 | Jan. 26 | −34 | July 13 | 91 |
| 1958 | Jan. 1 | 2 | Aug. 11 | 94 |
| 1959 | Nov. 16 | −30 | July 23 | 96 |
| 1960 | Mar. 3 | −32 | July 19 | 98 |
| 1961 | Jan. 2 | 0 | Aug. 4 | 100 |
| 1962 | Jan. 21 | −32 | Aug. 16 | 92 |
| 1963 | Jan. 30 | −24 | Aug. 9 | 94 |
| 1964 | Dec. 17 | −28 | July 8 | 91 |
| 1965 | Mar. 24 | −10 | July 31 | 89 |
| 1966 | Mar. 4 | − 7 | Aug. 2,25 | 91 |
| 1967 | Jan. 24 | 2 | Aug. 19 | 95 |
| 1968 | Jan. 21 | −23 | July 7 | 94 |
| 1969 | Jan. 25 | −13 | Aug. 24 | 97 |
| 1970 | Jan. 15 | −14 | Aug. 21,25 | 92 |
| 1971 | Jan. 12 | − 8 | Aug. 6, 9 | 96 |
| 1972 | Jan. 28 | −24 | Aug. 9,10 | 92 |
| 1973 | Jan. 11 | −22 | July 11 | 97 |
| 1974 | Jan. 5 | −18 | June 16,20 | 93 |
| 1975 | Jan. 12, Feb. 9 | −16 | July 12 | 96 |
| 1976 | Feb. 5 | − 4 | July 27 | 90 |
| 1977 | Dec. 31 | −11 | June 7 | 97 |
| 1978 | Dec. 31 | −31 | July 16 | 91 |
| 1979 | Jan. 1 | −31 | July 20 | 97 |
| 1980 | Jan. 29 | −20 | July 23 | 92 |
| 1981 | Feb. 21 | −21 | Aug. 26,27 | 97 |
| 1982 | Feb. 9,10 | −23 | Aug. 8 | 91 |
| 1983 | Dec. 25 | −29 | Aug. 8 | 97 |
| 1984 | Jan. 18 | −14 | July 27 | 97 |
| 1985 | Jan. 30 | −24 | July 9,11,23 | 94 |
| 1986 | Nov. 10 | − 8 | May 30 | 93 |
| 1987 | Jan. 16, Dec. 31 | − 4 | July 27 | 95 |
| 1988 | Jan. 6 | −17 | July 22, Aug. 6 | 92 |
| 1989 | Feb. 4, 5 | −20 | Aug. 1 | 96 |
| 1990 | Dec. 30 | −33 | Aug. 16 | 94 |
| 1991 | Jan. 2, 3 | −11 | Aug. 10 | 92 |
| 1992 | Jan. 20 | 10 | Aug. 15 | 93 |
| 1993 | Feb. 18 | −19 | May 13 | 91 |
| 1994 | Feb. 8 | −25 | Aug. 15 | 97 |
| 1995 | Jan. 4 | −11 | Aug. 6 | 88 |

Table 9. Summary of temperature records at the Northwestern Agricultural Research Center January 1950 through December 1995.

AVERAGE TEMPERATURE BY MONTH AND YEAR
DEGREES FAHRENHEIT

| DATE | JAN. | FEB. | MAR. | APR. | MAY | JUNE | JULY | AUG. | SEPT. | OCT. | NOV. | DEC. | MEAN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1950 | 4.2 | 25.6 | 31.2 | 41.9 | 49.7 | 57.0 | 64.0 | 62.5 | 53.8 | 45.9 | 31.5 | 29.5 | 41.4 |
| 1951 | 20.2 | 27.7 | 27.0 | 42.1 | 50.0 | 54.2 | 64.7 | 60.4 | 50.6 | 40.8 | 30.8 | 16.9 | 40.5 |
| 1952 | 18.0 | 26.6 | 29.3 | 45.8 | 52.4 | 56.7 | 61.8 | 62.8 | 56.0 | 45.5 | 30.4 | 27.6 | 42.7 |
| 1953 | 36.0 | 32.9 | 37.2 | 41.2 | 49.5 | 54.6 | 64.3 | 63.1 | 56.1 | 46.2 | 37.0 | 31.3 | 45.8 |
| 1954 | 21.1 | 31.2 | 29.6 | 40.8 | 52.5 | 54.9 | 63.4 | 60.1 | 52.9 | 41.5 | 38.8 | 28.8 | 43.0 |
| 1955 | 25.7 | 22.1 | 24.5 | 39.1 | 47.7 | 58.8 | 62.7 | 62.2 | 52.5 | 44.6 | 23.5 | 21.8 | 40.4 |
| 1956 | 23.3 | 20.9 | 31.5 | 44.2 | 54.0 | 59.0 | 64.8 | 62.0 | 55.2 | 44.1 | 30.9 | 28.5 | 43.2 |
| 1957 | 10.2 | 23.4 | 33.3 | 43.7 | 55.6 | 59.7 | 65.4 | 62.4 | 55.8 | 41.4 | 32.1 | 32.4 | 43.0 |
| 1958 | 29.1 | 30.4 | 32.2 | 43.6 | 59.6 | 62.3 | 65.2 | 67.9 | 55.5 | 44.6 | 32.8 | 28.2 | 46.0 |
| 1959 | 24.7 | 23.1 | 35.3 | 45.2 | 48.1 | 59.9 | 64.5 | 61.0 | 53.0 | 43.9 | 25.5 | 27.6 | 42.7 |
| 1960 | 19.4 | 25.2 | 32.3 | 44.3 | 50.6 | 59.6 | 68.8 | 60.6 | 55.0 | 45.2 | 34.4 | 24.9 | 43.4 |
| 1961 | 27.8 | 37.0 | 38.2 | 42.0 | 52.6 | 64.7 | 66.2 | 67.8 | 49.6 | 42.3 | 28.2 | 23.6 | 45.0 |
| 1962 | 17.4 | 25.7 | 30.9 | 47.2 | 51.5 | 58.6 | 62.1 | 62.1 | 54.7 | 44.7 | 38.0 | 32.5 | 43.8 |
| 1963 | 11.8 | 33.1 | 38.7 | 42.3 | 51.4 | 59.4 | 63.0 | 64.9 | 58.7 | 47.4 | 35.8 | 24.0 | 44.2 |
| 1964 | 28.5 | 28.3 | 30.6 | 42.8 | 51.1 | 58.7 | 64.3 | 58.9 | 51.2 | 43.7 | 33.7 | 22.1 | 42.8 |
| 1965 | 30.2 | 28.7 | 28.6 | 45.2 | 50.6 | 57.6 | 64.6 | 63.6 | 46.4 | 47.6 | 35.0 | 28.8 | 43.9 |
| 1966 | 26.3 | 27.7 | 34.5 | 42.9 | 54.3 | 56.0 | 64.5 | 61.7 | 59.3 | 43.4 | 33.4 | 30.2 | 44.5 |
| 1967 | 31.0 | 33.2 | 32.9 | 40.6 | 52.2 | 59.4 | 66.1 | 67.2 | 61.0 | 45.9 | 33.8 | 25.1 | 45.7 |
| 1968 | 23.3 | 32.8 | 41.2 | 42.0 | 49.8 | 59.0 | 64.6 | 61.3 | 53.8 | 42.9 | 33.4 | 19.9 | 43.7 |
| 1969 | 13.1 | 24.0 | 29.6 | 47.1 | 53.9 | 58.8 | 62.3 | 63.6 | 56.0 | 40.0 | 35.2 | 27.7 | 42.6 |
| 1970 | 21.9 | 29.9 | 32.8 | 40.2 | 53.2 | 62.0 | 64.8 | 62.6 | 48.7 | 40.1 | 31.3 | 26.2 | 42.8 |
| 1971 | 23.6 | 29.9 | 33.2 | 43.6 | 52.5 | 54.9 | 61.9 | 68.2 | 49.5 | 40.4 | 34.1 | 22.0 | 42.8 |
| 1972 | 17.0 | 27.3 | 38.5 | 40.6 | 51.9 | 59.3 | 61.5 | 65.9 | 50.2 | 40.3 | 33.7 | 19.9 | 42.2 |
| 1973 | 20.7 | 27.8 | 37.7 | 42.2 | 51.5 | 57.5 | 65.1 | 64.5 | 53.3 | 44.1 | 29.3 | 30.8 | 43.7 |
| 1974 | 21.0 | 32.3 | 33.6 | 42.7 | 48.0 | 61.5 | 64.8 | 61.6 | 52.8 | 43.6 | 34.8 | 30.1 | 43.9 |
| 1975 | 21.5 | 21.5 | 29.9 | 37.6 | 48.6 | 55.9 | 69.1 | 59.8 | 52.1 | 42.9 | 35.4 | 27.5 | 41.8 |
| 1976 | 27.7 | 29.9 | 31.0 | 43.4 | 51.9 | 54.5 | 63.4 | 61.3 | 55.2 | 42.4 | 33.1 | 28.6 | 43.5 |
| 1977 | 20.0 | 30.9 | 34.4 | 45.0 | 49.7 | 61.5 | 62.6 | 62.8 | 51.7 | 42.5 | 30.4 | 22.0 | 42.8 |
| 1978 | 21.6 | 26.1 | 34.3 | 43.7 | 48.1 | 59.1 | 63.4 | 60.3 | 53.7 | 43.7 | 27.2 | 18.8 | 41.7 |
| 1979 | 4.1 | 24.9 | 34.7 | 42.3 | 51.5 | 59.4 | 65.0 | 65.4 | 56.9 | 46.6 | 30.7 | 33.0 | 42.9 |
| 1980 | 16.3 | 29.0 | 32.6 | 47.1 | 54.8 | 56.9 | 63.5 | 58.6 | 54.1 | 45.3 | 35.8 | 32.2 | 43.9 |
| 1981 | 30.1 | 31.3 | 38.5 | 44.5 | 52.5 | 53.8 | 62.8 | 66.4 | 55.3 | 43.2 | 36.0 | 27.0 | 45.1 |
| 1982 | 21.6 | 24.5 | 37.5 | 39.4 | 49.8 | 59.8 | 61.1 | 63.0 | 53.4 | 41.0 | 29.1 | 25.9 | 42.2 |
| 1983 | 30.3 | 33.8 | 37.9 | 42.4 | 51.9 | 57.6 | 59.6 | 65.4 | 50.4 | 42.9 | 36.6 | 11.1 | 43.3 |
| 1984 | 27.6 | 32.4 | 38.3 | 42.2 | 48.7 | 56.4 | 65.3 | 64.6 | 49.5 | 40.0 | 32.6 | 20.6 | 43.2 |
| 1985 | 19.2 | 19.0 | 30.8 | 44.8 | 53.7 | 57.6 | 68.3 | 60.2 | 47.8 | 40.8 | 18.6 | 18.3 | 39.9 |
| 1986 | 25.4 | 25.6 | 40.6 | 43.8 | 53.7 | 63.9 | 59.9 | 66.1 | 50.2 | 43.0 | 30.3 | 24.9 | 44.0 |
| 1987 | 22.2 | 27.9 | 35.0 | 47.8 | 55.6 | 61.6 | 62.9 | 59.8 | 56.1 | 43.2 | 35.3 | 25.4 | 44.4 |
| 1988 | 20.5 | 30.3 | 37.8 | 45.7 | 51.4 | 60.9 | 63.7 | 63.9 | 53.8 | 47.5 | 36.3 | 23.3 | 44.6 |
| 1989 | 27.5 | 12.4 | 28.8 | 44.2 | 49.6 | 59.8 | 65.4 | 61.9 | 52.7 | 42.7 | 35.8 | 25.3 | 42.2 |
| 1990 | 30.5 | 24.5 | 34.8 | 45.2 | 49.8 | 57.2 | 65.2 | 64.8 | 59.2 | 41.9 | 36.1 | 16.5 | 43.8 |
| 1991 | 18.3 | 34.6 | 32.8 | 42.4 | 50.3 | 55.1 | 64.0 | 65.2 | 54.4 | 40.6 | 32.1 | 29.3 | 43.3 |
| 1992 | 28.7 | 34.5 | 39.7 | 45.1 | 53.5 | 55.5 | 61.2 | 61.8 | 51.1 | 44.7 | 33.1 | 19.4 | 44.0 |
| 1993 | 14.7 | 18.4 | 33.7 | 43.6 | 56.0 | 56.5 | 56.6 | 59.7 | 51.4 | 44.4 | 25.0 | 25.4 | 40.5 |
| 1994 | 32.9 | 20.6 | 37.5 | 45.4 | 54.0 | 57.3 | 66.4 | 66.6 | 56.3 | 43.3 | 32.5 | 27.1 | 45.0 |
| 1995 | 23.6 | 33.7 | 33.1 | 42.6 | 51.6 | 56.3 | 63.1 | 59.5 | 54.9 | 41.1 | 34.9 | 26.7 | 43.4 |
| MEAN | 22.4 | 27.7 | 33.9 | 43.3 | 51.8 | 58.3 | 63.9 | 63.0 | 53.5 | 43.3 | 32.5 | 25.4 | 43.2 |

Table 10. Summary of precipitation records at the Northwestern Agricultural Research Center, Kalispell, MT, January 1950 thru December 1995.

| | Total Precipitation (inches) by Months and Years | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | JAN. | FEB. | MAR. | APR. | MAY | JUNE | JULY | AUG. | SEPT. | OCT. | NOV. | DEC. | TOTAL |
| 1950 | 2.62 | 1.13 | 2.31 | 0.84 | 0.15 | 3.90 | 3.12 | 0.75 | 0.52 | 2.30 | 1.16 | 2.48 | 21.28 |
| 1951 | 0.94 | 1.29 | 0.62 | 2.32 | 3.77 | 2.26 | 1.03 | 2.86 | 1.49 | 5.62 | 1.01 | 3.31 | 26.52 |
| 1952 | 1.03 | 0.98 | 0.97 | 0.17 | 1.32 | 3.95 | 0.56 | 0.69 | 0.13 | 0.05 | 0.60 | 0.98 | 11.43 |
| 1953 | 1.84 | 1.14 | 0.98 | 2.07 | 2.00 | 3.31 | T | 1.62 | 0.71 | 0.03 | 0.87 | 1.30 | 15.87 |
| 1954 | 2.65 | 0.79 | 0.83 | 0.79 | 1.52 | 2.98 | 2.91 | 3.79 | 1.09 | 0.54 | 1.00 | 0.43 | 19.32 |
| 1955 | 1.00 | 1.31 | 0.44 | 0.82 | 1.18 | 1.86 | 3.08 | -- | 1.64 | 1.89 | 1.97 | 2.38 | 17.57 |
| 1956 | 1.76 | 1.53 | 0.87 | 1.28 | 1.06 | 4.20 | 2.13 | 3.21 | 1.16 | 1.10 | 0.53 | 0.96 | 19.79 |
| 1957 | 1.47 | 1.14 | 0.75 | 1.22 | 1.75 | 2.51 | 0.52 | 0.78 | 0.10 | 1.59 | 0.96 | 1.76 | 14.55 |
| 1958 | 1.56 | 2.67 | 0.97 | 1.47 | 2.20 | 2.56 | 0.84 | 0.58 | 1.99 | 1.16 | 2.90 | 2.77 | 21.67 |
| 1959 | 1.95 | 1.33 | 0.75 | 1.62 | 4.10 | 1.75 | T | 0.91 | 4.22 | 3.36 | 4.32 | 0.34 | 24.65 |
| 1960 | 1.67 | 1.10 | 1.01 | 1.23 | 3.27 | 0.69 | 0.13 | 2.43 | 0.55 | 1.44 | 1.72 | 1.24 | 16.48 |
| 1961 | 0.65 | 1.46 | 1.96 | 2.26 | 4.02 | 1.45 | 0.76 | 0.64 | 3.40 | 1.22 | 1.77 | 2.09 | 21.68 |
| 1962 | 1.33 | 1.15 | 1.59 | 0.96 | 2.59 | 1.15 | 0.11 | 0.72 | 0.58 | 1.85 | 1.31 | 0.91 | 14.25 |
| 1963 | 1.69 | 1.21 | 0.85 | 1.07 | 0.57 | 5.00 | 1.44 | 2.10 | 1.46 | 0.75 | 0.95 | 1.70 | 18.79 |
| 1964 | 1.46 | 0.41 | 1.57 | 0.87 | 3.33 | 3.86 | 3.01 | 1.64 | 2.27 | 0.85 | 1.62 | 3.62 | 24.51 |
| 1965 | 2.25 | 0.64 | 0.24 | 2.55 | 0.81 | 2.30 | 1.15 | 4.74 | 1.72 | 0.21 | 1.31 | 0.55 | 18.47 |
| 1966 | 1.42 | 0.67 | 0.53 | 0.76 | 1.18 | 6.57 | 2.49 | 1.64 | 0.79 | 1.34 | 3.33 | 1.68 | 22.40 |
| 1967 | 1.50 | 0.62 | 1.27 | 0.99 | 1.30 | 2.53 | 0.02 | 0.01 | 0.91 | 1.88 | 0.62 | 1.16 | 12.81 |
| 1968 | 0.79 | 1.15 | 0.68 | 0.57 | 3.92 | 2.22 | 1.00 | 3.42 | 4.51 | 2.39 | 1.59 | 3.12 | 25.36 |
| 1969 | 3.05 | 0.75 | 0.69 | 1.39 | 1.19 | 5.21 | 0.70 | 0.09 | 1.54 | 1.90 | 0.31 | 1.14 | 17.96 |
| 1970 | 3.10 | 0.89 | 1.49 | 0.76 | 1.97 | 4.37 | 3.08 | 0.44 | 1.79 | 1.38 | 1.75 | 0.99 | 22.01 |
| 1971 | 1.84 | 0.77 | 0.69 | 0.58 | 2.45 | 4.42 | 1.31 | 1.11 | 0.94 | 0.87 | 1.70 | 1.62 | 18.30 |
| 1972 | 1.10 | 1.65 | 2.11 | 0.95 | 1.48 | 3.28 | 1.77 | 0.98 | 1.38 | 1.84 | 0.80 | 2.19 | 19.53 |
| 1973 | 0.52 | 0.56 | 0.70 | 0.45 | 1.13 | 2.14 | 0.01 | 0.63 | 1.37 | 1.41 | 2.95 | 1.94 | 13.81 |
| 1974 | 1.35 | 1.32 | 1.40 | 3.36 | 1.82 | 1.80 | 1.01 | 0.62 | 0.80 | 0.12 | 1.10 | 1.31 | 16.01 |
| 1975 | 1.56 | 1.08 | 1.50 | 1.27 | 1.50 | 1.40 | 1.08 | 4.26 | 1.18 | 2.96 | 0.85 | 1.39 | 20.03 |
| 1976 | 0.91 | 1.12 | 0.34 | 1.92 | 1.90 | 2.49 | 1.49 | 3.42 | 0.96 | 0.62 | 0.73 | 0.86 | 16.76 |
| 1977 | 0.83 | 0.71 | 1.40 | 0.41 | 2.90 | 0.52 | 3.60 | 1.50 | 2.84 | 0.56 | 1.62 | 4.10 | 20.99 |
| 1978 | 2.15 | 0.99 | 0.73 | 2.54 | 3.56 | 2.63 | 3.90 | 3.34 | 1.90 | 0.15 | 0.96 | 0.91 | 23.76 |
| 1979 | 1.70 | 1.45 | 0.82 | 2.33 | 2.67 | 1.23 | 0.40 | 1.79 | 1.03 | 1.75 | 0.50 | 1.03 | 16.70 |
| 1980 | 1.53 | 2.03 | 0.97 | 1.88 | 5.48 | 3.89 | 1.08 | 2.45 | 1.20 | 0.83 | 0.78 | 2.58 | 24.70 |
| 1981 | 1.81 | 1.85 | 2.17 | 1.75 | 3.86 | 4.70 | 1.17 | 0.96 | 0.77 | 0.56 | 1.49 | 1.91 | 23.00 |
| 1982 | 2.38 | 1.48 | 1.16 | 1.60 | 1.25 | 2.41 | 2.06 | 1.17 | 2.37 | 0.75 | 1.39 | 1.60 | 19.62 |
| 1983 | 0.93 | 0.85 | 1.71 | 2.41 | 1.20 | 2.96 | 3.66 | 1.16 | 1.70 | 1.13 | 1.96 | 2.57 | 22.24 |
| 1984 | 0.80 | 2.19 | 1.81 | 1.93 | 2.91 | 2.07 | 0.31 | 0.55 | 2.15 | 2.25 | 1.40 | 1.29 | 19.66 |
| 1985 | 0.31 | 1.28 | 0.90 | 1.31 | 2.81 | 1.89 | 0.35 | 1.62 | 5.35 | 1.55 | 1.61 | 0.51 | 19.49 |
| 1986 | 2.39 | 2.33 | 0.50 | 1.34 | 2.92 | 1.83 | 2.09 | 0.81 | 3.63 | 0.80 | 1.78 | 0.63 | 21.05 |
| 1987 | 0.38 | 0.46 | 3.47 | 1.15 | 1.89 | 1.95 | 4.85 | 0.98 | 0.81 | 0.12 | 0.91 | 1.18 | 18.15 |
| 1988 | 0.98 | 1.03 | 0.77 | 1.36 | 3.60 | 1.98 | 1.07 | 0.13 | 2.30 | 0.62 | 1.39 | 1.69 | 16.92 |
| 1989 | 1.39 | 1.48 | 2.29 | 1.09 | 2.70 | 2.05 | 2.70 | 3.69 | 1.50 | 2.29 | 3.75 | 1.92 | 26.85 |
| 1990 | 0.96 | 1.00 | 1.76 | 1.63 | 3.74 | 2.68 | 2.34 | 2.44 | T | 2.32 | 1.37 | 2.60 | 22.84 |
| 1991 | 1.41 | 0.41 | 0.72 | 1.21 | 2.72 | 5.36 | 0.77 | 1.15 | 0.80 | 0.75 | 2.26 | 0.58 | 18.14 |
| 1992 | 1.17 | 0.61 | 0.83 | 1.18 | 1.65 | 5.34 | 2.24 | 0.94 | 1.21 | 1.07 | 2.37 | 1.53 | 20.14 |
| 1993 | 1.68 | 0.60 | 0.73 | 3.77 | 2.22 | 4.00 | 7.00 | 1.19 | 1.54 | 0.83 | 1.23 | 1.27 | 26.06 |
| 1994 | 1.43 | 1.49 | 0.11 | 2.01 | 1.79 | 2.59 | 0.10 | 0.23 | 0.46 | 2.12 | 1.89 | 1.07 | 15.29 |
| 1995 | 1.17 | 0.90 | 2.33 | 2.25 | 1.44 | 5.63 | 1.91 | 1.47 | 1.21 | 2.75 | 2.33 | 1.91 | 25.30 |
| MEAN | 1.49 | 1.15 | 1.16 | 1.47 | 2.28 | 2.95 | 1.66 | 1.56 | 1.56 | 1.39 | 1.54 | 1.63 | 19.85 |

Table 11. Summary of growing degree day (GDD) data at the Northwestern Agricultural Researcl May 1, 1949 through October 31, 1995. GDD = Temp Max + Temp Min÷2 − 50 Max Temp > 86F substituted with 86; Min Temp < 50F substituted with 50

| | Average growing degree days by month and year. | | | | | | |
|---|---|---|---|---|---|---|---|
| YEAR | MAY | JUNE | JULY | AUG. | SEPT. | OCT. | TOTAL |
| 1949 | 314.0 | 356.5 | 467.0 | 499.5 | 322.0 | 57.5 | 2016.5 |
| 1950 | 208.0 | 308.0 | 459.5 | 465.0 | 314.0 | 97.5 | 1852.0 |
| 1951 | 223.0 | 251.5 | 488.5 | 411.5 | 212.5 | 33.0 | 1620.0 |
| 1952 | 243.5 | 309.0 | 458.5 | 472.5 | 358.0 | 199.0 | 2040.5 |
| 1953 | 194.5 | 252.5 | 503.5 | 455.5 | 336.0 | 172.0 | 1914.0 |
| 1954 | 270.5 | 255.0 | 473.5 | 387.0 | 248.0 | 61.5 | 1695.5 |
| 1955 | 165.0 | 364.5 | 439.5 | 502.5 | 263.0 | 103.5 | 1838.0 |
| 1956 | 282.0 | 351.5 | 491.0 | 437.5 | 316.5 | 98.0 | 1976.5 |
| 1957 | 312.5 | 350.5 | 509.5 | 466.0 | 366.0 | 60.0 | 2064.5 |
| 1958 | 427.5 | 398.0 | 504.5 | 553.0 | 295.0 | 136.0 | 2314.0 |
| 1959 | 187.0 | 370.0 | 499.5 | 417.5 | 211.0 | 68.0 | 1753.0 |
| 1960 | 202.5 | 380.5 | 563.0 | 383.0 | 334.0 | 132.5 | 1995.5 |
| 1961 | 248.0 | 479.5 | 537.5 | 548.5 | 190.0 | 99.5 | 2103.0 |
| 1962 | 201.0 | 367.5 | 454.0 | 438.0 | 326.0 | 86.5 | 1873.0 |
| 1963 | 265.0 | 335.0 | 468.0 | 508.5 | 378.0 | 150.0 | 2104.5 |
| 1964 | 219.5 | 324.5 | 484.5 | 357.0 | 208.0 | 88.0 | 1681.5 |
| 1965 | 222.0 | 328.5 | 488.5 | 453.5 | 126.0 | 173.0 | 1791.5 |
| 1966 | 306.5 | 291.0 | 495.0 | 445.5 | 375.0 | 97.0 | 2010.0 |
| 1967 | 255.0 | 354.5 | 538.0 | 545.0 | 444.0 | 101.5 | 2238.0 |
| 1968 | 207.5 | 348.0 | 497.0 | 407.0 | 243.0 | 57.5 | 1760.0 |
| 1969 | 293.5 | 338.5 | 460.5 | 503.5 | 306.5 | 38.0 | 1940.5 |
| 1970 | 281.5 | 391.0 | 472.5 | 474.5 | 196.5 | 72.5 | 1888.5 |
| 1971 | 259.0 | 263.0 | 434.0 | 553.5 | 217.0 | 100.0 | 1826.5 |
| 1972 | 228.5 | 348.5 | 425.0 | 505.5 | 226.0 | 87.0 | 1820.5 |
| 1973 | 259.5 | 320.5 | 515.0 | 497.0 | 266.5 | 106.5 | 1965.0 |
| 1974 | 152.5 | 390.5 | 476.0 | 432.5 | 314.0 | 179.0 | 1944.5 |
| 1975 | 180.0 | 283.5 | 563.0 | 362.5 | 290.5 | 77.5 | 1757.0 |
| 1976 | 251.0 | 247.0 | 463.0 | 400.0 | 347.5 | 119.5 | 1828.0 |
| 1977 | 184.0 | 419.0 | 431.5 | 428.0 | 224.5 | 93.0 | 1780.0 |
| 1978 | 131.0 | 348.0 | 442.0 | 375.0 | 243.5 | 145.0 | 1684.5 |
| 1979 | 225.5 | 368.5 | 484.5 | 510.5 | 362.0 | 163.0 | 2114.0 |
| 1980 | 268.0 | 290.0 | 438.5 | 361.0 | 254.0 | 151.0 | 1762.5 |
| 1981 | 209.0 | 210.5 | 445.5 | 517.0 | 312.5 | 73.0 | 1767.5 |
| 1982 | 195.0 | 369.5 | 402.5 | 473.0 | 282.0 | 66.5 | 1788.5 |
| 1983 | 259.5 | 315.5 | 358.5 | 510.5 | 229.0 | 98.5 | 1771.5 |
| 1984 | 162.0 | 294.5 | 511.0 | 511.0 | 214.0 | 108.5 | 1801.0 |
| 1985 | 294.5 | 347.0 | 562.0 | 394.5 | 162.0 | 67.0 | 1827.0 |
| 1986 | 247.5 | 456.5 | 363.0 | 529.0 | 152.0 | 86.0 | 1834.0 |
| 1987 | 287.5 | 404.0 | 434.5 | 388.5 | 352.5 | 154.0 | 2021.0 |
| 1988 | 218.5 | 397.0 | 449.0 | 503.0 | 276.5 | 197.5 | 2041.5 |
| 1989 | 178.5 | 350.5 | 516.0 | 388.5 | 276.5 | 80.0 | 1790.0 |
| 1990 | 165.5 | 296.0 | 485.0 | 459.0 | 417.5 | 75.0 | 1898.0 |
| 1991 | 175.0 | 243.0 | 464.0 | 499.5 | 312.5 | 170.5 | 1864.5 |
| 1992 | 277.0 | 410.5 | 375.0 | 441.5 | 223.0 | 140.0 | 1867.0 |
| 1993 | 301.5 | 273.5 | 260.0 | 383.0 | 249.5 | 114.0 | 1581.5 |
| 1994 | 261.5 | 315.0 | 512.5 | 529.5 | 361.0 | 82.0 | 2061.5 |
| 1995 | 219.5 | 275.0 | 427.5 | 381.5 | 303.5 | 39.0 | 1646.0 |
| MEAN | 236.6 | 334.9 | 467.9 | 456.7 | 281.7 | 105.4 | 1883.3 |

# Montana State University
# 1995 LENTIL WEED MANAGEMENT STUDY

Code:95-LENTIL
Cooperator :
Location :KALISPELL
By:Bob Stougaard

## Site Description

Crop: LENTILS Variety: CHILEAN Planting Date: 4-18-95
Planting Method: RESEARCH Rate, Unit: 60 , #/A Depth, Unit: 1.5 , "
Row Spacing, Unit: 6 , " Emergence Date: 4-29-95 Plot Design: RCB
Plot Width/Area, Unit: 10 , FT Plot Length, Unit: 15 , FT Reps: 3
Field Preparation/Plot Maintenance: FALL PLOW; SPRING DISC AND CULTIVATE. VIBRA-SHANK AND PACKING PRIOR TO SEEDBED PREPARATION.

## Soil Description

Texture: FINE SANDY LOAM % OM: 2.8 % Sand: 50 % Silt: 40 % Clay: 10
pH: 6.4 CEC: Soil Name: KALISPELL FSL Fertility Level:

## Moisture Conditions

Overall Moisture Conditions: GOOD THROUGHOUT CROPPING SEASON

## Application Information

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| Application Date: | 4-26-95 | 5-9-95 | 5-9-95 | | | |
| Time of Day: | 3:30 P.M. | 10:00 A.M | 4:00 P.M. | | | |
| Application Method: | BACKPACK | BACKPACK | BACKPACK | | | |
| Application Timing: | PRE | PSTSENCOR | PSTLENTIG | | | |
| Air Temp., Unit: | 59 ,F | 58 ,F | 70 ,F | , | , | , |
| % Relative Humidity: | 63 | 46 | 26 | | | |
| Wind Velocity, Unit: | 0 2 ,MPH | 0 ,MPH | 0 ,MPH | , | , | , |
| Dew Presence (Y/N): | N | N | N | | | |
| Water Hardness: | | N | N | | | |
| Soil Temp., Unit: | 69 ,F | 54 ,F | 68 ,F | , | , | , |
| Soil Moisture: | TOP 1"DRY | TOP DRY | TOP DRY | | | |
| % Cloud Cover: | 0 | 0 | 0 | | | |

| Weed Species | Weed Stage, Density at Application | | | | | |
|---|---|---|---|---|---|---|
| LAMBSQUARTERS | , | COTY,10/F | COTY,10/F | , | , | , |
| PIGWEED | , | COTY,10/F | COTY,10/F | , | , | , |
| LENTILS | , | 2" , | 2" , | , | , | , |

## Application Equipment

| | Sprayer Type | Speed MPH | Nozzle Type | Nozzle Size | Nozzle Height | Nozzle Spacing | Boom Width | GPA | Carrier | PSI |
|---|---|---|---|---|---|---|---|---|---|---|
| A. | BACKPACK | 2 | FLATFAN | 11002XR | 14" | 20" | 10' | 20 | H20 | 20 |

Weed Species and Stage at rating date:

| | 5-29-95 | 7-28-85 |
|---|---|---|
| LAMBSQUARTERS | 5-7LF, | 14" |
| PIGWEED | 4 LF, | 8"ROSSETTE |
| LENTILS | 6" , | 12" |

Lentil harvest was on 7-28-95

Summary:

Pre-emergence applications of Pursuit were the least injurious to the lentils, provided excellent pigweed control, but were not effective in controlling lambsquarter. The pre and post tank mixes of Pursuit plus Sencor were all injurious to the lentils and while offering satisfactory control of both lambsquarter and pigweed did reduce yields in the majority of plots. The lentil damage caused by the Pursuit plus Sencor treatments was most likely a result of .69 inches of precipitation falling within four days of the applications. The herbicide Lentigran was mildly injurious of lentils, provided good weed control and contributed to some of the highest yields of the study.

# Montana State University
# 1995 LENTIL WEED MANAGEMENT STUDY

Project Code:95-LENTIL
Cooperator :

Location :KALISPELL
By:Bob Stougaard

| Trt No | Treatment Name | Form Amt | FM DS | Rate/Unit | Grow Stg | LENTIL INJURY PERCENT 5-29-95 | LMBQTR CONTROL PERCENT 7-28-95 | PIGWEED CONTROL PERCENT 7-28-95 | LENTIL YIELD LBS/A 7-28-95 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | PURSUIT | 2 | EC 3 | oz pr/A | PRE | 7 | 76.7 | 96.3 | 1128 |
| 2 | PURSUIT | 2 | EC 2 | oz pr/A | PRE | 7 | 79.3 | 96.0 | 1466 |
| 3 | PURSUIT | 2 | EC 1.5 | oz pr/A | PRE | 5 | 68.3 | 94.7 | 1317 |
| 4 | PURSUIT | 2 | EC 3 | oz pr/A | PRE | 37 | 80.0 | 96.0 | 1068 |
| 4 | SENCOR | 4 | F .5 | pt pr/A | PRE | | | | |
| 5 | PURSUIT | 2 | EC 2 | oz pr/A | PRE | 33 | 88.3 | 94.3 | 998 |
| 5 | SENCOR | 4 | F .5 | pt pr/A | PRE | | | | |
| 6 | PURSUIT | 2 | EC 1.5 | oz pr/A | PRE | 28 | 80.0 | 94.7 | 1148 |
| 6 | SENCOR | 4 | F .5 | pt pr/A | PRE | | | | |
| 7 | PURSUIT | 2 | EC 3 | oz pr/A | PRE | 97 | 96.0 | 79.3 | 607 |
| 7 | SENCOR | 4 | F .37 | pt pr/A | POST | | | | |
| 8 | PURSUIT | 2 | EC 2 | oz pr/A | PRE | 95 | 94.3 | 84.3 | 700 |
| 8 | SENCOR | 4 | F .37 | pt pr/A | POST | | | | |
| 9 | PURSUIT | 2 | EC 1.5 | oz pr/A | PRE | 94 | 91.7 | 82.7 | 607 |
| 9 | SENCOR | 4 | F .37 | pt pr/A | POST | | | | |
| 10 | LENTIGRAN | 45 | WP .675 | lb ai/A | POST | 5 | 89.3 | 93.3 | 1346 |
| 11 | LENTIGRAN | 45 | WP .9 | lb ai/A | POST | 7 | 88.3 | 96.0 | 1583 |
| 12 | NONTREATED | | | | | 0 | 0.0 | 0.0 | 1105 |
| LSD (.05) = | | | | | | 20 | 18.5 | 16.5 | 377 |
| Standard Dev.= | | | | | | 11.8819 | 10.9467 | 9.76918 | 222.396 |
| CV = | | | | | | 34.41 | 14.09 | 11.63 | 20.41 |
| Block F | | | | | | 2.852 | 0.463 | 5.646 | 8.243 |
| Block Prob(F) | | | | | | 0.0792 | 0.6352 | 0.0105 | 0.0021 |
| Treatment F | | | | | | 31.694 | 16.631 | 23.105 | 6.260 |
| Treatment Prob(F) | | | | | | 0.0001 | 0.0001 | 0.0001 | 0.0001 |

Montana State University
WHITETOP STUDY, PURSUIT AND SURFACTANTS - LAKE COUNTY

Project Code:WHITETOP
Cooperator :L. Polinski

Location: Lake County
By:Bob Stougaard

Summary Comments:

At both test locations in Lake County Pursuit at 4 and 6 oz prod/A provided excellent whitetop control when applied in combination with a non-ionic surfactant (NIS) or methylated soybean oil (MSO). Lower rates of Pursuit (2oz prod/A) were also effective in whitetop control, especially if combined with 28% UAN and NIS or MSO. These studies will be relocated to determine the long term effectiveness of these treatments.

# Montana State University
## WHITETOP STUDY, PURSUIT AND SURFACTANTS - LAKE COUNTY

Project Code:WHITETOP
Cooperator :L. Polenski

Location :Lake Co., Site A, 1st Harvest
By:Bob Stougaard

| Trt No | Treatment Name | Form Amt | Fm Ds | Rate | Rate Unit | Grow Stg | Appl Code | WHTTOP CONTROL PERCENT 6-1-95 | WHTTOP YIELD TON/A 6-1-95 | GRASS YIELD TON/A 6-1-95 | ALFA YIELD TON/A 6-1-95 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | NONTREATED | | | | | | | 0 | 0.19 | 0.28 | 1.03 |
| 2 | PURSUIT | 2 EC | | .03 | lb ai/A | ROSSET | A | 78 | 0.01 | 0.42 | 0.66 |
| 2 | NIS | 1 EC | | .25 | gal pr/100gal | ROSSET | A | | | | |
| 3 | PURSUIT | 2 EC | | .03 | lb ai/A | ROSSET | A | 87 | 0.01 | 0.30 | 0.74 |
| 3 | NIS | 1 EC | | .25 | gal pr/100gal | ROSSET | A | | | | |
| 3 | 28% UAN | 1 EC | | 1 | qt pr/A | ROSSET | A | | | | |
| 4 | PURSUIT | 2 EC | | .03 | lb ai/A | ROSSET | A | 91 | 0.02 | 0.19 | 0.64 |
| 4 | MSO | 1 EC | | 1 | qt pr/A | ROSSET | A | | | | |
| 5 | PURSUIT | 2 EC | | .03 | lb ai/A | ROSSET | A | 90 | 0.00 | 0.19 | 0.58 |
| 5 | MSO | 1 EC | | 1 | qt pr/A | ROSSET | A | | | | |
| 5 | 28% UAN | 1 EC | | 1 | qt pr/A | ROSSET | A | | | | |
| 6 | PURSUIT | 2 EC | | .06 | lb ai/A | ROSSET | A | 88 | 0.01 | 0.19 | 0.75 |
| 6 | NIS | 1 EC | | .25 | gal pr/100gal | ROSSET | A | | | | |
| 7 | PURSUIT | 2 EC | | .06 | lb ai/A | ROSSET | A | 95 | 0.00 | 0.26 | 0.49 |
| 7 | NIS | 1 EC | | .25 | gal pr/100gal | ROSSET | A | | | | |
| 7 | 28% UAN | 1 EC | | 1 | qt pr/A | ROSSET | A | | | | |
| 8 | PURSUIT | 2 EC | | .06 | lb ai/A | ROSSET | A | 92 | 0.00 | 0.14 | 0.67 |
| 8 | MSO | 1 EC | | 1 | qt pr/A | ROSSET | A | | | | |
| 9 | PURSUIT | 2 EC | | .06 | lb ai/A | ROSSET | A | 90 | 0.00 | 0.25 | 0.62 |
| 9 | MSO | 1 EC | | 1 | qt pr/A | ROSSET | A | | | | |
| 9 | 28% UAN | 1 EC | | 1 | qt pr/A | ROSSET | A | | | | |
| 10 | PURSUIT | 2 EC | | .09 | lb ai/A | ROSSET | A | 92 | 0.01 | 0.22 | 0.60 |
| 10 | NIS | 1 EC | | .25 | gal pr/100gal | ROSSET | A | | | | |
| 11 | PURSUIT | 2 EC | | .09 | lb ai/A | ROSSET | A | 94 | 0.01 | 0.12 | 0.85 |
| 11 | NIS | 1 EC | | .25 | gal pr/100gal | ROSSET | A | | | | |
| 11 | 28% UAN | 1 EC | | 1 | qt pr/A | ROSSET | A | | | | |
| 12 | PURSUIT | 2 EC | | .09 | lb ai/A | ROSSET | A | 93 | 0.00 | 0.19 | 0.74 |
| 12 | MSO | 1 EC | | 1 | qt pr/A | ROSSET | A | | | | |
| 13 | PURSUIT | 2 EC | | .09 | lb ai/A | ROSSET | A | 97 | 0.00 | 0.20 | 0.64 |
| 13 | MSO | 1 EC | | 1 | qt pr/A | ROSSET | A | | | | |
| 13 | 28% UAN | 1 EC | | 1 | qt pr/A | ROSSET | A | | | | |
| LSD (.05) = | | | | | | | | 10 | 0.03 | 0.20 | 0.36 |
| Standard Dev.= | | | | | | | | 5.97162 | .015072 | .116169 | .211173 |
| CV = | | | | | | | | 7.14 | 74.40 | 51.31 | 30.46 |
| Block F | | | | | | | | 1.329 | 1.501 | 0.528 | 6.369 |
| Block Prob(F) | | | | | | | | 0.2834 | 0.2430 | 0.5965 | 0.0060 |
| Treatment F | | | | | | | | 54.839 | 33.374 | 1.362 | 1.252 |
| Treatment Prob(F) | | | | | | | | 0.0001 | 0.0001 | 0.2500 | 0.3071 |

# Montana State University
## WHITETOP STUDY, PURSUIT AND SURFACTANTS - LAKE COUNTY

Project Code:WHITETOP
Cooperator :L. Polinski

Location :Lake Co., Site A, 2cd Harvest
By:Bob Stougaard

| Trt No | Treatment Name | Form Amt | Fm Ds | Rate | Rate Unit | Grow .Stg | Appl Code | WHTTOP YIELD TON/A 8-9-95 | GRASS YIELD TON/A 8-9-95 | ALFA YIELD TON/A 8-9-95 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | NONTREATED | | | | | | | 0.00 | 0.08 | 0.50 |
| 2 | PURSUIT | 2 | EC | .03 | lb ai/A | ROSSET | A | 0.00 | 0.08 | 0.47 |
| 2 | NIS | 1 | EC | .25 | gal pr/100gal | ROSSET | A | | | |
| 3 | PURSUIT | 2 | EC | .03 | lb ai/A | ROSSET | A | 0.00 | 0.20 | 0.34 |
| 3 | NIS | 1 | EC | .25 | gal pr/100gal | ROSSET | A | | | |
| 3 | 28% UAN | 1 | EC | 1 | qt pr/A | ROSSET | A | | | |
| 4 | PURSUIT | 2 | EC | .03 | lb ai/A | ROSSET | A | 0.00 | 0.05 | 0.39 |
| 4 | MSO | 1 | EC | 1 | qt pr/A | ROSSET | A | | | |
| 5 | PURSUIT | 2 | EC | .03 | lb ai/A | ROSSET | A | 0.00 | 0.06 | 0.37 |
| 5 | MSO | 1 | EC | 1 | qt pr/A | ROSSET | A | | | |
| 5 | 28% UAN | 1 | EC | 1 | qt pr/A | ROSSET | A | | | |
| 6 | PURSUIT | 2 | EC | .06 | lb ai/A | ROSSET | A | 0.00 | 0.11 | 0.45 |
| 6 | NIS | 1 | EC | .25 | gal pr/100gal | ROSSET | A | | | |
| 7 | PURSUIT | 2 | EC | .06 | lb ai/A | ROSSET | A | 0.00 | 0.03 | 0.44 |
| 7 | NIS | 1 | EC | .25 | gal pr/100gal | ROSSET | A | | | |
| 7 | 28% UAN | 1 | EC | 1 | qt pr/A | ROSSET | A | | | |
| 8 | PURSUIT | 2 | EC | .06 | lb ai/A | ROSSET | A | 0.01 | 0.08 | 0.38 |
| 8 | MSO | 1 | EC | 1 | qt pr/A | ROSSET | A | | | |
| 9 | PURSUIT | 2 | EC | .06 | lb ai/A | ROSSET | A | 0.00 | 0.12 | 0.38 |
| 9 | MSO | 1 | EC | 1 | qt pr/A | ROSSET | A | | | |
| 9 | 28% UAN | 1 | EC | 1 | qt pr/A | ROSSET | A | | | |
| 10 | PURSUIT | 2 | EC | .09 | lb ai/A | ROSSET | A | 0.01 | 0.09 | 0.40 |
| 10 | NIS | 1 | EC | .25 | gal pr/100gal | ROSSET | A | | | |
| 11 | PURSUIT | 2 | EC | .09 | lb ai/A | ROSSET | A | 0.02 | 0.05 | 0.63 |
| 11 | NIS | 1 | EC | .25 | gal pr/100gal | ROSSET | A | | | |
| 11 | 28% UAN | 1 | EC | 1 | qt pr/A | ROSSET | A | | | |
| 12 | PURSUIT | 2 | EC | .09 | lb ai/A | ROSSET | A | 0.00 | 0.07 | 0.56 |
| 12 | MSO | 1 | EC | 1 | qt pr/A | ROSSET | A | | | |
| 13 | PURSUIT | 2 | EC | .09 | lb ai/A | ROSSET | A | 0.00 | 0.16 | 0.49 |
| 13 | MSO | 1 | EC | 1 | qt pr/A | ROSSET | A | | | |
| 13 | 28% UAN | 1 | EC | 1 | qt pr/A | ROSSET | A | | | |
| LSD (.05) = | | | | | | | | 0.02 | 0.10 | 0.24 |
| Standard Dev.= | | | | | | | | .011676 | .058770 | .139470 |
| CV = | | | | | | | | 284.60 | 64.02 | 31.30 |
| Block F | | | | | | | | 1.204 | 2.370 | 5.243 |
| Block Prob(F) | | | | | | | | 0.3175 | 0.1150 | 0.0129 |
| Treatment F | | | | | | | | 0.699 | 2.020 | 1.062 |
| Treatment Prob(F) | | | | | | | | 0.7371 | 0.0690 | 0.4304 |

# Montana State University
# WHITETOP STUDY, PURSUIT AND SURFACTANTS - LAKE COUNTY

Project Code:WHITETOP
Cooperator :L. Polinski

Location: Site A, near house
By:Bob Stougaard

## Site Description

Crop: ALFALFA  Variety: ??  Planting Date:
Planting Method:  Rate, Unit: ,  Depth, Unit: ,
Perennial Age, Unit: ,  Row Spacing, Unit: ,
Soil Temp., Unit: ,  Soil Moisture:  Emergence Date:

Plot Width/Area, Unit: 10 , FT  Plot Length, Unit: 15.0 , FT  Reps: 3
Site Type:  Seed Bed Desc.:  Ground Cover:
Tillage Type:  Study Design: RCB
Field Preparation/Plot Maintenance: TEST WERE LOCATED IN ESTABLISHED FIELD OF ALFALFA

## Soil Description

Texture:  % OM:  % Sand:  % Silt:  % Clay:
pH:  CEC:  Soil Name:  Fertility Level:

## Moisture Conditions

| Moisture On: | Date | Amount | Unit | Type | | Date | Amount | Unit | Type |
|---|---|---|---|---|---|---|---|---|---|
| 1. | | | | | 2. | | | | |
| 3. | | | | | 4. | | | | |
| 5. | | | | | 6. | | | | |
| 7. | | | | | 8. | | | | |

Overall Moisture Conditions:

## Application Information

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| Application Date: | 4-14-95 | | | | | |
| Time of Day: | 11:30 | | | | | |
| Application Method: | BACKPACK | | | | | |
| Application Timing: | EARLY PRE | | | | | |
| Air Temp., Unit: | 47 ,F | , | , | , | , | , |
| % Relative Humidity: | 43 | | | | | |
| Wind Velocity, Unit: | 0 ,MPH | , | , | , | , | , |
| Dew Presence (Y/N): | N | | | | | |
| Water Hardness: | N | | | | | |
| Soil Temp., Unit: | 48 ,F | , | , | , | , | , |
| Soil Moisture: | GOOD | | | | | |
| % Cloud Cover: | 75 | | | | | |

| Weed Species | Weed Stage, Density at Application | | | | | |
|---|---|---|---|---|---|---|
| ALFALFA | 1.5",5-8F | , | , | , | , | , |
| WHITETOP | 2" ,6.5/sq ft, Rosette | , | , | , | , | , |

Weed Species at Rating:

| | 6-1-95 | 8-9-95 |
|---|---|---|
| ALFALFA | 12-14" | 8-10" |
| WHITETOP | 8-10" | 1-2" |

## Application Equipment

| | Sprayer Type | Speed MPH | Nozzle Type | Nozzle Size | Nozzle Height | Nozzle Spacing | Boom Width | GPA | Carrier | PSI |
|---|---|---|---|---|---|---|---|---|---|---|
| A. | BACKPACK | 2.5 | FLATFAN | 11002XR | 14 | 20" | 10' | 20 | H20 | 20 |

# Montana State University
## WHITETOP STUDY, PURSUIT AND SURFACTANTS - LAKE COUNTY

Project Code:WHITETOP
Cooperator :L. Polinski

Location :Lake Co., Site B, 1st Harvest
By:Bob Stougaard

| Trt No | Treatment Name | Form Amt | Fm Ds | Rate | Rate Unit | Grow Stg | WHTTOP CONTROL PERCENT 6-1-95 | WHTTOP YIELD TON/A 6-1-95 | GRASS YIELD TON/A 6-1-95 | ALFA YIELD TON/A 6-1-95 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | NONTREATED | | | | | | 0 | 0.19 | 0.22 | 1.39 |
| 2 | PURSUIT | 2 | EC | .03 | lb ai/A | ROSSET A | 87 | 0.01 | 0.23 | 1.36 |
| 2 | NIS | 1 | EC | .25 | gal pr/100gal | ROSSET A | | | | |
| 3 | PURSUIT | 2 | EC | .03 | lb ai/A | ROSSET A | 82 | 0.02 | 0.12 | 1.40 |
| 3 | NIS | 1 | EC | .25 | gal pr/100gal | ROSSET A | | | | |
| 3 | 28% UAN | 1 | EC | 1 | qt pr/A | ROSSET A | | | | |
| 4 | PURSUIT | 2 | EC | .03 | lb ai/A | ROSSET A | 82 | 0.02 | 0.09 | 1.58 |
| 4 | MSO | 1 | EC | 1 | qt pr/A | ROSSET A | | | | |
| 5 | PURSUIT | 2 | EC | .03 | lb ai/A | ROSSET A | 97 | 0.01 | 0.18 | 1.59 |
| 5 | MSO | 1 | EC | 1 | qt pr/A | ROSSET A | | | | |
| 5 | 28% UAN | 1 | EC | 1 | qt pr/A | ROSSET A | | | | |
| 6 | PURSUIT | 2 | EC | .06 | lb ai/A | ROSSET A | 94 | 0.01 | 0.16 | 1.48 |
| 6 | NIS | 1 | EC | .25 | gal pr/100gal | ROSSET A | | | | |
| 7 | PURSUIT | 2 | EC | .06 | lb ai/A | ROSSET A | 93 | 0.00 | 0.05 | 1.26 |
| 7 | NIS | 1 | EC | .25 | gal pr/100gal | ROSSET A | | | | |
| 7 | 28% UAN | 1 | EC | 1 | qt pr/A | ROSSET A | | | | |
| 8 | PURSUIT | 2 | EC | .06 | lb ai/A | ROSSET A | 93 | 0.01 | 0.08 | 1.48 |
| 8 | MSO | 1 | EC | 1 | qt pr/A | ROSSET A | | | | |
| 9 | PURSUIT | 2 | EC | .06 | lb ai/A | ROSSET A | 95 | 0.00 | 0.14 | 1.50 |
| 9 | MSO | 1 | EC | 1 | qt pr/A | ROSSET A | | | | |
| 9 | 28% UAN | 1 | EC | 1 | qt pr/A | ROSSET A | | | | |
| 10 | PURSUIT | 2 | EC | .09 | lb ai/A | ROSSET A | 94 | 0.01 | 0.11 | 1.47 |
| 10 | NIS | 1 | EC | .25 | gal pr/100gal | ROSSET A | | | | |
| 11 | PURSUIT | 2 | EC | .09 | lb ai/A | ROSSET A | 95 | 0.00 | 0.09 | 1.27 |
| 11 | NIS | 1 | EC | .25 | gal pr/100gal | ROSSET A | | | | |
| 11 | 28% UAN | 1 | EC | 1 | qt pr/A | ROSSET A | | | | |
| 12 | PURSUIT | 2 | EC | .09 | lb ai/A | ROSSET A | 97 | 0.00 | 0.07 | 1.38 |
| 12 | MSO | 1 | EC | 1 | qt pr/A | ROSSET A | | | | |
| 13 | PURSUIT | 2 | EC | .09 | lb ai/A | ROSSET A | 97 | 0.00 | 0.08 | 1.35 |
| 13 | MSO | 1 | EC | 1 | qt pr/A | ROSSET A | | | | |
| 13 | 28% UAN | 1 | EC | 1 | qt pr/A | ROSSET A | | | | |
| LSD (.05) = | | | | | | | 10 | 0.08 | 0.14 | 0.40 |
| Standard Dev.= | | | | | | | 5.74531 | .048429 | .084755 | .239178 |
| CV = | | | | | | | 6.76 | 212.21 | 67.05 | 16.80 |
| Block F | | | | | | | 2.673 | 0.664 | 0.910 | 0.270 |
| Block Prob(F) | | | | | | | 0.0895 | 0.5242 | 0.4161 | 0.7659 |
| Treatment F | | | | | | | 61.907 | 3.425 | 1.353 | 0.568 |
| Treatment Prob(F) | | | | | | | 0.0001 | 0.0050 | 0.2543 | 0.8461 |

# Montana State University
## WHITETOP STUDY, PURSUIT AND SURFACTANTS - LAKE COUNTY

Project Code:WHITETOP
Cooperator :L. Polinski

Location :Lake Co., Site B, 2cd Harvest
By:Bob Stougaard

| Trt No | Treatment Name | Form | Amt | Fm Ds | Rate | Rate Unit | Grow Stg | Appl Code | WHTTOP YIELD TON/A 8-9-95 | GRASS YIELD TON/A 8-9-95 | ALFA YIELD TON/A 8-9-95 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | NONTREATED | | | | | | | | 0.00 | 0.57 | 1.17 |
| 2 | PURSUIT | 2 | EC | | .03 | lb ai/A | ROSSET | A | 0.00 | 0.63 | 1.22 |
| 2 | NIS | 1 | EC | | .25 | gal pr/100gal | ROSSET | A | | | |
| 3 | PURSUIT | 2 | EC | | .03 | lb ai/A | ROSSET | A | 0.00 | 0.29 | 1.53 |
| 3 | NIS | 1 | EC | | .25 | gal pr/100gal | ROSSET | A | | | |
| 3 | 28% UAN | 1 | EC | | 1 | qt pr/A | ROSSET | A | | | |
| 4 | PURSUIT | 2 | EC | | .03 | lb ai/A | ROSSET | A | 0.01 | 0.54 | 1.46 |
| 4 | MSO | 1 | EC | | 1 | qt pr/A | ROSSET | A | | | |
| 5 | PURSUIT | 2 | EC | | .03 | lb ai/A | ROSSET | A | 0.00 | 0.59 | 1.30 |
| 5 | MSO | 1 | EC | | 1 | qt pr/A | ROSSET | A | | | |
| 5 | 28% UAN | 1 | EC | | 1 | qt pr/A | ROSSET | A | | | |
| 6 | PURSUIT | 2 | EC | | .06 | lb ai/A | ROSSET | A | 0.00 | 0.59 | 1.31 |
| 6 | NIS | 1 | EC | | .25 | gal pr/100gal | ROSSET | A | | | |
| 7 | PURSUIT | 2 | EC | | .06 | lb ai/A | ROSSET | A | 0.00 | 0.38 | 1.12 |
| 7 | NIS | 1 | EC | | .25 | gal pr/100gal | ROSSET | A | | | |
| 7 | 28% UAN | 1 | EC | | 1 | qt pr/A | ROSSET | A | | | |
| 8 | PURSUIT | 2 | EC | | .06 | lb ai/A | ROSSET | A | 0.00 | 0.61 | 1.27 |
| 8 | MSO | 1 | EC | | 1 | qt pr/A | ROSSET | A | | | |
| 9 | PURSUIT | 2 | EC | | .06 | lb ai/A | ROSSET | A | 0.00 | 0.30 | 1.59 |
| 9 | MSO | 1 | EC | | 1 | qt pr/A | ROSSET | A | | | |
| 9 | 28% UAN | 1 | EC | | 1 | qt pr/A | ROSSET | A | | | |
| 10 | PURSUIT | 2 | EC | | .09 | lb ai/A | ROSSET | A | 0.00 | 0.47 | 1.39 |
| 10 | NIS | 1 | EC | | .25 | gal pr/100gal | ROSSET | A | | | |
| 11 | PURSUIT | 2 | EC | | .09 | lb ai/A | ROSSET | A | 0.00 | 0.71 | 1.22 |
| 11 | NIS | 1 | EC | | .25 | gal pr/100gal | ROSSET | A | | | |
| 11 | 28% UAN | 1 | EC | | 1 | qt pr/A | ROSSET | A | | | |
| 12 | PURSUIT | 2 | EC | | .09 | lb ai/A | ROSSET | A | 0.00 | 0.37 | 1.48 |
| 12 | MSO | 1 | EC | | 1 | qt pr/A | ROSSET | A | | | |
| 13 | PURSUIT | 2 | EC | | .09 | lb ai/A | ROSSET | A | 0.00 | 0.61 | 1.38 |
| 13 | MSO | 1 | EC | | 1 | qt pr/A | ROSSET | A | | | |
| 13 | 28% UAN | 1 | EC | | 1 | qt pr/A | ROSSET | A | | | |
| LSD (.05) = | | | | | | | | | 0.01 | 0.28 | 0.48 |
| Standard Dev.= | | | | | | | | | .003460 | .165269 | .287171 |
| CV = | | | | | | | | | 449.69 | 32.26 | 21.41 |
| Block F | | | | | | | | | 1.929 | 4.580 | 1.293 |
| Block Prob(F) | | | | | | | | | 0.1672 | 0.0207 | 0.2928 |
| Treatment F | | | | | | | | | 1.000 | 2.040 | 0.765 |
| Treatment Prob(F) | | | | | | | | | 0.4777 | 0.0663 | 0.6788 |

# Montana State University
## WHITETOP STUDY, PURSUIT AND SURFACTANTS - LAKE COUNTY

Project Code:WHITETOP
Cooperator :L. Polinski

Location: Site B, Canal location
By:Bob Stougaard

### Site Description

Crop: ALFALFA  Variety:  Planting Date:
Planting Method:  Rate, Unit: ,  Depth, Unit: ,
Perennial Age, Unit: ,  Row Spacing, Unit: ,
Soil Temp., Unit: ,  Soil Moisture:  Emergence Date:

Plot Width/Area, Unit: 10 , FT  Plot Length, Unit: 15.0 , FT  Reps: 3
Site Type:  Seed Bed Desc.:  Ground Cover:
Tillage Type:  Study Design: RCB
Field Preparation/Plot Maintenance: TEST WERE LOCATED IN ESTABLISHED FIELD OF ALFALFA

### Soil Description

Texture:  % OM:  % Sand:  % Silt:  % Clay:
pH:  CEC:  Soil Name:  Fertility Level:

### Moisture Conditions

| Moisture On: | Date | Amount | Unit | Type | | Date | Amount | Unit | Type |
|---|---|---|---|---|---|---|---|---|---|
| 1. | | | | | 2. | | | | |
| 3. | | | | | 4. | | | | |
| 5. | | | | | 6. | | | | |
| 7. | | | | | 8. | | | | |

Overall Moisture Conditions:

### Application Information

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| Application Date: | 4-14-95 | | | | | |
| Time of Day: | 1:30 | | | | | |
| Application Method: | BACKPACK | | | | | |
| Application Timing: | EARLY PRE | | | | | |
| Air Temp., Unit: | 55 ,F | , | , | , | , | , |
| % Relative Humidity: | 33 | | | | | |
| Wind Velocity, Unit: | 0 ,MPH | , | , | , | , | , |
| Dew Presence (Y/N): | N | | | | | |
| Water Hardness: | N | | | | | |
| Soil Temp., Unit: | 48 ,F | , | , | , | , | , |
| Soil Moisture: | GOOD | | | | | |
| % Cloud Cover: | 66 | | | | | |

| Weed Species | Weed Stage, Density at Application | | | | | |
|---|---|---|---|---|---|---|
| ALFALFA | 3",7-10/F | , | , | , | , | , |
| WHITETOP | 1-2",6.5/SQ FT, | | , | , | , | , |

Weed Species at Rating:

| | 6-1-95 | 8-9-95 |
|---|---|---|
| ALFALFA | 16-20" | 14-18" |
| WHITETOP | 14-16" | 1-2" |

### Application Equipment

| | Sprayer Type | Speed MPH | Nozzle Type | Nozzle Size | Nozzle Height | Nozzle Spacing | Boom Width | GPA | Carrier | PSI |
|---|---|---|---|---|---|---|---|---|---|---|
| A. | BACKPACK | 2.5 | FLATFAN | 11002XR | 14 | 20" | 10' | 20 | H20 | 20 |

# Montana State University
## WHITETOP STUDY, PURSUIT AND SURFACTANTS - LAKE COUNTY

Project Code: WHITETOP
Cooperator: L. POLANSKI

Location: LAKE CO, SITE A (HOUSE) 1ST CUT
By: Bob Stougaard

| Trt No | Treatment Name | Form Amt | Fm Ds | Rate | Rate Unit | RFV 1/ 1ST CUT | % PLANT PROTEIN 1ST CUT 6-1-95 | % PLANT NDF 2/ 1ST CUT 6-1-95 | % PLANT ADF 3/ 1ST CUT 6-1-95 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | NONTREATED | | | | | 144.68 | 15.89 | 42.87 | 29.03 |
| 2 | PURSUIT | 2 | EC | .03 | lb ai/A | 131.93 | 15.27 | 48.43 | 26.60 |
| 2 | NIS | 1 | EC | .25 | gal pr/100gal | | | | |
| 3 | PURSUIT | 2 | EC | .03 | lb ai/A | 166.14 | 15.92 | 38.93 | 24.93 |
| 3 | NIS | 1 | EC | .25 | gal pr/100gal | | | | |
| 3 | 28% UAN | 1 | EC | 1 | qt pr/A | | | | |
| 4 | PURSUIT | 2 | EC | .03 | lb ai/A | 145.09 | 14.63 | 44.17 | 25.87 |
| 4 | MSO | 1 | EC | 1 | qt pr/A | | | | |
| 5 | PURSUIT | 2 | EC | .03 | lb ai/A | 136.31 | 15.08 | 47.93 | 24.73 |
| 5 | MSO | 1 | EC | 1 | qt pr/A | | | | |
| 5 | 28% UAN | 1 | EC | 1 | qt pr/A | | | | |
| 6 | PURSUIT | 2 | EC | .06 | lb ai/A | 159.56 | 15.06 | 40.40 | 26.23 |
| 6 | NIS | 1 | EC | .25 | gal pr/100gal | | | | |
| 7 | PURSUIT | 2 | EC | .06 | lb ai/A | 153.40 | 15.06 | 42.50 | 24.87 |
| 7 | NIS | 1 | EC | .25 | gal pr/100gal | | | | |
| 7 | 28% UAN | 1 | EC | 1 | qt pr/A | | | | |
| 8 | PURSUIT | 2 | EC | .06 | lb ai/A | 154.39 | 17.84 | 41.30 | 26.47 |
| 8 | MSO | 1 | EC | 1 | qt pr/A | | | | |
| 9 | PURSUIT | 2 | EC | .06 | lb ai/A | 151.35 | 15.15 | 41.10 | 28.37 |
| 9 | MSO | 1 | EC | 1 | qt pr/A | | | | |
| 9 | 28% UAN | 1 | EC | 1 | qt pr/A | | | | |
| 10 | PURSUIT | 2 | EC | .09 | lb ai/A | 182.06 | 14.94 | 37.30 | 25.67 |
| 10 | NIS | 1 | EC | .25 | gal pr/100gal | | | | |
| 11 | PURSUIT | 2 | EC | .09 | lb ai/A | 210.61 | 16.27 | 31.93 | 23.20 |
| 11 | NIS | 1 | EC | .25 | gal pr/100gal | | | | |
| 11 | 28% UAN | 1 | EC | 1 | qt pr/A | | | | |
| 12 | PURSUIT | 2 | EC | .09 | lb ai/A | 153.43 | 16.17 | 40.13 | 29.23 |
| 12 | MSO | 1 | EC | 1 | qt pr/A | | | | |
| 13 | PURSUIT | 2 | EC | .09 | lb ai/A | 150.53 | 15.48 | 41.87 | 28.73 |
| 13 | MSO | 1 | EC | 1 | qt pr/A | | | | |
| 13 | 28% UAN | 1 | EC | 1 | qt pr/A | | | | |
| LSD (.05) = | | | | | | 40.68 | 2.41 | 8.58 | 4.444 |
| Standard Dev.= | | | | | | 24.1404 | 1.42765 | .050919 | .026354 |
| CV = | | | | | | 15.39 | 9.15 | 12.28 | 9.96 |
| Block F | | | | | | 0.598 | 1.224 | 0.932 | 5.512 |
| Block Prob(F) | | | | | | 0.5578 | 0.3118 | 0.4075 | 0.0107 |
| Treatment F | | | | | | 2.166 | 1.045 | 2.108 | 1.535 |
| Treatment Prob(F) | | | | | | 0.0518 | 0.4430 | 0.0580 | 0.1792 |

1/RFV = Relative Feed Value
2/NDF = Nuetral Detergent Fiber
3/ADF = Acid Detergent Fiber

# Montana State University
## WHITETOP STUDY, PURSUIT AND SURFACTANTS - LAKE COUNTY

Project Code: WHITETOP
Cooperator: L. POLANSKI

Location: LAKE CO, SITE A (HOUSE) 2CD CUT
By: Bob Stougaard

| Trt No | Treatment Name | Form Amt | Fm Ds | Rate | Rate Unit | RFV 1/ 2CD CUT | % PLANT PROTEIN 2CD CUT 8-9-95 | % PLANT NDF 2/ 2CD CUT 8-9-95 | % PLANT ADF 3/ 2CD CUT 8-9-95 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | NONTREATED | | | | | 193.31 | 20.15 | 33.90 | 25.03 |
| 2 | PURSUIT | 2 | EC | .03 | lb ai/A | 183.70 | 20.07 | 35.70 | 23.90 |
| 2 | NIS | 1 | EC | .25 | gal pr/100ga | | | | |
| 3 | PURSUIT | 2 | EC | .03 | lb ai/A | 158.41 | 19.86 | 39.80 | 27.13 |
| 3 | NIS | 1 | EC | .25 | gal pr/100ga | | | | |
| 3 | 28% UAN | 1 | EC | 1 | qt pr/A | | | | |
| 4 | PURSUIT | 2 | EC | .03 | lb ai/A | 177.68 | 21.36 | 36.27 | 25.87 |
| 4 | MSO | 1 | EC | 1 | qt pr/A | | | | |
| 5 | PURSUIT | 2 | EC | .03 | lb ai/A | 191.25 | 21.29 | 34.40 | 25.80 |
| 5 | MSO | 1 | EC | 1 | qt pr/A | | | | |
| 5 | 28% UAN | 1 | EC | 1 | qt pr/A | | | | |
| 6 | PURSUIT | 2 | EC | .06 | lb ai/A | 175.65 | 18.81 | 37.10 | 26.43 |
| 6 | NIS | 1 | EC | .25 | gal pr/100ga | | | | |
| 7 | PURSUIT | 2 | EC | .06 | lb ai/A | 195.65 | 19.44 | 32.60 | 26.17 |
| 7 | NIS | 1 | EC | .25 | gal pr/100ga | | | | |
| 7 | 28% UAN | 1 | EC | 1 | qt pr/A | | | | |
| 8 | PURSUIT | 2 | EC | .06 | lb ai/A | 179.04 | 19.92 | 36.03 | 25.17 |
| 8 | MSO | 1 | EC | 1 | qt pr/A | | | | |
| 9 | PURSUIT | 2 | EC | .06 | lb ai/A | 182.10 | 20.79 | 36.07 | 23.90 |
| 9 | MSO | 1 | EC | 1 | qt pr/A | | | | |
| 9 | 28% UAN | 1 | EC | 1 | qt pr/A | | | | |
| 10 | PURSUIT | 2 | EC | .09 | lb ai/A | 172.03 | 20.04 | 37.67 | 24.80 |
| 10 | NIS | 1 | EC | .25 | gal pr/100ga | | | | |
| 11 | PURSUIT | 2 | EC | .09 | lb ai/A | 182.03 | 20.27 | 34.57 | 27.40 |
| 11 | NIS | 1 | EC | .25 | gal pr/100ga | | | | |
| 11 | 28% UAN | 1 | EC | 1 | qt pr/A | | | | |
| 12 | PURSUIT | 2 | EC | .09 | lb ai/A | 188.29 | 20.12 | 34.37 | 24.93 |
| 12 | MSO | 1 | EC | 1 | qt pr/A | | | | |
| 13 | PURSUIT | 2 | EC | .09 | lb ai/A | 162.84 | 19.86 | 39.33 | 26.17 |
| 13 | MSO | 1 | EC | 1 | qt pr/A | | | | |
| 13 | 28% UAN | 1 | EC | 1 | qt pr/A | | | | |
| LSD (.05) = | | | | | | 35.54 | 2.14 | 6.200 | 3.300 |
| Standard Dev.= | | | | | | 21.0894 | 1.26873 | .036766 | .019556 |
| CV = | | | | | | 11.71 | 6.30 | 10.22 | 7.64 |
| Block F | | | | | | 1.071 | 0.123 | 1.403 | 17.082 |
| Block Prob(F) | | | | | | 0.3584 | 0.8846 | 0.2653 | 0.0001 |
| Treatment F | | | | | | 0.837 | 0.889 | 0.979 | 0.942 |
| Treatment Prob(F) | | | | | | 0.6148 | 0.5690 | 0.4940 | 0.5245 |

1/RFV = Relative Feed Value
2/NDF = Nuetral Detergent Fiber
3/ADF = Acid Detergent Fiber

# Montana State University
## WHITETOP STUDY, PURSUIT AND SURFACTANTS - LAKE COUNTY

Project Code: WHITETOP
Cooperator: L. POLANSKI

Location: LAKE CO, SITE B (CANAL) 1ST CUT
By: Bob Stougaard

| Trt No | Treatment Name | Form Amt | Fm Ds | Rate | Rate Unit | RFV 1/ 1ST CUT | % PLANT PROTEIN 1ST CUT 6-1-95 | % PLANT NDF 2/ 1ST CUT 6-1-95 | % PLANT ADF 3/ 1ST CUT 6-1-95 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | NONTREATED | | | | | 202.59 | 16.61 | 35.37 | 25.50 |
| 2 | PURSUIT | 2 EC | | .03 | lb ai/A | 155.45 | 16.81 | 41.23 | 25.73 |
| 2 | NIS | 1 EC | | .25 | gal pr/100gal | | | | |
| 3 | PURSUIT | 2 EC | | .03 | lb ai/A | 158.57 | 16.73 | 41.00 | 25.97 |
| 3 | NIS | 1 EC | | .25 | gal pr/100gal | | | | |
| 3 | 28% UAN | 1 EC | | 1 | qt pr/A | | | | |
| 4 | PURSUIT | 2 EC | | .03 | lb ai/A | 163.51 | 17.52 | 37.90 | 29.60 |
| 4 | MSO | 1 EC | | 1 | qt pr/A | | | | |
| 5 | PURSUIT | 2 EC | | .03 | lb ai/A | 160.02 | 16.94 | 39.43 | 27.30 |
| 5 | MSO | 1 EC | | 1 | qt pr/A | | | | |
| 5 | 28% UAN | 1 EC | | 1 | qt pr/A | | | | |
| 6 | PURSUIT | 2 EC | | .06 | lb ai/A | 142.51 | 16.75 | 43.50 | 28.63 |
| 6 | NIS | 1 EC | | .25 | gal pr/100gal | | | | |
| 7 | PURSUIT | 2 EC | | .06 | lb ai/A | 174.12 | 17.09 | 36.67 | 26.53 |
| 7 | NIS | 1 EC | | .25 | gal pr/100gal | | | | |
| 7 | 28% UAN | 1 EC | | 1 | qt pr/A | | | | |
| 8 | PURSUIT | 2 EC | | .06 | lb ai/A | 196.06 | 17.67 | 34.70 | 20.33 |
| 8 | MSO | 1 EC | | 1 | qt pr/A | | | | |
| 9 | PURSUIT | 2 EC | | .06 | lb ai/A | 184.80 | 17.12 | 36.23 | 25.83 |
| 9 | MSO | 1 EC | | 1 | qt pr/A | | | | |
| 9 | 28% UAN | 1 EC | | 1 | qt pr/A | | | | |
| 10 | PURSUIT | 2 EC | | .09 | lb ai/A | 154.14 | 16.15 | 43.07 | 22.73 |
| 10 | NIS | 1 EC | | .25 | gal pr/100gal | | | | |
| 11 | PURSUIT | 2 EC | | .09 | lb ai/A | 164.05 | 16.57 | 39.03 | 26.53 |
| 11 | NIS | 1 EC | | .25 | gal pr/100gal | | | | |
| 11 | 28% UAN | 1 EC | | 1 | qt pr/A | | | | |
| 12 | PURSUIT | 2 EC | | .09 | lb ai/A | 145.17 | 16.73 | 43.63 | 27.20 |
| 12 | MSO | 1 EC | | 1 | qt pr/A | | | | |
| 13 | PURSUIT | 2 EC | | .09 | lb ai/A | 176.10 | 16.17 | 36.60 | 25.63 |
| 13 | MSO | 1 EC | | 1 | qt pr/A | | | | |
| 13 | 28% UAN | 1 EC | | 1 | qt pr/A | | | | |
| LSD (.05) = | | | | | | 54.54 | 2.00 | 8.940 | 5.500 |
| Standard Dev.= | | | | | | 32.363 | 1.1890 | .053057 | .032639 |
| CV = | | | | | | 19.32 | 7.06 | 13.57 | 12.57 |
| Block F | | | | | | 0.913 | 3.017 | 2.300 | 1.729 |
| Block Prob(F) | | | | | | 0.4147 | 0.0678 | 0.1220 | 0.1989 |
| Treatment F | | | | | | 0.973 | 0.424 | 1.057 | 1.569 |
| Treatment Prob(F) | | | | | | 0.4994 | 0.9383 | 0.4341 | 0.1679 |

1/RFV = Relative Feed Value
2/NDF = Nuetral Detergent Fiber
3/ADF = Acid Detergent Fiber

# Montana State University
## WHITETOP STUDY, PURSUIT AND SURFACTANTS - LAKE COUNTY

Project Code: WHITETOP
Cooperator: L. POLANSKI

Location: LAKE CO, SITE B (CANAL) 2CD CUT
By: Bob Stougaard

| Trt No | Treatment Name | Form Amt | Fm Ds | Rate | Rate Unit | RFV 1/ 2CD CUT | % PLANT PROTEIN 2CD CUT 8-9-95 | % PLANT NDF 2/ 2CD CUT 8-9-95 | % PLANT ADF 3/ 2CD CUT 8-9-95 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | NONTREATED | | | | | 132.94 | 16.08 | 44.90 | 34.43 |
| 2 | PURSUIT | 2 | EC | .03 | lb ai/A | 115.33 | 17.48 | 50.23 | 35.33 |
| 2 | NIS | 1 | EC | .25 | gal pr/100gal | | | | |
| 3 | PURSUIT | 2 | EC | .03 | lb ai/A | 144.86 | 18.25 | 42.70 | 28.87 |
| 3 | NIS | 1 | EC | .25 | gal pr/100gal | | | | |
| 3 | 28% UAN | 1 | EC | 1 | qt pr/A | | | | |
| 4 | PURSUIT | 2 | EC | .03 | lb ai/A | 168.38 | 16.85 | 37.70 | 28.40 |
| 4 | MSO | 1 | EC | 1 | qt pr/A | | | | |
| 5 | PURSUIT | 2 | EC | .03 | lb ai/A | 115.99 | 16.79 | 52.80 | 34.83 |
| 5 | MSO | 1 | EC | 1 | qt pr/A | | | | |
| 5 | 28% UAN | 1 | EC | 1 | qt pr/A | | | | |
| 6 | PURSUIT | 2 | EC | .06 | lb ai/A | 124.92 | 16.29 | 48.83 | 31.17 |
| 6 | NIS | 1 | EC | .25 | gal pr/100gal | | | | |
| 7 | PURSUIT | 2 | EC | .06 | lb ai/A | 134.26 | 15.40 | 45.13 | 31.33 |
| 7 | NIS | 1 | EC | .25 | gal pr/100gal | | | | |
| 7 | 28% UAN | 1 | EC | 1 | qt pr/A | | | | |
| 8 | PURSUIT | 2 | EC | .06 | lb ai/A | 122.20 | 16.54 | 50.73 | 33.83 |
| 8 | MSO | 1 | EC | 1 | qt pr/A | | | | |
| 9 | PURSUIT | 2 | EC | .06 | lb ai/A | 142.00 | 17.52 | 42.40 | 31.63 |
| 9 | MSO | 1 | EC | 1 | qt pr/A | | | | |
| 9 | 28% UAN | 1 | EC | 1 | qt pr/A | | | | |
| 10 | PURSUIT | 2 | EC | .09 | lb ai/A | 121.56 | 16.67 | 47.83 | 34.43 |
| 10 | NIS | 1 | EC | .25 | gal pr/100gal | | | | |
| 11 | PURSUIT | 2 | EC | .09 | lb ai/A | 129.02 | 14.67 | 46.20 | 32.50 |
| 11 | NIS | 1 | EC | .25 | gal pr/100gal | | | | |
| 11 | 28% UAN | 1 | EC | 1 | qt pr/A | | | | |
| 12 | PURSUIT | 2 | EC | .09 | lb ai/A | 123.70 | 16.31 | 47.30 | 33.40 |
| 12 | MSO | 1 | EC | 1 | qt pr/A | | | | |
| 13 | PURSUIT | 2 | EC | .09 | lb ai/A | 130.18 | 16.88 | 46.50 | 31.70 |
| 13 | MSO | 1 | EC | 1 | qt pr/A | | | | |
| 13 | 28% UAN | 1 | EC | 1 | qt pr/A | | | | |
| LSD (.05) = | | | | | | 39.34 | 2.38 | 10.640 | 8.140 |
| Standard Dev.= | | | | | | 23.3421 | 1.41213 | .063109 | .048278 |
| CV = | | | | | | 17.79 | 8.51 | 13.60 | 14.88 |
| Block F | | | | | | 3.479 | 2.176 | 6.117 | 2.797 |
| Block Prob(F) | | | | | | 0.0471 | 0.1354 | 0.0071 | 0.0809 |
| Treatment F | | | | | | 1.127 | 1.273 | 1.208 | 0.623 |
| Treatment Prob(F) | | | | | | 0.3847 | 0.2956 | 0.3326 | 0.8025 |

1/RFV = Relative Feed Value
2/NDF = Nuetral Detergent Fiber
3/ADF = Acid Detergent Fiber

# Montana State University
# IRRIGATED SPRING WHEAT PROTEIN ENHANCEMENT STUDY - 1995

Code:95 - SWPE Location :KALISPELL
Cooperator :WESTCOTT/ENGLE By:Bob Stougaard

## Summary Comments

This was the second year of a protein enhancement study on spring wheat. Yields increased as preplant N rates increased. Nitrogen applications at heading consistently increased grain protein, regardless of the amount of preplant N.

# Montana State University
# IRRIGATED SPRING WHEAT PROTEIN ENHANCEMENT STUDY - 1995

Code:95 - SWPE Location :KALISPELL
Cooperator :WESTCOTT/ENGLE By:Bob Stougaard

## Site Description

Crop: SPRING WHEAT Variety: NEWANA,LEN,HI-LINE Planting Date: 4-20-95
Planting Method: PRESSDRILL Rate, Unit: 60 , LB/A Depth, Unit: 1.5 , "
Perennial Age, Unit: , Row Spacing, Unit: 6 , "
Soil Temp., Unit: , F Soil Moisture: Emergence Date: 4-29-95

Plot Width/Area, Unit: 6 , FT Plot Length, Unit: 14 , FT Reps: 4
Site Type: Seed Bed Desc.: Ground Cover:
Tillage Type: Study Design: Split-Plot
Field Preparation/Plot Maintenance: FALL PLOW, SPRING DISC AND VIBR-SHANK. CULTI-PACKED PROIR TO SEEDING.

## Soil Description

Texture: FINE SANDY LOAM % OM: 3.3 % Sand: 60 % Silt: 30 % Clay: 10
pH: 8.0 CEC: Soil Name: KALISPELL FSL Fertility Level:

## Moisture Conditions

| Moisture On: | Date | Amount | Unit | Type | | Date | Amount | Unit | Type |
|---|---|---|---|---|---|---|---|---|---|
| 1. | 6-28-95 | .5 | " | IRRIGATION | 2. | 7-20-95 | .75 | " | IRRIGATION |
| 3. | | | | | 4. | | | | |

Overall Moisture Conditions: Suppplemental irrigation required in June and July, otherwise favorable moisture during the spring.

## Application and Seeding Information:

Initial N fertilizer applicationd made on 4-20-95 prior to seeding. Fertilizer was incorporated twice using Kubota 275 and vibra-shnak. Base line fertilizer also applied previous day to cultivation ( 50 LB K2O, 50 LB P2O5 per acre ). Seeding accomplished with research seeder ( ZEROMAX AT 42.0 ) at 60 lb/A after area packed using cultipacker.

Split application of fertilizer made on 6-27-95 at heading of cereals.

Hoelon application (2 PT/A) on 5-15-95

Quads pulled 8-29 & 30-95

Harvest on 9-11-95

Soil samples on 10-13-95

## Summary Comments

This was the second year of a protein enhancement study on spring wheat. Yields increased as preplant N rates increased. Nitrogen applications at heading consistently increased grain protein, regardless of the amount of preplant N.

Table 1.

Montana State University

IRRIGATED SPRING WHEAT PROTEIN ENHANCEMENT STUDY - 1995

Project Code:95 - SWPE Location :KALISPELL
Cooperator :WESTCOTT/ENGLE By:Bob Stougaard

| Trt No | Treatment Name | SP WHT SPAD 1 6-27-95 | SP WHT SPAD 2 7-21-95 | SP WHT PROTEIN PERCENT 9-11-95 | SP WHT FLAG LF TKN %N 9-11-95 | SP WHT STRAW TKN %N 9-11-95 |
|---|---|---|---|---|---|---|
| 1 | LEN | 43.05 | 41.28 | 13.90 | 3.793 | 0.4305 |
| 1 | 0 NITROGEN | | | | | |
| 1 | NO SPLIT N | | | | | |
| 2 | LEN | 43.05 | 43.67 | 14.55 | | 0.4235 |
| 2 | 0 NITROGEN | | | | | |
| 2 | SPLIT N | | | | | |
| 3 | LEN | 49.35 | 42.97 | 12.85 | 4.220 | 0.4305 |
| 3 | 50 LBS N | | | | | |
| 3 | NO SPLIT N | | | | | |
| 4 | LEN | 49.35 | 44.43 | 13.98 | | 0.4445 |
| 4 | 50 LBS N | | | | | |
| 4 | SPLIT N | | | | | |
| 5 | LEN | 48.28 | 46.65 | 13.58 | 4.365 | 0.3868 |
| 5 | 100 LBS N | | | | | |
| 5 | NO SPLIT N | | | | | |
| 6 | LEN | 48.28 | 45.48 | 14.75 | | 0.5075 |
| 6 | 100 LBS N | | | | | |
| 6 | SPLIT N | | | | | |
| 7 | LEN | 48.80 | 44.43 | 14.55 | 4.393 | 0.4495 |
| 7 | 150 LBS N | | | | | |
| 7 | NO SPLIT N | | | | | |
| 8 | LEN | 48.80 | 46.60 | 14.83 | | 0.4565 |
| 8 | 150 LBS N | | | | | |
| 8 | SPLIT N | | | | | |
| 9 | NEWANA | 48.20 | 44.05 | 12.03 | 3.845 | 0.4090 |
| 9 | 0 NITROGEN | | | | | |
| 9 | NO SPLIT N | | | | | |
| 10 | NEWANA | 48.20 | 47.60 | 13.68 | | 0.5105 |
| 10 | 0 NITROGEN | | | | | |
| 10 | SPLIT N | | | | | |
| 11 | NEWANA | 53.20 | 45.13 | 11.08 | 4.113 | 0.4235 |
| 11 | 50 LBS N | | | | | |
| 11 | NO SPLIT N | | | | | |
| 12 | NEWANA | 53.20 | 49.38 | 12.85 | | 0.4710 |
| 12 | 50 LBS N | | | | | |
| 12 | SPLIT N | | | | | |

# Montana State University
## IRRIGATED SPRING WHEAT PROTEIN ENHANCEMENT STUDY - 1995

Project Code:95 - SWPE  Location :KALISPELL
Cooperator :WESTCOTT/ENGLE  By:Bob Stougaard

| Trt No | Treatment Name | SP WHT SPAD 1 6-27-95 | SP WHT SPAD 2 7-21-95 | SP WHT PROTEIN PERCENT 9-11-95 | SP WHT FLAG LF TKN %N 9-11-95 | SP WHT STRAW TKN %N 9-11-95 |
|---|---|---|---|---|---|---|
| 13 | NEWANA 100 LBS N NO SPLIT N | 54.10 | 48.08 | 11.75 | 4.170 | 0.4635 |
| 14 | NEWANA 100 LBS N SPLIT N | 54.10 | 49.45 | 12.92 | | 0.5163 |
| 15 | NEWANA 150 LBS N NO SPLIT N | 54.20 | 49.80 | 12.35 | 4.468 | 0.5163 |
| 16 | NEWANA 150 LBS N SPLIT N | 54.20 | 50.67 | 13.33 | | 0.6288 |
| 17 | HI-LINE 0 NITROGEN NO SPLIT N | 48.07 | 42.75 | 13.30 | 4.245 | 0.4365 |
| 18 | HI-LINE 0 NITROGEN SPLIT N | 48.07 | 45.23 | 14.35 | | 0.5025 |
| 19 | HI-LINE 50 LBS N NO SPLIT N | 50.30 | 41.82 | 12.25 | 4.190 | 0.3698 |
| 20 | HI-LINE 50 LBS N SPLIT N | 50.30 | 44.75 | 14.30 | | 0.4788 |
| 21 | HI-LINE 100 LBS N NO SPLIT N | 51.72 | 44.85 | 13.20 | 4.385 | 0.4148 |
| 22 | HI-LINE 100 LBS N SPLIT N | 51.72 | 44.47 | 14.55 | | 0.4393 |
| 23 | HI-LINE 150 LBS N NO SPLIT N | 48.85 | 47.15 | 13.63 | 4.485 | 0.4775 |
| 24 | HI-LINE 150 LBS N SPLIT N | 48.85 | 46.13 | 14.50 | | 0.4945 |
| LSD (.05) = | | 2.81 | 2.71 | 0.62 | 0.291 | 0.1130 |
| Standard Dev.= | | 1.98864 | 1.91725 | .436814 | .201401 | .079881 |
| CV = | | 3.99 | 4.20 | 3.25 | 4.77 | 17.30 |
| Block F | | 6.672 | 20.773 | 9.192 | 0.673 | 7.530 |
| Block Prob(F) | | 0.0005 | 0.0001 | 0.0001 | 0.5749 | 0.0002 |
| Treatment F | | 9.575 | 6.950 | 22.537 | 4.916 | 1.833 |
| Treatment Prob(F) | | 0.0001 | 0.0001 | 0.0001 | 0.0002 | 0.0283 |

Table 2. Montana State University

## IRRIGATED SPRING WHEAT PROTEIN ENHANCEMENT STUDY - 1995

Project Code:95 - SWPE Location :KALISPELL
Cooperator :WESTCOTT/ENGLE By:Bob Stougaard

| Trt No | Treatment Name | SP WHT LAI 6-15-95 | SPR WHT BIOMASS LBS/A 9-5-95 | SPR WHT RATIO TOT/GRN 9-5-95 | SP WHEAT RATIO STRW/GRN 9-5-95 | SPR WHT YIELD BU/A 9-11-95 | SPR WHT TEST WT LB/BU 9-11-9 |
|---|---|---|---|---|---|---|---|
| 1 | LEN 0 NITROGEN NO SPLIT N | 0.828 | 4110 | 2.29 | 1.29 | 47.4 | 60.1 |
| 2 | LEN 0 NITROGEN SPLIT N | 0.828 | 5856 | 2.23 | 1.23 | 58.9 | 59.8 |
| 3 | LEN 50 LBS N NO SPLIT N | 1.295 | 6701 | 2.18 | 1.18 | 63.3 | 59.5 |
| 4 | LEN 50 LBS N SPLIT N | 1.295 | 7050 | 2.25 | 1.25 | 73.6 | 61.1 |
| 5 | LEN 100 LBS N NO SPLIT N | 1.338 | 8052 | 2.17 | 1.17 | 73.9 | 59.9 |
| 6 | LEN 100 LBS N SPLIT N | 1.338 | 7973 | 2.24 | 1.24 | 76.9 | 59.7 |
| 7 | LEN 150 LBS N NO SPLIT N | 1.293 | 8581 | 2.17 | 1.17 | 67.3 | 59.5 |
| 8 | LEN 150 LBS N SPLIT N | 1.293 | 8863 | 2.14 | 1.14 | 81.4 | 59.2 |
| 9 | NEWANA 0 NITROGEN NO SPLIT N | 0.913 | 5304 | 2.10 | 1.10 | 57.9 | 59.9 |
| 10 | NEWANA 0 NITROGEN SPLIT N | 0.913 | 6701 | 2.00 | 1.00 | 67.1 | 58.4 |
| 11 | NEWANA 50 LBS N NO SPLIT N | 1.550 | 8727 | 2.04 | 1.04 | 79.2 | 59.3 |
| 12 | NEWANA 50 LBS N SPLIT N | 1.550 | 8604 | 2.04 | 1.04 | 82.4 | 59.4 |
| 13 | NEWANA 100 LBS N NO SPLIT N | 1.610 | 9831 | 2.01 | 1.01 | 85.4 | 46.4 |
| 14 | NEWANA 100 LBS N SPLIT N | 1.610 | 9065 | 1.94 | 0.94 | 87.1 | 59.8 |

# Montana State University
## IRRIGATED SPRING WHEAT PROTEIN ENHANCEMENT STUDY - 1995

Project Code:95 - SWPE  Location :KALISPELL
Cooperator :WESTCOTT/ENGLE  By:Bob Stougaard

| Trt No | Treatment Name | SP WHT LAI 6-15-95 | SPR WHT BIOMASS LBS/A 9-5-95 | SPR WHT RATIO TOT/GRN 9-5-95 | SP WHEAT RATIO STRW/GRN 9-5-95 | SPR WHT YIELD BU/A 9-11-95 | SPR WHT TEST WT LB/BU 9-11-9 |
|---|---|---|---|---|---|---|---|
| 15 | NEWANA | 1.940 | 9685 | 2.07 | 1.07 | 86.1 | 59.2 |
| 15 | 150 LBS N | | | | | | |
| 15 | NO SPLIT N | | | | | | |
| 16 | NEWANA | 1.940 | 9651 | 2.01 | 1.01 | 90.8 | 59.7 |
| 16 | 150 LBS N | | | | | | |
| 16 | SPLIT N | | | | | | |
| 17 | HI-LINE | 0.678 | 4888 | 2.00 | 1.00 | 47.1 | 59.8 |
| 17 | 0 NITROGEN | | | | | | |
| 17 | NO SPLIT N | | | | | | |
| 18 | HI-LINE | 0.678 | 5225 | 1.97 | 0.97 | 55.0 | 58.9 |
| 18 | 0 NITROGEN | | | | | | |
| 18 | SPLIT N | | | | | | |
| 19 | HI-LINE | 1.410 | 7252 | 2.02 | 1.02 | 64.0 | 60.7 |
| 19 | 50 LBS N | | | | | | |
| 19 | NO SPLIT N | | | | | | |
| 20 | HI-LINE | 1.410 | 7523 | 2.01 | 1.01 | 67.4 | 60.1 |
| 20 | 50 LBS N | | | | | | |
| 20 | SPLIT N | | | | | | |
| 21 | HI-LINE | 1.888 | 8333 | 2.03 | 1.03 | 77.2 | 60.3 |
| 21 | 100 LBS N | | | | | | |
| 21 | NO SPLIT N | | | | | | |
| 22 | HI-LINE | 1.888 | 8762 | 2.06 | 1.06 | 78.5 | 60.2 |
| 22 | 100 LBS N | | | | | | |
| 22 | SPLIT N | | | | | | |
| 23 | HI-LINE | 1.383 | 8007 | 2.00 | 1.00 | 72.6 | 60.4 |
| 23 | 150 LBS N | | | | | | |
| 23 | NO SPLIT N | | | | | | |
| 24 | HI-LINE | 1.383 | 7861 | 1.97 | 0.97 | 73.8 | 59.8 |
| 24 | 150 LBS N | | | | | | |
| 24 | SPLIT N | | | | | | |
| LSD (.05) = | | 0.369 | 2089 | 0.12 | 0.12 | 12.3 | 7.8 |
| Standard Dev.= | | .260730 | 476.79 | .087931 | .087928 | 8.69817 | 5.49700 |
| CV = | | 19.41 | 19.41 | 4.23 | 8.15 | 12.18 | 9.28 |
| Block F | | 25.668 | 24.841 | 1.775 | 1.777 | 72.291 | 2.233 |
| Block Prob(F) | | 0.0001 | 0.0001 | 0.1599 | 0.1596 | 0.0001 | 0.0921 |
| Treatment F | | 8.555 | 4.666 | 5.362 | 5.363 | 7.787 | 1.024 |
| Treatment Prob(F) | | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.4494 |

Montana State University

# BANVEL/TANKMIX COMBINATIONS ON SMALL GRAINS

Code:BANVEL Location :Kalispell, MT
Cooperator :Wayne Belles By:Bob Stougaard

Summary:
Although applications of Banvel and SAN 845H initially caused significant crop injury, the crop eventually recovered without suffering yield loss. Common lambsquarter was the most prevalent weed in this study and was easily controlled by all treatments evaluated. Tough failed to control wild buckwheat and shepherdspurse, whereas Banvel and SAN 845H treatments provided excellent control. There were no yield differences even though weed pressure was heavy.

# Montana State University
## Banvel/Tankmix Combinations on Small Grains

Project Code:BANVEL
Cooperator :Wayne Belles

Location :Kalispell, MT
By:Bob Stougaard

| Trt No | Treatment Name | Form Amt | Fm Ds | Rate | Rate Unit | Grow Stg | Appl Code | BARLEY INJURY PERCENT 5-29-95 | BARLEY INJURY PERCENT 6-13-95 | LMBQTR CONTROL PERCENT 6-13-95 | BUCKWHT CONTROL PERCENT 6-13-95 | SHEPURSE CONTROL PERCENT 6-13-95 | BARLEY YIELD BU/A 8-22-95 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | NON-TREATED | | | | | | | 0 | 0 | 0 | 0 | 0 | 69.0 |
| 2 | BANVEL | 4 | SL | .094 | lb ai/A | PO1 | A | 5 | 0 | 100 | 100 | 100 | 80.4 |
| 2 | 2,4-D DMA SALT | 3.8 | SL | .25 | lb ai/A | PO1 | A | | | | | | |
| 2 | HARMONY EXTRA | 75 | WG | .0078 | lb ai/A | PO1 | A | | | | | | |
| 2 | NIS | 1 | EC | .25 | % v/v | PO1 | P | | | | | | |
| 3 | BANVEL | 4 | SL | .094 | lb ai/A | PO1 | A | 13 | 3 | 100 | 100 | 100 | 78.4 |
| 3 | 2,4-D DMA SALT | 3.8 | SL | .25 | lb ai/A | PO1 | A | | | | | | |
| 3 | HARMONY EXTRA | 75 | WG | .0156 | lb ai/A | PO1 | A | | | | | | |
| 3 | NIS | 1 | EC | .25 | % v/v | PO1 | P | | | | | | |
| 4 | BANVEL | 4 | SL | .094 | lb ai/A | PO1 | A | 22 | 10 | 100 | 99 | 100 | 81.6 |
| 4 | 2,4-D DMA SALT | 3.8 | SL | .25 | lb ai/A | PO1 | A | | | | | | |
| 4 | TOUGH | 3.75 | EC | .47 | lb ai/A | PO1 | A | | | | | | |
| 4 | NIS | 1 | EC | .25 | % v/v | PO1 | P | | | | | | |
| 5 | BANVEL | 4 | SL | .094 | lb ai/A | PO1 | A | 17 | 3 | 100 | 98 | 100 | 81.1 |
| 5 | 2,4-D DMA SALT | 3.8 | SL | .25 | lb ai/A | PO1 | A | | | | | | |
| 5 | TOUGH | 3.75 | EC | .235 | lb ai/A | PO1 | A | | | | | | |
| 5 | NIS | 1 | EC | .25 | % v/v | PO1 | P | | | | | | |
| 6 | BANVEL | 4 | SL | .094 | lb ai/A | PO1 | A | 20 | 7 | 100 | 100 | 100 | 75.8 |
| 6 | 2,4-D DMA SALT | 3.8 | SL | .25 | lb ai/A | PO1 | A | | | | | | |
| 6 | BUCTRIL | 2 | EC | .25 | lb ai/A | PO1 | A | | | | | | |
| 6 | NIS | 1 | EC | .25 | % v/v | PO1 | P | | | | | | |
| 7 | BANVEL | 4 | SL | .094 | lb ai/A | PO1 | A | 17 | 2 | 100 | 96 | 100 | 78.7 |
| 7 | 2,4-D DMA SALT | 3.8 | SL | .38 | lb ai/A | PO1 | A | | | | | | |
| 7 | NIS | 1 | EC | .25 | % v/v | PO1 | P | | | | | | |
| 8 | SAN 845H | 70 | WP | .094 | lb ai/A | PO1 | A | 20 | 3 | 100 | 99 | 100 | 68.2 |
| 8 | 2,4-D DMA SALT | 3.8 | SL | .38 | lb ai/A | PO1 | A | | | | | | |
| 8 | NIS | 1 | EC | .25 | % v/v | PO1 | P | | | | | | |
| 9 | SAN 845H | 70 | WP | .094 | lb ai/A | PO1 | A | 22 | 0 | 100 | 99 | 100 | 83.4 |
| 9 | WARRANT | 85 | WG | .38 | lb ai/A | PO1 | A | | | | | | |
| 9 | NIS | 1 | EC | .25 | % v/v | PO1 | P | | | | | | |
| 10 | TOUGH | 3.75 | EC | .47 | lb ai/A | PO1 | A | 3 | 7 | 99 | 0 | 20 | 74.8 |
| 10 | NIS | 1 | EC | .25 | % v/v | PO1 | P | | | | | | |
| LSD (.05) = | | | | | | | | 8 | 8 | 1 | 3 | 19 | 12.7 |
| Standard Dev.= | | | | | | | | 4.64479 | 4.44097 | .641180 | 1.80842 | 10.9545 | 7.34442 |
| CV = | | | | | | | | 33.58 | 126.88 | 0.71 | 2.29 | 13.36 | 9.52 |
| Block F | | | | | | | | 2.588 | 2.408 | 1.541 | 0.581 | 1.000 | 10.783 |
| Block Prob(F) | | | | | | | | 0.1028 | 0.1183 | 0.2412 | 0.5695 | 0.3874 | 0.0011 |
| Treatment F | | | | | | | | 9.189 | 1.732 | 7260.189 | 1595.539 | 36.556 | 1.496 |
| Treatment Prob(F) | | | | | | | | 0.0001 | 0.1535 | 0.0001 | 0.0001 | 0.0001 | 0.2309 |

NIS was Activator-90

# Montana State University
## Banvel/Tankmix Combinations on Small Grains

Code:BANVEL Location :Kalispell, MT
Cooperator :Wayne Belles By:Bob Stougaard

### Site Description

Crop: BARLEY Variety: GALLATIN Planting Date: 4-21-95
Planting Method: PRESSDRILL Rate, Unit: 60 , LB/A Depth, Unit: 1.5 , "
Perennial Age, Unit: , Row Spacing, Unit: 7 , "
Soil Temp., Unit: , Soil Moisture: Emergence Date: 5-1-95

Plot Width/Area, Unit: 10 , FT Plot Length, Unit: 15 , FT Reps: 3
Site Type: Seed Bed Desc.: Ground Cover: NONE
Tillage Type: Study Design: RCB
Field Preparation/Plot Maintenance: FALL PLOW, SPRING DISC AND CULTIVATE, PACKED PRIOR TO SEEDING, HARROWED AFTER WEED SEED SPREAD.

### Soil Description

Texture: SILT LOAM % OM: 3 % Sand: 50 % Silt: 40 % Clay: 10
pH: 7.7 CEC: Soil Name: CRESTON S.L. Fertility Level:

### Moisture Conditions

Overall Moisture Conditions: FAVORABLE THROUGHOUT CROPPING SEASON

### Application Information

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| Application Date: | 5-18-95 | | | | | |
| Time of Day: | 11:00 A.M | | | | | |
| Application Method: | BACKPACK | | | | | |
| Application Timing: | POST | | | | | |
| Air Temp., Unit: | 61 ,F | , | , | , | , | , |
| % Relative Humidity: | 50 | | | | | |
| Wind Velocity, Unit: | 0 2 ,MPH | , | , | , | , | , |
| Dew Presence (Y/N): | N | | | | | |
| Water Hardness: | N | | | | | |
| Soil Temp., Unit: | 59 ,F | , | , | , | , | , |
| Soil Moisture: | GOOD | | | | | |
| % Cloud Cover: | 50 | | | | | |

| Weed Species | Weed Stage, Density at Application |
|---|---|
| WILD BUCKWHEAT | 2 LF,3/FT |
| LAMBSQUARTERS | 6 LF,3/FT |
| SHEPERDSPURSE | 10LF,2/FT |
| BARLEY | 4-5LF |

### Application Equipment

| | Sprayer Type | Speed MPH | Nozzle Type | Nozzle Size | Nozzle Height | Nozzle Spacing | Boom Width | GPA | Carrier | PSI |
|---|---|---|---|---|---|---|---|---|---|---|
| A. | BACKPACK | 2.5 | FLATFAN | 1100VS | 14" | 20" | 10' | 20 | H20 | 20 |

Weed Stage at rating dates:

| | 5-29-95 | 6-13-95 |
|---|---|---|
| BARLEY | 7 LEAF,5" | E. BOOT |
| WILD BUCKWHEAT | 6 LF,4"TALL | ,5-7" |
| LAMBSQUARTER | 10 LF,5"TALL | ,8" |
| SHEPHERDSPURSE | 15LF,5"TALL | ,9" |

# Montana State University
# 1995 ASSERT CARRIER VOLUME, RATE AND DATE STUDY

Project Code: ASSERT CV
Cooperator:

Location: KALISPELL, MT
By: Bob Stougaard

Summary Comments:

This study was again established in 1995 to evaluate the consistency of reduced herbicide rates when adjusting application techniques. This was the third year we investigated the effect of carrier volume on postemergence wild oat control. Fractions of the labeled Assert rate were applied in either 8,16, or 24 GPA. These treatments were then applied to different wild oat growth stages at either 1,2 or 3 weeks after crop emergence. Increasing carrier volumes from 8 to 16 GPA improved wild oat control. However, there was little difference in control between 16 and 24 gallons. The response to carrier volume was similar regardless of herbicide use rate.

# Montana State University
# 1995 ASSERT CARRIER VOLUME, RATE AND DATE STUDY

Project Code: ASSERT CV
Cooperator : Bruce Maxwell

Location: KALISPELL, MT
By: Bob Stougaard

| Trt No | Treatment Name | Form Amt | Rate lb ai/A | Grow Stg | BARLEY INJURY % 5-29-95 | WILD OAT CONTROL % 8-4-95 | BARLEY LODGE % 8-4-95 | BARLEY PLUMP % 8-23-95 | BARLEY YIELD BU/A 8-23-95 | BARLEY TEST WT LB/BU 8-23-95 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1WABE | | | 1WABE | 0 | 0.0 | 47.5 | 73.0 | 45.9 | 51.3 |
| 1 | CHECK | | | | | | | | | |
| 2 | ASSERT | 2.5 EC | .11 | 1WABE | 0 | 72.5 | 1.3 | 87.8 | 71.7 | 53.6 |
| 2 | 8 GPA | | | | | | | | | |
| 3 | ASSERT | 2.5 EC | .11 | 1WABE | 0 | 91.0 | 0.0 | 91.0 | 93.4 | 54.5 |
| 3 | 16 GPA | | | | | | | | | |
| 4 | ASSERT | 2.5 EC | .11 | 1WABE | 0 | 88.0 | 4.3 | 87.5 | 89.8 | 54.5 |
| 4 | 24 GPA | | | | | | | | | |
| 5 | ASSERT | 2.5 EC | .23 | 1WABE | 0 | 84.0 | 8.8 | 82.3 | 89.8 | 53.2 |
| 5 | 8 GPA | | | | | | | | | |
| 6 | ASSERT | 2.5 EC | .23 | 1WABE | 0 | 93.0 | 0.0 | 90.0 | 98.1 | 53.5 |
| 6 | 16 GPA | | | | | | | | | |
| 7 | ASSERT | 2.5 EC | .23 | 1WABE | 0 | 91.3 | 7.0 | 87.5 | 100.4 | 54.4 |
| 7 | 24 GPA | | | | | | | | | |
| 8 | ASSERT | 2.5 EC | .46 | 1WABE | 0 | 90.5 | 12.5 | 86.0 | 104.2 | 52.9 |
| 8 | 8 GPA | | | | | | | | | |
| 9 | ASSERT | 2.5 EC | .46 | 1WABE | 0 | 95.5 | 4.5 | 87.0 | 102.9 | 54.1 |
| 9 | 16 GPA | | | | | | | | | |
| 10 | ASSERT | 2.5 EC | .46 | 1WABE | 0 | 94.3 | 3.8 | 88.8 | 96.6 | 54.6 |
| 10 | 24 GPA | | | | | | | | | |
| 11 | 2 WABE | | | 2WABE | 0 | 0.0 | 30.0 | 80.8 | 68.1 | 52.3 |
| 11 | CHECK | | | | | | | | | |
| 12 | ASSERT | 2.5 EC | .11 | 2WABE | 0 | 73.8 | 12.5 | 83.8 | 79.6 | 53.9 |
| 12 | 8 GPA | | | | | | | | | |
| 13 | ASSERT | 2.5 EC | .11 | 2WABE | 0 | 78.0 | 1.5 | 86.5 | 80.3 | 53.4 |
| 13 | 16 GPA | | | | | | | | | |
| 14 | ASSERT | 2.5 EC | .11 | 2WABE | 0 | 73.5 | 22.5 | 84.3 | 77.4 | 53.6 |
| 14 | 24 GPA | | | | | | | | | |
| 15 | ASSERT | 2.5 EC | .23 | 2WABE | 0 | 73.8 | 22.5 | 86.0 | 81.0 | 52.9 |
| 15 | 8 GPA | | | | | | | | | |
| 16 | ASSERT | 2.5 EC | .23 | 2WABE | 0 | 84.5 | 3.8 | 87.0 | 80.4 | 53.7 |
| 16 | 16 GPA | | | | | | | | | |
| 17 | ASSERT | 2.5 EC | .23 | 2WABE | 0 | 85.5 | 5.0 | 87.3 | 79.1 | 54.4 |
| 17 | 24 GPA | | | | | | | | | |
| 18 | ASSERT | 2.5 EC | .46 | 2WABE | 0 | 76.3 | 5.0 | 91.0 | 85.6 | 54.2 |
| 18 | 8 GPA | | | | | | | | | |
| 19 | ASSERT | 2.5 EC | .46 | 2WABE | 0 | 93.5 | 0.0 | 91.3 | 95.5 | 54.8 |
| 19 | 16 GPA | | | | | | | | | |
| 20 | ASSERT | 2.5 EC | .46 | 2WABE | 0 | 93.5 | 0.8 | 91.3 | 91.1 | 54.7 |
| 20 | 24 GPA | | | | | | | | | |

(Cont'd on next page)

# Montana State University
# 1995 ASSERT CARRIER VOLUME, RATE AND DATE STUDY

Project Code: ASSERT CV
Cooperator : Bruce Maxwell

Location: KALISPELL, MT
By: Bob Stougaard

| Trt No | Treatment Name | Form Amt | Rate lb ai/A | Grow Stg | BARLEY INJURY % 5-29-95 | WILD OAT CONTROL % 8-4-95 | BARLEY LODGE % 8-4-95 | BARLEY PLUMP % 8-23-95 | BARLEY YIELD BU/A 8-23-95 | BARLEY TEST WT LB/BU 8-23-95 |
|---|---|---|---|---|---|---|---|---|---|---|
| 21 | ASSERT | | | 3WABE | 0 | 0.0 | 43.8 | 78.8 | 58.7 | 52.3 |
| 21 | CHECK | | | | | | | | | |
| 22 | ASSERT | 2.5 EC | .11 | 3WABE | 0 | 72.5 | 10.0 | 85.3 | 86.6 | 53.3 |
| 22 | 8 GPA | | | | | | | | | |
| 23 | ASSERT | 2.5 EC | .11 | 3WABE | 0 | 84.3 | 0.0 | 88.3 | 90.8 | 54.3 |
| 23 | 16 GPA | | | | | | | | | |
| 24 | ASSERT | 2.5 EC | .11 | 3WABE | 0 | 82.5 | 7.5 | 90.8 | 90.3 | 55.0 |
| 24 | 24 GPA | | | | | | | | | |
| 25 | ASSERT | 2.5 EC | .23 | 3WABE | 0 | 90.0 | 0.0 | 93.8 | 82.8 | 54.0 |
| 25 | 8 GPA | | | | | | | | | |
| 26 | ASSERT | 2.5 EC | .23 | 3WABE | 0 | 93.8 | 1.3 | 89.8 | 96.1 | 54.3 |
| 26 | 16 GPA | | | | | | | | | |
| 27 | ASSERT | 2.5 EC | .23 | 3WABE | 0 | 93.3 | 14.0 | 86.0 | 97.1 | 54.5 |
| 27 | 24 GPA | | | | | | | | | |
| 28 | ASSERT | 2.5 EC | .46 | 3WABE | 0 | 95.8 | 0.0 | 93.8 | 79.9 | 54.7 |
| 28 | 8 GPA | | | | | | | | | |
| 29 | ASSERT | 2.5 EC | .46 | 3WABE | 0 | 98.5 | 5.0 | 91.3 | 93.7 | 54.8 |
| 29 | 16 GPA | | | | | | | | | |
| 30 | ASSERT | 2.5 EC | .46 | 3WABE | 0 | 98.3 | 10.0 | 89.3 | 90.7 | 53.5 |
| 30 | 24 GPA | | | | | | | | | |
| LSD (.05) = | | | | | 0 | 9.3 | 22.5 | 6.4 | 17.6 | 1.3 |
| Standard Dev.= | | | | | 0 | 6.57818 | 15.8891 | 4.52316 | 12.4280 | .937137 |
| CV = | | | | | 0 | 8.43 | 167.55 | 5.19 | 14.46 | 1.74 |
| Block F | | | | | 0.000 | 3.141 | 4.597 | 2.909 | 7.040 | 0.957 |
| Block Prob(F) | | | | | 1.0000 | 0.0293 | 0.0049 | 0.0390 | 0.0003 | 0.4170 |
| Treatment F | | | | | 0.000 | 70.802 | 2.416 | 3.826 | 4.292 | 3.491 |
| Treatment Prob(F) | | | | | 1.0000 | 0.0001 | 0.0009 | 0.0001 | 0.0001 | 0.0001 |

# Montana State University
# 1995 ASSERT CARRIER VOLUME, RATE AND DATE STUDY

Project Code: ASSERT CV
Cooperator: Bruce Maxwell

Location: KALISPELL, MT
By: Bob Stougaard

## Site Description

Crop: BARLEY Variety: GALLATIN Planting Date: 4-21-95
Planting Method: PRESSDRILL Rate, Unit: 60 LB/A Depth, Unit: 1.5 "
Perennial Age, Row Spacing, Unit: 7"
Soil Temp. NA, Unit: Soil Moisture: Good Emergence Date: 5-1-95
Plot Width/Area, Unit: 10 , FT Plot Length, Unit: 15 , FT Reps: 4
Site Type: FIELD PLANTING Seed Bed Desc.: EXCELLENT Ground Cover: NONE
Tillage Type: SEE BELOW Study Design: RCB
Field Preparation/Plot Maintenance: FALL PLOW,SPRING DISC AND CULTIVATE, PACKED PRIOR TO SEEDING, SEEDED THEN HARROWED AFTER WEED SEED SPREAD.

## Soil Description

Texture: SILT LOAM % OM: 3 % Sand: 50 % Silt: 40 % Clay: 10
pH: 7.7 CEC: Soil Name: CRESTON S.L. Fertility Level:

## Moisture Conditions

Overall Moisture Conditions: Moisture conditions favorable though season

## Application Information

| | A | B | C |
|---|---|---|---|
| Application Date: | 5-8-95 | 5-15-95 | 5-22-95 |
| Time of Day: | 1:30 P.M. | 11:00 A.M | 3:00 P.M. |
| Application Method: | CUB | CUB | CUB |
| Application Timing: | 1 WABE | 2 WABE | 3 WABE |
| Air Temp., Unit: | 62 ,F | 58 ,F | 72 ,F |
| % Relative Humidity: | 41 | 47 | 26 |
| Wind Velocity, Unit: | 3 5 ,MPH | 3 5 ,MPH | 0 2 ,MPH |
| Dew Presence (Y/N): | N | N | N |
| Water Hardness: | N | N | N |
| Soil Temp., Unit: | 58 ,F | 54 ,F | 65 ,F |
| Soil Moisture: | GOOD | GOOD | DRY TOP |
| % Cloud Cover: | 50 | 99 | 99 |

| Weed Species | Weed Stage, Density at Application | | |
|---|---|---|---|
| BARLEY | 2 ,LF | 3 ,LF | 7 ,LF |
| WILD OAT | 1.5 ,LF | 2.5 ,LF | 3.5 ,LF |

Weed stages at Ratings:

| | 5-29-95 | 8-4-95 |
|---|---|---|
| Barley | 3-5 leaf | Mature |
| Wild oat | 2-4 leaf | Mature |

## Application Equipment

| | Sprayer Type | Speed MPH | Nozzle Type | Nozzle Size | Nozzle Height | Nozzle Spacing | Boom Width | GPA | Carrier | PSI |
|---|---|---|---|---|---|---|---|---|---|---|
| A. CUB | TRACTOR | 2 | FLATFAN | 11002VS | 14" | 20" | 10' | 8 | H2O | 20 |
| B. | " | 4 | " | " | " | " | " | 16 | " | " |
| C. | " | 8 | " | " | " | " | " | 24 | " | " |

Montana State University

# ASSERT SG FORMULATION COMPATABILITY STUDY ON WHEAT OR BARLEY

Project Code:AFCS-AZ03 Location :Kalispell, MT
Cooperator :Pam Hutchinson By:Bob Stougaard

Summary Comments:

Slight crop injury observed early in the season with SG formulations was not discerned at mid season or harvest. Wild oat control dropped when Assert SG was tank mixed with Harmony Extra and the phenoxies (Bronate and MCPA). A significant drop in test weight was also observed when Assert SG was tank mixed with Bronate and Harmony Extra.

NIS used was Activator 90
Note on formulation performance: poor dissolution of SG even at high water temps.

# Montana State University
# ASSERT SG FORMULATION COMPATABILITY STUDY ON BARLEY

Project Code:AFCS-AZ03
Cooperator :Pam Hutchinson

Location :Kalispell, MT
By:Bob Stougaard

| Trt No | Treatment Name | Form Amt | Fm Ds | Rate | Rate Unit | Grow Stg | BARLEY CROPINJ % 5-29-95 | BARLEY CROPINJ % 6-15-95 | WILD OAT CONTROL % 8-4-95 | BARLEY YIELD BU/ACRE 8-23-95 | BARLEY TEST WT LB/BU 8-23-95 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Nontreated | | | | | | 0.0 | 0.0 | 0.0 | 45.3 | 47.20 |
| 2 | ASSERT | 2.5 | LC | .47 | lb ai/A | PO1 | 0.0 | 3.3 | 90.0 | 76.2 | 49.30 |
| 2 | NIS | 1 | EC | .25 | % v/v | PO1 | | | | | |
| 3 | ASSERT | 67 | SG | .47 | lb ai/A | PO1 | 0.0 | 3.3 | 90.0 | 84.9 | 49.40 |
| 3 | NIS | 1 | EC | .25 | % v/v | PO1 | | | | | |
| 4 | ASSERT | 67 | SG | .23 | lb ai/A | PO1 | 0.0 | 0.0 | 88.3 | 85.3 | 48.97 |
| 4 | AVENGE | 64 | SG | .5 | lb ai/A | PO1 | | | | | |
| 4 | NIS | 1 | EC | .25 | % v/v | PO1 | | | | | |
| 5 | ASSERT | 67 | SG | .23 | lb ai/A | PO1 | 5.0 | 0.0 | 84.3 | 79.9 | 49.03 |
| 5 | AVENGE | 2 | AS | .5 | lb ai/A | PO1 | | | | | |
| 5 | NIS | 1 | EC | .25 | % v/v | PO1 | | | | | |
| 6 | ASSERT | 67 | SG | .47 | lb ai/A | PO1 | 0.0 | 3.3 | 96.7 | 81.1 | 49.23 |
| 6 | MCPA | 3.7 | EC | .5 | lb ai/A | PO1 | | | | | |
| 6 | NIS | 1 | EC | .25 | % v/v | PO1 | | | | | |
| 7 | ASSERT | 67 | SG | .47 | lb ai/A | PO1 | 8.3 | 10.0 | 91.7 | 74.6 | 49.27 |
| 7 | BRONATE | 4 | EC | .5 | lb ai/A | PO1 | | | | | |
| 7 | NIS | 1 | EC | .25 | % v/v | PO1 | | | | | |
| 8 | ASSERT | 67 | SG | .47 | lb ai/A | PO1 | 0.0 | 5.0 | 88.0 | 81.3 | 49.33 |
| 8 | 2,4-D | 4 | EC | .5 | lb ai/A | PO1 | | | | | |
| 8 | NIS | 1 | EC | .25 | % v/v | PO1 | | | | | |
| 9 | ASSERT | 67 | SG | .47 | lb ai/A | PO1 | 0.0 | 1.7 | 85.0 | 76.8 | 49.23 |
| 9 | HARMONY EXTRA | 75 | WG | .024 | lb ai/A | PO1 | | | | | |
| 9 | NIS | 1 | EC | .25 | % v/v | PO1 | | | | | |
| 10 | ASSERT | 67 | SG | .47 | lb ai/A | PO1 | 0.0 | 1.7 | 80.0 | 83.4 | 48.40 |
| 10 | HARMONY EXTRA | 75 | WG | .024 | lb ai/A | PO1 | | | | | |
| 10 | MCPA | 3.7 | EC | .25 | lb ai/A | PO1 | | | | | |
| 10 | NIS | 1 | EC | .25 | % v/v | PO1 | | | | | |
| 11 | ASSERT | 67 | SG | .47 | lb ai/A | PO1 | 10.0 | 5.0 | 70.0 | 71.4 | 47.90 |
| 11 | HARMONY EXTRA | 75 | WG | .024 | lb ai/A | PO1 | | | | | |
| 11 | BRONATE | 4 | EC | .5 | lb ai/A | PO1 | | | | | |
| 11 | NIS | 1 | EC | .25 | % v/v | PO1 | | | | | |
| 12 | HARMONY EXTRA | 75 | WG | .024 | lb ai/A | PO1 | 0.0 | 0.0 | 0.0 | 50.4 | 47.07 |
| LSD (.05) = | | | | | | | 2.8 | 4.3 | 7.6 | 12.8 | 0.74 |
| Standard Dev.= | | | | | | | 1.66667 | 2.56235 | 4.46959 | 7.55002 | .436771 |
| CV = | | | | | | | 85.71 | 92.24 | 6.21 | 10.17 | 0.90 |
| Block F | | | | | | | 1.000 | 2.962 | 1.531 | 13.493 | 8.052 |
| Block Prob(F) | | | | | | | 0.3840 | 0.0726 | 0.2385 | 0.0002 | 0.0024 |
| Treatment F | | | | | | | 14.636 | 4.000 | 176.425 | 8.968 | 11.389 |
| Treatment Prob(F) | | | | | | | 0.0001 | 0.0027 | 0.0001 | 0.0001 | 0.0001 |

Montana State University

# ASSERT SG FORMULATION COMPATABILITY STUDY ON WHEAT OR BARLEY

Project Code:AFCS-AZO3 Location :Kalispell, MT
Cooperator :Pam Hutchinson By:Bob Stougaard

## Site Description

Crop: SPRING BARLEY Variety: GALLATIN Planting Date: 4-21-95
Planting Method: PRESSDRILL Rate, Unit: 60 , #/A Depth, Unit: 1.5 , "
Perennial Age, Unit: , Row Spacing, Unit: 7"
Soil Temp., Unit: , Soil Moisture: Emergence Date: 5-1-95
Plot Width/Area, Unit: 10 , FT Plot Length, Unit: 15 , FT Reps: 3
Site Type: Seed Bed Desc.: Ground Cover:
Tillage Type: Study Design: RCB
Field Preparation/Plot Maintenance: FALL PLOW, SPRING DISC AND CULTIVATE. PACKED PRIOR TO SEEDING

## Soil Description

Texture: FINE SANDY LOAM % OM: 3.5 % Sand: 50 % Silt: 40 % Clay: 10
pH: 7.9 CEC: Soil Name: KALISPELL FSL Fertility Level:

## Moisture Conditions

Overall Moisture Conditions: Favorable spring moisture, abundant June precip.

## Application Information

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| Application Date: | 5-19-95 | | | | | |
| Time of Day: | 4:30 | | | | | |
| Application Method: | BACKPACK | | | | | |
| Application Timing: | POST 3LF | | | | | |
| Air Temp., Unit: | 67 ,F | , | , | , | , | , |
| % Relative Humidity: | 26 | | | | | |
| Wind Velocity, Unit: | 1 3 ,MPH | , | , | , | , | , |
| Dew Presence (Y/N): | N | | | | | |
| Water Hardness: | N | | | | | |
| Soil Temp., Unit: | 72 ,F | , | , | , | , | , |
| Soil Moisture: | GOOD | | | | | |
| % Cloud Cover: | 0 | | | | | |

| Weed Species | Weed Stage, Density at Application | | | | | |
|---|---|---|---|---|---|---|
| WILD OATS | 3 LF,6/FT | , | , | , | , | , |
| BARLEY | 6 LF,1 TL | , | , | , | , | , |

Weed Stages at Rating Dates:

| | 5-29-95 | 6-15-95 | 8-4-95 |
|---|---|---|---|
| WILD OAT | NA | NA | HEADED |
| BARLEY | TILLERED | HEADING | HEADED |

## Application Equipment

| Sprayer Type | Speed MPH | Nozzle Type | Nozzle Size | Nozzle Height | Nozzle Spacing | Boom Width | GPA | Carrier | PSI |
|---|---|---|---|---|---|---|---|---|---|
| BACKPACK | 2.5 | FLAT FAN | 11002XR | 14" | 20" | 10' | 20 | H20 | 20 |

Montana State University

# ACHIEVE TANK MIX STUDY - 1995 EFFICACY TRIAL IN BARLEY

Code:95-ACHTANK
Cooperator :ZENECA AG

Location :KALISPELL, MT
By:Bob Stougaard

Summary:

This has been the third year in evaluating the new wild oat herbicide Achieve (Zeneca). Although this product is labeled in Europe and Canada the U.S. registration may still be a few years away. Achieve appears to be one of the most active herbicides on wild oats that we have tested, has a broader window of application, and has excellent potential for reduced rate technology uses. Tank-mixes with broadleaf herbicides are also looking plausible with the exception of some phenoxy chemicals.

# Montana State University
## ACHIEVE TANK MIX STUDY - 1995 EFFICACY TRIALS IN BARLEY

Project Code:95-ACHTANK
Cooperator :ZENECA AG PRODUCTS/ORR

Location :KALISPELL, MT
By:Bob Stougaard

| Trt No | Treatment Name | Form Amt | Fm Ds | Rate/Unit | Growth Stg. | BARLEY INJURY PERCENT 5-29-95 | BARLEY INJURY PERCENT 6-13-95 | W. OAT CONTROL PERCENT 8-4-95 | BARLEY YIELD BU/A 8-23-95 | BARLEY TEST WT LB/BU 8-23-95 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | ACHIEVE | 40 | WG | .18 lb ai/A | POST | 0 | 12 | 96.7 | 97.2 | 60.6 |
| 1 | TF8035 | | | .5 % v/v | POST | | | | | |
| 2 | ACHIEVE | 40 | WG | .18 lb ai/A | POST | 7 | 7 | 98.3 | 103.1 | 61.1 |
| 2 | TF8035 | | | .5 % v/v | POST | | | | | |
| 2 | BRONATE | 4 | EC | 1.5 pt pr/A | POST | | | | | |
| 3 | ACHIEVE | 40 | WG | .18 lb ai/A | POST | 8 | 8 | 98.0 | 97.4 | 60.1 |
| 3 | TF8035 | | | .5 % v/v | POST | | | | | |
| 3 | BUCTRIL | 2 | EC | 2.0 pt pr/A | POST | | | | | |
| 4 | ACHIEVE | 40 | WG | .18 lb ai/A | POST | 12 | 20 | 95.7 | 90.8 | 61.0 |
| 4 | TF8035 | | | .5 % v/v | POST | | | | | |
| 4 | MCPA ESTER | 4 | EC | .5 lb ai/A | POST | | | | | |
| 5 | ACHIEVE | 40 | WG | .25 lb ai/A | POST | 0 | 13 | 98.3 | 97.9 | 59.4 |
| 5 | TF8035 | | | .5 % v/v | POST | | | | | |
| 6 | HOELON | 3 | EC | 1.0 lb ai/A | POST | 12 | 55 | 94.3 | 90.4 | 58.4 |
| 6 | COC | | | 1.0 pt pr/A | POST | | | | | |
| 7 | ASSERT | 2.5 | EC | .47 lb ai/A | POST | 0 | 12 | 95.3 | 92.0 | 60.2 |
| 7 | NIS | | | .25 % v/v | POST | | | | | |
| 8 | ACHIEVE | 40 | WG | .18 lb ai/A | POST | 2 | 5 | 98.3 | 107.7 | 60.9 |
| 8 | TF8035 | | | .5 % v/v | POST | | | | | |
| 8 | AMMONIUM SULFA | | | 1.5 lb ai/A | POST | | | | | |
| 9 | ACHIEVE | 40 | WG | .18 lb ai/A | POST | 37 | 20 | 86.0 | 91.6 | 59.2 |
| 9 | 2,4-D ESTER | 4 | EC | .5 lb ai/A | POST | | | | | |
| 9 | TF8035 | | | .5 % v/v | POST | | | | | |
| 9 | AMMONIUM SULFA | | | 1.5 lb ai/A | POST | | | | | |
| 10 | ACHIEVE | 40 | WG | .18 lb ai/A | POST | 30 | 12 | 74.3 | 78.4 | 58.7 |
| 10 | 2,4-D ESTER | 4 | EC | .5 lb ai/A | POST | | | | | |
| 10 | TF8035 | | | .5 % v/v | POST | | | | | |
| 11 | ASSERT | 2.5 | EC | .23 lb ai/A | POST | 2 | 15 | 93.0 | 91.3 | 61.7 |
| 11 | AVENGE | 64 | SG | .50 lb ai/A | POST | | | | | |
| 11 | NIS | | | .5 % v/v | POST | | | | | |
| 12 | NONTREATED | | | | | 0 | 0 | 0.0 | 32.1 | 53.0 |
| LSD (.05) = | | | | | | 8 | 9 | 5.3 | 11.8 | 1.9 |
| Standard Dev.= | | | | | | 4.51569 | 5.42720 | 3.14506 | 6.96825 | 1.09516 |
| CV = | | | | | | 50.02 | 36.38 | 3.67 | 7.82 | 1.84 |
| Block F | | | | | | 1.669 | 3.701 | 0.390 | 4.079 | 8.099 |
| Block Prob(F) | | | | | | 0.2115 | 0.0412 | 0.6814 | 0.0311 | 0.0023 |
| Treatment F | | | | | | 22.176 | 19.576 | 235.579 | 23.269 | 13.220 |
| Treatment Prob(F) | | | | | | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 |

# Montana State University
# ACHIEVE TANK MIX STUDY - 1995 EFFICACY TRIAL IN BARLEY

Code:95-ACHTANK
Cooperator :ZENECA AG
Location :KALISPELL, MT
By:Bob Stougaard

## Site Description

Crop: BARLEY Variety: GALLATIN Planting Date: 4-21-95
Planting Method: PRESSDRILL Rate, Unit: 60 , LB/A Depth, Unit: 1.5 , "
Perennial Age, Unit: , Row Spacing, Unit: 7 , "
Soil Temp., Unit: , Soil Moisture: Emergence Date: 5-1-95
Plot Width/Area, Unit: 10 , FT Plot Length, Unit: 15 , FT Reps: 3
Site Type: Seed Bed Desc.: Ground Cover: NONE
Tillage Type: Study Design: RCB
Field Preparation/Plot Maintenance: FALL PLOW; SPRING DISC AND CULTIVATE; PACKED PRIOR TO SEEDING; HARROWED AFTER WEED SEED SPREAD.

## Soil Description

Texture: SILT LOAM % OM: 3 % Sand: 50 % Silt: 40 % Clay: 10
pH: 7.7 CEC: Soil Name: CRESTON S. L. Fertility Level:

## Moisture Conditions

Overall Moisture Conditions: Favorable soil moisture throughout cropping season

## Application Information

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| Application Date: | 5-22-95 | | | | | |
| Time of Day: | 3:00 P.M. | | | | | |
| Application Method: | BACKPACK | | | | | |
| Application Timing: | POST | | | | | |
| Air Temp., Unit: | 72 ,F | , | , | , | , | , |
| % Relative Humidity: | 26 | | | | | |
| Wind Velocity, Unit: | 0 2 ,MPH | , | , | , | , | , |
| Dew Presence (Y/N): | N | | | | | |
| Water Hardness: | | | | | | |
| Soil Temp., Unit: | 65 ,F | , | , | , | , | , |
| Soil Moisture: | DRY TOP | | | | | |
| % Cloud Cover: | 99 | | | | | |

| Weed Species | Weed Stage, Density at Application | | | | | |
|---|---|---|---|---|---|---|
| WILD OAT | 4.5 ,LF | , | , | , | , | , |
| BARLEY | 6 ,LF | , | , | , | , | , |

| Weed Species | Weed Stage at rating date" | | |
|---|---|---|---|
| | 5-29 | 6-13 | 8-4 |
| WILD OAT | 5-7 LF | 8" | Mature |
| BARLEY | 1TLR | 6-9" | Mature |

## Application Equipment

| | Sprayer Type | Speed MPH | Nozzle Type | Nozzle Size | Nozzle Height | Nozzle Spacing | Boom Width | GPA | Carrier | PSI |
|---|---|---|---|---|---|---|---|---|---|---|
| A. | BACKPACK | 2.5 | FLATFAN | 11002VS | 14" | 20" | 10' | 20 | H20 | 20 |

Note: Achieve 40 WG did not readily dissolve in spray solution at 59 degree water temp ( 15-30 second shaking/agitation period necessary ).

Montana State University

# EVALUATION OF WILD OAT HERBICIDES, RATES AND APPLICATION TIMINGS AT SEVERAL WILD OAT DENSITIES

Project Code:WILD OAT DENSITY
Cooperator:

Location: KALISPELL - R8
By: Bob Stougaard

Summary Comments: This study investigates the long-term effect of using reduced herbicide rates for wild oat control. The treatments listed on the data table were established in 1994. Different wild oat seed populations were generated in 1994 as a result of the wild oat densities initially established and the various herbicide rates utilized. The entire area was recropped to barley in 1995 where wild oat populations were monitored and barley yields determined.

The influence of the 1994 treatments on 1995 wild oat populations was evident. 1995 wild oat populations decreased as the 1994 herbicide rates increased and as 1994 wild oat seeding populations decreased. There did not appear to be much difference between herbicides as it pertains to 1995 wild oat populations. It appears that using half the labeled rate of either herbicide is sufficient to reduce wild oat seed production to the point where subsequent populations do not interfere with the crop.

# Montana State University
# EVALUATION OF WILD OAT HERBICIDES, RATES AND APPLICATION TIMINGS AT SEVERAL WILD OAT DENSITIES

Project Code:WILD OAT DENSITY
Cooperator:
Location: KALISPELL - R8
By: Bob Stougaard

## Site Description

Crop: SPRING BARLEY Variety: GALLATIN Planting Date: 4-17-95
Planting Method: RESEARCH Rate, Unit: 60 LB/A Depth, Unit: 1.5 "
Perennial Age, Unit: , Row Spacing, Unit: 7"
Soil Temp., Unit: 00 , F Soil Moisture: GOOD Emergence Date: 4-29-95
Plot Width/Area, Unit: 10 , FT Plot Length, Unit: 15 , FT Reps: 4
Site Type: R8, SOLID Seed Bed Desc.: EXCELLENT Ground Cover: 10%stubble
Tillage Type: Study Design:
Field Preparation/Plot Maintenance: FALL PLOW, SPRING DISC AND CULTIVATE. PACKED PRIOR TO SEEDING

## Soil Description

Texture: FINE SANDY LOAM % OM: 4.0 % Sand: 60 % Silt: 30 % Clay: 10
pH: 7.7 CEC: Soil Name: KALISPELL FSL Fertility Level:

## Moisture Conditions

Overall Moisture Conditions: Good spring moisture, abundant June precip.

# Montana State University
## WILD OAT DENSITY HERBICIDE RATE STUDY

Project Code:COMPLEX WILD OAT  Location :KALISPELL - R8
By:Bob Stougaard

| Trt No | Treatment Name | Rate lb ai /A | Stg | WILD OAT PLANTS /SQ FT 5-30-95 | WILD OAT PLANTS /SQ FT 7-25-95 | WILD OAT HEADS /SQ FT 7-25-95 | WILD OAT STRAW GM/SQ FT 7-25-95 | WILD OAT SEED WT GM/SQ FT 7-25-95 |
|---|---|---|---|---|---|---|---|---|
| 1 | 0 WILD OATS | | | 0.9 | 1.1 | 2.6 | 3.0 | 1.0 |
| 1 | FARGO | 4 EC 0 | PPI | | | | | |
| 2 | 0 WILD OATS | | | 2.5 | 2.5 | 5.6 | 7.6 | 2.8 |
| 2 | FARGO | 4 EC .31 | PPI | | | | | |
| 3 | 0 WILD OATS | | | 1.9 | 2.5 | 6.8 | 9.6 | 3.4 |
| 3 | FARGO | 4 EC .62 | PPI | | | | | |
| 4 | 0 WILD OATS | | | 0.4 | 0.9 | 2.2 | 3.6 | 1.1 |
| 4 | FARGO | 4 EC 1.25 | PPI | | | | | |
| 5 | 0 WILD OATS | | | 0.9 | 1.1 | 2.4 | 3.8 | 1.5 |
| 5 | ASSERT | 2.5 EC 0 | POST | | | | | |
| 6 | 0 WILD OATS | | | 1.0 | 1.3 | 3.8 | 6.6 | 2.2 |
| 6 | ASSERT | 2.5 EC .11 | POST | | | | | |
| 6 | NIS | 80 EC .25 | POST | | | | | |
| 7 | 0 WILD OATS | | | 0.9 | 0.8 | 1.8 | 2.1 | 0.7 |
| 7 | ASSERT | 2.5 EC .23 | POST | | | | | |
| 7 | NIS | 80 EC .25 | POST | | | | | |
| 8 | 0 WILD OATS | | | 0.3 | 0.9 | 1.4 | 0.9 | 0.3 |
| 8 | ASSERT | 2.5 EC .46 | POST | | | | | |
| 8 | NIS | 80 EC .25 | POST | | | | | |
| 9 | 15 WILD OATS | | | 20.6 | 19.9 | 28.3 | 28.9 | 11.0 |
| 9 | FARGO | 4 EC 0 | PPI | | | | | |
| 10 | 15 WILD OATS | | | 12.2 | 11.0 | 21.2 | 21.3 | 8.0 |
| 10 | FARGO | 4 EC .31 | PPI | | | | | |
| 11 | 15 WILD OATS | | | 3.7 | 3.7 | 5.7 | 6.9 | 2.6 |
| 11 | FARGO | 4 EC .62 | PPI | | | | | |
| 12 | 15 WILD OATS | | | 0.9 | 1.0 | 2.7 | 5.3 | 1.8 |
| 12 | FARGO | 4 EC 1.25 | PPI | | | | | |
| 13 | 15 WILD OATS | | | 16.4 | 16.8 | 29.1 | 33.9 | 13.3 |
| 13 | ASSERT | 2.5 EC 0 | POST | | | | | |
| 14 | 15 WILD OATS | | | 6.9 | 7.2 | 11.9 | 14.2 | 4.8 |
| 14 | ASSERT | 2.5 EC .11 | POST | | | | | |
| 14 | NIS | 80 EC .25 | POST | | | | | |
| 15 | 15 WILD OATS | | | 4.2 | 4.1 | 7.6 | 7.2 | 2.4 |
| 15 | ASSERT | 2.5 EC .23 | POST | | | | | |
| 15 | NIS | 80 EC .25 | POST | | | | | |
| 16 | 15 WILD OATS | | | 4.8 | 2.4 | 3.5 | 2.2 | 0.6 |
| 16 | ASSERT | 2.5 EC .46 | POST | | | | | |
| 16 | NIS | 80 EC .25 | POST | | | | | |

(Cont'd on next page)

# Montana State University
## WILD OAT DENSITY HERBICIDE RATE STUDY

| Trt No | Treatment Name | Rate lb ai/ A | Stg | WILD OAT PLANTS /SQ FT 5-30-95 | WILD OAT PLANTS /SQ FT 7-25-95 | WILD OAT HEADS /SQ FT 7-25-95 | WILD OAT STRAW GM/SQ FT 7-25-95 | WILD OAT SEED WT GM/SQ FT 7-25-95 |
|---|---|---|---|---|---|---|---|---|
| 17 | 25 WILD OATS | | | 20.0 | 18.5 | 29.3 | 34.1 | 12.7 |
| 17 | FARGO | 4 EC 0 | PPI | | | | | |
| 18 | 25 WILD OATS | | | 18.8 | 20.4 | 30.4 | 37.4 | 15.0 |
| 18 | FARGO | 4 EC .31 | PPI | | | | | |
| 19 | 25 WILD OATS | | | 2.7 | 3.8 | 8.5 | 11.7 | 4.4 |
| 19 | FARGO | 4 EC .62 | PPI | | | | | |
| 20 | 25 WILD OATS | | | 3.7 | 4.2 | 10.8 | 14.7 | 6.0 |
| 20 | FARGO | 4 EC 1.25 | PPI | | | | | |
| 21 | 25 WILD OATS | | | 25.7 | 23.9 | 37.4 | 34.0 | 13.1 |
| 21 | ASSERT | 2.5 EC 0 | POST | | | | | |
| 22 | 25 WILD OATS | | | 10.9 | 10.8 | 16.6 | 16.5 | 6.2 |
| 22 | ASSERT | 2.5 EC .11 | POST | | | | | |
| 22 | NIS | 80 EC .25 | POST | | | | | |
| 23 | 25 WILD OATS | | | 6.0 | 6.3 | 9.5 | 9.5 | 3.2 |
| 23 | ASSERT | 2.5 EC .23 | POST | | | | | |
| 23 | NIS | 80 EC .25 | POST | | | | | |
| 24 | 25 WILD OATS | | | 0.6 | 0.8 | 0.9 | 0.9 | 0.2 |
| 24 | ASSERT | 2.5 EC .46 | POST | | | | | |
| 24 | NIS | 80 EC .25 | POST | | | | | |
| 25 | 45 WILD OATS | | | 36.2 | 35.5 | 46.2 | 38.4 | 14.4 |
| 25 | FARGO | 4 EC 0 | PPI | | | | | |
| 26 | 45 WILD OATS | | | 11.2 | 12.3 | 21.3 | 25.3 | 9.8 |
| 26 | FARGO | 4 EC .31 | PPI | | | | | |
| 27 | 45 WILD OATS | | | 5.5 | 5.7 | 11.5 | 15.7 | 6.2 |
| 27 | FARGO | 4 EC .62 | PPI | | | | | |
| 28 | 45 WILD OATS | | | 4.6 | 5.3 | 10.6 | 15.1 | 5.3 |
| 28 | FARGO | 4 EC 1.25 | PPI | | | | | |
| 29 | 45 WILD OATS | | | 45.3 | 47.8 | 60.6 | 46.3 | 18.1 |
| 29 | ASSERT | 2.5 EC 0 | POST | | | | | |
| 30 | 45 WILD OATS | | | 16.9 | 17.4 | 26.4 | 27.9 | 10.0 |
| 30 | ASSERT | 2.5 EC .11 | POST | | | | | |
| 30 | NIS | 80 EC .25 | POST | | | | | |
| 31 | 45 WILD OATS | | | 6.1 | 7.5 | 12.4 | 15.1 | 5.4 |
| 31 | ASSERT | 2.5 EC .23 | POST | | | | | |
| 31 | NIS | 80 EC .25 | POST | | | | | |
| 32 | 45 WILD OATS | | | 1.1 | 1.9 | 3.1 | 2.3 | 0.6 |
| 32 | ASSERT | 2.5 EC .46 | POST | | | | | |
| 32 | NIS | 80 EC .25 | POST | | | | | |
| LSD (.05) | = | | | 10.9 | 10.8 | 13.8 | 12.9 | 5.1 |
| CV | = | | | 84.92 | 82.80 | 66.93 | 58.81 | 61.62 |
| BLOCK F | = | | | 1.714 | 1.478 | 2.492 | 2.759 | 3.268 |
| BLOCK PROB(F) | = | | | 0.169 | 0.226 | 0.065 | 0.047 | 0.025 |
| TREATMENT F | = | | | 7.906 | 8.105 | 8.748 | 8.072 | 8.077 |
| TREATMENT PROB(F) | = | | | .0001 | .0001 | .0001 | .0001 | .0001 |

# Montana State University
# WILD OAT DESNITY HERBICIDE RATE STUDY

| Trt No | Treatment Name | Rate lb ai/A | Stg | BARLEY PLANTS /SQ FT 5-30-95 | BARLEY PLANTS /SQ FT 7-25-95 | BARLEY HEADS /SQ FT 7-25-95 | BARLEY STRAW GM/SQ FT 7-25-95 | BARLEY SEED WT GM/SQ FT 7-25-95 |
|---|---|---|---|---|---|---|---|---|
| 17 | 25 WILD OATS | | | 7.9 | 9.8 | 27.8 | 40.2 | 16.8 |
| 17 | FARGO | 4 EC 0 | PPI | | | | | |
| 18 | 25 WILD OATS | | | 8.7 | 10.1 | 32.0 | 47.7 | 20.5 |
| 18 | FARGO | 4 EC .31 | PPI | | | | | |
| 19 | 25 WILD OATS | | | 9.9 | 11.8 | 45.3 | 69.6 | 30.3 |
| 19 | FARGO | 4 EC .62 | PPI | | | | | |
| 20 | 25 WILD OATS | | | 10.4 | 11.2 | 49.0 | 76.2 | 34.1 |
| 20 | FARGO | 4 EC 1.25 | PPI | | | | | |
| 21 | 25 WILD OATS | | | 9.3 | 11.5 | 38.4 | 55.8 | 24.4 |
| 21 | ASSERT | 2.5 EC 0 | POST | | | | | |
| 22 | 25 WILD OATS | | | 9.9 | 11.7 | 39.7 | 59.4 | 26.1 |
| 22 | ASSERT | 2.5 EC .11 | POST | | | | | |
| 22 | NIS | 80 EC .25 | POST | | | | | |
| 23 | 25 WILD OATS | | | 11.7 | 14.1 | 48.1 | 80.5 | 34.9 |
| 23 | ASSERT | 2.5 EC .23 | POST | | | | | |
| 23 | NIS | 80 EC .25 | POST | | | | | |
| 24 | 25 WILD OATS | | | 12.7 | 15.0 | 65.3 | 101.2 | 43.9 |
| 24 | ASSERT | 2.5 EC .46 | POST | | | | | |
| 24 | NIS | 80 EC .25 | POST | | | | | |
| 25 | 45 WILD OATS | | | 10.0 | 11.8 | 36.9 | 51.4 | 22.3 |
| 25 | FARGO | 4 EC 0 | PPI | | | | | |
| 26 | 45 WILD OATS | | | 9.8 | 11.6 | 36.8 | 59.0 | 25.9 |
| 26 | FARGO | 4 EC .31 | PPI | | | | | |
| 27 | 45 WILD OATS | | | 9.3 | 11.4 | 42.2 | 74.2 | 32.5 |
| 27 | FARGO | 4 EC .62 | PPI | | | | | |
| 28 | 45 WILD OATS | | | 11.0 | 11.0 | 40.8 | 64.3 | 27.1 |
| 28 | FARGO | 4 EC 1.25 | PPI | | | | | |
| 29 | 45 WILD OATS | | | 10.3 | 10.9 | 29.4 | 42.2 | 18.3 |
| 29 | ASSERT | 2.5 EC 0 | POST | | | | | |
| 30 | 45 WILD OATS | | | 10.4 | 11.6 | 50.4 | 64.4 | 29.0 |
| 30 | ASSERT | 2.5 EC .11 | POST | | | | | |
| 30 | NIS | 80 EC .25 | POST | | | | | |
| 31 | 45 WILD OATS | | | 10.3 | 11.8 | 43.1 | 65.1 | 28.1 |
| 31 | ASSERT | 2.5 EC .23 | POST | | | | | |
| 31 | NIS | 80 EC .25 | POST | | | | | |
| 32 | 45 WILD OATS | | | 8.3 | 10.6 | 51.7 | 86.4 | 38.3 |
| 32 | ASSERT | 2.5 EC .46 | POST | | | | | |
| 32 | NIS | 80 EC .25 | POST | | | | | |
| LSD (.05) | = | | | 2.4 | 3.1 | 12.6 | 19.2 | 8.5 |
| CV | = | | | 17.65 | 18.90 | 20.97 | 20.39 | 20.67 |
| BLOCK F | = | | | 2.011 | 3.471 | 4.642 | 6.656 | 10.14 |
| BLOCK PROB(F) | = | | | 0.118 | 0.019 | 0.005 | 0.004 | 0.001 |
| TREATMENT F | = | | | 1.465 | 1.372 | 3.169 | 4.457 | 4.573 |
| TREATMETN PROB(F) | = | | | 0.083 | 0.125 | .0001 | .0001 | .0001 |

# Montana State University
# WILD OAT DESNITY HERBICIDE RATE STUDY

Project Code:COMPLEX WILD OAT  Location :KALISPELL - R8
Cooperator :  By:Bob Stougaard

| Trt No | Treatment Name | Rate lb ai/A | Stg | BARLEY PLANTS /SQ FT 5-30-95 | BARLEY PLANTS /SQ FT 7-25-95 | BARLEY HEADS /SQ FT 7-25-95 | BARLEY STRAW GM/SQ FT 7-25-95 | BARLEY SEED WT GM/SQ FT 7-25-95 |
|---|---|---|---|---|---|---|---|---|
| 1 | 0 WILD OATS | | | 9.3 | 11.1 | 45.6 | 76.4 | 35.3 |
| 1 | FARGO | 4 EC 0 | PPI | | | | | |
| 2 | 0 WILD OATS | | | 10.3 | 11.7 | 45.6 | 73.6 | 33.2 |
| 2 | FARGO | 4 EC .31 | PPI | | | | | |
| 3 | 0 WILD OATS | | | 8.7 | 9.2 | 38.8 | 64.0 | 27.5 |
| 3 | FARGO | 4 EC .62 | PPI | | | | | |
| 4 | 0 WILD OATS | | | 9.3 | 11.8 | 42.0 | 67.9 | 29.5 |
| 4 | FARGO | 4 EC 1.25 | PPI | | | | | |
| 5 | 0 WILD OATS | | | 9.4 | 10.9 | 44.3 | 72.2 | 31.7 |
| 5 | ASSERT | 2.5 EC 0 | POST | | | | | |
| 6 | 0 WILD OATS | | | 8.8 | 10.0 | 51.6 | 86.5 | 37.2 |
| 6 | ASSERT | 2.5 EC .11 | POST | | | | | |
| 6 | NIS | 80 EC .25 | POST | | | | | |
| 7 | 0 WILD OATS | | | 10.5 | 12.6 | 49.9 | 83.8 | 37.2 |
| 7 | ASSERT | 2.5 EC .23 | POST | | | | | |
| 7 | NIS | 80 EC .25 | POST | | | | | |
| 8 | 0 WILD OATS | | | 12.5 | 13.7 | 50.7 | 82.4 | 35.6 |
| 8 | ASSERT | 2.5 EC .46 | POST | | | | | |
| 8 | NIS | 80 EC .25 | POST | | | | | |
| 9 | 15 WILD OATS | | | 9.4 | 10.7 | 31.1 | 43.6 | 18.3 |
| 9 | FARGO | 4 EC 0 | PPI | | | | | |
| 10 | 15 WILD OATS | | | 9.7 | 11.3 | 33.9 | 52.5 | 23.3 |
| 10 | FARGO | 4 EC .31 | PPI | | | | | |
| 11 | 15 WILD OATS | | | 10.3 | 11.4 | 38.1 | 61.4 | 26.8 |
| 11 | FARGO | 4 EC .62 | PPI | | | | | |
| 12 | 15 WILD OATS | | | 9.9 | 11.4 | 49.8 | 76.9 | 33.4 |
| 12 | FARGO | 4 EC 1.25 | PPI | | | | | |
| 13 | 15 WILD OATS | | | 9.5 | 11.1 | 37.0 | 55.4 | 24.8 |
| 13 | ASSERT | 2.5 EC 0 | POST | | | | | |
| 14 | 15 WILD OATS | | | 9.0 | 10.2 | 40.3 | 60.0 | 26.4 |
| 14 | ASSERT | 2.5 EC .11 | POST | | | | | |
| 14 | NIS | 80 EC .25 | POST | | | | | |
| 15 | 15 WILD OATS | | | 10.5 | 11.8 | 48.5 | 78.0 | 34.8 |
| 15 | ASSERT | 2.5 EC .23 | POST | | | | | |
| 15 | NIS | 80 EC .25 | POST | | | | | |
| 16 | 15 WILD OATS | | | 10.4 | 14.3 | 51.0 | 79.1 | 35.6 |
| 16 | ASSERT | 2.5 EC .46 | POST | | | | | |
| 16 | NIS | 80 EC .25 | POST | | | | | |

(Cont'd on next page)

# Montana State University
## WILD OAT DENSITY HERBICIDE RATE STUDY

Project Code:COMPLEX WILD OAT  Location :KALISPELL - R8
Cooperator :  By:Bob Stougaard

| Trt No | Treatment Name | Rate lb ai/A | Stg | BARLEY YIELD BU/A 8-24-95 | BARLEY TEST WT LB/BU 8-24-95 | BARLEY % PLUMP 8-24-95 | BARLEY MOISTURE PERCENT 8-24-95 |
|---|---|---|---|---|---|---|---|
| 1 | 0 WILD OATS | | | 76.3 | 53.0 | 87.0 | 13.13 |
| 1 | FARGO | 4 EC 0 | PPI | | | | |
| 2 | 0 WILD OATS | | | 68.3 | 52.2 | 83.3 | 13.23 |
| 2 | FARGO | 4 EC .31 | PPI | | | | |
| 3 | 0 WILD OATS | | | 63.7 | 52.7 | 87.8 | 13.80 |
| 3 | FARGO | 4 EC .62 | PPI | | | | |
| 4 | 0 WILD OATS | | | 66.3 | 52.9 | 84.8 | 14.88 |
| 4 | FARGO | 4 EC 1.25 | PPI | | | | |
| 5 | 0 WILD OATS | | | 68.5 | 52.8 | 88.3 | 14.50 |
| 5 | ASSERT | 2.5 EC 0 | POST | | | | |
| 6 | 0 WILD OATS | | | 69.5 | 50.8 | 81.5 | 13.83 |
| 6 | ASSERT | 2.5 EC .11 | POST | | | | |
| 6 | NIS | 80 EC .25 | POST | | | | |
| 7 | 0 WILD OATS | | | 76.8 | 53.6 | 84.3 | 13.50 |
| 7 | ASSERT | 2.5 EC .23 | POST | | | | |
| 7 | NIS | 80 EC .25 | POST | | | | |
| 8 | 0 WILD OATS | | | 70.4 | 53.1 | 87.5 | 13.50 |
| 8 | ASSERT | 2.5 EC .46 | POST | | | | |
| 8 | NIS | 80 EC .25 | POST | | | | |
| 9 | 15 WILD OATS | | | 45.3 | 52.1 | 78.5 | 12.55 |
| 9 | FARGO | 4 EC 0 | PPI | | | | |
| 10 | 15 WILD OATS | | | 52.7 | 52.7 | 81.5 | 12.53 |
| 10 | FARGO | 4 EC .31 | PPI | | | | |
| 11 | 15 WILD OATS | | | 63.9 | 52.6 | 88.3 | 14.93 |
| 11 | FARGO | 4 EC .62 | PPI | | | | |
| 12 | 15 WILD OATS | | | 70.9 | 52.3 | 80.0 | 13.65 |
| 12 | FARGO | 4 EC 1.25 | PPI | | | | |
| 13 | 15 WILD OATS | | | 51.0 | 51.8 | 77.8 | 12.30 |
| 13 | ASSERT | 2.5 EC 0 | POST | | | | |
| 14 | 15 WILD OATS | | | 58.4 | 52.4 | 84.0 | 13.00 |
| 14 | ASSERT | 2.5 EC .11 | POST | | | | |
| 14 | NIS | 80 EC .25 | POST | | | | |
| 15 | 15 WILD OATS | | | 74.2 | 53.5 | 86.0 | 13.10 |
| 15 | ASSERT | 2.5 EC .23 | POST | | | | |
| 15 | NIS | 80 EC .25 | POST | | | | |
| 16 | 15 WILD OATS | | | 78.1 | 53.4 | 85.8 | 12.85 |
| 16 | ASSERT | 2.5 EC .46 | POST | | | | |
| 16 | NIS | 80 EC .25 | POST | | | | |

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# Montana State University
# WILD OAT DENSITY HERBICIDE RATE STUDY

| Trt No | Treatment Name | Rate lb ai/A | Stg | BARLEY YIELD BU/A 8-24-95 | BARLEY TEST WT LB/BU 8-24-95 | BARLEY % PLUMP 8-24-95 | BARLEY MOISTURE PERCENT 8-24-95 |
|---|---|---|---|---|---|---|---|
| 17 | 25 WILD OATS | | | 43.0 | 50.8 | 74.5 | 13.05 |
| 17 | FARGO | 4 EC 0 | PPI | | | | |
| 18 | 25 WILD OATS | | | 57.7 | 51.1 | 76.8 | 12.68 |
| 18 | FARGO | 4 EC .31 | PPI | | | | |
| 19 | 25 WILD OATS | | | 68.1 | 53.3 | 85.3 | 13.53 |
| 19 | FARGO | 4 EC .62 | PPI | | | | |
| 20 | 25 WILD OATS | | | 68.1 | 52.9 | 86.5 | 13.35 |
| 20 | FARGO | 4 EC 1.25 | PPI | | | | |
| 21 | 25 WILD OATS | | | 47.9 | 51.5 | 75.0 | 11.78 |
| 21 | ASSERT | 2.5 EC 0 | POST | | | | |
| 22 | 25 WILD OATS | | | 57.4 | 51.4 | 74.5 | 13.25 |
| 22 | ASSERT | 2.5 EC .11 | POST | | | | |
| 22 | NIS | 80 EC .25 | POST | | | | |
| 23 | 25 WILD OATS | | | 71.3 | 52.7 | 84.5 | 13.20 |
| 23 | ASSERT | 2.5 EC .23 | POST | | | | |
| 23 | NIS | 80 EC .25 | POST | | | | |
| 24 | 25 WILD OATS | | | 81.5 | 52.6 | 82.3 | 13.45 |
| 24 | ASSERT | 2.5 EC .46 | POST | | | | |
| 24 | NIS | 80 EC .25 | POST | | | | |
| 25 | 45 WILD OATS | | | 39.9 | 51.3 | 71.0 | 13.18 |
| 25 | FARGO | 4 EC 0 | PPI | | | | |
| 26 | 45 WILD OATS | | | 56.6 | 52.1 | 79.8 | 12.92 |
| 26 | FARGO | 4 EC .31 | PPI | | | | |
| 27 | 45 WILD OATS | | | 64.8 | 51.7 | 79.3 | 13.13 |
| 27 | FARGO | 4 EC .62 | PPI | | | | |
| 28 | 45 WILD OATS | | | 65.0 | 52.4 | 86.5 | 13.50 |
| 28 | FARGO | 4 EC 1.25 | PPI | | | | |
| 29 | 45 WILD OATS | | | 44.2 | 51.3 | 70.8 | 11.87 |
| 29 | ASSERT | 2.5 EC 0 | POST | | | | |
| 30 | 45 WILD OATS | | | 54.0 | 52.9 | 80.0 | 13.00 |
| 30 | ASSERT | 2.5 EC .11 | POST | | | | |
| 30 | NIS | 80 EC .25 | POST | | | | |
| 31 | 45 WILD OATS | | | 64.8 | 51.0 | 81.0 | 13.25 |
| 31 | ASSERT | 2.5 EC .23 | POST | | | | |
| 31 | NIS | 80 EC .25 | POST | | | | |
| 32 | 45 WILD OATS | | | 78.6 | 52.5 | 84.8 | 14.30 |
| 32 | ASSERT | 2.5 EC .46 | POST | | | | |
| 32 | NIS | 80 EC .25 | POST | | | | |
| LSD (.05) | = | | | 10.5 | 1.501 | 6.699 | 1.432 |
| CV | = | | | 11.94 | 1.990 | 5.821 | 7.682 |
| BLOCK F | = | | | 1.824 | 37.64 | 9.366 | 1.311 |
| BLOCK PROB(F) | = | | | 0.139 | 0.001 | 0.001 | 0.276 |
| TREATMENT F | = | | | 8.989 | 2.450 | 4.301 | 1.989 |
| TREATMENT PROB(F) | = | | | .0001 | .0005 | .0001 | .0001 |

Montana State University

# EFFECT OF SEEDING RATES, PATTERNS, AND REDUCED POSTEMERGENCE HERBICIDE RATES ON WILD OAT CONTROL

Project Code:SPBAR POP

Location :KALISPELL, MT

By:Bob Stougaard

Summary Comments:

Wild oat control was affected by both seeding density and pattern. Broadcast seeding patterns were more competitive against wild oats when compared to the standard 6 inch drill method, and resulted in a significant reduction in wild oat biomass. Higher seeding rates also increased the competitive ability of barley. However, broadcast patterns most benefited from higher rates. Excellent weed control was achieved by using a combination of herbicide applications coupled with the more competitive cropping system. Broadcast seeding combined with higher seeding rates increased the consistency of reduced rate herbicide applications.

# Montana State University
# EFFECT OF SEEDING RATES, PATTERNS, AND REDUCED POST EMERGENCE RATES ON WILD OAT CONTROL

Project Code:SP BAR POP
Cooperator :

Location :KALISPELL, MT
By:Bob Stougaard

| Trt No | Treatment Name | Form | Rate lb ai/A | BARLEY AVG POP 1.46 FT2 5-24-95 | BARLEY GMS FWT 5 PLTS 6-9-95 | BARLEY GMS DWT 5 PLTS 6-9-95 | BARLEY HEIGHT CM 8-4-95 | HEADING DATE JULIAN | BARLEY LODGING INDEX 6-29-95 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | BROADCAST | | | 35 | 37.4 | 6.1 | 91.3 | 176.3 | 13 |
| 1 | 60 #/A | | | | | | | | |
| 1 | NONTREATED | | | | | | | | |
| 2 | BROADCAST | | | 29 | 35.4 | 6.0 | 90.0 | 177.0 | 0 |
| 2 | 60 #/A | | | | | | | | |
| 2 | ASSERT | 2.5 EC | .12 | | | | | | |
| 3 | BROADCAST | | | 31 | 34.9 | 6.1 | 87.5 | 176.3 | 0 |
| 3 | 60 #/A | | | | | | | | |
| 3 | ASSERT | 2.5 EC | .23 | | | | | | |
| 4 | BROADCAST | | | 35 | 41.2 | 7.0 | 88.8 | 176.8 | 0 |
| 4 | 60 #/A | | | | | | | | |
| 4 | ASSERT | 2.5 EC | .46 | | | | | | |
| 5 | BROADCAST | | | 46 | 36.8 | 6.3 | 87.5 | 175.8 | 2 |
| 5 | 110 #/A | | | | | | | | |
| 5 | NONTREATED | | | | | | | | |
| 6 | BROADCAST | | | 50 | 32.3 | 5.5 | 91.3 | 176.0 | 0 |
| 6 | 110 #/A | | | | | | | | |
| 6 | ASSERT | 2.5 EC | .12 | | | | | | |
| 7 | BROADCAST | | | 46 | 29.5 | 5.3 | 88.8 | 175.8 | 0 |
| 7 | 110 #/A | | | | | | | | |
| 7 | ASSERT | 2.5 EC | .23 | | | | | | |
| 8 | BROADCAST | | | 47 | 28.7 | 4.9 | 87.5 | 176.0 | 0 |
| 8 | 110 #/A | | | | | | | | |
| 8 | ASSERT | 2.5 EC | .46 | | | | | | |
| 9 | BROADCAST | | | 63 | 28.4 | 4.4 | 90.0 | 175.8 | 15 |
| 9 | 150 #/A | | | | | | | | |
| 9 | NONTREATED | | | | | | | | |
| 10 | BROADCAST | | | 62 | 30.0 | 4.6 | 90.0 | 175.5 | 0 |
| 10 | 150 #/A | | | | | | | | |
| 10 | ASSERT | 2.5 EC | .12 | | | | | | |
| 11 | BROADCAST | | | 60 | 22.2 | 3.9 | 90.0 | 175.8 | 0 |
| 11 | 150 #/A | | | | | | | | |
| 11 | ASSERT | 2.5 EC | .23 | | | | | | |
| 12 | BROADCAST | | | 72 | 25.1 | 3.9 | 88.8 | 175.8 | 0 |
| 12 | 150 #/A | | | | | | | | |
| 12 | ASSERT | 2.5 EC | .46 | | | | | | |
| 13 | 6" DRILL | | | 23 | 30.8 | 5.2 | 90.0 | 178.8 | 0 |
| 13 | 60 #/A | | | | | | | | |
| 13 | NONTREATED | | | | | | | | |

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Montana State University

# EFFECT OF SEEDING RATES, PATTERNS, AND REDUCED POST EMERGENCE RATES ON WILD OAT CONTROL

Project Code:SP BAR POP
Cooperator :

Location :KALISPELL, MT
By:Bob Stougaard

| Trt No | Treatment Name | Form | Rate lb ai/A | BARLEY AVG POP 1.46 FT2 5-24-95 | BARLEY GMS FWT 5 PLTS 6-9-95 | BARLEY GMS DWT 5 PLTS 6-9-95 | BARLEY HEIGHT CM 8-4-95 | HEADING DATE JULIAN | BARLEY LODGING INDEX 6-29-95 |
|---|---|---|---|---|---|---|---|---|---|
| 14 | 6" DRILL<br>60 #/A<br>ASSERT | 2.5 EC | .12 | 23 | 24.8 | 3.7 | 92.5 | 177.5 | 0 |
| 15 | 6" DRILL<br>60 #/A<br>ASSERT | 2.5 EC | .23 | 25 | 24.4 | 3.8 | 88.8 | 178.0 | 0 |
| 16 | 6" DRILL<br>60 #/A<br>ASSERT | 2.5 EC | .46 | 23 | 30.3 | 5.1 | 90.0 | 177.3 | 0 |
| 17 | 6" DRILL<br>110 #/A<br>NONTREATED | | | 36 | 22.2 | 3.2 | 87.5 | 176.8 | 15 |
| 18 | 6" DRILL<br>110 #/A<br>ASSERT | 2.5 EC | .12 | 34 | 21.7 | 3.7 | 86.3 | 177.3 | 0 |
| 19 | 6" DRILL<br>110 #/A<br>ASSERT | 2.5 EC | .23 | 39 | 24.8 | 4.1 | 87.5 | 176.8 | 0 |
| 20 | 6" DRILL<br>110 #/A<br>ASSERT | 2.5 EC | .46 | 34 | 24.0 | 3.8 | 88.8 | 177.5 | 0 |
| 21 | 6" DRILL<br>150 #/A<br>NONTREATED | | | 47 | 16.0 | 2.5 | 86.3 | 176.8 | 0 |
| 22 | 6" DRILL<br>150 #/A<br>ASSERT | 2.5 EC | .12 | 51 | 29.0 | 4.3 | 88.8 | 176.3 | 3 |
| 23 | 6" DRILL<br>150 #/A<br>ASSERT | 2.5 EC | .23 | 52 | 23.9 | 3.5 | 92.5 | 176.8 | 4 |
| 24 | 6" DRILL<br>150 #/A<br>ASSERT | 2.5 EC | .46 | 46 | 19.0 | 2.8 | 87.5 | 176.8 | 0 |
| LSD (.05) = | | | | 9 | 14.1 | 2.2 | 5.8 | 1.1 | 11 |
| Standard Dev.= | | | | 6.17456 | 9.99084 | 1.53143 | 4.09541 | .743430 | 7.89068 |
| CV = | | | | 14.76 | 35.64 | 33.54 | 4.60 | 0.42 | 376.87 |
| Block F | | | | 0.198 | 3.319 | 1.459 | 10.537 | 48.017 | 1.299 |
| Block Prob(F) | | | | 0.8976 | 0.0248 | 0.2332 | 0.0001 | 0.0001 | 0.2818 |
| Treatment F | | | | 19.539 | 1.546 | 2.380 | 0.721 | 4.798 | 1.428 |
| Treatment Prob(F) | | | | 0.0001 | 0.0850 | 0.0030 | 0.8082 | 0.0001 | 0.1299 |

# Montana State University
# EFFECT OF SEEDING RATES, PATTERNS, AND REDUCED POST EMERGENCE HERBICIDE RATES ON WILD OAT CONTROL

Project Code:SP BAR POP
Cooperator :

Location:KALISPELL, MT
By:Bob Stougaard

| Trt No | Treatment Name | Form | Rate lb ai/A | WILD OAT NO.PLTS 2 FT2 7-11-95 | WILD OAT FRESH WT 2 FT2 7-11-95 | BARLEY YIELD BU/A 8-23-95 | BARLEY TEST WT LB/BU 8-23-95 | WILD OAT PERCENT INFEST. 8-1-95 | BARLEY PERCENT PROTEIN 8-23-95 | BARELY PERCENT PLUMP 8-23-95 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | BROADCAST | | | 24.5 | 414.5 | 49.3 | 51.0 | 38.8 | 10.98 | 65.3 |
| 1 | 60 #/A | | | | | | | | | |
| 1 | NONTREATED | | | | | | | | | |
| 2 | BROADCAST | | | 19.3 | 183.0 | 65.4 | 50.7 | 28.5 | 10.68 | 66.8 |
| 2 | 60 #/A | | | | | | | | | |
| 2 | ASSERT | 2.5 EC | .12 | | | | | | | |
| 3 | BROADCAST | | | 3.3 | 23.3 | 76.3 | 50.9 | 14.8 | 10.23 | 73.0 |
| 3 | 60 #/A | | | | | | | | | |
| 3 | ASSERT | 2.5 EC | .23 | | | | | | | |
| 4 | BROADCAST | | | 17.8 | 74.3 | 73.2 | 50.6 | 18.8 | 10.60 | 67.5 |
| 4 | 60 #/A | | | | | | | | | |
| 4 | ASSERT | 2.5 EC | .46 | | | | | | | |
| 5 | BROADCAST | | | 30.3 | 269.8 | 67.7 | 50.8 | 17.5 | 10.15 | 70.0 |
| 5 | 110 #/A | | | | | | | | | |
| 5 | NONTREATED | | | | | | | | | |
| 6 | BROADCAST | | | 12.8 | 81.3 | 78.6 | 50.8 | 9.3 | 10.50 | 67.0 |
| 6 | 110 #/A | | | | | | | | | |
| 6 | ASSERT | 2.5 EC | .12 | | | | | | | |
| 7 | BROADCAST | | | 5.5 | 43.3 | 85.4 | 50.1 | 7.3 | 10.53 | 69.3 |
| 7 | 110 #/A | | | | | | | | | |
| 7 | ASSERT | 2.5 EC | .23 | | | | | | | |
| 8 | BROADCAST | | | 10.3 | 44.5 | 86.9 | 53.3 | 7.5 | 9.85 | 79.3 |
| 8 | 110 #/A | | | | | | | | | |
| 8 | ASSERT | 2.5 EC | .46 | | | | | | | |
| 9 | BROADCAST | | | 16.8 | 118.0 | 72.0 | 50.8 | 24.3 | 10.58 | 66.8 |
| 9 | 150 #/A | | | | | | | | | |
| 9 | NONTREATED | | | | | | | | | |
| 10 | BROADCAST | | | 16.3 | 96.0 | 73.8 | 51.5 | 13.5 | 10.15 | 69.3 |
| 10 | 150 #/A | | | | | | | | | |
| 10 | ASSERT | 2.5 EC | .12 | | | | | | | |
| 11 | BROADCAST | | | 5.5 | 30.8 | 83.0 | 51.5 | 4.8 | 10.18 | 76.5 |
| 11 | 150 #/A | | | | | | | | | |
| 11 | ASSERT | 2.5 EC | .23 | | | | | | | |
| 12 | BROADCAST | | | 6.8 | 30.8 | 86.6 | 50.1 | 6.8 | 10.55 | 65.8 |
| 12 | 150 #/A | | | | | | | | | |
| 12 | ASSERT | 2.5 EC | .46 | | | | | | | |
| 13 | 6" DRILL | | | 18.0 | 282.8 | 57.3 | 50.0 | 40.0 | 10.38 | 56.8 |
| 13 | 60 #/A | | | | | | | | | |
| 13 | NONTREATED | | | | | | | | | |

(Cont'd on next page)

Montana State University

# EFFECT OF SEEDING RATES, PATTERNS, AND REDUCED POST EMERGENCE HERBICIDE RATES ON WILD OAT CONTROL

Project Code:SP BAR POP
Cooperator :

Location:KALISPELL, MT
By:Bob Stougaard

| Trt No | Treatment Name | Form | Rate lb ai/A | WILD OAT NO.PLTS 2 FT2 7-11-95 | WILD OAT FRESH WT 2 FT2 7-11-95 | BARLEY YIELD BU/A 8-23-95 | BARLEY TEST WT LB/BU 8-23-95 | WILD OAT PERCENT INFEST. 8-1-95 | BARLEY PERCENT PROTEIN 8-23-95 | BARLEY PERCENT PLUMP 8-23-95 |
|---|---|---|---|---|---|---|---|---|---|---|
| 14 | 6" DRILL | | | 16.0 | 162.8 | 67.3 | 51.7 | 25.0 | 10.40 | 65.3 |
| 14 | 60 #/A | | | | | | | | | |
| 14 | ASSERT | 2.5 EC | .12 | | | | | | | |
| 15 | 6" DRILL | | | 13.5 | 75.0 | 78.8 | 51.9 | 18.0 | 10.25 | 71.3 |
| 15 | 60 #/A | | | | | | | | | |
| 15 | ASSERT | 2.5 EC | .23 | | | | | | | |
| 16 | 6" DRILL | | | 11.0 | 47.8 | 83.1 | 51.7 | 13.5 | 10.35 | 67.5 |
| 16 | 60 #/A | | | | | | | | | |
| 16 | ASSERT | 2.5 EC | .46 | | | | | | | |
| 17 | 6" DRILL | | | 30.5 | 342.0 | 61.2 | 49.7 | 26.3 | 10.65 | 66.8 |
| 17 | 110 #/A | | | | | | | | | |
| 17 | NONTREATED | | | | | | | | | |
| 18 | 6" DRILL | | | 11.8 | 88.3 | 74.3 | 51.1 | 17.0 | 10.05 | 65.0 |
| 18 | 110 #/A | | | | | | | | | |
| 18 | ASSERT | 2.5 EC | .12 | | | | | | | |
| 19 | 6" DRILL | | | 14.8 | 49.0 | 81.5 | 51.8 | 16.3 | 10.17 | 66.8 |
| 19 | 110 #/A | | | | | | | | | |
| 19 | ASSERT | 2.5 EC | .23 | | | | | | | |
| 20 | 6" DRILL | | | 13.0 | 52.5 | 86.7 | 51.4 | 8.3 | 10.42 | 67.3 |
| 20 | 110 #/A | | | | | | | | | |
| 20 | ASSERT | 2.5 EC | .46 | | | | | | | |
| 21 | 6" DRILL | | | 34.5 | 242.8 | 63.5 | 49.6 | 27.8 | 10.42 | 59.5 |
| 21 | 150 #/A | | | | | | | | | |
| 21 | NONTREATED | | | | | | | | | |
| 22 | 6" DRILL | | | 16.3 | 73.5 | 84.1 | 49.6 | 11.8 | 10.55 | 65.3 |
| 22 | 150 #/A | | | | | | | | | |
| 22 | ASSERT | 2.5 EC | .12 | | | | | | | |
| 23 | 6" DRILL | | | 11.3 | 45.8 | 89.3 | 49.7 | 5.3 | 10.48 | 65.0 |
| 23 | 150 #/A | | | | | | | | | |
| 23 | ASSERT | 2.5 EC | .23 | | | | | | | |
| 24 | 6" DRILL | | | 27.5 | 73.0 | 83.4 | 51.1 | 7.0 | 10.28 | 69.0 |
| 24 | 150 #/A | | | | | | | | | |
| 24 | ASSERT | 2.5 EC | .46 | | | | | | | |
| LSD (.05) = | | | | 17.3 | 149.7 | 11.6 | 2.1 | 11.5 | 0.68 | 8.9 |
| Standard Dev.= | | | | 12.2344 | 105.846 | 8.20915 | 1.48031 | 8.12014 | .478727 | 6.261 |
| CV = | | | | 75.92 | 86.28 | 10.89 | 2.91 | 47.82 | 4.61 | 9.27 |
| Block F | | | | 5.476 | 3.588 | 12.594 | 6.162 | 11.849 | 15.572 | 5.437 |
| Block Prob(F) | | | | 0.0020 | 0.0180 | 0.0001 | 0.0009 | 0.0001 | 0.0001 | 0.002 |
| Treatment F | | | | 1.827 | 4.260 | 6.690 | 1.477 | 6.143 | 1.014 | 2.177 |
| Treatment Prob(F) | | | | 0.0289 | 0.0001 | 0.0001 | 0.1091 | 0.0001 | 0.4611 | 0.007 |

Montana State University

# EFFECT OF SEEDING RATES, PATTERNS, AND REDUCED POSTEMERGENCE HERBICIDE RATES ON WILD OAT CONTROL

Project Code:SB BAR POP
Cooperator :

Location :KALISPELL, MT
By:Bob Stougaard

| Trt No | Treatment Name | Form | Rate | BARLEY LAI % 6-2-95 | BARLEY LAI % 6-12-95 | BARLEY LAI % 6-21-95 |
|---|---|---|---|---|---|---|
| 1 | BROADCAST | | | 3.025 | 3.705 | 5.520 |
| 1 | 60 #/A | | | | | |
| 1 | NONTREATED | | | | | |
| 2 | BROADCAST | | | 2.523 | 3.125 | 5.235 |
| 2 | 60 #/A | | | | | |
| 2 | ASSERT | 2.5 EC | .12 | | | |
| 3 | BROADCAST | | | 2.283 | 2.715 | 4.905 |
| 3 | 60 #/A | | | | | |
| 3 | ASSERT | 2.5 EC | .23 | | | |
| 4 | BROADCAST | | | 2.240 | 3.115 | 5.018 |
| 4 | 60 #/A | | | | | |
| 4 | ASSERT | 2.5 EC | .46 | | | |
| 5 | BROADCAST | | | 3.105 | 3.503 | 5.378 |
| 5 | 110 #/A | | | | | |
| 5 | NONTREATED | | | | | |
| 6 | BROADCAST | | | 2.970 | 3.255 | 5.318 |
| 6 | 110 #/A | | | | | |
| 6 | ASSERT | 2.5 EC | .12 | | | |
| 7 | BROADCAST | | | 2.675 | 3.450 | 4.445 |
| 7 | 110 #/A | | | | | |
| 7 | ASSERT | 2.5 EC | .23 | | | |
| 8 | BROADCAST | | | 2.840 | 3.108 | 4.833 |
| 8 | 110 #/A | | | | | |
| 8 | ASSERT | 2.5 EC | .46 | | | |
| 9 | BROADCAST | | | 3.680 | 4.205 | 5.975 |
| 9 | 150 #/A | | | | | |
| 9 | NONTREATED | | | | | |
| 10 | BROADCAST | | | 3.330 | 3.930 | 6.013 |
| 10 | 150 #/A | | | | | |
| 10 | ASSERT | 2.5 EC | .12 | | | |
| 11 | BROADCAST | | | 3.110 | 3.673 | 4.913 |
| 11 | 150 #/A | | | | | |
| 11 | ASSERT | 2.5 EC | .23 | | | |
| 12 | BROADCAST | | | 3.483 | 3.850 | 5.905 |
| 12 | 150 #/A | | | | | |
| 12 | ASSERT | 2.5 EC | .46 | | | |

Montana State University

# EFFECT OF SEEDING RATES, PATTERNS, AND REDUCED POSTEMERGENCE HERBICIDE RATES ON WILD OAT CONTROL

Project Code:SB BAR POP
Cooperator :

Location :KALISPELL, MT
By:Bob Stougaard

| Trt No | Treatment Name | Form | Rate | BARLEY LAI % 6-2-95 | BARLEY LAI % 6-12-95 | BARLEY LAI % 6-21-95 |
|---|---|---|---|---|---|---|
| 13 | 6" DRILL | | | 1.608 | 1.970 | 4.253 |
| 13 | 60 #/A | | | | | |
| 13 | NONTREATED | | | | | |
| 14 | 6" DRILL | | | 1.585 | 2.500 | 4.630 |
| 14 | 60 #/A | | | | | |
| 14 | ASSERT | 2.5 EC | .12 | | | |
| 15 | 6" DRILL | | | 1.618 | 2.410 | 4.510 |
| 15 | 60 #/A | | | | | |
| 15 | ASSERT | 2.5 EC | .23 | | | |
| 16 | 6" DRILL | | | 1.648 | 2.400 | 4.233 |
| 16 | 60 #/A | | | | | |
| 16 | ASSERT | 2.5 EC | .46 | | | |
| 17 | 6" DRILL | | | 2.685 | 3.503 | 5.978 |
| 17 | 110 #/A | | | | | |
| 17 | NONTREATED | | | | | |
| 18 | 6" DRILL | | | 1.938 | 2.525 | 3.883 |
| 18 | 110 #/A | | | | | |
| 18 | ASSERT | 2.5 EC | .12 | | | |
| 19 | 6" DRILL | | | 1.923 | 2.675 | 4.740 |
| 19 | 110 #/A | | | | | |
| 19 | ASSERT | 2.5 EC | .23 | | | |
| 20 | 6" DRILL | | | 1.650 | 2.653 | 4.383 |
| 20 | 110 #/A | | | | | |
| 20 | ASSERT | 2.5 EC | .46 | | | |
| 21 | 6" DRILL | | | 2.335 | 3.293 | 4.870 |
| 21 | 150 #/A | | | | | |
| 21 | NONTREATED | | | | | |
| 22 | 6" DRILL | | | 2.675 | 3.280 | 5.585 |
| 22 | 150 #/A | | | | | |
| 22 | ASSERT | 2.5 EC | .12 | | | |
| 23 | 6" DRILL | | | 2.935 | 3.600 | 5.760 |
| 23 | 150 #/A | | | | | |
| 23 | ASSERT | 2.5 EC | .23 | | | |
| 24 | 6" DRILL | | | 2.438 | 3.173 | 4.943 |
| 24 | 150 #/A | | | | | |
| 24 | ASSERT | 2.5 EC | .46 | | | |
| LSD (.05) = | | | | 0.782 | 0.895 | 1.107 |
| Standard Dev.= | | | | .5530 | .6330 | 0.783 |
| CV = | | | | 22.01 | 20.09 | 15.50 |
| Block F | | | | 2.263 | 10.415 | 7.427 |
| Block Prob(F) | | | | .0888 | .0001 | 0.0002 |
| Treatment F | | | | 5.309 | 3.196 | 2.488 |
| Treatment Prob(F) | | | | .0001 | .0001 | 0.0019 |

Montana State University

# EFFECT OF SEEDING RATES, PATTERNS, AND REDUCED POSTEMERGENCE HERBICIDE RATES ON WILD OAT CONTROL

Project Code:SB POP
Cooperator :

Location :KALISPELL, MT
By:Bob Stougaard

| Trt No | Treatment Name | Form | Rate | BARLEY % LP 6-2-95 | BARLEY % LP 6-12-95 | BARLEY % LP 6-21 |
|---|---|---|---|---|---|---|
| 1 | BROADCAST | | | 0.1100 | 0.0633 | 0.0168 |
| 1 | 60 #/A | | | | | |
| 1 | NONTREATED | | | | | |
| 2 | BROADCAST | | | 0.1463 | 0.0953 | 0.0223 |
| 2 | 60 #/A | | | | | |
| 2 | ASSERT | 2.5 EC | .12 | | | |
| 3 | BROADCAST | | | 0.1770 | 0.1218 | 0.0258 |
| 3 | 60 #/A | | | | | |
| 3 | ASSERT | 2.5 EC | .23 | | | |
| 4 | BROADCAST | | | 0.1815 | 0.1030 | 0.0248 |
| 4 | 60 #/A | | | | | |
| 4 | ASSERT | 2.5 EC | .46 | | | |
| 5 | BROADCAST | | | 0.1028 | 0.0720 | 0.0198 |
| 5 | 110 #/A | | | | | |
| 5 | NONTREATED | | | | | |
| 6 | BROADCAST | | | 0.1093 | 0.0903 | 0.0188 |
| 6 | 110 #/A | | | | | |
| 6 | ASSERT | 2.5 EC | .12 | | | |
| 7 | BROADCAST | | | 0.1373 | 0.0635 | 0.0355 |
| 7 | 110 #/A | | | | | |
| 7 | ASSERT | 2.5 EC | .23 | | | |
| 8 | BROADCAST | | | 0.1175 | 0.0940 | 0.0280 |
| 8 | 110 #/A | | | | | |
| 8 | ASSERT | 2.5 EC | .46 | | | |
| 9 | BROADCAST | | | 0.0680 | 0.0455 | 0.0128 |
| 9 | 150 #/A | | | | | |
| 9 | NONTREATED | | | | | |
| 10 | BROADCAST | | | 0.0953 | 0.0710 | 0.0140 |
| 10 | 150 #/A | | | | | |
| 10 | ASSERT | 2.5 EC | .12 | | | |
| 11 | BROADCAST | | | 0.1125 | 0.0663 | 0.0310 |
| 11 | 150 #/A | | | | | |
| 11 | ASSERT | 2.5 EC | .23 | | | |
| 12 | BROADCAST | | | 0.0718 | 0.0520 | 0.0115 |
| 12 | 150 #/A | | | | | |
| 12 | ASSERT | 2.5 EC | .46 | | | |

Montana State University

# EFFECT OF SEEDING RATES, PATTERNS, AND REDUCED POSTEMERGENCE HERBICIDE RATES ON WILD OAT CONTROL

Project Code:SB POP
Cooperator :

Location :KALISPELL, MT
By:Bob Stougaard

| Trt No | Treatment Name | Form | Rate | BARLEY % LP 6-2-95 | BARLEY % LP 6-12-95 | BARLEY % LP 6-21 |
|---|---|---|---|---|---|---|
| 13 | 6" DRILL<br>60 #/A<br>NONTREATED | | | 0.2975 | 0.2235 | 0.0445 |
| 14 | 6" DRILL<br>60 #/A<br>ASSERT | 2.5 EC | .12 | 0.3033 | 0.1485 | 0.0400 |
| 15 | 6" DRILL<br>60 #/A<br>ASSERT | 2.5 EC | .23 | 0.2750 | 0.1888 | 0.0435 |
| 16 | 6" DRILL<br>60 #/A<br>ASSERT | 2.5 EC | .46 | 0.2698 | 0.1615 | 0.0470 |
| 17 | 6" DRILL<br>110 #/A<br>NONTREATED | | | 0.1285 | 0.0683 | 0.0123 |
| 18 | 6" DRILL<br>110 #/A<br>ASSERT | 2.5 EC | .12 | 0.2278 | 0.1358 | 0.0615 |
| 19 | 6" DRILL<br>110 #/A<br>ASSERT | 2.5 EC | .23 | 0.2295 | 0.1220 | 0.0295 |
| 20 | 6" DRILL<br>110 #/A<br>ASSERT | 2.5 EC | .46 | 0.3093 | 0.1260 | 0.0498 |
| 21 | 6" DRILL<br>150 #/A<br>NONTREATED | | | 0.1705 | 0.0820 | 0.0320 |
| 22 | 6" DRILL<br>150 #/A<br>ASSERT | 2.5 EC | .12 | 0.1493 | 0.0873 | 0.0203 |
| 23 | 6" DRILL<br>150 #/A<br>ASSERT | 2.5 EC | .23 | 0.1113 | 0.0570 | 0.0145 |
| 24 | 6" DRILL<br>150 #/A<br>ASSERT | 2.5 EC | .46 | 0.1565 | 0.0853 | 0.0298 |
| LSD (.05) = | | | | .0868 | .0672 | .0256 |
| Standard Dev.= | | | | .0613 | .0475 | .0181 |
| CV = | | | | 36.30 | 47.08 | 63.42 |
| Block F | | | | 3.203 | 9.172 | 2.059 |
| Block Prob(F) | | | | 0.028 | .0001 | 0.114 |
| Treatment F | | | | 6.113 | 3.585 | 2.234 |
| Treatment Prob(F) | | | | .0001 | .0001 | .0055 |

Montana State University

# EFFECT OF SEEDING RATES, PATTERNS, AND REDUCED POSTEMERGENCE HERBICIDE RATES ON WILD OAT CONTROL

Project Code:SPBAR POP

Location :KALISPELL, MT
By:Bob Stougaard

## Site Description

Crop: Spring Barley Variety: Gallatin Planting Date: 4-26-95
Planting Method: Brdcst/Drl Rate, Unit: Varied, lb/A Depth, Unit: 1.5 , "
Perennial Age, Unit: , Row Spacing, Unit: ,
Soil Temp., Unit: , Soil Moisture: Emergence Date: 5-4-95
Plot Width/Area, Unit: 10 , FT Plot Length, Unit: 15 , FT Reps: 4
Site Type: Seed Bed Desc.: Ground Cover:
Tillage Type: Study Design: Factorial
Field Preparation/Plot Maintenance: Fall plow, spring disk. Culivation and packing prior to seeding. Drill seeding accomplished with research plot, double-disk drill, broadcast seed disseminated by hand and incorporated twice by cultivator\packer.

## Soil Description

Texture: Fine Sandy Loam % OM: 6.0 % Sand: 60 % Silt: 30 % Clay: 10
pH: 7.9 CEC: Soil Name: Kalispell FSL Fertility Level:

## Moisture Conditions

Overall Moisture Conditions: Adequate spring moisture, abundant June precip.

## Application Information

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| Application Date: | 5-16-95 | | | | | |
| Time of Day: | 3:45 PM | | | | | |
| Application Method: | Backpack | | | | | |
| Application Timing: | EarlyPost | | | | | |
| Air Temp., Unit: | 74 ,F | , | , | , | , | , |
| % Relative Humidity: | 20 | | | | | |
| Wind Velocity, Unit: | 0 ,mph | , | , | , | , | , |
| Dew Presence (Y/N): | N | | | | | |
| Water Hardness: | N | | | | | |
| Soil Temp., Unit: | 72 ,F | , | , | , | , | , |
| Soil Moisture: | Dry Top | | | | | |
| % Cloud Cover: | 0 | | | | | |

| Weed Species | Weed Stage, Density at Application | | | | | |
|---|---|---|---|---|---|---|
| Barley | 2.5L,5" | , | , | , | , | , |
| Wild Oat | 1.5L,3-5" | , | , | , | , | , |

Weed Stages at Ratng Dates:

| | 5-24-95 | 6-9-95 | 7-11-95 | 8-4-95 | 8-23-95 |
|---|---|---|---|---|---|
| Barley | 5 lf | Heading | Headed | Headed | Mature |
| Wild Oat | 4-5 lf | Heading | Headed | Headed | Mature |

## Application Equipment

| Sprayer Type | Speed MPH | Nozzle Type | Nozzle Size | Nozzle Height | Nozzle Spacing | Boom Width | GPA | Carrier | PSI |
|---|---|---|---|---|---|---|---|---|---|
| Backpack | 2.5 | Flatfan | 11002XR | 14" | 20" | 10' | 20 | H2O | 20 |

Surfactant used with Assert was Activator-90 at .25% v/v.

# Montana State University
# WILD OAT POPULATIION STUDY - R9 1995 THRESHOLD STUDY

Project Code:95-WOP-R9
Cooperator :BRUCE MAXWELL

Location :KALISPELL, MT
By:Bob Stougaard

Summary: This data represents the long term effect of allowing different wild oat populations to produce seed. The treatments listed on the data table were established in 1993. The area was recropped during 1994, utilizing the same barley plant densities as were used at the outset of the study. During 1995, the area was fallowed, and wild oat population counts were made prior to each tillage operation from the first replication only.

# Montana State University
## WILD OAT POPULATIION STUDY - R9 1995 THRESHOLD STUDY

Project Code:95-WOP-R9
Cooperator :BRUCE MAXWELL

Location :KALISPELL, MT
By:Bob Stougaard

| Trt No | Treatment Name | WILD OAT POP CT 1.46 FT2 5-5-95 | WILD OAT POP CT 1.46 FT2 5-22-95 | WILD OAT POP CT 1.46 FT2 6-12-95 | WILD OAT POP CT 1.46 FT2 6-28-95 | WILD OAT POP CT 1.46 FT2 7-13-95 | WILD OAT POP CT 1.46 FT2 7-28-95 | WILD OAT POP CT 1.46 FT2 8-28-95 | WILD OAT POP CT 1.46 FT2 9-19-95 | WILD OAT TOTAL CT 1.46 FT2 SEASON |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 BARLEY<br>0 DAP<br>0 WILD OAT | 76 | 536 | 63 | 104 | 33 | 12 | 53.0 | 20.0 | 1017 |
| 2 | 0 BARLEY<br>0 DAP<br>10 WILD OAT | 92 | 368 | 64 | 98 | 27 | 16 | 59.5 | 22.5 | 800 |
| 3 | 0 BARLEY<br>0 DAP<br>40 WILD OAT | 112 | 352 | 55 | 106 | 23 | 14 | 56.0 | 13.0 | 796 |
| 4 | 0 BARLEY<br>0 DAP<br>160 WILD OAT | 74 | 339 | 55 | 112 | 33 | 9 | 51.5 | 16.5 | 556 |
| 5 | 0 BARLEY<br>0 DAP<br>400 WILD OAT | 36 | 126 | 101 | 129 | 35 | 26 | 60.0 | 32.5 | 555 |
| 6 | 1/2X BARLEY<br>0 DAP<br>0 WILD OAT | 155 | 240 | 48 | 79 | 15 | 4 | 32.0 | 13.0 | 578 |
| 7 | 1/2X BARLEY<br>0 DAP<br>10 WILD OAT | 84 | 273 | 81 | 72 | 15 | 10 | 43.5 | 23.5 | 687 |
| 8 | 1/2X BARLEY<br>0 DAP<br>40 WILD OAT | 56 | 283 | 75 | 121 | 23 | 10 | 48.5 | 28.0 | 561 |
| 9 | 1/2X BARLEY<br>0 DAP<br>160 WILD OAT | 86 | 297 | 66 | 113 | 23 | 9 | 68.5 | 34.5 | 661 |
| 10 | 1/2X BARLEY<br>0 DAP<br>400 WILD OAT | 120 | 341 | 76 | 80 | 21 | 9 | 60.0 | 15.0 | 660 |
| 11 | 1/2X BARLEY<br>7 DAP<br>0 WILD OAT | 112 | 338 | 51 | 109 | 23 | 13 | 44.0 | 15.5 | 717 |
| 12 | 1/2X BARLEY<br>7 DAP<br>10 WILD OAT | 115 | 505 | 48 | 112 | 28 | 10 | 60.5 | 21.5 | 890 |
| 13 | 1/2X BARLEY<br>7 DAP<br>40 WILD OAT | 12 | 87 | 79 | 175 | 33 | 25 | 79.0 | 31.0 | 546 |
| 14 | 1/2X BARLEY<br>7 DAP<br>160 WILD OAT | 87 | 298 | 47 | 121 | 29 | 8 | 54.5 | 22.0 | 622 |

# Montana State University
## WILD OAT POPULATIION STUDY - R9 1995 THRESHOLD STUDY

Project Code:95-WOP-R9
Cooperator :BRUCE MAXWELL

Location :KALISPELL, MT
By:Bob Stougaard

| Trt No | Treatment Name | WILD OAT POP CT 1.46 FT2 5-5-95 | WILD OAT POP CT 1.46 FT2 5-22-95 | WILD OAT POP CT 1.46 FT2 6-12-95 | WILD OAT POP CT 1.46 FT2 6-28-95 | WILD OAT POP CT 1.46 FT2 7-13-95 | WILD OAT POP CT 1.46 FT2 7-28-95 | WILD OAT POP CT 1.46 FT2 8-28-95 | WILD OAT POP CT 1.46 FT2 9-19-95 | WILD OAT TOTAL CT 1.46 FT2 SEASON |
|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 1/2XBARLEY<br>7 DAP<br>400 WILD OAT | 152 | 426 | 74 | 146 | 41 | 10 | 79.0 | 13.5 | 973 |
| 16 | 1X BARLEY<br>0 DAP<br>0 WILD OAT | 58 | 276 | 95 | 168 | 43 | 17 | 43.0 | 15.0 | 746 |
| 17 | 1X BARLEY<br>0 DAP<br>10 WILD OAT | 94 | 341 | 71 | 86 | 30 | 10 | 45.0 | 12.5 | 655 |
| 18 | 1X BARLEY<br>0 DAP<br>40 WILD OAT | 71 | 330 | 75 | 112 | 24 | 11 | 45.0 | 23.0 | 724 |
| 19 | 1X BARLEY<br>0 DAP<br>160 WILD OAT | 30 | 298 | 70 | 128 | 27 | 11 | 58.5 | 18.5 | 599 |
| 20 | 1X BARLEY<br>0 DAP<br>400 WILD OAT | 51 | 152 | 75 | 119 | 26 | 13 | 73.5 | 31.5 | 505 |
| 21 | 1X BARLEY<br>7 DAP<br>0 WILD OAT | 50 | 209 | 93 | 110 | 22 | 8 | 47.0 | 21.5 | 557 |
| 22 | 1X BARLEY<br>7 DAP<br>10 WILD OAT | 104 | 328 | 73 | 113 | 36 | 13 | 41.0 | 20.5 | 787 |
| 23 | 1X BARLEY<br>7 DAP<br>40 WILD OAT | 158 | 335 | 48 | 82 | 27 | 11 | 47.5 | 18.0 | 769 |
| 24 | 1X BARLEY<br>7 DAP<br>160 WILD OAT | 57 | 204 | 70 | 85 | 30 | 7 | 51.0 | 17.0 | 532 |
| 25 | 1X BARLEY<br>7 DAP<br>400 WILD OAT | 25 | 129 | 69 | 105 | 37 | 23 | 60.5 | 30.5 | 518 |
| 26 | 2X BARLEY<br>0 DAP<br>0 WILD OAT | 117 | 510 | 40 | 84 | 21 | 6 | 52.0 | 14.0 | 821 |
| 27 | 2X BARLEY<br>0 DAP<br>10 WILD OAT | 23 | 242 | 52 | 133 | 42 | 15 | 55.0 | 26.5 | 575 |
| 28 | 2X BARLEY<br>0 DAP<br>40 WILD OAT | 235 | 405 | 54 | 78 | 18 | 5 | 41.0 | 9.0 | 826 |

# Montana State University
## WILD OAT POPULATIION STUDY - R9 1995 THRESHOLD STUDY

Project Code:95-WOP-R9
Cooperator :BRUCE MAXWELL

Location :KALISPELL, MT
By:Bob Stougaard

| Trt No | Treatment Name | WILD OAT POP CT 1.46 FT2 5-5-95 | WILD OAT POP CT 1.46 FT2 5-22-95 | WILD OAT POP CT 1.46 FT2 6-12-95 | WILD OAT POP CT 1.46 FT2 6-28-95 | WILD OAT POP CT 1.46 FT2 7-13-95 | WILD OAT POP CT 1.46 FT2 7-28-95 | WILD OAT POP CT 1.46 FT2 8-28-95 | WILD OAT POP CT 1.46 FT2 9-19-95 | WILD OAT TOTAL CT 1.46 FT2 SEASON |
|---|---|---|---|---|---|---|---|---|---|---|
| 29 | 2X BARLEY<br>0 DAP<br>160 WILD OAT | 146 | 341 | 40 | 96 | 15 | 9 | 64.5 | 13.5 | 739 |
| 30 | 2X BARLEY<br>0 DAP<br>400 WILD OAT | 73 | 338 | 43 | 112 | 23 | 15 | 65.0 | 16.0 | 585 |
| 31 | 2X BARLEY<br>7 DAP<br>0 WILD OAT | 20 | 502 | 37 | 84 | 22 | 11 | 30.5 | 13.5 | 634 |
| 32 | 2X BARLEY<br>7 DAP<br>10 WILD OAT | 5 | 108 | 43 | 94 | 26 | 16 | 55.0 | 20.0 | 385 |
| 33 | 2X BARLEY<br>7 DAP<br>40 WILD OAT | 157 | 382 | 36 | 79 | 15 | 15 | 43.0 | 20.5 | 840 |
| 34 | 2X BARLEY<br>7 DAP<br>160 WILD OAT | 58 | 378 | 36 | 80 | 27 | 13 | 32.5 | 10.0 | 613 |
| 35 | 2X BARLEY<br>7 DAP<br>400 WILD OAT | 94 | 400 | 53 | 95 | 19 | 7 | 28.5 | 7.5 | 685 |

# Montana State University
## 1995 Dormant Herbicide Applications to Peppermint

Project Code:95-DHA-FISHER  Location :FISHER FARM, KALISPELL,MT
Cooperator :CLYDE FISHER  By:Bob Stougaard

Fall and spring dormant herbicide applications were evaluated in an established stand of peppermint for crop tolerance and control of broadleaf weeds. Devrinol and Command caused moderate peppermint stand reduction in both fall and spring applications. Early season crop injury was observed from other spring applications (Karmex, Sinbar, Stinger and Buctril) but the crop later recovered. The majority of fall treatments provided marginal weed control with the exception of Command and Devrinol which gave good groundsel control. Spring applications were more successful in both weed control and higher peppermint oil yields. Stinger applied in the spring provided the most complete weed control and the highest yields.

### Site Description

Crop: PEPPERMINT  Variety: BLACK MITCHAM  Planting Date: 4-4-90
Planting Method: ROOTS  Rate, Unit: ,  Depth, Unit: ,
Perennial Age, Unit: ,  Row Spacing, Unit: ,
Soil Temp., Unit: ,  Soil Moisture:  Emergence Date:
Plot Width/Area, Unit: 10 , FT  Plot Length, Unit: 18 , FT  Reps: 3
Site Type:  Seed Bed Desc.:  Ground Cover:
Tillage Type:  Study Design: RCB
Field Preparation/Plot Maintenance: STUDY WAS CONDUCTED IN AN AREA OF AN ESTABLISHED FIELD

### Soil Description

Texture: VERY FINE SL  % OM: 3.5  % Sand: 50  % Silt: 40  % Clay: 10
pH: 7.5  CEC:  Soil Name: FLATHEAD V F S L  Fertility Level:

### Moisture Conditions

Overall Moisture Conditions: MOISTURE VERY GOOD THROUGHOUT SEASON. IRRIGATED

### Application Information

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| Application Date: | 10-20-94 | 10-25-95 | 3-28-95 | | | |
| Time of Day: | 2:30 PM | 2:00 | 4:00 | | | |
| Application Method: | BACKPACK | BACKPACK | BACKPACK | | | |
| Application Timing: | FALL | FALL | SPRING | | | |
| Air Temp., Unit: | 52 ,F | 45 ,F | 52 ,F | , | , | , |
| % Relative Humidity: | 26 | 40 | 39 | | | |
| Wind Velocity, Unit: | 2 ,MPH | 0 ,MPH | 1 ,MPH | , | , | , |
| Dew Presence (Y/N): | N | N | N | | | |
| Water Hardness: | N | N | N | | | |
| Soil Temp., Unit: | 48 ,F | 42 ,F | 45 ,F | , | , | , |
| Soil Moisture: | V GOOD | V.GOOD | GOOD | | | |
| % Cloud Cover: | 95 | 99 | 0 | | | |

| Weed Species | Weed Stage, Density at Application | | | | | |
|---|---|---|---|---|---|---|
| PEPPERMINT | 4-5", | SAME, | NO , | , | , | , |
| GROUNDSEL | 3-10, | SAME, | LIVE, | , | , | , |
| FLOWERING,SEEDLING | , | , | PLTS, | , | , | , |
| | , | , | , | , | , | , |

| Weed Species | Stage at Rating 6-13-95 | 8-1-95 | 9-5-95 | | | |
|---|---|---|---|---|---|---|
| PEPPERMINT | 12-14", | 22-24", | 36", | , | , | , |
| GROUNDSEL | 5-14", | 7-15", | 14", | , | , | , |
| PRICKLY LETTUCE | 6-8", | 24-36", | 36-40", | , | , | , |

### Application Equipment

| | Sprayer Type | Speed MPH | Nozzle Type | Nozzle Size | Nozzle Height | Nozzle Spacing | Boom Width | GPA | Carrier | PSI |
|---|---|---|---|---|---|---|---|---|---|---|
| A. | BACKPACK | 2 | FLATFAN | 11002XR | 14" | 20" | 10' | 20 | H2O | 20 |
| B. | " | | | | | | | | | |
| C. | " | | | | | | | | | |

# Montana State University
## 1995 Dormant Herbicide Applications to Peppermint

Project Code:95-DHA-FISHER
Cooperator :CLYDE FISHER

Location :FISHER FARM, KALISPELL,MT
By:Bob Stougaard

| Trt No | Treatment Name | Form Type | Rate lb ai | Appl Time | MINT CRPINJ % 6-13-95 | MINT STDRED % 6-13-95 | PRKLET CONTROL % 6-13-95 | GRNSEL CONTROL % 6-15-95 | MINT %BIOMASS INCREASE 8-1-95 | BRDLEAF %BIOMASS DECREASE 8-1-95 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | COMMAND | 4 EC | .75 | FALL | 0.0 | 25.0 | 0.0 | 70.0 | 28.4 | 44.8 |
| 2 | DEVRINOL | 50 WP | 4 | FALL | 0.0 | 21.7 | 23.3 | 93.3 | 33.6 | 60.5 |
| 3 | KARMEX | 80 DF | 1.6 | FALL | 0.0 | 7.7 | 0.0 | 0.0 | 1.6 | 6.5 |
| 4 | SINBAR | 80 WP | .8 | FALL | 0.0 | 4.3 | 0.0 | 16.7 | 12.3 | 31.9 |
| 5 | SINBAR | 80 WP | 1.6 | FALL | 0.0 | 6.7 | 63.3 | 30.0 | 31.5 | 20.3 |
| 6 | STINGER | 3 EC | .18 | FALL | 0.0 | 10.7 | 46.7 | 10.0 | 26.7 | 8.4 |
| 7 | BUCTRIL | 2 EC | .1875 | FALL | 0.0 | 4.3 | 16.7 | 40.0 | 42.5 | 20.8 |
| 8 | COMMAND | 4 EC | .75 | SPRING | 5.0 | 19.3 | 78.0 | 100.0 | 83.3 | 52.1 |
| 9 | DEVRINOL | 50 WP | 4 | SPRING | 0.0 | 21.7 | 46.7 | 96.7 | 25.0 | 39.7 |
| 10 | KARMEX | 80 DF | 1.6 | SPRING | 0.0 | 11.7 | 59.3 | 56.7 | 73.7 | 47.2 |
| 11 | SINBAR | 80 WP | .8 | SPRING | 0.0 | 9.0 | 99.7 | 30.0 | 79.4 | 69.6 |
| 12 | SINBAR | 80 WP | 1.6 | SPRING | 0.0 | 15.0 | 100.0 | 80.0 | 111.4 | 87.8 |
| 13 | STINGER | 3 EC | .18 | SPRING | 0.0 | 10.0 | 99.7 | 91.7 | 118.7 | 94.4 |
| 14 | BUCTRIL | 2 EC | .1875 | SPRING | 0.0 | 8.3 | 16.7 | 10.0 | 43.0 | 28.6 |
| 15 | NONTREATED | | | | 0.0 | 6.0 | 0.0 | 0.0 | 0 | 0 |
| LSD (.05) = | | | | | 3.7 | 16.6 | 41.4 | 45.6 | 84.1 | 51.5 |
| Standard Dev.= | | | | | 2.23607 | 9.95219 | 24.7815 | 27.2969 | 50.297 | 30.8144 |
| CV = | | | | | 670.82 | 82.33 | 57.19 | 56.48 | 106.1 | 75.44 |
| Block F | | | | | 1.000 | 0.633 | 0.588 | 0.785 | 11.215 | 0.661 |
| Block Prob(F) | | | | | 0.3806 | 0.5385 | 0.5620 | 0.4659 | 0.0003 | 0.5243 |
| Treatment F | | | | | 1.000 | 1.401 | 7.248 | 5.696 | 1.656 | 2.577 |
| Treatment Prob(F) | | | | | 0.4793 | 0.2167 | 0.0001 | 0.0001 | 0.1244 | 0.0160 |

# Montana State University
## Reduced Herbicide Rates for Wild Oat Control in Peppermint

Project Code:95-WOP-R5 Location :Kalispell, MT
Cooperator: By:Bob Stougaard

Summary Comments:
The surfactants MSO (COC) and Activatror-90 (NIS) were applied alone or with 28% ammonium nitrate (UAN) in combination with Assure II. Results were similar to 1994 observations. MSO enhanced herbicide activity more so than Activator-90 and the addition of 28% UAN aided the activity of both surfactants. The best control was obtained with a combination of MSO plus 28% UAN.

### Site Description

Crop: PEPPERMINT Variety: BLACK MITCHAM Planting Date: 4-4-94
Planting Method: ROOTS Rate, Unit: , Depth, Unit: ,
Perennial Age, Unit: , Row Spacing, Unit: ,
Soil Temp., Unit: , Soil Moisture: Emergence Date:

Plot Width/Area, Unit: 10 , FT Plot Length, Unit: 15 , FT Reps: 3
Site Type: Seed Bed Desc.: Ground Cover:
Tillage Type: Study Design: RCB
Field Preparation/Plot Maintenance:

### Soil Description

Texture: SILT LOAM % OM: 3.0 % Sand: 40 % Silt: 50 % Clay: 10
pH: 7.0 CEC: Soil Name: CRESTON SL Fertility Level:

### Moisture Conditions

Overall Moisture Conditions: GOOD OVERALL MOISTURE CONDITIONS - IRRIGATED

### Application Information

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| Application Date: | 5-18-95 | 5-30-95 | | | | |
| Time of Day: | 9:00 AM | 9:00 AM | | | | |
| Application Method: | BACKPACK | BACKPACK | | | | |
| Application Timing: | 4 LEAF | 8 LEAF | | | | |
| Air Temp., Unit: | 61 ,F | 64 ,F | , | , | , | , |
| % Relative Humidity: | 69 | 15 | | | | |
| Wind Velocity, Unit: | 2 ,MPH | 0 ,MPH | , | , | , | , |
| Dew Presence (Y/N): | N | N | | | | |
| Water Hardness: | N | N | | | | |
| Soil Temp., Unit: | 56 ,F | 61 ,F | , | , | , | , |
| Soil Moisture: | V GOOD | V GOOD | | | | |
| % Cloud Cover: | 99 | 0 | | | | |

| Weed Species | Weed Stage, Density at Application | | | | | |
|---|---|---|---|---|---|---|
| WILD OAT | 4 LF,3-4" | 5-7L,8-9" | , | , | , | , |
| PEPPERMINT | 2-3", | 5" , | , | , | , | , |

Weed Stage at Ratings:

| | 6-28-95 |
|---|---|
| Wild oat | 14-20" |
| Peppermint | 12-14" |

### Application Equipment

| | Sprayer Type | Speed MPH | Nozzle Type | Nozzle Size | Nozzle Height | Nozzle Spacing | Boom Width | GPA | Carrier | PSI |
|---|---|---|---|---|---|---|---|---|---|---|
| A. | BACKPACK | 2 | FLATFAN | 11002XR | 14" | 20" | 10' | 20 | H20 | 20 |
| B. | " | | | | | | | | | |

# Montana State University
## Reduced Herbicide Rates for Wild Oat Control in Peppermint

Project Code:95-WOP-R5 Location :Kalispell, MT
Cooperator : By:Bob Stougaard

| Trt No | Treatment Name | Form Amt | Fm Ds | Rate | Rate Unit | Grow Stg | WILD OAT CONTROL PERCENT 6-28-95 | WILD OAT HAY YLD T/A 8-2-95 | MINT HAY YLD T/A 8-2-95 | WILD OAT %BIOMASS REDUCTION 8-2-95 | MINT %BIOMASS INCREASE 8-2-95 | MINT OIL YIELD LB/A 9-7-95 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | ASSURE II | .8 | EC | 3 | oz pr/A | 4LF | 40 | 1.88 | 1.76 | 50.4 | 61.2 | 14.1 |
| 1 | NIS | 1 | EC | .125 | % v/v | 4LF | | | | | | |
| 2 | ASSURE II | .8 | EC | 3 | oz pr/A | 4LF | 68 | 1.95 | 1.38 | 50.2 | 23.0 | 21.5 |
| 2 | NIS | 1 | EC | .125 | % v/v | 4LF | | | | | | |
| 2 | UAN 28% | 1 | EC | 2 | qt pr/A | 4LF | | | | | | |
| 3 | ASSURE II | .8 | EC | 3 | oz pr/A | 4LF | 88 | 0.40 | 2.42 | 90.1 | 124.4 | 28.6 |
| 3 | COC | 1 | EC | 1 | qt pr/A | 4LF | | | | | | |
| 4 | ASSURE II | .8 | EC | 3 | oz pr/A | 4LF | 94 | 0.08 | 2.43 | 98.2 | 126.2 | 37.5 |
| 4 | COC | 1 | EC | 1 | qt pr/A | 4LF | | | | | | |
| 4 | UAN 28% | 1 | EC | 2 | qt pr/A | 4LF | | | | | | |
| 5 | ASSURE II | .8 | EC | 7 | oz pr/A | 4LF | 84 | 0.48 | 2.22 | 87.9 | 109.2 | 30.4 |
| 5 | NIS | 1 | EC | .125 | % v/v | 4LF | | | | | | |
| 6 | ASSURE II | .8 | EC | 7 | oz pr/A | 4LF | 92 | 0.09 | 2.49 | 97.8 | 134.4 | 35.2 |
| 6 | NIS | 1 | EC | .125 | % v/v | 4LF | | | | | | |
| 6 | UAN 28% | 1 | EC | 2 | qt pr/A | 4LF | | | | | | |
| 7 | ASSURE II | .8 | EC | 7 | oz pr/A | 4LF | 97 | 0.03 | 2.51 | 99.2 | 134.1 | 40.2 |
| 7 | COC | 1 | EC | 1 | qt pr/A | 4LF | | | | | | |
| 8 | ASSURE II | .8 | EC | 7 | oz pr/A | 4LF | 98 | 0.10 | 2.71 | 97.3 | 156.0 | 37.4 |
| 8 | COC | 1 | EC | 1 | qt pr/A | 4LF | | | | | | |
| 8 | UAN 28% | 1 | EC | 2 | qt pr/A | 4LF | | | | | | |
| 9 | ASSURE II | .8 | EC | 3 | oz pr/A | 8LF | 50 | 0.97 | 1.97 | 73.9 | 86.8 | 29.9 |
| 9 | NIS | 1 | EC | .125 | % v/v | 8LF | | | | | | |
| 10 | ASSURE II | .8 | EC | 3 | oz pr/A | 8LF | 84 | 0.16 | 2.38 | 95.6 | 126.1 | 37.2 |
| 10 | NIS | 1 | EC | .125 | % v/v | 8LF | | | | | | |
| 10 | UAN 28% | 1 | EC | 2 | qt pr/A | 8LF | | | | | | |
| 11 | ASSURE II | .8 | EC | 3 | oz pr/A | 8LF | 68 | 0.41 | 2.11 | 87.6 | 100.4 | 33.9 |
| 11 | COC | 1 | EC | 1 | qt pr/A | 8LF | | | | | | |
| 12 | ASSURE II | .8 | EC | 3 | oz pr/A | 8LF | 87 | 0.18 | 2.41 | 95.3 | 126.8 | 33.9 |
| 12 | COC | 1 | EC | 1 | qt pr/A | 8LF | | | | | | |
| 12 | UAN 28% | 1 | EC | 2 | qt pr/A | 8LF | | | | | | |
| 13 | ASSURE II | .8 | EC | 7 | oz pr/A | 8LF | 73 | 0.37 | 2.36 | 91.2 | 118.2 | 40.4 |
| 13 | NIS | 1 | EC | .125 | % v/v | 8LF | | | | | | |
| 14 | ASSURE II | .8 | EC | 7 | oz pr/A | 8LF | 98 | 0.02 | 2.37 | 99.4 | 123.7 | 36.0 |
| 14 | NIS | 1 | EC | .125 | % v/v | 8LF | | | | | | |
| 14 | UAN 28% | 1 | EC | 2 | qt pr/A | 8LF | | | | | | |
| 15 | ASSURE II | .8 | EC | 7 | oz pr/A | 8LF | 97 | 0.06 | 2.62 | 98.5 | 145.7 | 44.8 |
| 15 | COC | 1 | EC | 1 | qt pr/A | 8LF | | | | | | |
| 16 | ASSURE II | .8 | EC | 7 | oz pr/A | 8LF | 98 | 0.04 | 2.29 | 99.0 | 114.3 | 30.8 |
| 16 | COC | 1 | EC | 1 | qt pr/A | 8LF | | | | | | |
| 16 | UAN 28% | 1 | EC | 2 | qt pr/A | 8LF | | | | | | |
| 17 | NONTREATED | | | | | | 0 | 3.81 | 1.08 | 0 | 0 | 25.9 |
| LSD (.05) = | | | | | | | 21 | 0.83 | 0.70 | 21.3 | 69.0 | 15.1 |
| Standard Dev.= | | | | | | | 12.3923 | .495844 | .422575 | 12.8028 | 41.4008 | 9.05631 |
| CV = | | | | | | | 16.00 | 76.38 | 19.16 | 15.42 | 38.87 | 27.61 |
| Block F | | | | | | | 0.540 | 2.880 | 6.032 | 2.316 | 8.857 | 1.476 |
| Block Prob(F) | | | | | | | 0.5881 | 0.0708 | 0.0060 | 0.1150 | 0.0009 | 0.2438 |
| Treatment F | | | | | | | 13.589 | 12.539 | 3.204 | 12.884 | 3.099 | 2.056 |
| Treatment Prob(F) | | | | | | | 0.0001 | 0.0001 | 0.0025 | 0.0001 | 0.0031 | 0.0404 |

# Montana State University
## 1994-95 Living Mulch Study in Peppermint

Project Code:95-LMS-R5 Location :KALISPELL, MT
Cooperator :WESTCOTT By:Bob Stougaard

Summary:

This project illustrated which species have the best potential as living mulch crops and also demonstrated the potential weed control benefits and nitrogen reclamation aspects of using this system. At both sites, rye produced the most biomass of all the crops evaluated. Spring rye produces the most fall growth, but overall net biomass accumulation was greater for winter rye. It appears that spring mulch growth has a greater impact than fall growth from the stand point of weed suppression and nitrogen reclamation. Mint yield response to mulching will vary depending upon the severity of the winter and straw seems to serve well in terms of insulating the crop.

### Site Description

Crop: PEPPERMINT Variety: BLACK MITCHAM Planting Date: 4-4-93
Planting Method: ROOTS Rate, Unit: 1000 , #/A Depth, Unit: 3 , "
Perennial Age, Unit: 3 , YR Row Spacing, Unit: 18 , "
Soil Temp., Unit: , Soil Moisture: Emergence Date:
Plot Width/Area, Unit: 10 , FT Plot Length, Unit: 15 , FT Reps: 3
Site Type: ESTBL. FIELD Seed Bed Desc.: Ground Cover: 30-50%
Tillage Type: Study Design: RCB
Field Preparation/Plot Maintenance: PRODUCER TYPE CULTURAL AND MAINTENANCE PROCEDURES.

### Soil Description

Texture: SILT LOAM % OM: 2.8 % Sand: 440 % Silt: 50 % Clay: 10
pH: 6.4 CEC: Soil Name: CRESTON SL Fertility Level:

### Moisture Conditions

Overall Moisture Conditions: IRRIGATED WITH .5" WATER EVERY WEEK

### Living Mulch Seeding Information

| | 2 WK PRE | POST HARVEST |
|---|---|---|
| Seeding Date: | 8-1-94 | 8-16-94 |
| Seeding Method: | Aerial | Double Disc |
| Seeding Timing: | 2WK Pre | POST Harvest |
| Soil Moisture: | Good | Good |

Seeding Rates: Cereals 120 lb/A, Austrian Winter Peas 150 lb/A, Rape 12 lb/A Hairy Vetch 40 lb/A

Table 1.

Montana State University
1994-95 Living Mulch Study in Peppermint

Project Code:95-LMS-R5 Location :KALISPELL, MT
Cooperator :WESTCOTT By:STOUGAARD

| Treatment Name | Seeding Date | MULCH HEIGHT INCHES 10-19-94 | MULCH GRN CVR PERCENT 10-19-94 | MULCH DRY WT LBS/A 10-24-94 | MULCH DRY WT LBS/A 5-19-95 |
|---|---|---|---|---|---|
| Winter Wheat | PREHAR | 6.3 | 1.3 | 16 | 88 |
| Spring Wheat | PREHAR | 10.0 | 3.3 | 89 | - |
| Spring Rye | PREHAR | 15.7 | 14.3 | 195 | - |
| Winter Rye | PREHAR | 6.3 | 4.3 | 146 | 1875 |
| Winter Rape | PREHAR | 4.3 | 6.0 | 19 | - |
| Spring Rape | PREHAR | 4.7 | 4.7 | 30 | - |
| Hairy Vetch | PREHAR | 5.0 | 22.7 | 147 | 757 |
| Winter Peas | PREHAR | 3.7 | 2.7 | 29 | - |
| Winter Wheat | PSTHAR | 5.7 | 38.3 | 677 | 1601 |
| Spring Wheat | PSTHAR | 10.3 | 45.0 | 541 | - |
| Spring Rye | PSTHAR | 16.0 | 68.3 | 2335 | - |
| Winter Rye | PSTHAR | 6.7 | 50.0 | 1241 | 3761 |
| Winter Rape | PSTHAR | 2.7 | 7.0 | 120 | - |
| Spring Rape | PSTHAR | 3.3 | 11.7 | 126 | - |
| Hairy Vetch | PSTHAR | 3.7 | 28.3 | 514 | 2050 |
| Winter Peas | PSTHAR | 2.7 | 18.7 | 303 | - |
| Straw | 1 T/A | - | - | - | - |
| Nontreated | | - | - | - | - |
| LSD (.05) = | | 3.6 | 9.8 | 842 | 1001 |
| Standard Dev.= | | 2.14314 | 5.87993 | 504.802 | 550.139 |
| CV = | | 32.05 | 28.80 | 123.75 | 32.58 |
| Block F | | 3.796 | 2.152 | 1.292 | 1.076 |
| Block Prob(F) | | 0.0339 | 0.1339 | 0.2896 | 0.3772 |
| Treatment F | | 11.636 | 35.556 | 4.360 | 15.660 |
| Treatment Prob(F) | | 0.0001 | 0.0001 | 0.0003 | 0.0002 |

Table 2.

Montana State University
1994-95 Living Mulch Study in Peppermint

Project Code:95-LMS-R5 Location :KALISPELL, MT
Cooperator :WESTCOTT By:STOUGAARD

| Treatment Name | Seeding Date | WEEDS NUMBER PER ACRE 5-19-95 | WEED DRY WT LBS/ACRE 5-19-95 | MINT YIELD LBS/A 7-28-95 | MULCH EXTRT N LBS/A 10-24-94 | MULCH EXTRT N LBS/A 5-19-95 |
|---|---|---|---|---|---|---|
| Winter Wheat | PREHAR | 116667 | 121 | 19831 | .4 | 3.6 |
| Spring Wheat | PREHAR | - | - | 17029 | 2.2 | - |
| Spring Rye | PREHAR | - | - | 18261 | 6.0 | - |
| Winter Rye | PREHAR | 78333 | 481 | 20906 | 4.5 | 76.8 |
| Winter Rape | PREHAR | - | - | 19915 | .5 | - |
| Spring Rape | PREHAR | - | - | 18696 | 1.0 | - |
| Hairy Vetch | PREHAR | 103333 | 191 | 19058 | 5.3 | 22.2 |
| Winter Peas | PREHAR | - | - | 20846 | 1.0 | - |
| Winter Wheat | PSTHAR | 18333 | 158 | 15737 | 18.3 | 46.9 |
| Spring Wheat | PSTHAR | - | - | 19625 | 15.5 | - |
| Spring Rye | PSTHAR | - | - | 21413 | 50.5 | - |
| Winter Rye | PSTHAR | 8333 | 14 | 16739 | 35.8 | 95.6 |
| Winter Rape | PSTHAR | - | - | 22995 | 3.0 | - |
| Spring Rape | PSTHAR | - | - | 19324 | 3.4 | - |
| Hairy Vetch | PSTHAR | 16667 | 30 | 19565 | 18.5 | 83.0 |
| Winter Peas | PSTHAR | - | - | 17271 | 10.5 | - |
| Straw | 1 T/A | 106667 | 268 | 25387 | - | - |
| Nontreated | | 173333 | 282 | 22669 | - | - |
| LSD (.05) = | | 84031 | 260 | 4016 | 20.7 | 41.6 |
| Standard Dev.= | | 50400.1 | 156.030 | 2408.90 | 12.4344 | 22.892 |
| CV = | | 143.62 | 181.94 | 12.21 | 112.70 | 41.87 |
| Block F | | 14.590 | 0.151 | 13.376 | 1.182 | 2.841 |
| Block Prob(F) | | .0172 | 0.8606 | 0.000 | 0.3206 | 0.1055 |
| Treatment F | | 3.506 | 2.37 | 3.008 | 3.915 | 7.657 |
| Treatment Prob(F) | | 0.0009 | 0.018 | 0.0031 | 0.0007 | 0.0034 |

Table 3.

Montana State University
1994-95 Living Mulch Study in Peppermint

Project Code:95-LMS-R5 Location :KALISPELL, MT
Cooperator :WESTCOTT By:STOUGAARD

| Treatment Name | Seeding Date | SOIL N PPM 0-1' | SOIL N PPM 1-2' | SOIL N PPM 2-3' | SOIL N PPM 3-4' | SOIL N PPM TOTAL |
|---|---|---|---|---|---|---|
| Winter Wheat | PREHAR | 5.2 | 4.3 | 4.6 | 86.0 | 100.1 |
| Spring Wheat | PREHAR | 3.9 | 3.8 | 9.4 | 6.9 | 23.9 |
| Spring Rye | PREHAR | 3.9 | 3.4 | 20.0 | 146.3 | 173.5 |
| Winter Rye | PREHAR | 3.3 | 2.3 | 3.2 | 33.5 | 42.3 |
| Winter Rape | PREHAR | - | - | - | - | - |
| Spring Rape | PREHAR | - | - | - | - | - |
| Hairy Vetch | PREHAR | 2.4 | 2.3 | 2.6 | 3.5 | 10.8 |
| Winter Peas | PREHAR | - | - | - | - | - |
| Winter Wheat | PSTHAR | 3.7 | 3.2 | 4.5 | 18.4 | 29.7 |
| Spring Wheat | PSTHAR | 5.6 | 3.6 | 6.5 | 103.0 | 118.7 |
| Spring Rye | PSTHAR | 4.4 | 2.9 | 3.0 | 3.9 | 14.1 |
| Winter Rye | PSTHAR | 2.0 | 2.3 | 2.4 | 3.1 | 9.8 |
| Winter Rape | PSTHAR | - | - | - | - | - |
| Spring Rape | PSTHAR | - | - | - | - | - |
| Hairy Vetch | PSTHAR | 3.9 | 2.5 | 3.7 | 3.7 | 13.8 |
| Winter Peas | PSTHAR | - | - | - | - | - |
| Straw | 1 T/A | 9.1 | 4.1 | 18.2 | 127.5 | 158.8 |
| Nontreated | | 2.5 | 2.9 | 3.4 | 103.6 | 112.4 |
| LSD (.05) = | | 5.329 | 1.843 | 17.130 | 162.407 | 179.9 |
| Standard Dev.= | | 3.1466 | 1.08814 | 10.1159 | 95.9051 | 106.238 |
| CV = | | 75.85 | 34.88 | 149.19 | 179.99 | 157.79 |
| Block F | | 2.805 | 7.513 | 3.748 | 8.961 | 8.764 |
| Block Prob(F) | | 0.0822 | 0.0033 | 0.0397 | 0.0014 | 0.0016 |
| Treatment F | | 1.069 | 1.290 | 1.083 | 1.005 | 1.003 |
| Treatment Prob(F) | | 0.4267 | 0.2931 | 0.4171 | 0.4729 | 0.4741 |

Table 4.

Montana State University
Peppermint Living Mulch Study - Corvallis

Project Code:LMS-COR Location :CORVALLIS, MT
Cooperator :STOUGAARD By:WESTCOTT

| | | MULCH HEIGHT INCHES 11-11-94 | MULCH NUMBER SQ FT 11-11-94 | MULCH DRY WT LBS/A 5-22-95 | WEED NUMBER PER ACRE 5-22-95 | WEED DRY WT LBS/ACRE 5-22-95 | MINT YIELD LBS/A 9-4-95 |
|---|---|---|---|---|---|---|---|
| WINTER WHEAT | PREHAR | 3.4 | 10.8 | 447 | 152923 | 27.4 | 1041 |
| SPRING WHEAT | PREHAR | 7.6 | 6.3 | - | - | - | 1520 |
| SPRING RYE | PREHAR | 9.4 | 13.8 | - | - | - | 1402 |
| WINTER RYE | PREHAR | 2.9 | 7.8 | 1746 | 34904 | 1.4 | 2597 |
| WINTER RAPE | PREHAR | - | 5.3 | - | - | - | 1123 |
| SPRING RAPE | PREHAR | - | 21.1 | - | - | - | 1483 |
| WINTER WHEAT | PSTHAR | 2.6 | 9.3 | 615 | 313962 | 7.5 | 1816 |
| SPRING WHEAT | PSTHAR | 4.3 | 8.3 | - | - | - | 1597 |
| SPRING RYE | PSTHAR | 4.6 | 28.3 | - | - | - | 1632 |
| WINTER RYE | PSTHAR | 2.4 | 27.0 | 1252 | 775000 | .3 | 1765 |
| WINTER RAPE | PSTHAR | - | 1.4 | - | - | - | 1435 |
| SPRING RAPE | PSTHAR | - | 3.9 | - | - | - | 1678 |
| STRAW | 1T/A | - | | - | - | - | 2906 |
| UNTREATED | | - | | - | - | - | 1753 |
| LSD (.05) = | | 1.23 | 16.698 | 728.2 | 1285433 | 28.9711 | 614.4 |
| Standard Dev.= | | .821447 | 11.5641 | 455.254 | 803659 | 18.1129 | 429.915 |
| CV = | | 17.72 | 97.09 | 44.86 | 251.78 | 197.89 | 25.34 |
| Block F | | 1.751 | 0.038 | 2.938 | 0.771 | 2.533 | 8.073 |
| Block Prob(F) | | 0.1946 | 0.9898 | 0.0916 | 0.5389 | 0.1225 | 0.0003 |
| Treatment F | | 38.728 | 2.370 | 6.900 | 0.653 | 1.922 | 5.492 |
| Treatment Prob(F) | | 0.0001 | 0.0274 | 0.0104 | 0.6010 | 0.1966 | 0.0001 |

Table 5.

Montana State University
Peppermint Living Mulch Study - Corvallis

Project Code:LMS-COR
Cooperator :STOUGAARD

Location :CORVALLIS, MT
By:WESTCOTT

| | | SOIL N PPM 0-1' | SOIL N PPM 1-2' | SOIL N PPM 2-3' | SOIL N PPM TOTAL | MULCH EXTRT N LBS/A 5-22-95 |
|---|---|---|---|---|---|---|
| WINTER WHEAT | PREHAR | 9.0 | 33.4 | 283.8 | 326.1 | 8.0 |
| SPRING WHEAT | PREHAR | - | - | - | - | - |
| SPRING RYE | PREHAR | - | - | - | - | - |
| WINTER RYE | PREHAR | 10.1 | 122.0 | 273.3 | 336.7 | 24.6 |
| WINTER RAPE | PREHAR | - | - | - | - | - |
| SPRING RAPE | PREHAR | - | - | - | - | - |
| WINTER WHEAT | PSTHAR | 7.4 | 83.9 | 295.0 | 313.2 | 11.2 |
| SPRING WHEAT | PSTHAR | - | - | - | - | - |
| SPRING RYE | PSTHAR | - | - | - | - | - |
| WINTER RYE | PSTHAR | 7.9 | 256.3 | 297.5 | 412.8 | 16.8 |
| WINTER RAPE | PSTHAR | - | - | - | - | - |
| SPRING RAPE | PSTHAR | - | - | - | - | - |
| STRAW | 1T/A | 8.0 | 94.6 | 265.0 | 368.5 | - |
| UNTREATED | | 7.0 | 67.6 | 373.3 | 355.3 | - |
| LSD (.05) = | | 4.715 | 176.22 | 128.2 | 353.1 | 11.9 |
| Standard Dev.= | | 3.12928 | 116.948 | 81.3561 | 234.539 | 7.41858 |
| CV = | | 38.02 | 106.68 | 27.30 | 66.65 | 48.93 |
| Block F | | 3.307 | 1.409 | 3.428 | 1.130 | 3.020 |
| Block Prob(F) | | 0.0492 | 0.2789 | 0.0604 | 0.3686 | 0.0865 |
| Treatment F | | 0.536 | 1.762 | 0.917 | 0.093 | 3.819 |
| Treatment Prob(F) | | 0.7460 | 0.1815 | 0.5081 | 0.9921 | 0.0514 |

**YEAR/PROJECT: 1995/755** **Intrastate Alfalfa Yield Trials - Irrigated & Dryland**

PERSONNEL: Leon Welty, NWARC
Louise Prestbye, NWARC
In cooperation with Robert Dunn and Ray Ditterline, MSU-Bozeman

Alfalfa varieties were established at both dryland and irrigated sites each spring from 1992 to 1995. The trials planted on 4/25/95 were harvested twice, in late July and early October (after frost). The established dryland nurseries were harvested three times: 6/24, 7/28, and 10/2/95, while most of the varieties were still in the bud stage. The irrigated 1994 trial was harvested 5/26 (vegetative), 7/10 (mid-bud), 8/10 (pre-bud), and after frost on 10/10 (vegetative). The irrigated 1993 nursery was harvested 5/26, 6/30, 8/2, and 10/5/95 while in the vegetative stage. The irrigated 1992 nursery was cut at the same time, but was plowed under after the third cutting, eliminating a fall harvest.

Maturity was delayed due to a cool, wet season, Precipitation from September 1, 1994 to August 31, 1995 was 22.64 inches, compared to a 46-year average of 19.71 inches. Growing season precipitation (April - August, 1995) was 12.70 inches, 2.84 inches above average.

There were no significant differences among varieties for total 1995 dry matter yield in the 1992, 1994, and 1995 dryland trials. Mean yields were 5.66 tons/acre for the 1992 nursery, 4.87 tons/acre for the 1994 trial, and 3.06 tons/acre for the new seeding. The 1993 trial (which was located on heavier soil than the other dryland sites) did show significant differences among some varieties, with '5454' the highest yielding (6.18 tons/acre) and 'Ladak 65' the lowest (4.84 tons/acre). Mean yield was 5.57 tons/acre. The 1992 dryland trial produced a mean total of 18.13 tons/acre over its 4-year life span, with a range of 14.92 tons/acre for 'Wisfall' (which had very poor early establishment and vigor) to 19.98 tons/acre for 'Excalibur II'. The 1993 trial had a 3-year total production averaging 13.61 tons/acre, ranging from Ladak 65 (11.65 t/a) to 5454 (14.77 t/a). The 1994 nursery averaged a total yield of 6.17 tons/acre over the 2-year period, ranging from 5.12 tons/acre for'330' to 7.12 tons/acre for 'ZX 9344'.

All the irrigated trials had significant yield differences among varieties. The 1992 trial had a mean yield for 1995 of 4.13 tons/acre, ranging from 2.66 tons/acre for Wisfall to 5.11 tons/acre for 'MBS 2131'. Four-year total production ranged from 15.49 tons/acre (Wisfall) to 20.89 tons/acre (MBS 2131), with a mean of 19.36 tons/acre. The 1993 trial averaged 5.71 tons/acre in 1995, ranging from 5.06 tons/acre for Ladak 65 to 6.37 for '5454'. The mean 3-year total production was 15.62 tons/acre, ranging from 13.97 for 'Spredor 3' to 17.00 tons/acre for 'AS-K9'. The 1994 trial produced an average of 5.30 tons/acre in 1995, ranging from 4.41 for Ladak 65 to 5.88 tons/acre for 'Pasture Plus'. The 2-year total averaged 8.77 tons/acre, ranging from Ladak 65's 7.73 to Pasture Plus's 9.38 tons/acre. The 1995 seeding averaged 2.71 tons/acre in the establishment year. 'Riley' produced the least with 2.38 tons/acre, while '3L 102' produced the most with 3.02 tons/acre.

# 1992 INTRASTATE ALFALFA YIELD TRIAL
# KALISPELL - IRRIGATED - 1995

| VARIETY | MTNo | FD[1] | VW[2] | Occupancy | Dry Matter Yield 5/24/95 Harvest-1 | 6/30/95 Harvest-2 | 8/2/95 Harvest-3 | 1995 TOTAL |
|---|---|---|---|---|---|---|---|---|
| | | | | *% of plot* | *t/a* | *t/a* | *t/a* | *t/a* |
| MBS 2131 | 259 | - | - | 98 | 2.17 | 1.31 | 1.63 | 5.11 |
| 5454 | 263 | 4 | MR | 95 | 1.90 | 1.19 | 1.54 | 4.63 |
| PGI 3212 | 260 | - | - | 95 | 1.87 | 1.11 | 1.50 | 4.49 |
| WL 323 | 251 | 4 | R | 88 | 1.79 | 1.10 | 1.56 | 4.45 |
| GUARDSMAN | 252 | - | - | 96 | 1.85 | 1.14 | 1.45 | 4.44 |
| 5364 | 213 | 4 | MR | 94 | 1.88 | 1.11 | 1.43 | 4.41 |
| CROWN II | 247 | 3 | R | 95 | 1.74 | 1.12 | 1.52 | 4.38 |
| DK 133 | 261 | 4 | R | 94 | 1.71 | 1.12 | 1.52 | 4.34 |
| EXCALIBUR II | 248 | - | - | 94 | 1.78 | 1.08 | 1.46 | 4.32 |
| 5246 | 262 | 3 | R | 98 | 1.82 | 1.07 | 1.39 | 4.28 |
| CLASS | 249 | 3 | R | 90 | 1.65 | 1.09 | 1.53 | 4.27 |
| WL 322HQ | 250 | 4 | R | 91 | 1.71 | 1.08 | 1.47 | 4.26 |
| ACHIEVA | 253 | 3 | R | 91 | 1.65 | 1.06 | 1.50 | 4.20 |
| BENCHMARK | 254 | 3 | R | 93 | 1.64 | 1.07 | 1.49 | 4.20 |
| PROFIT | 258 | 2 | R | 94 | 1.73 | 1.05 | 1.41 | 4.18 |
| ARROW | 192 | 3 | R | 95 | 1.71 | 1.02 | 1.40 | 4.13 |
| LADAK 65 | 2 | 1 | - | 88 | 1.89 | 0.91 | 1.31 | 4.11 |
| MILKMAKER II | 266 | 2 | - | 91 | 1.72 | 0.97 | 1.36 | 4.05 |
| AP 8950 | 265 | - | - | 94 | 1.54 | 0.97 | 1.40 | 3.91 |
| PERRY | 133 | 3 | - | 94 | 1.69 | 0.92 | 1.27 | 3.87 |
| WEBFOOT MPR | 257 | 4 | HR | 93 | 1.54 | 0.95 | 1.33 | 3.82 |
| ABI 9143 | 264 | - | - | 89 | 1.54 | 0.93 | 1.34 | 3.81 |
| WI 9125 | 256 | - | - | 81 | 1.51 | 0.85 | 1.20 | 3.56 |
| RILEY | 122 | 4 | LR | 89 | 1.47 | 0.75 | 1.21 | 3.43 |
| WISFALL | 255 | - | - | 79 | 1.40 | 0.48 | 0.79 | 2.66 |
| MEAN | | | | 92 | 1.72 | 1.02 | 1.40 | 4.13 |
| LSD(0.05) | | | | 5 | 0.19 | 0.12 | 0.15 | 0.42 |
| CV(s/mean)x100 | | | | 3.7 | 7.7 | 8.4 | 7.8 | 7.3 |

[1] *Fall Dormancy rating*

[2] *Vert Wilt resistance*

Seeding date: 4/23/92

Stage of maturity at cutting: Harvest-1: late veg. Harvest-2: late veg. Harvest-3: mid-bud

Growing season precipitation (Apr 95-Aug 95): 12.70", avg.9.86"

Crop year precipitation (Sep 94 - Aug 95): 22.64", avg.19.71"

Last spring frost: 5/27/95, 32 degrees F

First fall frost: 9/21/95, 22 degrees F

Frost free period: 116 days, avg. 112

Soil series: Creston Silt Loam, Flathead Very Fine Silt Loam

Elevation: 2,940 ft.

NOTE: Weed competition reduced dry matter yields at this irrigated site as compared to the 1992 dryland trial.

# 1992 INTRASTATE ALFALFA YIELD TRIAL
# KALISPELL - IRRIGATED

| VARIETY | FD[1] | VW[2] | Dry Matter Yield 1992 | 1993 | 1994 | 1995 | TOTAL |
|---|---|---|---|---|---|---|---|
| | | | *t/a* | *t/a* | *t/a* | *t/a* | *t/a* |
| MBS 2131 | -- | -- | 4.41 | 4.58 | 6.80 | 5.11 | 20.89 |
| DK 133 | 4 | R | 4.84 | 4.94 | 6.58 | 4.34 | 20.69 |
| Crown II | 3 | R | 4.89 | 4.71 | 6.58 | 4.38 | 20.56 |
| WL 323 | 4 | R | 4.66 | 4.74 | 6.66 | 4.45 | 20.50 |
| Achieva | 3 | R | 4.99 | 4.87 | 6.41 | 4.20 | 20.46 |
| Benchmark | 3 | R | 4.81 | 4.82 | 6.49 | 4.20 | 20.32 |
| 5454 | 4 | MR | 4.24 | 5.03 | 6.43 | 4.63 | 20.32 |
| PGI 3212 | -- | -- | 4.69 | 4.65 | 6.49 | 4.49 | 20.31 |
| Class | 3 | R | 4.87 | 4.85 | 6.29 | 4.27 | 20.27 |
| 5364 | 4 | MR | 4.45 | 4.92 | 6.43 | 4.41 | 20.21 |
| Excalibur II | -- | -- | 4.71 | 4.79 | 6.37 | 4.32 | 20.19 |
| Guardsman | -- | -- | 4.39 | 4.79 | 6.43 | 4.44 | 20.05 |
| Arrow | 3 | R | 4.46 | 4.61 | 6.48 | 4.13 | 19.68 |
| Webfoot M | 3 | -- | 4.79 | 4.76 | 6.21 | 3.82 | 19.59 |
| 5246 | 3 | R | 4.07 | 4.63 | 6.26 | 4.28 | 19.24 |
| Perry | 3 | -- | 4.59 | 4.29 | 6.19 | 3.87 | 18.94 |
| WL 322HQ | 4 | R | 4.00 | 4.32 | 6.15 | 4.26 | 18.74 |
| Profit | 2 | R | 4.15 | 4.36 | 6.05 | 4.18 | 18.73 |
| AP 8950 | -- | -- | 4.31 | 4.58 | 5.92 | 3.91 | 18.72 |
| WI 9125 | -- | -- | 4.67 | 3.95 | 6.28 | 3.56 | 18.45 |
| Milkmaker I | 2 | -- | 4.16 | 4.38 | 5.82 | 4.05 | 18.41 |
| ABI 9143 | -- | -- | 4.21 | 4.41 | 5.89 | 3.81 | 18.32 |
| Ladak 65 | 1 | -- | 4.01 | 3.68 | 5.93 | 4.11 | 17.72 |
| Riley | 4 | LR | 4.17 | 4.02 | 5.66 | 3.43 | 17.27 |
| Wisfall | -- | -- | 4.04 | 3.50 | 5.29 | 2.66 | 15.49 |
| MEAN | | | 4.46 | 4.53 | 6.24 | 4.13 | 19.36 |
| LSD(0.05) | | | 0.28 | 0.26 | 0.45 | 0.42 | 0.73 |
| CV(s/mean) | | | 4.4 | 4.0 | 5.0 | 7.3 | 3.4 |

Seeding date: 4/24/92

*[1]Fall dormancy rating*
*[2]Vert wilt resistance*

# 1992 INTRASTATE ALFALFA YIELD TRIAL
# KALISPELL - DRYLAND - 1995

| VARIETY | MTNo | FD[1] | VW[2] | Occupancy | Dry Matter Yield 6/24/95 Harvest-1 | 7/26/95 Harvest-2 | 10/2/95 Harvest-3 | 1995 TOTAL |
|---|---|---|---|---|---|---|---|---|
| | | | | % of plot | t/a | t/a | t/a | t/a |
| 5246 | 262 | 3 | R | 93 | 3.42 | 1.65 | 1.49 | 6.56 |
| BENCHMARK | 254 | 3 | R | 90 | 3.18 | 1.60 | 1.70 | 6.47 |
| WL 323 | 251 | 4 | R | 90 | 3.09 | 1.59 | 1.54 | 6.22 |
| 5364 | 213 | 4 | MR | 88 | 2.98 | 1.70 | 1.51 | 6.19 |
| MBS 2131 | 259 | - | - | 93 | 2.94 | 1.63 | 1.62 | 6.19 |
| PROFIT | 258 | 2 | R | 95 | 2.96 | 1.51 | 1.58 | 6.04 |
| DK 133 | 261 | 4 | R | 89 | 2.77 | 1.58 | 1.68 | 6.03 |
| ARROW | 192 | 3 | R | 90 | 2.94 | 1.51 | 1.52 | 5.96 |
| GUARDSMAN | 252 | - | - | 94 | 2.96 | 1.54 | 1.38 | 5.87 |
| ACHIEVA | 253 | 3 | R | 90 | 2.82 | 1.58 | 1.46 | 5.85 |
| CROWN II | 247 | 3 | R | 91 | 2.81 | 1.48 | 1.49 | 5.77 |
| 5454 | 263 | 4 | MR | 91 | 2.77 | 1.59 | 1.29 | 5.64 |
| EXCALIBUR II | 248 | - | - | 90 | 2.78 | 1.45 | 1.36 | 5.58 |
| CLASS | 249 | 3 | R | 86 | 2.65 | 1.49 | 1.40 | 5.54 |
| WI 9125 | 256 | - | - | 65 | 2.91 | 1.23 | 1.41 | 5.54 |
| MILKMAKER II | 266 | 2 | - | 94 | 2.75 | 1.48 | 1.23 | 5.46 |
| ABI 9143 | 264 | - | - | 88 | 2.65 | 1.48 | 1.30 | 5.44 |
| WL 322HQ | 250 | 4 | R | 91 | 2.64 | 1.42 | 1.33 | 5.38 |
| LADAK 65 | 2 | 1 | - | 89 | 2.86 | 1.25 | 1.26 | 5.37 |
| RILEY | 122 | 4 | LR | 89 | 2.65 | 1.32 | 1.23 | 5.20 |
| WISFALL | 255 | - | - | 80 | 3.19 | 0.90 | 1.05 | 5.14 |
| WEBFOOT MPR | 257 | 4 | HR | 90 | 2.53 | 1.39 | 1.21 | 5.13 |
| PERRY | 133 | 3 | - | 89 | 2.47 | 1.37 | 1.30 | 5.13 |
| AP 8950 | 265 | - | - | 86 | 2.35 | 1.42 | 1.24 | 5.00 |
| PGI 3212 | 260 | - | - | 88 | 2.57 | 1.31 | 1.05 | 4.93 |
| MEAN | | | | 89 | 2.82 | 1.46 | 1.38 | 5.66 |
| LSD(0.05) | | | | 6 | NS | 0.35 | NS | NS |
| CV(s/mean)*100 | | | | 4.8 | 21.7 | 17.0 | 34.3 | 22.8 |

*1/ Fall Dormancy rating*
*2/ Vert Wilt resistance*

Seeding date: 4/23/92
Fertilizer: 176 lbs $P_2O_5$ preplant
Harvest area = 65 sqft
Stage of maturity at cutting: 1st harv-late bud; 2nd harv-prebloom; 3rd harv-early bud
Growing season precipitation (Apr 95-Aug 95): 12.70", avg.9.86"
Crop year precipitation (Sep 94 - Aug 95): 22.64", avg.19.71"
Last spring frost: 5/27/95, 32 degrees F
First fall frost: 9/21/95, 22 degrees F
Avg. frost free period: 112 days
Soil series: Flathead Very Fine Sandy Loam
Elevation: 2,940 ft.

# 1992 INTRASTATE ALFALFA YIELD TRIAL
# KALISPELL - DRYLAND

| VARIETY | MTNo | FD[1] | VW[2] | ----------Dry Matter Yield---------- 1992 | 1993 | 1994 | 1995 | TOTAL |
|---|---|---|---|---|---|---|---|---|
| | | | | *t/a* | *t/a* | *t/a* | *t/a* | *t/a* |
| EXCALIBUR II | 248 | - | - | 3.41 | 6.76 | 4.17 | 5.64 | 19.98 |
| ACHIEVA | 253 | 3 | R | 2.91 | 6.72 | 3.90 | 6.19 | 19.71 |
| BENCHMARK | 254 | 3 | R | 3.20 | 6.51 | 3.97 | 5.96 | 19.64 |
| 5246 | 262 | 3 | R | 3.13 | 6.17 | 3.68 | 6.56 | 19.54 |
| GUARDSMAN | 252 | - | - | 2.99 | 6.64 | 3.88 | 5.58 | 19.10 |
| CLASS | 249 | 3 | R | 4.01 | 5.75 | 3.38 | 5.87 | 19.01 |
| 5364 | 213 | 4 | MR | 2.78 | 5.61 | 4.04 | 6.47 | 18.90 |
| 5454 | 263 | 4 | MR | 2.49 | 6.36 | 3.79 | 6.22 | 18.86 |
| ARROW | 192 | 3 | R | 2.90 | 6.15 | 3.77 | 6.03 | 18.85 |
| WL 323 | 251 | 4 | R | 3.03 | 6.69 | 4.08 | 4.93 | 18.73 |
| ABI 9143 | 264 | - | - | 2.89 | 5.92 | 3.51 | 6.19 | 18.51 |
| PGI 3212 | 260 | - | - | 3.01 | 6.38 | 3.69 | 5.38 | 18.47 |
| WEBFOOT MPR | 257 | 4 | HR | 3.29 | 6.29 | 3.63 | 5.14 | 18.35 |
| AP 8950 | 265 | - | - | 3.48 | 5.62 | 3.19 | 6.04 | 18.33 |
| CROWN II | 247 | 3 | R | 2.68 | 6.00 | 3.69 | 5.85 | 18.22 |
| MBS 2131 | 259 | - | - | 3.02 | 6.04 | 3.57 | 5.54 | 18.17 |
| PROFIT | 258 | 2 | R | 2.91 | 6.00 | 3.84 | 5.37 | 18.12 |
| MILKMAKER II | 266 | 2 | - | 2.91 | 6.26 | 3.36 | 5.46 | 17.98 |
| DK 133 | 261 | 4 | R | 2.74 | 5.97 | 3.43 | 5.77 | 17.92 |
| WL 322HQ | 250 | 4 | R | 2.94 | 6.03 | 3.77 | 5.00 | 17.73 |
| RILEY | 122 | 4 | LR | 2.57 | 5.65 | 3.28 | 5.20 | 16.69 |
| PERRY | 133 | 3 | - | 2.48 | 5.00 | 3.16 | 5.44 | 16.08 |
| LADAK 65 | 2 | 1 | - | 2.29 | 4.83 | 3.34 | 5.54 | 15.99 |
| WI 9125 | 256 | - | - | 1.93 | 4.89 | 3.50 | 5.13 | 15.45 |
| WISFALL | 255 | - | - | 1.86 | 4.87 | 3.07 | 5.13 | 14.92 |
| MEAN | | | | 2.87 | 5.96 | 3.63 | 5.66 | 18.13 |
| LSD(0.05) | | | | 0.70 | 0.74 | 0.79 | NS | 2.94 |
| CV(s/mean)*100 | | | | 17.2 | 8.8 | 15.5 | 22.8 | 11.6 |

*1/ Fall Dormancy rating*

*2/ Vert Wilt resistance*

Seeding date: 4/23/92

## 1993 INTRASTATE ALFALFA YIELD TRIAL
## KALISPELL - IRRIGATED - 1995

| VARIETY | MTNo | FD[1] | VW[2] | Occupancy | Dry Matter Yield 5/26/95 Harvest-1 | 6/30/95 Harvest-2 | 8/2/95 Harvest-3 | 10/5/95 Harvest-4 | 1995 TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| | | | | % of plot | t/a | t/a | t/a | t/a | t/a |
| 5454 | 263 | 4 | MR | 100 | 2.39 | 1.46 | 1.50 | 1.03 | 6.37 |
| ICI 631 | 270 | -- | -- | 100 | 2.40 | 1.40 | 1.48 | 1.06 | 6.33 |
| AS-K94 | 271 | -- | -- | 94 | 2.18 | 1.33 | 1.40 | 1.05 | 5.95 |
| WISYN-C | 267 | - | - | 96 | 2.24 | 1.27 | 1.35 | 1.06 | 5.92 |
| DAWN | 207 | - | - | 95 | 2.19 | 1.30 | 1.37 | 1.05 | 5.90 |
| 5364 | 213 | 4 | MR | 96 | 2.28 | 1.28 | 1.34 | 1.00 | 5.89 |
| DART | 272 | 3 | R | 98 | 2.21 | 1.20 | 1.33 | 1.04 | 5.79 |
| W6040 | 268 | -- | -- | 95 | 2.20 | 1.22 | 1.35 | 1.02 | 5.78 |
| AP 8950 | 265 | - | - | 96 | 2.08 | 1.26 | 1.41 | 1.02 | 5.77 |
| VERNEMA | 220 | 4 | MR | 95 | 2.21 | 1.23 | 1.32 | 0.95 | 5.70 |
| VENTURE | 274 | 4 | R | 95 | 2.13 | 1.23 | 1.35 | 1.00 | 5.70 |
| WRANGLER | 146 | 2 | LR | 98 | 2.27 | 1.17 | 1.31 | 0.94 | 5.68 |
| APOLLO SUPREME | 206 | 4 | R | 99 | 2.18 | 1.21 | 1.31 | 0.99 | 5.68 |
| PROFIT | 258 | 2 | R | 95 | 2.13 | 1.22 | 1.35 | 0.97 | 5.66 |
| DOMINATOR | 273 | 4 | R | 98 | 2.10 | 1.19 | 1.30 | 1.04 | 5.62 |
| PERRY | 133 | 3 | - | 94 | 2.18 | 1.13 | 1.26 | 0.97 | 5.54 |
| SPREDOR 3 | 269 | 1 | MR | 95 | 2.24 | 1.01 | 1.12 | 0.77 | 5.12 |
| ABI 9143 | 264 | - | - | 90 | 1.83 | 1.08 | 1.21 | 0.95 | 5.10 |
| LADAK 65 | 2 | 1 | - | 94 | 2.23 | 0.95 | 1.16 | 0.72 | 5.06 |
| mean | | | | 96 | 2.19 | 1.22 | 1.33 | 0.98 | 5.71 |
| LSD(0.05) | | | | 4 | 0.12 | 0.08 | 0.08 | 0.07 | 0.27 |
| CV(s/mean)*100 | | | | 2.9 | 3.8 | 4.5 | 4.0 | 5.1 | 3.3 |

[1] *Fall Dormancy rating*

[2] *Vert Wilt resistance*

Fertilizer: 44 lbs/a N + 208 lbs $P_2O_5$ preplant
Seeding date: 4/22/93
Stage of maturity at cutting: Harvest-1: late vegetative; Harvest-2: late vegetative; Harvest-3: vegetative; Harvest-4: vegetative
Irrigation: 6"
Growing season precipitation (Apr 95-Aug 95): 12.70", avg.9.86"
Crop year precipitation (Sep 94 - Aug 95): 22.64", avg.19.71"
Last spring frost: 5/27/95, 32 degrees F
First fall frost: 9/21/95, 22 degrees F
Avg. frost free period: 112 days
Soil series: Creston Silt Loam, Flathead Very Fine Silt Loam
Elevation: 2,940 ft.

# 1993 INTRASTATE ALFALFA YIELD TRIAL
# KALISPELL - IRRIGATED - 1995

| VARIETY | MTNo | FD[1] | VW[2] | Dry Matter Yield 1993 t/a | 1994 t/a | 1995 t/a | 1993-95 TOTAL t/a |
|---|---|---|---|---|---|---|---|
| AS-K94 | 271 | -- | -- | 3.74 | 7.31 | 5.95 | 17.00 |
| ICI 631 | 270 | -- | -- | 3.39 | 6.96 | 6.33 | 16.67 |
| 5454 | 263 | 4 | MR | 3.06 | 6.86 | 6.37 | 16.30 |
| WISYN-C | 267 | - | - | 3.24 | 7.10 | 5.92 | 16.26 |
| VERNEMA | 220 | 4 | MR | 3.48 | 6.86 | 5.70 | 16.04 |
| VENTURE | 274 | 4 | R | 3.36 | 6.86 | 5.70 | 15.92 |
| W6040 | 268 | -- | -- | 3.38 | 6.72 | 5.78 | 15.88 |
| DAWN | 207 | - | - | 3.20 | 6.73 | 5.90 | 15.83 |
| 5364 | 213 | 4 | MR | 3.14 | 6.79 | 5.89 | 15.82 |
| DART | 272 | 3 | R | 3.21 | 6.82 | 5.79 | 15.81 |
| AP 8950 | 265 | - | - | 3.38 | 6.58 | 5.77 | 15.73 |
| PROFIT | 258 | 2 | R | 3.30 | 6.65 | 5.66 | 15.61 |
| WRANGLER | 146 | 2 | LR | 3.06 | 6.69 | 5.68 | 15.43 |
| APOLLO SUPREME | 206 | 4 | R | 3.07 | 6.62 | 5.68 | 15.37 |
| PERRY | 133 | 3 | - | 3.03 | 6.73 | 5.54 | 15.30 |
| DOMINATOR | 273 | 4 | R | 3.05 | 6.51 | 5.62 | 15.18 |
| ABI 9143 | 264 | - | - | 3.24 | 6.39 | 5.10 | 14.73 |
| LADAK 65 | 2 | 1 | - | 2.87 | 6.06 | 5.06 | 13.99 |
| SPREDOR 3 | 269 | 1 | MR | 2.87 | 5.97 | 5.12 | 13.97 |
| mean | | | | 3.21 | 6.69 | 5.71 | 15.62 |
| LSD(0.05) | | | | 0.28 | 0.24 | 0.27 | 0.66 |
| CV(s/mean)x100 | | | | 6.1 | 2.5 | 3.3 | 3.0 |

[1] *Fall Dormancy rating*

[2] *Vert Wilt resistance*

Fertilizer: 44 lbs/a N + 208 lbs $P_2O_5$ preplant
Seeding date: 4/22/93

## 1993 INTRASTATE ALFALFA YIELD TRIAL
## KALISPELL - DRYLAND - 1995

| VARIETY | MTNo | FD[1] | VW[2] | Occupancy | Dry Matter Yield 6/24/95 Harvest-1 | 7/26/95 Harvest-2 | 10/2/95 Harvest-3 | TOTAL |
|---|---|---|---|---|---|---|---|---|
| | | | | % of plot | t/a | t/a | t/a | t/a |
| 5454 | 263 | 4 | MR | 96 | 3.01 | 1.90 | 1.27 | 6.18 |
| 5364 | 213 | 4 | MR | 98 | 3.12 | 1.80 | 1.11 | 6.02 |
| ICI 631 | 270 | -- | -- | 95 | 2.91 | 1.87 | 1.15 | 5.93 |
| APOLLO SUPREME | 206 | 4 | R | 98 | 2.96 | 1.75 | 1.20 | 5.91 |
| WISYN-C | 267 | - | - | 95 | 2.81 | 1.74 | 1.24 | 5.78 |
| PROFIT | 258 | 2 | R | 96 | 2.81 | 1.71 | 1.21 | 5.72 |
| VERNEMA | 220 | 4 | MR | 95 | 2.85 | 1.74 | 1.13 | 5.72 |
| DAWN | 207 | - | - | 96 | 2.76 | 1.71 | 1.19 | 5.66 |
| ABI 9143 | 264 | - | - | 95 | 2.77 | 1.71 | 1.12 | 5.61 |
| W6040 | 268 | -- | -- | 98 | 2.73 | 1.72 | 1.17 | 5.61 |
| AS-K94 | 271 | -- | -- | 95 | 2.59 | 1.80 | 1.21 | 5.60 |
| VENTURE | 274 | 4 | R | 94 | 2.71 | 1.72 | 1.15 | 5.57 |
| DOMINATOR | 273 | 4 | R | 96 | 2.61 | 1.72 | 1.17 | 5.50 |
| WRANGLER | 146 | 2 | LR | 95 | 2.79 | 1.65 | 1.03 | 5.46 |
| DART | 272 | 3 | R | 96 | 2.61 | 1.69 | 1.14 | 5.43 |
| PERRY | 133 | 3 | - | 96 | 2.71 | 1.57 | 1.04 | 5.32 |
| AP 8950 | 265 | - | - | 91 | 2.33 | 1.71 | 1.16 | 5.20 |
| SPREDOR 3 | 269 | 1 | MR | 95 | 2.66 | 1.42 | 0.78 | 4.86 |
| LADAK 65 | 2 | 1 | - | 95 | 2.75 | 1.35 | 0.74 | 4.84 |
| mean | | | | 96 | 2.76 | 1.70 | 1.12 | 5.57 |
| LSD(0.05) | | | | NS | 0.22 | 0.09 | 0.08 | 0.33 |
| CV(s/mean)x100 | | | | 2.6 | 5.7 | 3.6 | 4.8 | 4.2 |

[1] *Fall Dormancy rating*
[2] *Vert Wilt resistance*

Seeding date: 4/22/93
Fertilizer: 44 lbs/a N + 208 lbs/a $P_2O_5$ preplant
Harvest area = 80 sqft
Stage of maturity at cutting:
Harvest-1: late bud
Harvest-2: mid-bud
Harvest-3: early bud
Crop year precipitation (Apr 95-Aug 95): 12.70", avg.9.86"
Yearly Precipitation (Sep 94 - Aug 95): 22.64", avg.19.71"
Last spring frost: 5/27/95, 32 degrees F
First fall frost: 9/21/95, 22 degrees F
Avg. frost free period: 112 days
Soil series: Creston Silt Loam
Elevation: 2,940 ft.

## 1993 INTRASTATE ALFALFA YIELD TRIAL
## KALISPELL - DRYLAND - 1993-1995

| VARIETY | MTNo | FD[1] | VW[2] | 1993 | 1994 | 1995 | TOTAL YIELD 1993-95 |
|---|---|---|---|---|---|---|---|
| | | | | *t/a* | *t/a* | *t/a* | *t/a* |
| 5454 | 263 | 4 | MR | 2.47 | 6.12 | 6.18 | 14.77 |
| 5364 | 213 | 4 | MR | 2.38 | 6.13 | 6.02 | 14.53 |
| ICI 631 | 270 | -- | -- | 2.63 | 5.92 | 5.93 | 14.48 |
| APOLLO SUPREME | 206 | 4 | R | 2.52 | 5.93 | 5.91 | 14.36 |
| AS-K94 | 271 | -- | -- | 2.63 | 6.00 | 5.60 | 14.23 |
| WISYN-C | 267 | - | - | 2.61 | 5.80 | 5.78 | 14.19 |
| W6040 | 268 | -- | -- | 2.69 | 5.89 | 5.61 | 14.19 |
| PROFIT | 258 | 2 | R | 2.43 | 5.77 | 5.72 | 13.93 |
| VERNEMA | 220 | 4 | MR | 2.56 | 5.59 | 5.72 | 13.87 |
| DAWN | 207 | - | - | 2.58 | 5.59 | 5.66 | 13.83 |
| ABI 9143 | 264 | - | - | 2.49 | 5.66 | 5.61 | 13.76 |
| VENTURE | 274 | 4 | R | 2.63 | 5.48 | 5.57 | 13.68 |
| DOMINATOR | 273 | 4 | R | 2.47 | 5.59 | 5.50 | 13.56 |
| DART | 272 | 3 | R | 2.43 | 5.48 | 5.43 | 13.34 |
| AP 8950 | 265 | - | - | 2.53 | 5.23 | 5.20 | 12.96 |
| WRANGLER | 146 | 2 | LR | 2.08 | 5.22 | 5.46 | 12.76 |
| PERRY | 133 | 3 | - | 2.19 | 5.19 | 5.32 | 12.70 |
| SPREDOR 3 | 269 | 1 | MR | 2.02 | 4.92 | 4.86 | 11.80 |
| LADAK 65 | 2 | 1 | - | 1.94 | 4.87 | 4.84 | 11.65 |
| | | | | | | | |
| mean | | | | 2.44 | 5.60 | 5.58 | 13.61 |
| LSD(0.05) | | | | 0.31 | 0.44 | 0.33 | 0.83 |
| CV(s/mean)x100 | | | | 8.9 | 5.6 | 4.2 | 4.3 |

[1] *Fall Dormancy rating*
[2] *Vert Wilt resistance*

Seeding date: 4/22/93

# 1994 INTRASTATE ALFALFA YIELD TRIAL
# KALISPELL - IRRIGATED

| | | | | Dry Matter Yield | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | *5/26/95* | *7/10/95* | *8/10/95* | *10/10/95* | |
| **VARIETY** | **MTNo** | **FD[1]** | **VW[2]** | **Harvest-1** | **Harvest-2** | **Harvest-3** | **Harvest-4** | **TOTAL** |
| | | | | *t/a* | *t/a* | *t/a* | *t/a* | *t/a* |
| Pasture Plus | 277 | -- | -- | 2.30 | 1.36 | 1.40 | 0.82 | 5.88 |
| 5454 | 263 | 4 | MR | 2.32 | 1.28 | 1.34 | 0.76 | 5.71 |
| Legendairy | 288 | 2 | HR | 2.28 | 1.32 | 1.35 | 0.71 | 5.65 |
| Hygain | 284 | 4 | R | 2.17 | 1.31 | 1.34 | 0.75 | 5.57 |
| Reward | 276 | 4 | R | 2.20 | 1.25 | 1.33 | 0.78 | 5.55 |
| 5262 | 214 | 2 | LR | 2.22 | 1.28 | 1.33 | 0.74 | 5.55 |
| ZX 9344 | 279 | -- | -- | 2.20 | 1.28 | 1.28 | 0.73 | 5.49 |
| 330 | 287 | 4 | R | 2.08 | 1.29 | 1.32 | 0.80 | 5.48 |
| Rushmore | 286 | 4 | R | 2.17 | 1.27 | 1.27 | 0.74 | 5.44 |
| ABI 9033 | 280 | -- | -- | 2.17 | 1.27 | 1.29 | 0.72 | 5.44 |
| PGI 9047 | 275 | -- | -- | 2.12 | 1.29 | 1.25 | 0.74 | 5.40 |
| MS9301 | 293 | -- | -- | 2.15 | 1.25 | 1.26 | 0.74 | 5.39 |
| MS9304 | 294 | -- | -- | 2.19 | 1.26 | 1.22 | 0.71 | 5.38 |
| 3B50 | 289 | -- | -- | 2.10 | 1.25 | 1.27 | 0.72 | 5.33 |
| Dividend | 291 | 2 | R | 2.14 | 1.28 | 1.23 | 0.66 | 5.31 |
| Magnum III-Wet | 285 | 3 | MR | 2.13 | 1.20 | 1.24 | 0.73 | 5.29 |
| ABI 923AA | 281 | -- | -- | 2.12 | 1.24 | 1.23 | 0.66 | 5.24 |
| Sterling | 290 | 2 | R | 2.08 | 1.24 | 1.22 | 0.70 | 5.23 |
| WL-323 | 251 | 4 | R | 2.00 | 1.22 | 1.25 | 0.71 | 5.18 |
| Vernema | 220 | 4 | MR | 2.06 | 1.21 | 1.20 | 0.69 | 5.16 |
| Avalanche | 282 | 2 | HR | 2.10 | 1.20 | 1.19 | 0.66 | 5.14 |
| ZC 9030 | 278 | -- | -- | 2.08 | 1.16 | 1.13 | 0.73 | 5.09 |
| STI-94 | 292 | -- | -- | 1.96 | 1.21 | 1.23 | 0.68 | 5.07 |
| 91-12 | 283 | -- | -- | 1.94 | 1.18 | 1.21 | 0.73 | 5.05 |
| Perry | 133 | 3 | -- | 2.10 | 1.16 | 1.13 | 0.64 | 5.03 |
| Wrangler | 146 | 2 | LR | 2.03 | 1.07 | 1.07 | 0.57 | 4.74 |
| Ladak 65 | 2 | 1 | -- | 2.10 | 1.02 | 0.86 | 0.42 | 4.41 |
| MEAN | | | | 2.13 | 1.23 | 1.24 | 0.70 | 5.30 |
| LSD(0.05) | | | | 0.14 | 0.08 | 0.12 | 0.07 | 0.34 |
| CV(s/mean)x100 | | | | 4.5 | 4.7 | 6.7 | 6.6 | 4.5 |

[1] *Fall Dormancy rating*

[2] *Vert Wilt resistance*

Seeding date: 4/27/94
Fertilizer: 44 lbs/a N + 208 lbs/a $P_2O_5$ preplant
Stage of maturity at cutting: harv1-veg., harv2-midbud, harv3prebud, harv4-veg.
Irrigation: 6"
Growing season precipitation (Apr 95-Aug 95): 12.70", avg.9.86"
Crop year precipitation (Sep 94 - Aug 95): 22.64", avg.19.71"
Last spring frost: 5/27/95, 32 degrees F
First fall frost: 9/21/95, 22 degrees F
Avg. frost free period: 112 days
Soil series: Creston Silt Loam, Flathead Very Fine Silt Loam

# 1994 INTRASTATE ALFALFA YIELD TRIAL
# KALISPELL - IRRIGATED

| VARIETY | MTNo | FD[1] | VW[2] | ------Dry Matter Yield------ 1994 t/a | 1995 t/a | TOTAL t/a |
|---|---|---|---|---|---|---|
| Pasture Plus | 277 | -- | -- | 3.50 | 5.88 | 9.38 |
| Reward | 276 | 4 | R | 3.62 | 5.55 | 9.17 |
| 5262 | 214 | 2 | LR | 3.59 | 5.55 | 9.15 |
| ZX 9344 | 279 | -- | -- | 3.63 | 5.49 | 9.12 |
| 5454 | 263 | 4 | MR | 3.37 | 5.71 | 9.08 |
| MS9304 | 294 | -- | -- | 3.65 | 5.38 | 9.03 |
| 3B50 | 289 | -- | -- | 3.62 | 5.33 | 8.95 |
| Legendairy | 288 | 2 | HR | 3.30 | 5.65 | 8.95 |
| Vernema | 220 | 4 | MR | 3.76 | 5.16 | 8.92 |
| Hygain | 284 | 4 | R | 3.35 | 5.57 | 8.91 |
| 330 | 287 | 4 | R | 3.42 | 5.48 | 8.90 |
| PGI 9047 | 275 | -- | -- | 3.49 | 5.40 | 8.89 |
| MS9301 | 293 | -- | -- | 3.47 | 5.39 | 8.86 |
| ABI 9033 | 280 | -- | -- | 3.40 | 5.44 | 8.84 |
| Rushmore | 286 | 4 | R | 3.33 | 5.44 | 8.78 |
| Dividend | 291 | 2 | R | 3.45 | 5.31 | 8.75 |
| WL-323 | 251 | 4 | R | 3.57 | 5.18 | 8.74 |
| Magnum III-We | 285 | 3 | MR | 3.36 | 5.29 | 8.65 |
| Avalanche | 282 | 2 | HR | 3.51 | 5.14 | 8.64 |
| STI-94 | 292 | -- | -- | 3.54 | 5.07 | 8.61 |
| ZC 9030 | 278 | -- | -- | 3.50 | 5.09 | 8.60 |
| ABI 923AA | 281 | -- | -- | 3.35 | 5.24 | 8.59 |
| Perry | 133 | 3 | -- | 3.55 | 5.03 | 8.58 |
| 91-12 | 283 | -- | -- | 3.43 | 5.05 | 8.47 |
| Sterling | 290 | 2 | R | 3.20 | 5.23 | 8.43 |
| Wrangler | 146 | 2 | LR | 3.48 | 4.74 | 8.22 |
| Ladak 65 | 2 | 1 | -- | 3.32 | 4.41 | 7.73 |
| MEAN | | | | 3.47 | 5.30 | 8.77 |
| LSD(0.05) | | | | 0.32 | 0.34 | 0.45 |
| P-VALUE | | | | NS | 0.00 | 0.00 |
| CV(s/mean) | | | | 6.5 | 4.5 | 3.7 |

Seeding date: 4/27/94

[1]Fall Dormancy rating
[2]Vert wilt resistance

1st harvest - 7/22/94 - early bloom
2nd harvest - 9/26/94 - prebloom

**1994 INTRASTATE ALFALFA YIELD TRIAL**
**KALISPELL - DRYLAND - 1995**

| VARIETY | MTNo | FD[1] | VW[2] | Occupancy | Dry Matter Yield 6/24/95 Harvest-1 | 7/26/95 Harvest-2 | 10/2/95 Harvest-3 | TOTAL |
|---|---|---|---|---|---|---|---|---|
| | | | | *% of plot* | *t/a* | *t/a* | *t/a* | *t/a* |
| Ladak 65 | 2 | 1 | -- | 93 | 2.92 | 1.38 | 0.77 | 5.06 |
| Perry | 133 | 3 | -- | 93 | 2.65 | 1.34 | 0.60 | 4.59 |
| Wrangler | 146 | 2 | LR | 93 | 2.76 | 1.32 | 0.63 | 4.71 |
| 5262 | 214 | 2 | LR | 94 | 2.96 | 1.71 | 0.99 | 5.66 |
| Vernema | 220 | 4 | MR | 94 | 2.56 | 1.29 | 0.48 | 4.33 |
| WL-323 | 251 | 4 | R | 93 | 2.73 | 1.47 | 0.74 | 4.93 |
| 5454 | 263 | 4 | MR | 95 | 2.49 | 1.30 | 0.53 | 4.33 |
| PGI 9047 | 275 | -- | -- | 93 | 2.72 | 1.27 | 0.55 | 4.53 |
| Reward | 276 | 4 | R | 95 | 2.44 | 1.43 | 0.70 | 4.57 |
| Pasture Plus | 277 | -- | -- | 94 | 2.65 | 1.46 | 0.63 | 4.73 |
| ZC 9030 | 278 | -- | -- | 94 | 2.77 | 1.38 | 0.67 | 4.82 |
| ZX 9344 | 279 | -- | -- | 95 | 3.08 | 1.61 | 0.86 | 5.55 |
| ABI 9033 | 280 | -- | -- | 98 | 2.80 | 1.51 | 0.71 | 5.01 |
| ABI 923AA | 281 | -- | -- | 89 | 2.98 | 1.61 | 0.82 | 5.40 |
| Avalanche | 282 | 2 | HR | 90 | 2.71 | 1.52 | 0.79 | 5.01 |
| WL 252 HQ | 283 | -- | -- | 93 | 2.91 | 1.49 | 0.75 | 5.14 |
| Hygain | 284 | 4 | R | 94 | 2.94 | 1.70 | 0.99 | 5.62 |
| Magnum III-Wet | 285 | 3 | MR | 94 | 2.79 | 1.55 | 0.84 | 5.17 |
| Rushmore | 286 | 4 | R | 95 | 2.48 | 1.42 | 0.69 | 4.59 |
| 330 | 287 | 4 | R | 86 | 2.21 | 1.30 | 0.46 | 3.96 |
| Legendairy | 288 | 2 | HR | 94 | 2.91 | 1.59 | 0.89 | 5.39 |
| 3B50 | 289 | -- | -- | 94 | 2.74 | 1.55 | 0.86 | 5.14 |
| Sterling | 290 | 2 | R | 89 | 2.63 | 1.40 | 0.55 | 4.57 |
| Dividend | 291 | 2 | R | 91 | 2.65 | 1.32 | 0.62 | 4.59 |
| STI-94 | 292 | -- | -- | 86 | 2.34 | 1.31 | 0.67 | 4.32 |
| MS9301 | 293 | -- | -- | 95 | 2.57 | 1.42 | 0.72 | 4.70 |
| MS9304 | 294 | -- | -- | 98 | 2.73 | 1.48 | 0.77 | 4.98 |
| MEAN | | | | 93 | 2.71 | 1.45 | 0.71 | 4.87 |
| LSD(0.05) | | | | 6 | NS | NS | NS | NS |
| CV(s/mean)x100 | | | | 4.3 | 15.2 | 16.6 | 44.6 | 18.5 |

[1] *Fall Dormancy rating*

[2] *Vert Wilt resistance*

Seeding date: 4/21/94
Fertilizer: 44 lbs/a N + 208 lbs/a $P_2O_5$ preplant
Stage of maturity at cutting: Harvest-1, late bud; Harvest-2, prebloom; Harvest-3, early bud
Growing season precipitation (Apr 95-Aug 95): 12.70", avg.9.86"
Crop year precipitation (Sep 94 - Aug 95): 22.64", avg.19.71"
Last spring frost: 5/27/95, 32 degrees F
First fall frost: 9/21/95, 22 degrees F
Avg. frost free period: 112 days
Soil series: Flathead Very Fine Sandy Loam

## 1994 INTRASTATE ALFALFA YIELD TRIAL
## KALISPELL - DRYLAND - 1994-95

| VARIETY | MTNo | FD[1] | VW[2] | 1994 YIELD *t/a* | 1995 YIELD *t/a* | 1994-95 TOTAL *t/a* |
|---|---|---|---|---|---|---|
| ZX 9344 | 279 | -- | -- | 1.57 | 5.55 | 7.12 |
| Hygain | 284 | 4 | R | 1.36 | 5.62 | 6.98 |
| ABI 923AA | 281 | -- | -- | 1.50 | 5.40 | 6.90 |
| Legendairy | 288 | 2 | HR | 1.47 | 5.39 | 6.86 |
| 5262 | 214 | 2 | LR | 1.20 | 5.66 | 6.85 |
| WL 252 HQ | 283 | -- | -- | 1.43 | 5.14 | 6.57 |
| Magnum III-We | 285 | 3 | MR | 1.33 | 5.17 | 6.50 |
| Ladak 65 | 2 | 1 | -- | 1.32 | 5.06 | 6.38 |
| 3B50 | 289 | -- | -- | 1.24 | 5.14 | 6.38 |
| WL-323 | 251 | 4 | R | 1.43 | 4.93 | 6.36 |
| ABI 9033 | 280 | -- | -- | 1.33 | 5.01 | 6.34 |
| Avalanche | 282 | 2 | HR | 1.29 | 5.01 | 6.30 |
| MS9304 | 294 | -- | -- | 1.20 | 4.98 | 6.18 |
| Wrangler | 146 | 2 | LR | 1.37 | 4.71 | 6.08 |
| ZC 9030 | 278 | -- | -- | 1.25 | 4.82 | 6.08 |
| Pasture Plus | 277 | -- | -- | 1.27 | 4.73 | 6.00 |
| Sterling | 290 | 2 | R | 1.40 | 4.57 | 5.97 |
| MS9301 | 293 | -- | -- | 1.20 | 4.70 | 5.90 |
| Rushmore | 286 | 4 | R | 1.26 | 4.59 | 5.85 |
| Reward | 276 | 4 | R | 1.25 | 4.57 | 5.82 |
| Dividend | 291 | 2 | R | 1.21 | 4.59 | 5.79 |
| PGI 9047 | 275 | -- | -- | 1.24 | 4.53 | 5.77 |
| Perry | 133 | 3 | -- | 1.17 | 4.59 | 5.75 |
| STI-94 | 292 | -- | -- | 1.35 | 4.32 | 5.67 |
| Vernema | 220 | 4 | MR | 1.24 | 4.33 | 5.57 |
| 5454 | 263 | 4 | MR | 1.18 | 4.33 | 5.50 |
| 330 | 287 | 4 | R | 1.16 | 3.96 | 5.12 |
| MEAN | | | | 1.30 | 4.87 | 6.17 |
| LSD(0.05) | | | | NS | NS | NS |
| CV(s/mean)x100 | | | | 19.7 | 18.5 | 18.4 |

[1] *Fall Dormancy rating*

[2] *Vert Wilt resistance*

Seeding date: 4/21/94

# 1995 INTRASTATE ALFALFA YIELD TRIAL
## KALISPELL - IRRIGATED - 1995

| VARIETY | MTNo | FD[1] | VW[2] | Occupancy | Dry Matter Yield 7/28/95 Harvest 1 | Dry Matter Yield 10/09/95 Harvest 2 | TOTAL |
|---|---|---|---|---|---|---|---|
| | | | | % of plot | t/a | t/a | t/a |
| 3L 102 | 311 | - | - | 95 | 1.83 | 1.20 | 3.02 |
| Key | 305 | 4 | HR | 95 | 1.84 | 1.18 | 3.02 |
| Accord | 298 | 4 | R | 94 | 1.89 | 1.12 | 3.01 |
| Oneida VR | 309 | 3 | HR | 94 | 1.79 | 1.20 | 2.99 |
| Stamina | 296 | 4 | HR | 95 | 1.84 | 1.13 | 2.97 |
| DK 127 | 302 | 3 | R | 96 | 1.87 | 1.07 | 2.94 |
| FGEXP | 313 | - | - | 95 | 1.77 | 1.13 | 2.90 |
| Viking 1 | 232 | 2 | HR | 93 | 1.73 | 1.09 | 2.82 |
| Proof | 303 | 3 | R | 88 | 1.75 | 1.05 | 2.80 |
| 5454 | 263 | 4 | MR | 98 | 1.71 | 1.09 | 2.80 |
| WI95-1 | 310 | 2 | LR | 94 | 1.74 | 1.04 | 2.78 |
| 3L 103 | 312 | - | - | 95 | 1.68 | 1.08 | 2.76 |
| ZX9345A | 301 | 4 | R | 94 | 1.65 | 1.08 | 2.73 |
| 5312 | 297 | 3 | HR | 98 | 1.70 | 0.99 | 2.69 |
| ZX9345B | 307 | 4 | HR | 96 | 1.56 | 1.07 | 2.63 |
| Aspen | 308 | 4 | R | 88 | 1.58 | 1.00 | 2.58 |
| 5262 | 214 | 2 | LR | 93 | 1.58 | 0.99 | 2.57 |
| 5472 | 221 | 4 | MR | 95 | 1.57 | 1.00 | 2.57 |
| Haygrazer | 300 | 4 | R | 89 | 1.51 | 1.04 | 2.55 |
| ABI 9231 | 306 | 4 | HR | 95 | 1.56 | 0.98 | 2.53 |
| Vernal | 8 | 2 | - | 99 | 1.54 | 0.94 | 2.48 |
| Leafmaster | 304 | 4 | HR | 96 | 1.41 | 1.02 | 2.43 |
| Defiant | 299 | 2 | HR | 76 | 1.44 | 0.96 | 2.40 |
| Ladak 65 | 2 | 1 | - | 99 | 1.61 | 0.79 | 2.40 |
| Riley | 122 | 4 | LR | 86 | 1.42 | 0.96 | 2.38 |
| MEAN | | | | 93 | 1.66 | 1.05 | 2.71 |
| LSD(0.05) | | | | 5 | 0.15 | 0.10 | 0.23 |
| CV(s/mean) x100 | | | | 3.7 | 6.3 | 7.1 | 6.0 |

*[1] Fall Dormancy rating*

*[2] Vert Wilt resistance*

Seeding date: 4/25/95
Seeding rate: 8 lbs PLS/acre
Fertilizer: 44 lbs N + 208 lbs P2O5/a preplant
Pesticides: Poast + Dash (1 qt + 1 qt/a) on 6/9 & 6/28/95
Irrigation: 6"
Stage of maturity at cutting: *Harvest 1 - prebloom; harvest-2 - midbud*
Last spring frost: 5/27/95 (32 degrees F)
First fall frost: 9/21/95 (22 degrees F)
Average frost free period: 112 days
Growing season precipitation (Apr - Aug '95): 12.70" (avg 9.86")
Crop year precipitation (Sept '94 - Aug '95): 22.64" (avg 19.71")
Soil series: Creston silt loam

# 1995 INTRASTATE ALFALFA YIELD TRIAL - DRYLAND

**Kalispell, 1995**

| Variety | MTNO | FD[1] | VW[2] | Occupancy | Harvest 1 7/27/95 | Harvest 2 10/02/95 | Total Yield 1995 |
|---|---|---|---|---|---|---|---|
| | | | | % of plot | tons/acre | | |
| 3L 102 | 311 | - | - | 96 | 2.19 | 1.31 | 3.49 |
| WI95-1 | 310 | 2 | LR | 93 | 2.04 | 1.38 | 3.41 |
| ASPEN | 308 | 4 | R | 86 | 1.92 | 1.32 | 3.23 |
| 5262 | 214 | 2 | LR | 96 | 1.95 | 1.25 | 3.20 |
| VIKING 1 | 232 | 2 | HR | 96 | 2.02 | 1.17 | 3.19 |
| ACCORD | 298 | 4 | R | 94 | 1.78 | 1.39 | 3.17 |
| FGEXP | 313 | - | - | 93 | 1.87 | 1.30 | 3.17 |
| 3L 103 | 312 | - | - | 95 | 1.98 | 1.18 | 3.16 |
| ONEIDA VR | 309 | 3 | HR | 90 | 1.83 | 1.32 | 3.15 |
| STAMINA | 296 | 4 | HR | 94 | 1.93 | 1.19 | 3.12 |
| KEY | 305 | 4 | HR | 93 | 1.85 | 1.22 | 3.07 |
| ZX9345A | 301 | 4 | R | 93 | 1.86 | 1.21 | 3.07 |
| DEFIANT | 299 | 2 | HR | 94 | 1.92 | 1.15 | 3.07 |
| DK 127 | 302 | 3 | R | 94 | 1.91 | 1.16 | 3.07 |
| LEAFMASTER | 304 | 4 | HR | 79 | 1.58 | 1.43 | 3.01 |
| PROOF | 303 | 3 | R | 95 | 1.83 | 1.17 | 3.00 |
| ABI 9231 | 306 | 4 | HR | 96 | 1.81 | 1.17 | 2.98 |
| RILEY | 122 | 4 | LR | 85 | 1.79 | 1.15 | 2.94 |
| HAYGRAZER | 300 | 4 | R | 86 | 1.64 | 1.29 | 2.93 |
| ZX9345B | 307 | 4 | HR | 91 | 1.72 | 1.20 | 2.91 |
| 5472 | 221 | 4 | MR | 93 | 1.64 | 1.26 | 2.89 |
| 5312 | 297 | 3 | HR | 95 | 1.82 | 1.05 | 2.87 |
| LADAK 65 | 2 | 1 | - | 93 | 1.88 | 0.97 | 2.85 |
| 5454 | 263 | 4 | MR | 94 | 1.67 | 1.17 | 2.83 |
| VERNAL | 8 | 2 | - | 91 | 1.66 | 1.14 | 2.80 |
| mean | | | | 92 | 1.84 | 1.22 | 3.06 |
| LSD(0.05) | | | | 4 | NS | NS | NS |
| CV (s/mean)*100 | | | | 3.2 | 13.6 | 18.3 | 13.2 |

[1] *Fall Dormancy rating*

[2] *Vert Wilt resistance*

*Fertilizer: 44 lbs/a N + 208 lbs/a $P_2O_5$ preplant*
*Pesticide: Poast + Dash - 1 qt/a on 6/9, 1 qt/a on 6/28*
*Seeding date: 4/25/95*
*Stage of maturity at cutting: Harvest-1: mid-bloom*
*Growing season precipitation (Apr 95-Aug 95): 12.70", avg.9.86"*
*Crop year precipitation (Sep 94 - Aug 95): 22.64", avg.19.71"*
*Last spring frost: 5/27/95, 32 degrees F*
*First fall frost: 9/21/95, 22 degrees F*
*Avg. frost free period: 112 days*
*Soil series: Flathead Very Fine Sandy Loam*
*Elevation: 2,940 ft.*

**YEAR/PROJECT: 1995/755** **Perennial Forage Grass Trials - Irrigated**

PERSONNEL: Leon Welty, NWARC
Louise Prestbye, NWARC
In cooperation with Dennis Cash, MSU-Bozeman

In 1993, a trial was initiated which included two new cultivars of meadow bromegrass ('Paddock' and 'Fleet'), three cultivars of perennial ryegrass ('Greenstone', 'Dairymaster', and 'Zero Nui'), and 'Matua' prairie grass. Matua produced almost 7 tons/acre of dry matter the first year, but did not survive the first winter. In 1995 Paddock, Fleet, and 'Regar' meadow bromegrasses produced over 5 tons/acre, with Paddock (5.64 tons/acre) yielding significantly more than Regar (5.12 tons/acre). As in 1994, the ryegrasses were very slow to initiate spring growth, having produced little more than 200 lbs/acre by the first harvest on May 24. The mountain bromegrass cultivar and the two wheatgrasses yielded 4.20 to 4.29 tons/acre in 1995. Among the ryegrasses, Dairymaster produced 2.37, Zero Nui produced 2.05, and Greenstone produced only 1.82 tons/acre, with the stands succumbing to weeds by the end of the season. Over the 3 years, the meadow bromegrasses have produced significantly more dry matter than the other species in the trial and have shown the best stand persistence.

A second trial was seeded in 1994. Cultivars included Greenstone, Zero Nui, and 'PG65' perennial ryegrasses, Matua prairie grass, 'Gala' bromegrass, and Regar meadow bromegrass. As in the 1993 trial, Matua and the ryegrasses performed impressively the seeding year, but their ability to survive the winter and regain vigorous growth in the spring was poor. On May 1, 1995, Matua and Gala had almost no new growth, while the ryegrasses had 20 to 40% occupancy and fair vigor, compared to Regar's excellent stand and vigorous regrowth. Only one plot out of four of Matua and Gala had any forage growth at all. Of the ryegrasses, PG65 produced 3.16 tons/acre in 1995, Zero Nui produced 2.43 and Greenstone produced 2.27 tons/acre. Of the two year total production, Regar produced 64% the second year, PG65 produced 33%, Zero Nui 29%, Greenstone 26%, Gala 18%, and Matua only 7%. Compared to Regar, the new cultivars appear poorly adapted as perennial grasses to the northwestern Montana climate.

## IRRIGATED 1993 INTRASTATE GRASS STUDY
## KALISPELL, 1995

| SPECIES [1] | CULTIVAR | DRY MATTER YIELD 5/24 | 7/5 | 8/2 | 10/9 | 1995 Total | 1993-95 Total |
|---|---|---|---|---|---|---|---|
| | | tons/acre | | | | | |
| Meadow bromegrass | Paddock | 2.70 | 1.07 | 0.74 | 1.13 | 5.64 | 18.54 |
| Meadow bromegrass | Fleet | 2.51 | 1.04 | 0.70 | 1.04 | 5.28 | 17.74 |
| Meadow bromegrass | Regar | 2.47 | 1.05 | 0.65 | 0.96 | 5.12 | 16.65 |
| Perennial ryegrass | Greenstone | 0.10 | 0.87 | 0.39 | 0.47 | 1.82 | 15.25 |
| Perennial ryegrass | Dairymaster | 0.11 | 1.04 | 0.43 | 0.80 | 2.37 | 14.66 |
| Mountain bromegrass | CO8005308 | 2.12 | 0.90 | 0.52 | 0.67 | 4.20 | 14.59 |
| Perennial ryegrass | Zero Nui | 0.11 | 1.01 | 0.26 | 0.67 | 2.05 | 13.18 |
| Pub. wheatgrass | Greenleaf | 2.13 | 1.26 | 0.27 | 0.63 | 4.29 | 12.88 |
| Int. wheatgrass | Oahe | 2.19 | 1.14 | 0.23 | 0.67 | 4.23 | 12.66 |
| MEAN | | 1.60 | 1.04 | 0.46 | 0.78 | 3.89 | 15.13 |
| LSD(0.05) | | 0.24 | 0.16 | 0.07 | 0.18 | 0.40 | 1.12 |
| CV(s/mean)*100 | | 10.4 | 10.4 | 10.5 | 15.5 | 7.1 | 5.0 |

*Seeding date: 4/28/93*
*Fertilizer: Fall, 1992 - 180 lbs/a $P_2O_5$*
*6/14/93 - 80 lbs/a N*
*3/30/94 - 102 lbs/a N; 7/1/94 - 60 lbs/a N*
*4/5/95 - 102 lbs/a N*
*Irrigation: 3 applications, 2"/applic - total=6"*
*Crop Year Precipitation (Sept.1994-Aug.1995): 22.64 inches*
*Frost Free Period: 117 days*

[1] Perennial ryegrass - *Lolium perenne*
Meadow bromegrass - *B. biebersteinii*
Mountain bromegrass - *B. marginatus*
Pubescent wheatgrass - *Agropyron trichophorum*
Intermediate wheatgrass - *A. intermedium*

## IRRIGATED 1994 INTRASTATE GRASS STUDY
## KALISPELL, 1995

| SPECIES [1] | CULTIVAR | STAND [2] % | VIGOR [3] (0-5) | DRY MATTER YIELD 5/24 | 7/5 | 8/2 | 10/9 | 1995 TOTAL | 1994-95 TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| | | | | tons/acre | | | | | |
| Meadow brome | Regar | 98 | 5.0 | 3.24 | 1.14 | 1.05 | 1.22 | 6.65 | 10.40 |
| Perennial rye | PG65 | 40 | 3.3 | 0.40 | 1.04 | 0.57 | 1.15 | 3.16 | 9.47 |
| Perennial rye | Greenstone | 23 | 3.3 | 0.16 | 0.85 | 0.45 | 0.81 | 2.27 | 8.76 |
| Perennial rye | Zero Nui | 20 | 2.8 | 0.16 | 0.95 | 0.36 | 0.97 | 2.43 | 8.34 |
| Prairie grass | Matua | 7 | 1.3 | 0.05 | 0.17 | 0.14 | 0.18 | 0.54 | 7.22 |
| Bromegrass | Gala | 13 | 1.0 | 0.20 | 0.32 | 0.12 | 0.28 | 0.91 | 5.15 |
| MEAN | | 33 | 2.8 | 0.70 | 0.74 | 0.44 | 0.77 | 2.66 | 8.22 |
| LSD(0.05) | | 23 | 1.6 | 0.43 | 0.44 | 0.27 | 0.44 | 1.44 | 1.69 |
| CV(s/mean) | | 46.1 | 39.3 | 40.3 | 39.3 | 39.9 | 37.7 | 35.9 | 13.6 |

*Seeding date: 4/29/94*
*Fertilizer: Fall, 1992 - 180 lbs/a $P_2O_5$*
*5/20/94 - 80 lbs/a N*
*4/5/95 - 102 lbs/a N*
*Irrigation: 3 applications, 2"/applic - total=6"*
*Crop Year Precipitation (Sept.1994-Aug.1995): 22.64 inches*
*Frost Free Period: 117 days*

[1] Perennial ryegrass - *Lolium perenne*
Prairie grass - *Bromus unioloides* (Willd.)
Gala brome - *B.stimenius*
Meadow bromegrass - *B. biebersteinii*

[2] *visual estimate of plot occupancy taken 5/1/95*
[3] *0=dead; 5=high vigor - taken 5/1/95*

YEAR/PROJECT: 1995/755 **Safflower Forage Trial - Dryland**

PERSONNEL: Leon Welty, NWARC
Louise Prestbye, NWARC
Cooperators: Jerry Bergman, EARC
Dave Wichman, CARC
Ray Ditterline, MSU-Bozeman
Mal Westcott, WARC
Gil Stallknecht, SARC
Neil Riveland, WRC-Williston, ND

Safflower (*Carthamus tinctorius* cv. Centennial) was seeded on May 1, May 19, and June 9, and harvested for forage on Aug.1, Sept.1, and Sept.28. The study was designed as a split plot with planting dates(PD) as main plots and harvest dates(HD) as subplots.

Dry matter forage yield decreased significantly with each delay in PD - from 4.88 to 2.49 tons/acre. Harvesting on 8/1 significantly reduced yields compared to delaying HD until 9/1. A further delay until 9/28, however, did not result in more forage accumulation. Maturity at harvest ranged from vegetative for first HD of the last PD to hard seed for the last HD of the first PD.

Protein content of the harvested forage ranged from 9.9% to 20.5%. Mean protein for the 6/9 PD (15.2%) was significantly higher than for the earlier PDs. For all PDs, protein at the first HD was higher than at the later harvests, but there was no significant decrease in protein content when harvest was delayed from 9/1 to 9/28. Both NDF and ADF decreased as PD was delayed from 5/19 to 6/9, while mean fiber content of the second HD was lower than the first and third HDs. Mean relative feed value (RFV) for the third planting date was significantly higher than the first two planting dates. Mean RFV for the second harvest date was significantly higher than the first, which was higher than the third. The highest RFV, 156.2, was for the first harvest of the last planting date, which was also the lowest yielding treatment.

# SAFFLOWER FORAGE TRIAL - 1995

## KALISPELL - DRYLAND

| Planting Date | Harvest Date | Growth Stage | Dry Matter % | Plant Height inches | Yield tons/acre | Protein % | ADF % | NDF % | RFV |
|---|---|---|---|---|---|---|---|---|---|
| 5/1 | 8/1 | full bud | 29.3 | 44.0 | 4.08 | 11.7 | 41.4 | 53.7 | 98.4 |
| 5/1 | 9/1 | milk | 41.3 | 42.3 | 5.42 | 9.9 | 35.6 | 44.6 | 128.6 |
| 5/1 | 9/28 | hard dough | 57.5 | 44.0 | 5.15 | 10.8 | 41.0 | 52.4 | 101.4 |
| 5/19 | 8/1 | early bud | 23.0 | 37.3 | 2.77 | 14.6 | 41.3 | 50.3 | 105.4 |
| 5/19 | 9/1 | midbloom | 39.8 | 37.0 | 4.28 | 10.5 | 33.6 | 43.4 | 135.4 |
| 5/19 | 9/28 | soft dough | 56.3 | 38.5 | 4.05 | 11.3 | 40.3 | 50.4 | 107.0 |
| 6/9 | 8/1 | vegetative | 17.8 | 28.5 | 1.61 | 20.5 | 31.9 | 38.3 | 156.2 |
| 6/9 | 9/1 | prebloom | 34.5 | 31.0 | 2.89 | 12.7 | 34.6 | 44.4 | 130.3 |
| 6/9 | 9/28 | late bloom | 53.3 | 31.5 | 2.97 | 12.4 | 36.5 | 45.6 | 123.6 |
| | | mean = | 39.2 | 37.1 | 3.69 | 12.7 | 37.3 | 47.0 | 120.7 |
| LSD(0.05) | Planting Date means | | 5.0 | 3.1 | 0.58 | 0.8 | 3.5 | 3.3 | 13.6 |
| | Harvest Date means | | 2.3 | 0.9 | 0.30 | 0.8 | 1.9 | 2.3 | 8.4 |
| | Interaction | | NS | 3.2 | NS | 1.5 | 4.4 | 4.7 | 18.1 |

*Previous crop: Kale green manure*
*Soil series: Creston Silt Loam*
*Tillage: conventional*
*Fertilizer: 40 lbs/a P2O5, 80 lbs/a N*
*Weed control: by hand*
*Crop year precipitation (Sep 94 - Aug 95): 22.64", avg.19.71"*
*Seasonal precipitation (Apr 95-Aug 95): 12.70", avg.9.86"*
*Growing degree days(base 50): 1646, avg.1883*
*First fall frost: 9/21/95, 22 degrees F*
*Last spring frost: 5/27/95, 32 degrees F*
*Frost free period: 117 days, avg. 112*

YEAR/PROJECT: 1995/755 **Safflower Plant Population Study - Dryland**

PERSONNEL: Leon Welty, NWARC
Louise Prestbye, NWARC

On May 4, 1995 'Centennial' safflower was broadcast seeded and seeded in 6- and 12-inch rows at rates of 30, 40, and 50 lbs PLS/acre. Stands (# of plants/ft$^2$) increased as seeding rate increased. There was no significant difference in stand between the 6-inch and 12-inch spacing, but both produced significantly denser stands than broadcasting. The 6-inch spacing resulted in slightly taller plants than broadcasting.

There were no significant differences in dry matter percentage among treatments. The mean dry matter content was 35% at harvest on August 8 when the plants were between late bud and early bloom. Seeding rate produced no significant differences in forage yield, although there was a tendency toward higher yield at higher seeding rates. Six-inch spacing produced slightly more forage than 12-inch spacing (5.44 vs 5.07 tons/acre). Broadcast seeding produced significantly lower mean yield than row seeding (4.18 tons/acre), but it interacted with seeding rate, increasing from 3.46 tons/acre at the 30-lb rate to 5.03 tons/acre at the 50-lb rate. The lack of response to increased seeding rate for row-planted safflower indicates that 30 lbs/acre is sufficient for either 6- or 12-inch rows.

# SAFFLOWER POPULATION TRIAL - SEEDING RATE / ROW SPACING

**Kalispell, 1995**

## STAND (#/sqft)

| Seeding Rate (lbs/a) | Spacing 6" | 12" | broadcast | means |
|---|---|---|---|---|
| 30 | 7.8 | 9.0 | 4.0 | 6.9 |
| 40 | 10.5 | 12.9 | 8.5 | 10.6 |
| 50 | 15.5 | 14.1 | 9.8 | 13.1 |
| means | 11.3 | 12.0 | 7.4 | |

LSD(0.05) SR = 3.0
RS = 2.2
SR x RS - NS

## HEIGHT (inches)

| Seeding Rate (lbs/a) | Spacing 6" | 12" | broadcast | means |
|---|---|---|---|---|
| 30 | 40.8 | 40.8 | 38.8 | 40.1 |
| 40 | 41.3 | 40.0 | 39.8 | 40.3 |
| 50 | 40.0 | 40.5 | 39.8 | 40.1 |
| means | 40.7 | 40.4 | 39.4 | |

LSD(0.05) SR - NS
RS = 1.2
SR x RS - NS

## DRY MATTER (%)

| Seeding Rate (lbs/a) | Spacing 6" | 12" | broadcast | means |
|---|---|---|---|---|
| 30 | 35.1 | 37.4 | 34.1 | 35.5 |
| 40 | 36.9 | 36.6 | 36.8 | 36.8 |
| 50 | 35.7 | 35.0 | 35.7 | 35.4 |
| means | 35.9 | 36.3 | 35.5 | |

LSD(0.05) SR - NS
RS = NS
SR x RS - NS

## DRY MATTER YIELD (tons/acre)

| Seeding Rate (lbs/a) | Spacing 6" | 12" | broadcast | means |
|---|---|---|---|---|
| 30 | 5.35 | 5.16 | 3.46 | 4.65 |
| 40 | 5.62 | 4.90 | 4.05 | 4.85 |
| 50 | 5.35 | 5.16 | 5.03 | 5.18 |
| means | 5.44 | 5.07 | 4.18 | |

LSD(0.05) SR - NS
RS = 0.55
SRxRS = 1.00 (P=0.10)

**Forage quality: No significant differences among treatments**
**Mean protein = 10.5%; NDF = 47.2%; ADF = 37.0%**

*Seeding date: 5/4/95*
*Stand counts: 5/26/95*
*Harvest date: 8/8/95*
*Harvest area: 59 sqft*
*Growth stage at harvest: late bud - early bloom*
Crop year precipitation (Apr 95-Aug 95): 12.70", avg.9.86"
*Yearly Precipitation (Sep 94 - Aug 95): 22.64", avg.19.71"*
*Last spring frost: 5/27/95, 32 degrees F*
*First fall frost: 9/21/95, 22 degrees F*
*Avg. frost free period: 112 days*
*Soil series: Flathead Very Fine Sandy Loam*
*Elevation: 2,940 ft.*

YEAR/PROJECT: 1995/755 **1994 Grass Underseeding Trial - Dryland**

PERSONNEL: Leon Welty, NWARC
Louise Prestbye, NWARC

The objective was to evaluate 2 annual high-yielding grasses for late season forage when seeded under conventional annual forage crops. Three replicates of 4 main plots consisting of 'Haybet' barley, Austrian winter pea, a mixture of Austrian winter pea and Haybet, and a blank control were established 4/19/95. 'Matua' prairie grass and a 4X annual ryegrass were seeded across each replicate, perpendicular to the main plots. The plots were fertilized with 54 lbs N and 28 lbs $P_2O_5$/a on 4/25/95, and MCPA was applied at 0.25 lb AI/a on 5/16. Each plot was harvested for forage 7/10/95, when the grasses and barley had headed and the peas were at the 4th flowering node. Haybet alone and mixed with pea produced almost twice the forage of the pea alone and the pure grass plots. The strips underseeded with ryegrass produced more than the Matua. Subsamples were taken from each subplot and separated into species components. The ryegrass was a stronger competitor than the Matua. If the goal were to maximize total early season yield, ryegrass would be the better component for the system; however, if a higher quality forage was desired, Matua would allow the grain or legume to contribute more to the system. The late season harvest was taken 9/1. Again, the ryegrass produced more biomass than the Matua. The pure grass produced the most regrowth, having had no competition earlier in the season. The plots containing Haybet produced the least late season forage, the barley having outcompeted the companion grasses earlier and leaving weak stands for regrowth. Austrian winter pea produced the lowest total season yield, but of the 3 annual forages it allowed the underseeded grasses to provide the most late season regrowth. This system would also provide the legume benefits of high protein forage in the early season.

# GRASS UNDERSEEDING TRIAL

**Kalispell, 1995**

**FORAGE DRY MATTER YIELD (t/a) 7/10/95**

| Annual Forage | Rye | Matua | mean |
|---|---|---|---|
| **Haybet Barley** | 5.53 | 5.67 | 5.60 |
| **Aus.Winter Pea** | 3.90 | 2.53 | 3.22 |
| **AWP/Haybet** | 6.20 | 5.87 | 6.03 |
| **Pure Grass** | 3.77 | 2.60 | 3.18 |
| mean | 4.85 | 4.17 | |

LSD(0.05) Annual Forage: 0.58
Grass species: sig. at P<=0.01
LSD(0.05) AF x G: 0.81

**FORAGE COMPOSITION (%) - 7/10/95 [1]**

| | Rye | | | Matua | | |
|---|---|---|---|---|---|---|
| | grass | barley | pea | grass | barley | pea |
| **Haybet Barley** | 18 | 82 | | 8 | 92 | |
| **Aus.Winter Pea** | 53 | | 40 | 23 | | 70 |
| **AWP/Haybet** | 18 | 78 | 5 | 7 | 87 | 6 |

[1] *Weeds made up the remainder*

**GRASS DRY MATTER YIELD (t/a) 9/1/95**

| Annual Forage | Rye | Matua | mean |
|---|---|---|---|
| **Haybet Barley** | 0.90 | 0.00 | 0.45 |
| **Aus.Winter Pea** | 1.78 | 1.58 | 1.68 |
| **AWP/Haybet** | 0.95 | 0.16 | 0.56 |
| **Pure Grass** | 2.19 | 2.14 | 2.16 |
| mean | 1.45 | 0.97 | |

LSD(0.05) Annual Forage: 0.26
Grass species: sig. at P<=0.01
LSD(0.05) AF x G: NS

**TOTAL FORAGE YIELD (t/a) - 1995**

| Annual Forage | Rye | Matua | mean |
|---|---|---|---|
| **Haybet Barley** | 6.41 | 5.67 | 6.04 |
| **Aus.Winter Pea** | 5.66 | 4.08 | 4.87 |
| **AWP/Haybet** | 7.13 | 6.04 | 6.59 |
| **Control** | 5.97 | 4.72 | 5.34 |
| mean | 6.29 | 5.13 | |

LSD(0.05) Annual Forage: 0.60
Grass species: sig. at P<=0.01
LSD(0.05) AF x G: NS

PROJECT TITLE: Intrastate Spring Barley Evaluation

PROJECT LEADERS: Bob Stougaard and Todd Keener, Kalispell, MT.
Tom Blake and Pat Hensleigh, PS&ES, Bozeman, MT.

OBJECTIVE:
To evaluate spring barley varieties for yield, quality, and improved resistance to foliar diseases in consideration for future release to Montana grain growers.

RESULTS:
Excellent yields and good test weights were obtained in the spring barley nursery in response to adequate precipitation in the spring and abundant June rainfall. Favorable percent plump readings were recorded form the majority of cultivars. Late summer cropping conditions were good and allowed good quality barley to be harvested. The high rainfall in June caused light to moderate lodging in half of the entries. Scald levels were moderate to high through out the nursery with all varieties showing some level of infection.

SUMMARY:
All but three of the sixty-four entries in the Intrastate Spring Barley nursery yielded above 100 bu/A, had good test weights and fair test weights.

FUTURE PLANS:
Disease resistant varieties will continue to be evaluated at Kalispell through cooperative variety testing.

Table 1. Agronomic data from the Intrastate Spring Barley Nursery grown on the Northwestern Agricultural Research Center in Kalispell, MT.
Planted: April 18, 1995 Harvested: September 1, 1995

| VARIETY | YIELD BU/A | TEST WT LB/BU | PERCENT PLUMP | HEIGHT INCHES | HEADING DATE | LODGING INDEX | SCALD 1/ |
|---|---|---|---|---|---|---|---|
| CI 15229 Steptoe | 157.09 | 46.30 | 97.00 | 34.12 | 168.67 | .00 | M |
| H5851161 MT 41918/MT 41279 | 138.97 | 51.97 | 88.00 | 35.43 | 173.00 | 20.00 | M-H |
| H5870120 Lindy/Martin (MT8 | 136.95 | 47.20 | 96.00 | 33.46 | 168.67 | .00 | M |
| DA592-47 WPB DA 592-47 | 134.94 | 47.83 | 99.00 | 26.25 | 177.00 | .00 | M |
| BA 1215 2B82-8529 (BA 85 | 134.94 | 52.77 | 95.00 | 38.71 | 175.00 | 5.57 | H |
| MT890008 Fleet/Bowman | 134.94 | 49.43 | 89.00 | 34.78 | 178.33 | 27.23 | M-H |
| H3860224 Lewis/Apex (MT860 | 133.93 | 53.73 | 91.00 | 32.81 | 177.33 | .00 | M-H |
| MT930203 MT851195/Bowman | 132.92 | 50.70 | 93.00 | 38.71 | 173.33 | 4.23 | H |
| ND 9866 Stark | 131.92 | 52.63 | 96.00 | 36.75 | 171.67 | 7.40 | M-H |
| MT140523 Hector/Klages | 130.91 | 50.80 | 85.00 | 36.75 | 171.67 | 28.73 | M-H |
| NS 78054 Baronesse | 129.90 | 53.17 | 97.00 | 31.50 | 176.33 | 3.33 | M-H |
| H1851195 MT41918/TR450 (MT | 126.88 | 51.90 | 98.00 | 37.40 | 173.33 | 7.33 | H |
| MT930029 Blenheim/Harringt | 126.88 | 52.20 | 92.00 | 38.06 | 176.33 | 2.23 | M-H |
| 21140523 Chinook | 126.88 | 52.87 | 89.00 | 36.75 | 175.33 | 6.67 | M |
| MN 52 Excel | 125.88 | 50.80 | 92.00 | 36.09 | 174.33 | 5.93 | M-H |
| MT930136 MT 81143/Bowman | 124.87 | 53.53 | 97.00 | 36.09 | 171.00 | 11.00 | H |
| MT920073 MT 81161/MT 83518 | 124.87 | 51.70 | 90.00 | 32.15 | 171.33 | 9.63 | H |
| MT930059 Bowman/MT851031 | 124.87 | 52.87 | 98.00 | 38.71 | 171.00 | .00 | H |
| MT930169 MT851012/Bowman | 123.86 | 51.47 | 93.00 | 37.40 | 175.33 | 20.00 | M-H |
| MT930013 Berolina/Gallatin | 123.86 | 52.03 | 91.00 | 40.03 | 173.67 | 15.57 | H |
| MT910033 Bowman/MT 81619 | 123.86 | 51.97 | 97.00 | 34.12 | 170.00 | 34.63 | H |
| CI 15478 Klages | 123.86 | 52.03 | 84.00 | 37.40 | 178.00 | .00 | M-H |
| MT910160 MT 81619/Bowman | 122.85 | 52.57 | 97.00 | 36.75 | 177.00 | .00 | M-H |
| MT930155 MT 83435/Bowman | 121.85 | 53.07 | 96.00 | 38.71 | 173.00 | .00 | M-H |
| SK 76333 Harrington | 120.84 | 51.37 | 93.00 | 37.40 | 176.33 | .00 | M-H |
| MT890070 MT47219/Bowman | 119.83 | 51.60 | 92.00 | 36.09 | 169.67 | 34.67 | H |
| MT920201 MT 83435/MT 81161 | 119.83 | 50.57 | 93.00 | 38.06 | 176.00 | .00 | H |
| MT920041 MT 81143/MT 81161 | 118.83 | 52.43 | 97.00 | 35.43 | 172.67 | .00 | M-H |
| MT886610 MT 81143/Lewis | 118.83 | 52.23 | 94.00 | 37.40 | 174.33 | .00 | M-H |
| MT910150 MT 81143/MT 83444 | 118.83 | 51.50 | 92.00 | 36.09 | 171.67 | .00 | M-H |
| MT930052 Bowman/MT851005 | 117.82 | 51.17 | 92.00 | 38.06 | 168.33 | 32.23 | M-H |
| BA 1202 BA 1202 | 117.82 | 51.80 | 97.00 | 36.09 | 175.67 | 2.77 | H |
| MT930049 Bowman/MT 81616 | 116.81 | 52.27 | 91.00 | 36.09 | 169.00 | 17.77 | H |
| WPB94 4 Sissy | 115.81 | 50.37 | 97.00 | 34.12 | 177.33 | 5.57 | M |
| PI491534 Gallatin | 115.80 | 51.53 | 86.00 | 37.40 | 174.00 | 5.20 | H |
| MT930068 Bowman/MT851032 | 114.80 | 51.17 | 87.00 | 36.75 | 168.00 | 42.03 | H |
| MT920161 MT 83424/MT 81161 | 114.80 | 52.07 | 93.00 | 34.78 | 173.33 | 21.10 | H |
| N1123111 Logan | 113.79 | 51.67 | 85.00 | 35.43 | 173.33 | 17.77 | H |
| CI 15856 Lewis | 113.79 | 51.90 | 94.00 | 36.75 | 174.33 | 3.33 | M-H |
| MT930132 MT 81143/Bowman | 113.79 | 50.97 | 93.00 | 36.75 | 172.67 | 31.57 | M-H |
| MT930133 MT 81143/Bowman | 111.78 | 51.97 | 89.00 | 36.09 | 170.67 | 25.93 | VH |
| MT910189 ND 7293/MT 81616 | 111.78 | 52.33 | 93.00 | 33.46 | 173.00 | .00 | H |
| C93 2 IdaGold | 110.77 | 49.53 | 78.00 | 24.93 | 179.00 | .00 | M-H |
| CI 15514 Hector | 110.77 | 51.37 | 81.00 | 40.03 | 174.33 | 22.20 | H |
| MT920070 MT 81161/MT 83518 | 110.77 | 50.10 | 78.00 | 35.43 | 173.33 | 26.67 | H |
| 2B894311 BA 2B89-4311 | 109.76 | 49.60 | 88.00 | 34.12 | 174.33 | 38.70 | H |
| ND 11055 Foster | 109.76 | 48.70 | 96.00 | 37.40 | 174.33 | .00 | M-H |
| MT930204 MT851195/Bowman | 108.76 | 50.87 | 94.00 | 38.71 | 171.67 | 42.23 | H |
| MT930065 Bowman/MT851032 | 108.76 | 50.43 | 88.00 | 36.75 | 169.67 | 28.70 | H |
| BZ489-74 BZ 489-74 | 107.75 | 59.57 | 93.00 | 33.46 | 178.00 | .00 | L-M |
| MT930135 MT 81143/Bowman | 107.75 | 51.30 | 82.00 | 35.43 | 173.67 | 25.67 | M-H |
| MT930076 Clark/Bowman | 106.74 | 50.83 | 87.00 | 36.75 | 169.67 | 32.43 | HH |
| BA 1614 BA 1614 | 106.74 | 49.47 | 95.00 | 38.06 | 174.33 | .00 | H |
| MT930047 Bowman/MT 81616 | 105.73 | 51.07 | 95.00 | 38.06 | 172.33 | 17.03 | H |

( Cont'd on next page )

Table 1 (Cont'd). Agronomic data from the Intrastate Spring Barley Nursery.

| VARIETY | YIELD BU/A | TEST WT LB/BU | PERCENT PLUMP | HEIGHT INCHES | HEADING DATE | LODGING INDEX | SCALD 1/ |
|---|---|---|---|---|---|---|---|
| MT930056 Bowman/MT851005 | 105.73 | 50.50 | 88.00 | 38.06 | 169.33 | 36.53 | H |
| MT930069 Bowman/MT851032 | 104.73 | 50.53 | 93.00 | 35.43 | 169.00 | 40.00 | H |
| MT890018 Gallatin/Apex | 103.72 | 50.67 | 80.00 | 32.15 | 174.33 | 44.60 | H |
| CI 15773 Morex | 102.71 | 49.60 | 93.00 | 41.99 | 170.00 | 8.90 | H |
| MT930050 Bowman/MT851005 | 102.71 | 51.23 | 96.00 | 36.09 | 169.67 | 31.33 | H |
| MT930096 Gallatin/Bowman | 101.71 | 48.07 | 73.00 | 33.46 | 167.67 | 65.27 | H |
| MT930051 Bowman/MT851005 | 100.70 | 51.73 | 97.00 | 38.06 | 170.00 | 29.90 | M-H |
| MT930070 Bowman/MT851032 | 98.69 | 50.20 | 86.00 | 36.09 | 169.67 | 32.00 | H |
| MT930097 Gallatin/Bowman | 97.68 | 50.33 | 73.00 | 35.43 | 168.00 | 45.00 | H |
| MT930071 Bowman/MT851032 | 93.65 | 50.20 | 85.00 | 36.09 | 169.00 | 43.33 | H |
| MEAN | 117.66 | 51.26 | ---- | 35.99 | 172.85 | 16.56 | |
| LSD (.05) | 15.73 | 2.06 | ---- | 2.51 | 1.64 | 25.05 | |

1/ Scald rating ( Degree of infection ): L= Low, M= Moderate, H= High

PROJECT TITLE: Early Yield Spring Barley Evaluation

PROJECT LEADERS: Bob Stougaard and Todd Keener, Kalispell, MT.
Tom Blake and Pat Hensleigh, PS&ES, Bozeman, MT.

OBJECTIVE:
To evaluate spring barley varieties for yield, quality, and improved resistance to foliar diseases in consideration for future release to Montana grain growers.

RESULTS:
Excellent yields and good test weights were obtained from many experimental cultivars. Percent plump readings were good but slightly less than the previous season. Favorable weather conditions contributed to good barley quality except for high moisture in June which caused light to moderate lodging. Disease levels were low through out the nursery.

SUMMARY:
The majority of entries in the Early Yield spring barley nursery yielded above 100 bu/A and had good test weights.

FUTURE PLANS:
Disease resistant varieties will continue to be evaluated at Kalispell through cooperative variety testing.

Table 1. Agronomic data from the Early Yield Spring Barley Nursery grown on the Northwestern Agricultural Research Center in Kalispell, MT.
Planted: April 18, 1995 Harvested: September 1, 1995

| VARIETY | YIELD BU/A | TEST WT LB/BU | PERCENT PLUMP | HEIGHT INCHES | HEADING DATE | LODGING INDEX |
|---|---|---|---|---|---|---|
| CI 15229 Steptoe | 154.07 | 47.80 | 95.00 | 34.12 | 168.00 | 2.23 |
| MT940067 MT 81143/Blenheim | 141.99 | 54.20 | 95.00 | 35.43 | 176.33 | 5.00 |
| MT940121 MT 81143/Gimpel | 135.95 | 53.60 | 98.00 | 35.43 | 177.00 | .00 |
| MT940099 MT 81143/Camilot | 132.92 | 53.07 | 91.00 | 31.50 | 176.33 | .00 |
| MT940082 MT 81143/Blenheim | 128.90 | 52.67 | 94.00 | 31.50 | 171.33 | 16.67 |
| MT940005 Harrington/MT851088 | 128.90 | 48.90 | 88.00 | 35.43 | 172.67 | 21.10 |
| EBC 158 Blenheim | 127.89 | 53.00 | 92.00 | 28.87 | 178.67 | .00 |
| NS 78054 Baronesse | 126.88 | 51.97 | 95.00 | 31.50 | 175.00 | 7.40 |
| MT940233 MT870056/Robust | 125.88 | 47.70 | 97.00 | 33.46 | 168.00 | 2.97 |
| MT940096 MT 81143/Camilot | 125.88 | 52.50 | 95.00 | 35.43 | 172.33 | .00 |
| CI 15478 Klages | 125.88 | 51.97 | 87.00 | 37.40 | 178.00 | .73 |
| MT940100 MT 81143/Camilot | 124.87 | 51.80 | 88.00 | 34.12 | 174.67 | 16.63 |
| MT940049 MT 81143/Blenheim | 124.87 | 53.37 | 90.00 | 32.15 | 176.33 | 2.23 |
| MT940197 MT860326/Clivia | 124.87 | 52.43 | 88.00 | 34.12 | 176.67 | 1.47 |
| SK 76333 Harrington | 123.86 | 52.30 | 94.00 | 35.43 | 175.67 | 2.77 |
| MT940087 MT 81143/Blenheim | 123.86 | 52.03 | 97.00 | 36.09 | 174.33 | 5.93 |
| MT940081 MT 81143/Blenheim | 123.86 | 55.03 | 96.00 | 34.78 | 174.00 | .00 |
| MT940052 MT 81143/Blenheim | 123.86 | 53.63 | 91.00 | 34.78 | 176.00 | .00 |
| MT940106 MT 81143/Gimpel | 122.85 | 51.80 | 78.00 | 32.15 | 172.67 | .00 |
| MT940169 MT851177/MT860326 | 120.84 | 51.67 | 85.00 | 31.50 | 175.67 | 20.73 |
| MT940196 MT860326/Clivia | 120.84 | 52.40 | 96.00 | 35.43 | 175.00 | 15.57 |
| MT940080 MT 81143/Blenheim | 120.84 | 53.57 | 94.00 | 32.81 | 172.00 | .00 |
| MT940022 MT 81143/Berolina | 120.84 | 54.07 | 97.00 | 38.71 | 177.67 | .00 |
| MT940177 MT860326/Clivia | 119.83 | 50.53 | 80.00 | 34.12 | 173.67 | 14.80 |
| MT940071 MT 81143/Blenheim | 119.83 | 52.53 | 96.00 | 30.84 | 173.67 | .00 |
| MT940163 MT851088/Blenheim | 119.83 | 52.73 | 89.00 | 34.12 | 175.00 | 5.00 |
| MT940203 MT860326/MT81143 | 119.83 | 51.73 | 87.00 | 35.43 | 173.00 | 10.20 |
| MT940151 MT851012/MT860756 | 119.83 | 51.03 | 94.00 | 34.12 | 173.67 | 3.70 |
| MT940220 MT860756/MT81143 | 118.83 | 52.03 | 86.00 | 32.81 | 171.00 | .00 |
| MT940079 MT 81143/Blenheim | 118.83 | 54.63 | 97.00 | 34.78 | 174.00 | .00 |
| MT940201 MT860326/MT81143 | 117.82 | 54.27 | 91.00 | 32.81 | 170.00 | 3.70 |
| MT940013 Harrington/MT851177 | 117.82 | 52.40 | 84.00 | 34.78 | 172.00 | 13.33 |
| MT940070 MT 81143/Blenheim | 117.82 | 50.03 | 86.00 | 33.46 | 172.67 | 29.40 |
| MT 81143 Hector/Klages//Klages/Sum | 117.82 | 53.33 | 95.00 | 36.75 | 171.67 | .00 |
| MT940064 MT 81143/Blenheim | 116.81 | 53.37 | 96.00 | 34.12 | 174.33 | 12.97 |
| MT940053 MT 81143/Blenheim | 116.81 | 52.37 | 89.00 | 31.50 | 176.33 | .00 |
| MT940048 MT 81143/Blenheim | 115.80 | 52.10 | 83.00 | 31.50 | 175.33 | 7.40 |
| MT940038 MT 81143/Berolina | 115.80 | 52.57 | 98.00 | 38.06 | 170.33 | 9.27 |
| MT940159 MT851031/Clivia | 113.79 | 51.67 | 94.00 | 36.09 | 173.00 | 8.87 |
| MT940019 MT 81143/Berolina | 113.79 | 51.90 | 96.00 | 38.71 | 172.33 | .00 |
| MT940218 MT860756/Lewis | 113.79 | 52.53 | 93.00 | 32.81 | 172.67 | .00 |
| MT940124 MT 81143/Gimpel | 113.79 | 53.23 | 95.00 | 32.81 | 175.67 | .00 |
| MT940225 MT861626/Clivia | 112.78 | 51.90 | 93.00 | 35.43 | 170.67 | 20.73 |
| MT940204 MT860326/MT81143 | 112.78 | 53.23 | 94.00 | 36.75 | 171.67 | 9.27 |
| EBC91 3 Alexis | 112.78 | 52.07 | 93.00 | 30.18 | 178.33 | 16.67 |
| MT940206 MT860326/MT81143 | 111.78 | 52.80 | 91.00 | 33.46 | 170.33 | 14.80 |
| MT940036 MT 81143/Berolina | 111.78 | 52.97 | 94.00 | 36.75 | 171.00 | .00 |
| MT940188 MT860326/Clivia | 111.78 | 51.77 | 83.00 | 36.75 | 170.00 | 17.77 |
| MT940205 MT860326/MT81143 | 111.78 | 52.67 | 95.00 | 32.81 | 171.33 | 3.70 |
| MT940238 MT860326/MT 81143 | 110.77 | 52.13 | 93.00 | 34.78 | 172.33 | 10.00 |
| MT940149 MT851012/Clivia | 109.76 | 51.70 | 93.00 | 34.78 | 174.00 | 2.77 |
| MT940027 MT 81143/Berolina | 109.76 | 53.70 | 94.00 | 37.40 | 172.33 | .00 |
| MT940232 MT870056/Karla | 109.76 | 46.33 | 89.00 | 28.87 | 168.00 | .00 |
| MT940173 MT860326/Clivia | 109.76 | 51.90 | 90.00 | 35.43 | 174.33 | 6.10 |
| MT940150 MT851012/Clivia | 108.76 | 52.83 | 94.00 | 32.81 | 177.00 | 1.10 |
| MT940221 MT860756/MT81143 | 105.73 | 51.73 | 84.00 | 35.43 | 170.33 | 10.43 |
| PI491534 Gallatin | 105.73 | 51.80 | 87.00 | 34.78 | 173.67 | 5.57 |
| CI 15514 Hector | 105.73 | 51.23 | 79.00 | 38.06 | 172.33 | 35.43 |

( Cont'd on next page )

| VARIETY | YIELD BU/A | TEST WT LB/BU | PERCENT PLUMP | HEIGHT INCHES | HEADING DATE | LODGING INDEX |
|---|---|---|---|---|---|---|
| MT940043 MT 81143/Berolina | 105.73 | 51.67 | 98.00 | 37.40 | 173.67 | .00 |
| MT940214 MT860756/Lewis | 104.73 | 51.83 | 92.00 | 32.15 | 174.00 | .00 |
| MT940024 MT 81143/Berolina | 102.71 | 50.93 | 97.00 | 37.40 | 171.33 | .00 |
| MT940212 MT860756/Lewis | 100.70 | 49.83 | 86.00 | 34.78 | 172.67 | 16.67 |
| MT940147 MT851012/Clivia | 99.69 | 52.70 | 97.00 | 33.46 | 175.67 | 2.23 |
| CI 15773 Morex | 97.68 | 49.63 | 89.00 | 39.37 | 169.00 | 20.73 |
| MEAN | 117.69 | 52.09 | ---- | 34.39 | 173.42 | 6.78 |
| LSD ( .05 ) | 17.41 | 1.87 | ---- | 2.49 | 1.61 | 17.97 |

PROJECT TITLE: Spring Oat Evaluation

PROJECT LEADERS: Bob Stougaard and Todd Keener, Kalispell, MT.
Tom Blake and Pat Hensleigh, PS&ES, Bozeman, MT.

OBJECTIVE:
To evaluate new and introduced oat varieties for adaptability, yield, quality and disease resistance in western Montana.

RESULTS:
Since 1992 a smaller spring oat nursery has been grown at Kalispell in cooperation with Bozeman breeders and Daryl Wesenberg of Aberdeen, Idaho. This nursery allows closer evaluation of varieties more adaptable to northwestern Montana. Excellent yields were harvested this year with Monida having the highest yield (232.9 bu/A). Five other varieties yielded in excess of 200 bu/A and the average yield for the nursery was 191 bu/A. Two Idaho varieties and one North Dakota entry had high test weights exceeding 42 lb/bu. Otana and Whitestone each had favorable test weights was well as good yields. Ajay is the shortest variety but there are five
other entries being tested with reduced heights and good lodging resistance.

SUMMARY:
Several spring oat varieties are proving adaptable to northwestern Montana by producing high yields and test weights as well as resisting lodging.

FUTURE PLANS: With this specific nursery we will continue the evaluation of new and introduced oat cultivars adapted to western Montana.

Table 1. Agronomic data from the Spring Oat Nursery grown on the Northwestern Agricultural Research Center in Kalispell, MT
Date planted: April 18, 1995 Date harvested: August 31, 1995

| | VARIETY | Yield Bu/A | Test Wt Lb/Bu | Height Inches | Heading Date | Lodging Index |
|---|---|---|---|---|---|---|
| CI483126 | Monida | 232.90 | 38.03 | 43.96 | 180.00 | .73 |
| CI467882 | Border | 216.26 | 36.63 | 40.68 | 180.67 | .57 |
| 83AB3250 | Cayuse/Monida | 210.21 | 37.20 | 36.75 | 181.00 | .57 |
| CI 9297 | Appaloosa | 210.21 | 35.63 | 42.65 | 181.67 | 20.40 |
| 81AB5792 | Rio Grande | 204.17 | 37.20 | 38.71 | 174.67 | 15.73 |
| ND870258 | Whitestone | 202.65 | 39.00 | 41.34 | 178.33 | 3.70 |
| 90AB1322 | 80Ab988/Monida | 199.63 | 37.20 | 36.75 | 178.67 | .00 |
| CI 8263 | Cayuse | 196.60 | 37.13 | 41.34 | 179.33 | 2.60 |
| CI 9252 | Otana | 196.60 | 39.37 | 47.24 | 179.67 | 1.50 |
| CI 9401 | Ogle | 193.58 | 36.97 | 40.68 | 174.33 | .00 |
| 82AB1142 | Ajay | 192.07 | 38.07 | 32.15 | 178.67 | .00 |
| NEWDAK | Newdak | 190.55 | 37.27 | 42.65 | 173.00 | 2.23 |
| ND820603 | Valley | 186.02 | 38.73 | 38.71 | 179.00 | .00 |
| W 82056 | Robert | 181.48 | 37.20 | 43.96 | 180.33 | .00 |
| CI 6611 | Park | 167.87 | 37.47 | 47.24 | 178.67 | 10.20 |
| 88AB3073 | Pennlo/PI447276 | 158.80 | 43.07 | 38.06 | 179.67 | .00 |
| ND862915 | Paul | 152.75 | 43.70 | 45.93 | 179.00 | 6.50 |
| 86AB1616 | 86Ab1616 | 148.21 | 42.43 | 41.99 | 181.33 | .00 |
| | MEAN | 191.14 | 38.46 | 41.16 | 178.78 | 3.60 |
| | LSD (.05) | 25.07 | 1.32 | 3.40 | 1.52 | 10.30 |

PROJECT TITLE: Western Regional Spring Wheat Evaluation

PROJECT LEADERS: Bob Stougaard and Todd Keener, Kalispell, MT.
Luther Talbert and Susan Lanning, Bozeman, MT.

OBJECTIVE:
To determine the adaptability of spring wheat varieties grown under high moisture conditions in northwestern Montana.

RESULTS:
Abundant precipitation levels in June contributed to high yields in the spring wheat nursery this year. The average yield for 1995 was 120 bu/a with thirty one of the thirty-three entries yielding above 100 bu/A. Penawawa, the soft white standard yielded 128.3 bu/A and the hard red standard, McKay, yielded 123.4 bu/A. Test weights were between 55.27 and 60.96 lb/bu with the average for the nursery being 58.73 lb/bu.

SUMMARY:
Lack of disease and lodging pressure contributed to high yields and good test weights in the majority of entries of the Western Regional Spring Wheat Nursery.

FUTURE PLANS:
Continue evaluation of new lines of spring wheat adapted for northwestern Montana.

Table 1. Agronomic data from the Western Regional Spring Wheat Nursery grown on the Northwestern Agricultural Research Center in Kalispell, MT.
Planted: April 18, 1995 Harvested: September 11, 1995

| | VARIETY | YIELD BU/A | TEST WT LB/BU | HEADING DATE | HEIGHT INCHES |
|---|---|---|---|---|---|
| OR895181 | PFAU.S/VEE#5.S,OR4895181 | 134.71 | 57.70 | 173.67 | 34.12 |
| UT 1117 | UT78S116-2746/906R | 133.91 | 60.77 | 177.00 | 37.40 |
| UT 1175 | UT78S166-2746/906-R | 130.68 | 58.57 | 176.00 | 38.06 |
| OR493032 | FCT 'S' | 129.07 | 59.80 | 177.00 | 32.81 |
| ID 456 | ID184/ID187//TREASURE,A84 | 128.26 | 57.60 | 172.33 | 34.12 |
| PI495916 | PENAWAWA | 128.26 | 58.20 | 174.33 | 34.12 |
| OR487401 | SN64/HN4//REX/3/EDCH/MEX/ | 128.26 | 60.97 | 177.00 | 34.78 |
| ID 474 | CENTENNIAL/ID0286,A85567S | 126.65 | 59.87 | 173.67 | 35.43 |
| OR488372 | VEE.S/BOW.S | 126.65 | 59.63 | 173.33 | 33.46 |
| OR487410 | CORVALLIS SEL.4870410 | 124.23 | 60.97 | 175.33 | 34.78 |
| PI574538 | WAWAWAI | 123.42 | 60.37 | 170.67 | 34.78 |
| UT 1146 | UT78S166-2746/906-R | 123.42 | 59.33 | 174.33 | 37.40 |
| PI566596 | ALPOWA | 123.42 | 60.47 | 174.33 | 36.75 |
| ID 492 | ID0367/KLASIC,A89232S-3 | 123.42 | 60.37 | 170.00 | 36.09 |
| ID 459 | A73236-2-6/ID0186/3/SIG*2 | 122.61 | 57.47 | 173.00 | 34.78 |
| ID 488 | PI294994/4*CENNTENNIAL,ID | 122.61 | 58.63 | 171.67 | 30.84 |
| CI 17903 | MCKAY | 121.81 | 59.30 | 175.33 | 33.46 |
| ID 476 | A78240S-2/906R,A8541S-3 | 121.00 | 58.77 | 169.33 | 30.84 |
| ML316402 | SEL.ML-316-402 | 120.19 | 58.10 | 174.67 | 31.50 |
| OR487374 | CORVALLIS SEL.4870374 | 119.39 | 56.83 | 170.67 | 25.59 |
| UT 2464 | UT 78S 147-209/906R | 118.58 | 59.53 | 177.00 | 36.75 |
| CA 896 | MAYA/NACOZARI, UC896 | 118.58 | 58.77 | 170.67 | 32.15 |
| ID 462 | ID203/ID166//WPB906R,ID85 | 117.77 | 60.20 | 172.33 | 34.78 |
| ID 448 | A771084S-B/ID246 | 116.97 | 56.77 | 176.33 | 33.46 |
| UC 638 | SERRA | 114.55 | 58.93 | 170.33 | 31.50 |
| SDM50014 | VANCE/SUNSTAR1 | 114.55 | 59.30 | 176.33 | 34.12 |
| ID 469 | ID0285-115-6/ID0312-B-11, | 114.55 | 58.37 | 167.67 | 30.18 |
| FMBR9154 | NW CONSORTIUM | 113.74 | 57.50 | 167.00 | 31.50 |
| ID 494 | SUNDOR/ID0377,A89298S-2 | 110.51 | 59.20 | 167.67 | 29.53 |
| CI 4734 | FEDERATION | 108.09 | 55.30 | 175.33 | 45.28 |
| NKF 8002 | KLASIC | 102.45 | 58.13 | 167.33 | 24.28 |
| FMBR5783 | NW CONSORTIUM | 99.22 | 57.23 | 171.33 | 24.28 |
| OR489224 | SNB'S'/PIMA,489224 | 98.41 | 55.27 | 177.33 | 30.84 |
| EXPERIMENTAL MEANS | | 120.00 | 58.73 | 173.04 | 33.33 |
| L.S.D. (.05 ) | | 15.06 | 1.70 | 2.07 | 1.59 |

PROJECT TITLE: Advanced Spring Wheat Evaluation

PROJECT LEADERS: Bob Stougaard and Todd Keener, Kalispell, MT.
Luther Talbert and Susan Lanning, Bozeman, MT.

OBJECTIVE:
To determine the adaptability of new and introduced spring wheat varieties grown under high moisture conditions in northwestern Montana.

RESULTS:
High yields were harvested in much of the spring wheat this year due to ample moisture in the spring and abundant June rainfall. The average yield of 130.7 bu/A was the highest in the last four years. Forty-one of the forty-seven entries yielding above 100 bu/A. Fergus and Penawawa were in the top three highest yielding varieties with 125 and 123 bu/A. McNeal and Newana had similar yields but the Hiline yield was only 106 bu/A. Test weights were between 58.3 and 63 lb/bu with the average for the nursery being 60.9 lb/bu. Lodging was minimal but the incidence of Septoria was moderate to high in half of the entries.

SUMMARY:
A late infection of Septoria and low lodging pressure did not effect the high yields and good test weights in the majority of entries of the Advanced Yield Spring Wheat Nursery.

FUTURE PLANS:
Continue evaluation of new lines of spring wheat adapted for northwestern Montana.

Table 1. Agronomic data from the Advanced Spring Wheat Nursery grown on the Northwestern Agricultural Research Center in Kalispell, MT.
Planted: April 18, 1995 Harvested: September 12, 1995

| | VARIETY | YIELD BU/A | TEST WT LB/BU | HEADING DATE | HEIGHT INCHES | LODGING INDEX | SEPTORIA 1/ |
|---|---|---|---|---|---|---|---|
| MT 9328 | MT7810/MT7926 | 130.68 | 61.37 | 176.00 | 37.40 | .00 | M |
| TR983239 | FERGUS | 125.03 | 62.77 | 169.33 | 31.50 | .00 | M |
| WA 6920 | PENAWAWA | 122.61 | 60.80 | 175.67 | 33.46 | .00 | L |
| MT 9427 | MT8808/MARBERG | 122.61 | 60.23 | 172.33 | 33.46 | .00 | M-H |
| MT 9332 | MT7810/MT7926 | 122.61 | 61.40 | 175.33 | 38.06 | .00 | M |
| MT 9419 | MT8808/MARBERG | 122.61 | 60.47 | 169.67 | 37.40 | .00 | L |
| ND 606 | AMIDON | 121.81 | 61.40 | 175.00 | 41.34 | .00 | L |
| MT 9453 | GLENMAN/AMIDON | 121.81 | 60.67 | 173.67 | 38.71 | .00 | M |
| MT 9426 | MT8808/MARBERG | 121.81 | 60.17 | 170.00 | 33.46 | .00 | H |
| MT 9407 | MT8808/MARBERG | 121.81 | 62.63 | 173.67 | 39.37 | .00 | L-M |
| ND 677 | ND622*2/CUTLESS | 121.81 | 60.97 | 174.00 | 38.71 | .00 | L |
| WBEXPRES | WESTBRED EXPRESS | 121.81 | 61.60 | 173.67 | 28.87 | .00 | L-M |
| BZ684-23 | VANNA | 121.81 | 59.97 | 176.67 | 32.81 | .00 | L-M |
| MT 9433 | MT8808/MARBERG | 121.00 | 61.73 | 175.67 | 39.37 | .00 | L-M |
| MT 9425 | MT8808/MARBERG | 121.00 | 60.13 | 170.00 | 34.12 | .00 | L |
| PI574642 | MCNEAL | 120.19 | 62.27 | 174.67 | 36.75 | .00 | L |
| CI 17430 | NEWANA | 119.39 | 61.27 | 177.33 | 34.12 | .00 | L |
| MT 9422 | MT8808/MARBERG | 117.77 | 59.50 | 173.67 | 38.06 | .00 | M-H |
| MT 9410 | MT8808/MARBERG | 115.35 | 61.77 | 172.00 | 38.06 | .00 | L-M |
| BZ992588 | RAMBO/906R | 115.35 | 60.73 | 172.33 | 34.78 | .00 | L |
| MT 9311 | MT7819/(OLAF/LEW) | 115.35 | 63.30 | 177.33 | 37.40 | .00 | M-H |
| MT 9360 | LEW/PND | 113.74 | 60.83 | 172.67 | 35.43 | .00 | L |
| ND 673 | GRANDIN/STOA'S' | 113.74 | 62.50 | 174.33 | 43.31 | .00 | L |
| MT 9432 | MT8808/MARBERG | 112.13 | 60.53 | 175.67 | 41.34 | .00 | L-M |
| MT 9420 | MT8808/MARBERG | 111.32 | 60.17 | 172.00 | 38.06 | .00 | H |
| MT 9434 | MT8808/MARBERG | 111.32 | 59.27 | 169.00 | 33.46 | .00 | H |
| CI 17429 | LEW | 110.51 | 63.03 | 177.67 | 42.65 | 15.50 | L-M |
| BZ984326 | BORDER | 110.51 | 60.60 | 169.33 | 34.78 | .00 | M-H |
| MT 9403 | MT8808/AMIDON | 109.71 | 61.57 | 173.67 | 38.71 | .00 | L-M |
| MT 9406 | MT8808/AMIDON | 108.90 | 60.73 | 169.67 | 39.37 | .00 | L-M |
| PH981-61 | WESTBRED 936 | 108.90 | 60.83 | 170.00 | 28.22 | .00 | L-M |
| BZ992632 | FORTUNA/906R | 108.90 | 62.87 | 171.67 | 36.75 | 5.93 | M |
| CI 17790 | LEN | 108.90 | 60.43 | 173.67 | 34.12 | .00 | L-M |
| MTRWA116 | PI372129/2*PONDERA | 107.29 | 61.73 | 170.00 | 32.81 | 2.43 | M-H |
| WB 926 | WESTBRED 926 | 106.48 | 60.57 | 169.67 | 32.81 | .00 | M |
| PI549275 | HI-LINE | 105.67 | 61.73 | 173.00 | 31.50 | .00 | H |
| MT 9430 | MT8808/MARBERG | 105.67 | 61.67 | 171.67 | 38.06 | .00 | L-M |
| MT 9408 | MT8808/MARBERG | 105.67 | 60.67 | 171.00 | 38.06 | .00 | L-M |
| MT 9307 | MT8339/3/FTA//NK | 104.06 | 62.00 | 177.33 | 43.31 | .00 | M |
| MT 9450 | GLENMAN/AMIDON | 103.25 | 60.30 | 173.67 | 37.40 | .00 | L-M |
| CI 10003 | THATCHER | 100.83 | 61.33 | 177.00 | 47.90 | 14.00 | L |
| PI483235 | GLENMAN | 100.83 | 58.50 | 175.33 | 34.78 | 11.50 | L-M |
| CI 13596 | FORTUNA | 99.22 | 60.80 | 173.33 | 41.99 | 19.20 | M-H |
| MT 9405 | MT8808/AMIDON | 99.22 | 58.27 | 168.67 | 31.50 | .00 | H |
| BZ992634 | FORTUNA/906R | 97.61 | 59.67 | 172.00 | 34.78 | .00 | M |
| MT 9467 | GLENMAN/PONDERA | 96.80 | 59.63 | 176.67 | 35.43 | .00 | L-M |
| MT 9413 | MT8808/MARBERG | 95.19 | 59.10 | 170.00 | 32.15 | .00 | H |
| MT 9469 | GLENMAN/PONDERA | 95.19 | 60.40 | 177.00 | 35.43 | .00 | M-H |
| MT 9354 | MT7810/(SU73/LEW) | 86.31 | 58.30 | 177.00 | 36.75 | 3.70 | M-H |
| | MEAN | 111.88 | 60.88 | 173.28 | 36.49 | 1.47 | |
| | L.S.D.(.05) | 19.86 | 2.50 | 1.85 | 2.23 | 4.55 | |

1/ Septoria rating ( Degree of infestation ): L=Low, M= Moderate, H= High

PROJECT TITLE: Western Regional Hard Red Winter Wheat Evaluation

PROJECT LEADERS: Bob Stougaard and Todd Keener, Kalispell, MT.
Phil Bruckner and Jim Burg, PS&ES, Bozeman, MT.

OBJECTIVE:
To evaluate hard red winter wheat lines for adaptability, yield, quality and disease resistance in western Montana.

RESULTS:
Yields for the hard red winter wheats were above normal and similar to those taken in 1994. The mean yield was 105.4 bu/A ( 111.3 bu/A in 1994 ) with the highest yield being 129.9 from the variety UT942149. Four new Utah entries were among the top seven highest yielding varieties along with two Hybritech varieties and an Idaho Neely cross. The average test weight for this nursery was 60.1 lb/bu. Eight varieties had test weights in excess of 62 lb/bu. WA 7761 had the high test weight of 63.23 lb/bu but had poor yields in both 1994 and 1995.

SUMMARY:
Four Utah entries and two Hybritech varieties showed excellent potential for high yields and test weights when grown in northwestern Montana environments.

FUTURE PLANS:
Continued evaluation of promising hard red winter wheat cultivars adapted for northwestern Montana.

Table 1. Agronomic data from the Western Regional Hard Red Winter Wheat Nursery grown on the Northwestern Agricultural Research Center Kalispell, MT. Planted: Sept. 20, 1994 Harvest: Aug. 29, 1995

| | VARIETY | YIELD BU/A | TEST WT LB/BU | HEIGHT INCHES | HEADING DATE | LODGING INDEX |
|---|---|---|---|---|---|---|
| UT942149 | MANNING/ID000281 | 129.87 | 61.73 | 45.93 | 162.00 | 10.00 |
| UT944151 | ID0114/HANSEL//ID0281 | 128.26 | 59.27 | 44.09 | 160.67 | .00 |
| ID000481 | NEELEY*2/KORAC 68, A8724W | 123.42 | 62.63 | 45.67 | 159.00 | 2.97 |
| XNH1648 | Hybritech F1 Hybrid | 121.81 | 61.47 | 41.08 | 156.00 | .00 |
| XNH1650 | Hybritech F1 Hybrid | 120.19 | 59.40 | 41.99 | 156.00 | .00 |
| UT000150 | ID51022/MANNING | 118.58 | 61.83 | 43.83 | 161.00 | .00 |
| UT944157 | ID0114/HANSEL/ID0281 | 118.58 | 61.97 | 43.57 | 158.33 | .00 |
| OR870834 | VS74-709/NAC | 117.77 | 60.67 | 36.48 | 160.33 | .00 |
| ID000447 | RGR/3/II-60-156/CI14107// | 116.16 | 60.53 | 34.38 | 160.67 | .00 |
| OR880017 | S148/PCHS/SPN | 115.35 | 60.03 | 38.06 | 156.67 | .00 |
| WA007759 | PI173467//CI13438//MG/3/C | 115.35 | 62.63 | 41.99 | 161.00 | .00 |
| SDM00215 | Multiple Cross Sunstar Se | 114.55 | 59.67 | 34.78 | 152.67 | .00 |
| ID000480 | BLIZZARD*2/NORKAN, A871W- | 114.55 | 60.50 | 42.13 | 158.67 | 28.87 |
| OR002619 | NZT/BEZ1//ALD,F1/4/F1,NAD | 113.74 | 61.23 | 35.17 | 159.67 | .00 |
| SDM00214 | Multiple Cross Sunstar Se | 112.93 | 59.80 | 38.19 | 154.33 | .00 |
| WA007760 | KVZ/BEZ//MNT/BURT/4/CI173 | 112.93 | 61.67 | 45.41 | 163.67 | 12.97 |
| ID000479 | A81698SW-74/A74171W-1-4-5 | 112.13 | 59.47 | 42.78 | 157.00 | .00 |
| UT182064 | CI12385/UK/CLM/3/CI13837/ | 110.51 | 58.93 | 42.65 | 156.67 | .00 |
| OR889128 | VPM/MOS 83-11-4-8//PEW | 108.09 | 58.53 | 34.12 | 156.33 | .00 |
| ID000478 | ARBON/UT819116//SURVIVOR, | 108.09 | 58.90 | 44.23 | 155.00 | 12.97 |
| WA007786 | CI13438/RMD//BURT/IT/3/SM | 108.09 | 62.23 | 48.43 | 161.67 | .00 |
| OR889176 | TJB368-251/BUC | 107.29 | 59.03 | 32.81 | 160.00 | .00 |
| OR871144 | WU-JIN-1/YOMH*7/LOV10 | 107.29 | 59.13 | 37.66 | 156.67 | .00 |
| WA007757 | PI173467/GNS//WSR/3/N10B/ | 107.29 | 60.73 | 47.77 | 160.33 | 28.53 |
| NWCPOPE1 | L24/53-7/WESTON | 104.87 | 62.37 | 44.49 | 161.00 | 3.33 |
| OR850513 | RBS/ANZA/3/KVZ/HYS//YMH/T | 104.87 | 62.60 | 32.55 | 157.33 | .00 |
| WA007785 | VPM/MC//ANDREWS, D9109101 | 103.25 | 62.70 | 47.24 | 162.00 | .00 |
| OR870512 | S148/PCHS//SPN | 102.45 | 62.23 | 37.53 | 161.33 | .00 |
| SDM00216 | Multiple Cross Sunstar Se | 101.64 | 58.43 | 32.55 | 156.00 | .00 |
| ID000467 | A76327W-2-3T-5P/A7457W-13 | 100.83 | 59.47 | 35.96 | 160.00 | .00 |
| WA007787 | HATTON sel white, WHT N93 | 98.41 | 60.43 | 45.28 | 160.33 | 17.60 |
| ID000453 | BEZ-1//CI13438/BURT/3/RGR | 96.80 | 61.90 | 48.82 | 158.33 | 14.07 |
| OR870944 | NAJ/HN7//MIRL/3/YMH/TOB// | 96.80 | 58.53 | 36.09 | 161.00 | .00 |
| WA007773 | WTN/3/HTNsib//short wheat | 95.19 | 61.90 | 48.95 | 160.00 | 24.27 |
| ID000477 | II-60-155*2/CI14107//RGR/ | 95.19 | 58.53 | 44.62 | 159.33 | 40.00 |
| WA007772 | PI512281/4/167822/IT/9342 | 95.19 | 61.33 | 46.06 | 163.00 | .00 |
| ID000455 | unknown, ID88-3677-6321 | 95.19 | 52.93 | 30.45 | 155.33 | .00 |
| WA007761 | WTN/HTN//WTN, N84091 | 93.57 | 63.23 | 48.82 | 160.00 | 23.50 |
| ID000482 | BLIZZARD*2/SUMNER, A877W- | 91.96 | 60.13 | 47.90 | 160.67 | 63.67 |
| WA007774 | CERCO//KAVKAZ/CI17271 | 87.12 | 58.90 | 44.49 | 163.67 | 34.07 |
| ID000466 | II-60-155/CI14106//MC/3/I | 81.47 | 57.63 | 47.11 | 157.00 | 46.40 |
| ID000465 | A7480W-9-2/A7528W, ID7734 | 81.47 | 56.70 | 45.93 | 159.33 | 66.10 |
| CI 13844 | WANSER | 79.05 | 56.50 | 48.69 | 159.67 | 38.13 |
| CI 1442 | KHARKOF | 70.18 | 54.80 | 47.77 | 159.67 | 75.80 |
| | MEAN | 105.42 | 60.07 | 41.92 | 159.08 | 12.35 |
| | LSD (.05) | 14.91 | 3.20 | 2.34 | 2.04 | 24.24 |

PROJECT TITLE: Soft White Winter Wheat Evaluation

PROJECT LEADERS: Bob Stougaard and Todd Keener, Kalispell, MT.
Phil Bruckner and Jim Burg, PS&ES, Bozeman, MT.

OBJECTIVE:
To evaluate soft white winter wheat lines for adaptability, yield, quality and disease resistance in western Montana.

RESULTS:
A smaller soft white wheat nursery was designed in cooperation with Bozeman to evaluate released varieties more specifically adapted for northwestern Montana. Fifteen soft white varieties were grown with Neely, a standard hard red variety used for comparison purposes. Yields were good, although slightly below yields from the Western Regional Nursery grown in 1994. Most entries yielded above 110 bu/A with Cashup having the highest at 131.5 bu/A. The majority of entries had sufficient hardiness to over winter except for McDermid which had 15% winter survival in the spring. McDermid did re-establish well later in the season to produce 96 bu/A. Test weights were normal for the season and averaged 59.4 lb/bu. Three entries had greater than 60 lb/bu test weights. All the soft whites were short to mid height while Neely had a greater height that contributed to lodging during the season.

SUMMARY:
In the first year of a smaller soft white winter wheat evaluation several varieties provided both good yields and test weights while demonstrating excellent lodging resistance.

FUTURE PLANS: With this specific nursery we will continue evaluation of soft white winter wheat cultivars adapted to western Montana.

Table 1. Agronomic data from the Soft White Winter Wheat Nursery grown on the Northwestern Agriculutural Research Center in Kalispell, MT.
Planted: September 20, 1994 Harvest: August 28, 1995

| | VARIETY | YIELD BU/A | TEST WT LB/BU | WINTER SURVIV | HEADING DATE | HEIGHT INCHES | LODGING INDEX |
|---|---|---|---|---|---|---|---|
| CASHUP | CASHUP | 131.49 | 59.43 | 99.33 | 159.33 | 34.78 | .00 |
| PI497672 | MALCOLM | 129.87 | 59.17 | 98.33 | 158.67 | 35.43 | .00 |
| PI552427 | MACVICAR | 129.07 | 58.60 | 99.33 | 158.67 | 35.43 | .00 |
| CI 17909 | LEWJAIN | 125.84 | 60.07 | 99.67 | 163.67 | 36.09 | .00 |
| PI536995 | KMOR | 124.23 | 58.63 | 99.33 | 162.33 | 36.09 | .00 |
| CI 17860 | NEELEY | 121.00 | 62.30 | 99.67 | 159.00 | 43.31 | 17.03 |
| PI536994 | ELTAN | 119.39 | 60.60 | 99.33 | 163.33 | 38.71 | .00 |
| PI559718 | W301 | 118.58 | 58.30 | 97.33 | 158.33 | 32.81 | .00 |
| BANNER | BANNER | 116.97 | 59.63 | 98.00 | 156.67 | 34.12 | .00 |
| CI 11755 | STEPHENS | 116.16 | 58.13 | 97.67 | 157.33 | 34.12 | .00 |
| PI511763 | MADSEN | 115.35 | 59.30 | 98.33 | 162.00 | 36.09 | .00 |
| CI 17419 | DAWS | 114.55 | 61.57 | 98.67 | 163.00 | 36.09 | .00 |
| CI 17954 | HILL 81 | 113.74 | 59.77 | 98.67 | 162.67 | 38.06 | .00 |
| BZ6W90-4 | BZW690-470 | 110.51 | 59.70 | 98.33 | 154.00 | 34.12 | .00 |
| MCDERMID | MCDERMID | 95.99 | 58.07 | 15.33 | 159.33 | 33.46 | .00 |
| PI560129 | GENE | 90.35 | 56.90 | 97.33 | 158.33 | 32.81 | .00 |
| | MEAN | 117.07 | 59.39 | 93.42 | 159.79 | 35.72 | 1.06 |
| | LSD (.05) | 22.05 | 1.21 | 2.35 | 2.17 | 1.64 | 7.44 |

PROJECT TITLE: Intrastate Winter Wheat Evaluation

PROJECT LEADERS: Bob Stougaard and Todd Keener, Kalispell, MT.
Phil Bruckner and Jim Burg, PS&ES, Bozeman, MT.

OBJECTIVE:
Evaluation of early generation winter wheat lines for yield, quality and disease resistance to dwarf bunt, Septoria and leaf rust.

RESULTS:
Yields ranged from 60 to 125 bu/a in the Intrastate Winter Wheat nursery with the mean yield being 103.8 bu/a. Yields were reduced by early onset of Septoria leaf spot and leaf rust in some varieties. Twenty-two varieties tested had resistance to Septoria while sixteen varieties showed resistance to leaf rust. A snow storm in June caused temporary lodging in many plots. High rainfall in June contributed to further lodging that caused extensive yield loss and low test weights in a few varieties. There was not a significant incidence of dwarf bunt to monitor cultivar reaction.

SUMMARY:
Disease and lodging pressure caused significant yield loss to many hard red winter wheat varieties in the Intrastate Winter Nursery during 1995.

FUTURE PLANS:
Disease resistant varieties will continue to be evaluated at Kalispell through cooperative variety testing.

Table 1. Agronomic data from the Intrastate Winter Wheat Nursery grown on the Northwestern Agricultural Research Center in Kalispell, MT.
Planted: September 20, 1994 Harvested: August 28, 1995

| | VARIETY | YIELD BU/A | TEST WT LB/BU | HEIGHT INCHES | HEADING DATE | LODGING INDEX | SEPTOR 1/ | L.RUST 2/ |
|---|---|---|---|---|---|---|---|---|
| JULES | JULES | 125.03 | 58.03 | 35.43 | 157.33 | 4.43 | M | R |
| MT 8039 | JUDITH | 125.03 | 59.10 | 43.31 | 156.33 | .00 | L | MR |
| CI 17846 | MANNING | 125.03 | 57.23 | 40.68 | 156.33 | 1.87 | O | HS |
| RH78W296 | BIGHORN | 123.42 | 60.17 | 36.09 | 157.67 | .00 | O | R |
| CI 17902 | WINRIDGE | 122.61 | 58.83 | 47.90 | 163.00 | 2.23 | O | MR |
| QT 547 | HYBRITECH HYBRID | 121.00 | 59.97 | 40.03 | 154.67 | .00 | L | S |
| S86-15 | KESTREL | 121.00 | 59.17 | 45.93 | 159.33 | 3.33 | H | R |
| PI560129 | PROMINTORY | 120.19 | 59.07 | 39.37 | 156.33 | .00 | H | S |
| PI557013 | MERIDIAN | 120.19 | 58.67 | 38.06 | 161.67 | .00 | M | HS |
| CI 17441 | VONA | 119.39 | 59.83 | 36.75 | 152.00 | 2.23 | O | R |
| CO850061 | YUMA | 116.97 | 58.70 | 35.43 | 152.33 | .00 | O | R |
| WI88-275 | WI88-275 | 115.35 | 56.80 | 36.75 | 152.33 | .00 | O | MR |
| MT 7811 | MT7811 | 114.55 | 60.30 | 42.65 | 156.67 | .00 | L | S |
| BZ6W90-4 | BZ6W90-422 | 112.13 | 55.27 | 41.99 | 156.67 | .00 | M-H | R |
| PI564761 | MT8719 | 111.32 | 60.03 | 41.99 | 158.00 | .00 | O | R |
| PI518591 | ARAPAHOE | 110.51 | 57.07 | 38.06 | 154.00 | 1.30 | M | R |
| MT 9222 | MT7811/MT7869//NWN/MT7 | 110.51 | 56.17 | 40.03 | 160.00 | .00 | O | S |
| MTSF2238 | VANGAURD | 109.71 | 57.90 | 42.65 | 157.00 | 29.43 | O | S |
| XNH 1643 | HYBRITECH HYBRID | 108.90 | 57.07 | 40.03 | 156.00 | .00 | O | HS |
| MT 91192 | WWP4394/MT7811//MT7431 | 108.90 | 59.30 | 40.68 | 155.33 | .00 | O | HS |
| QT 566 | HYBRITECH HYBRID | 108.90 | 58.37 | 40.68 | 155.00 | .00 | L | R |
| CI 17860 | NEELEY | 108.09 | 58.10 | 42.65 | 159.33 | 18.90 | O | HS |
| QT 542 | HYBRITECH 542 | 108.09 | 57.73 | 43.31 | 154.67 | 24.43 | O | S |
| MTS92055 | LEW/TBR//RDW | 104.87 | 59.60 | 42.65 | 156.67 | 19.63 | L | HS |
| SDM00214 | SDM00214 | 104.06 | 58.33 | 36.75 | 154.00 | .00 | H | S |
| CO910927 | HALT | 104.06 | 56.10 | 32.81 | 152.00 | .00 | O | HS |
| MTS92042 | LEW/TBR//RDW | 103.25 | 59.37 | 43.31 | 158.67 | 19.80 | O | HS |
| CI 17844 | REDWIN | 102.45 | 61.87 | 46.59 | 159.67 | .00 | M | S |
| MT 9432 | MT7811/TBR | 102.45 | 61.00 | 45.28 | 158.33 | 2.80 | O | S |
| PI564245 | KARL 92 | 101.64 | 57.10 | 30.84 | 151.33 | .00 | M | R |
| PI517194 | TIBER | 100.83 | 60.03 | 46.59 | 159.00 | 5.20 | M | HS |
| PI512302 | BLIZZARD | 100.83 | 59.37 | 45.93 | 160.00 | 44.40 | L | S |
| MT 91051 | ORSFTWT/FRD//MT7811 | 100.03 | 58.70 | 45.93 | 158.67 | 1.30 | O | HS |
| ALLIANCE | ALLIANCE | 99.22 | 57.00 | 36.09 | 152.00 | .00 | L | HS |
| RDW(SEL) | AC READYMADE | 98.41 | 59.00 | 43.96 | 159.33 | .00 | M | S |
| MTS92057 | LEW TBR//RDW | 97.61 | 58.83 | 40.68 | 155.33 | 9.27 | O | S |
| PI491533 | NORWIN | 94.38 | 58.33 | 29.53 | 160.00 | .00 | O | HS |
| MT 8949 | RDW/FRD//RRI(TT/BURT7) | 94.38 | 59.30 | 42.65 | 159.00 | 27.00 | O | HS |
| VISTA | VISTA | 93.57 | 57.60 | 33.46 | 152.67 | .00 | L-M | R |
| MT 88046 | PMN5/MT77003//HP344 | 93.57 | 57.33 | 39.37 | 153.67 | 2.23 | M | R |
| CO820009 | LAMAR | 91.96 | 57.00 | 41.99 | 154.00 | 57.40 | M | R |
| IKE | IKE | 90.35 | 56.57 | 35.43 | 151.67 | .00 | O | R |
| CI 17879 | ROCKY | 90.35 | 56.13 | 42.65 | 155.67 | 57.60 | L | R |
| CI 17727 | WESTON | 87.93 | 57.50 | 42.65 | 156.00 | 60.73 | M | HS |
| CENTURK | CENTURK | 83.09 | 54.87 | 42.65 | 156.33 | 80.77 | L | I |
| CI 17735 | NORSTAR | 79.05 | 56.07 | 57.09 | 163.33 | 78.60 | O | R |
| W529 | W529 | 74.21 | 56.30 | 54.46 | 162.33 | 63.47 | L | MR |
| PI478771 | AGASSIZ | 68.57 | 52.57 | 45.93 | 160.67 | 91.13 | L | I |
| CI 17439 | ROUGHRIDER | 59.69 | 48.13 | 47.24 | 160.00 | 67.77 | M-H | HS |
| | MEAN | 103.83 | 57.90 | 41.28 | 156.78 | 15.86 | | |
| | LSD (.05) | 18.70 | 2.79 | 2.23 | 1.70 | 18.06 | | |

1/ DISEASE LEVELS: O= NO DISEASE, L=LOW , M=MODERATE, H=HIGH
2/ DISEASE RESISTANCE: R=RESISTANT, M=MODERATE, S=SUSCEPTIBLE, I=INTERMEDIATE, H=HIGH

PROJECT TITLE: Advanced Yield Winter Wheat Evaluation

PROJECT LEADERS: Bob Stougaard and Todd Keener, Kalispell, MT.
Phil Bruckner and Jim Burg, PS&ES, Bozeman, MT.

OBJECTIVE:
To evaluate hard red winter wheat lines for adaptability, yield, quality and disease resistance in western Montana.

RESULTS:
Judith and Neely were the two high yielding varieties in the Advanced Yield Winter Wheat Nursery. Yields were high for the majority of hard red winter wheats with most being above 100 bu/A and the mean being 108.6 bu/A. The average test weight for this nursery was 60.8 lb/bu and the lowest was from Rocky (58.6 lb/bu) which also had the lowest yield. Lodging was light to moderate in seventeen of the thirty-six entries.

SUMMARY:
High yields and test weights were obtained from many Montana experimental lines that were evaluated in the Advanced Yield nursery

FUTURE PLANS:
Continued evaluation of promising hard red winter wheat cultivars adapted for northwestern Montana.

Table 1. Agronomic data from the Advanced Yield Winter Wheat Nursery grown on the Northwestern Agricultural Research Center in Kalispell, MT.
Planted: September 20, 1994 Harvested: August 30, 1995

| | VARIETY | YIELD BU/A | TEST WT LB/BU | HEIGHT INCHES | HEADING DATE | LODGING INDEX |
|---|---|---|---|---|---|---|
| MT 8039 | JUDITH | 133.10 | 61.07 | 44.36 | 156.67 | .00 |
| CI 17860 | NEELEY | 131.49 | 61.93 | 45.28 | 161.00 | 10.37 |
| MT 9422 | JDH/ALAB | 125.84 | 60.27 | 44.23 | 157.67 | 7.40 |
| MT 9446 | TX7843680/JDH//TAM12 | 125.84 | 60.43 | 45.93 | 160.00 | .00 |
| MT 9420 | JDH/LCO | 122.61 | 60.50 | 41.60 | 156.00 | .00 |
| MT 9426 | MT8030/NLY | 122.61 | 61.00 | 40.81 | 160.67 | .00 |
| MT 9403 | MT7811/MT8030 | 116.97 | 60.37 | 42.78 | 160.00 | 3.70 |
| MTS92135 | LEW/TBR//RDW | 116.97 | 61.47 | 42.26 | 157.33 | 23.90 |
| S86-15 | KESTREL | 116.97 | 60.77 | 46.85 | 160.00 | 30.20 |
| MT 9330 | MT8095/NWN//MT7823/S | 115.35 | 61.57 | 41.60 | 160.00 | .00 |
| MTS92021 | LEW/TBR//RDW | 115.35 | 61.57 | 44.88 | 159.67 | 24.07 |
| CI 17844 | REDWIN | 112.93 | 61.83 | 48.29 | 160.67 | .73 |
| MT 9418 | JDH/LCO | 112.13 | 60.27 | 42.52 | 157.67 | .00 |
| MT 9440 | MT7811/TBR | 111.32 | 61.70 | 45.93 | 163.33 | .00 |
| MT 9316 | TBR/SMN82287//MT7911 | 110.51 | 59.77 | 42.52 | 156.67 | 5.53 |
| MT 9402 | MT7811/MT8030 | 109.71 | 61.67 | 43.44 | 157.67 | .00 |
| MT 9409 | TBR/MT8030 | 109.71 | 60.30 | 40.81 | 159.67 | .00 |
| MT 9439 | MT7811/TBR | 108.90 | 60.80 | 43.57 | 162.33 | .00 |
| MT 9453 | BGH/RDW | 108.90 | 62.53 | 43.04 | 160.00 | .00 |
| MT 9321 | NWN/SMN82118//MT7969 | 108.09 | 60.90 | 39.24 | 160.33 | .00 |
| MT 9431 | MT7811/TBR | 108.09 | 61.70 | 45.93 | 160.33 | .00 |
| MT 9450 | TX7843680/JDH//TAM12 | 105.67 | 60.17 | 42.91 | 160.00 | .00 |
| MT 9221 | MT7811/MT7869//NWN/M | 105.67 | 61.47 | 46.06 | 159.00 | 1.67 |
| MT 9342 | MT7904/NWN//MT7823/M | 104.06 | 60.97 | 42.65 | 161.67 | 35.93 |
| MT 9441 | MT7811/TBR | 103.25 | 59.93 | 44.75 | 160.67 | .00 |
| MT 9434 | MT7811/TBR | 102.45 | 61.93 | 44.23 | 161.33 | .00 |
| MTS92045 | LEW/TBR//RDW | 100.83 | 59.40 | 42.65 | 156.33 | 8.90 |
| MT 9206 | MT693017/MT7829//MT7 | 99.22 | 59.67 | 45.80 | 160.67 | .00 |
| MT 9430 | MT7811/TBR | 99.22 | 61.13 | 45.28 | 161.67 | .00 |
| MT 9318 | TBR/SMN82287//MT7911 | 97.61 | 60.67 | 43.70 | 157.67 | 4.43 |
| MTS92078 | LEW/TBR//RDW | 94.38 | 59.97 | 45.14 | 160.33 | 52.10 |
| MT 9307 | SMN82112/TBR//NS2630 | 94.38 | 59.47 | 47.90 | 161.33 | 27.77 |
| MT 9210 | MT80194/MT7811//MT80 | 92.77 | 60.67 | 40.55 | 161.67 | 10.57 |
| MT 9455 | BGH/TBR | 91.15 | 61.07 | 43.96 | 160.67 | 12.23 |
| MT 9435 | MT7811/TBR | 87.93 | 61.37 | 46.46 | 160.33 | 2.60 |
| CI 17849 | ROCKY | 87.12 | 58.57 | 46.33 | 156.67 | 66.67 |
| | MEAN | 108.59 | 60.80 | 44.01 | 159.66 | 9.13 |
| | LSD (.05) | 17.15 | 1.42 | 1.71 | 1.88 | 18.07 |

Montana State University

# SPRING WHEAT RESPONSE TO SEEDING RATES AND PATTERNS

Project Code: SW POP
Cooperator:

Location: KALISPELL, MT
By: Bob Stougaard

Summary Comments:

This study was established to compare the yield response of the four spring wheat cultivars McNeal, Pondera, Border and Fortuna conducted in a weed free environment. Although significant differences existed between cultivars, the influence of broadcast and drilling systems were quite consistent. Broadcast seeding patterns resulted in more rapid seedling establishment, and greater vegetative growth and leaf area compared to drilled systems. Increased seeding rates enhanced these vegetative parameters regardless of the seeding pattern. However, broadcast patterns most benefited from higher seeding rates. Yields were not affected by seeding rates but were 5 percent greater for the broadcast system compared to the drilled seeding method. This study demonstrated that early season competitiveness and resource utilization can be enhanced by manipulating crop seeding patterns and densities.

# Montana State University
## SPRING WHEAT RESPONSE TO SEEDING RATES AND PATTERNS

Project Code:SW POP
Cooperator :

Location :KALISPELL, MT
By:Bob Stougaard

| Trt No | Treatment Name | SPR WHEAT PLANTS/ 1.46 FT2 5-10-95 | SPR WHEAT 5 PLANTS FWT 5-26-95 | SPR WHEAT 5 PLANTS DWT 5-26-95 | SPR WHEAT HEADING JULIAN | SPR WHEAT PLANT HT CM 8-4-95 | SPR WHEAT LODGE INDEX 8-10-95 |
|---|---|---|---|---|---|---|---|
| 1 | BORDER<br>BROADCAST<br>60 #/A | 28 | 10.0 | 2.0 | 165.8 | 72.5 | 0 |
| 2 | BORDER<br>BROADCAST<br>110 #/A | 43 | 10.0 | 2.0 | 165.3 | 76.3 | 0 |
| 3 | BORDER<br>BROADCAST<br>150 #/A | 61 | 9.1 | 1.8 | 165.0 | 77.5 | 0 |
| 4 | BORDER<br>6" DRILL<br>60 #/A | 28 | 8.9 | 1.8 | 165.5 | 75.0 | 0 |
| 5 | BORDER<br>6" DRILL<br>110 #/A | 40 | 8.3 | 1.1 | 165.0 | 72.5 | 0 |
| 6 | BORDER<br>6" DRILL<br>150 #/A | 53 | 6.5 | 1.2 | 165.3 | 72.5 | 0 |
| 7 | FORTUNA<br>BROADCAST<br>60 #/A | 23 | 9.5 | 1.8 | 169.8 | 90.0 | 15 |
| 8 | FORTUNA<br>BROADCAST<br>110 #/A | 36 | 7.7 | 1.5 | 168.5 | 87.5 | 22 |
| 9 | FORTUNA<br>BROADCAST<br>150 #/A | 47 | 6.5 | 1.3 | 167.3 | 90.0 | 22 |
| 10 | FORTUNA<br>6" DRILL<br>60 #/A | 23 | 5.6 | 1.1 | 168.5 | 90.0 | 10 |
| 11 | FORTUNA<br>6" DRILL<br>110 #/A | 33 | 5.1 | 1.0 | 168.5 | 86.3 | 16 |
| 12 | FORTUNA<br>6" DRILL<br>150 #/A | 47 | 4.1 | 0.8 | 168.0 | 88.8 | 20 |
| 13 | McNEAL<br>BROADCAST<br>60 #/A | 24 | 11.2 | 2.2 | 170.0 | 83.8 | 0 |
| 14 | McNEAL<br>BROADCAST<br>110 #/A | 40 | 9.0 | 1.7 | 170.3 | 82.5 | 0 |

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# Montana State University
## SPRING WHEAT RESPONSE TO SEEDING RATES AND PATTERNS

Project Code:SW POP
Cooperator :

Location :KALISPELL, MT
By:Bob Stougaard

| Trt No | Treatment Name | SPR WHEAT PLANTS/ 1.46 FT2 5-10-95 | SPR WHEAT 5 PLANTS FWT 5-26-95 | SPR WHEAT 5 PLANTS DWT 5-26-95 | SPR WHEAT HEADING JULIAN | SPR WHEAT PLANT HT CM 8-4-95 | SPR WHEAT LODGE INDEX 8-10-95 |
|---|---|---|---|---|---|---|---|
| 15 | McNEAL BROADCAST 150 #/A | 50 | 10.4 | 2.1 | 169.5 | 83.8 | 0 |
| 16 | McNEAL 6" DRILL 60 #/A | 24 | 6.8 | 1.2 | 170.3 | 77.5 | 0 |
| 17 | McNEAL 6" DRILL 110 #/A | 34 | 5.8 | 1.2 | 170.0 | 78.8 | 0 |
| 18 | McNEAL 6" DRILL 150 #/A | 51 | 4.8 | 1.0 | 170.0 | 76.3 | 0 |
| 19 | PONDERA BROADCAST 60 #/A | 26 | 8.1 | 1.6 | 168.3 | 75.0 | 0 |
| 20 | PONDERA BROADCAST 110 #/A | 39 | 7.1 | 1.4 | 167.0 | 73.8 | 0 |
| 21 | PONDERA BROADCAST 150 #/A | 42 | 6.7 | 1.3 | 166.3 | 75.0 | 0 |
| 22 | PONDERA 6" DRILL 60 #/A | 27 | 5.4 | 1.1 | 168.3 | 76.3 | 0 |
| 23 | PONDERA 6" DRILL 110 #/A | 37 | 7.0 | 1.4 | 167.0 | 75.0 | 0 |
| 24 | PONDERA 6" DRILL 150 #/A | 48 | 7.0 | 1.4 | 166.5 | 75.0 | 0 |
| LSD (.05) = | | 8 | 2.7 | 0.6 | 0.9 | 5.6 | 5 |
| Standard Dev.= | | 5.50676 | 1.91993 | .429086 | .619237 | 3.97617 | 3.81622 |
| CV = | | 14.67 | 25.58 | 29.91 | 0.37 | 4.99 | 87.86 |
| Block F | | 2.933 | 4.942 | 8.009 | 2.644 | 6.386 | 1.187 |
| Block Prob(F) | | 0.0395 | 0.0036 | 0.0001 | 0.0560 | 0.0007 | 0.3211 |
| Treatment F | | 15.477 | 4.051 | 3.313 | 35.769 | 9.814 | 17.688 |
| Treatment Prob(F) | | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 |

# Montana State University
## SPRING WHEAT RESPONSE TO SEEDING RATES AND PATTERNS

Project Code:SW POP
Cooperator :

Location :KALISPELL, MT
By:Bob Stougaard

| Trt No | Treatment Nmae | SPWHEAT YIELD BU/A 8-24-95 | SP WHEAT TEST WT LB/BU 8-25-95 | SP WHEAT PROTEIN % | SP WHEAT 1000 KWT LAB CNT 10-31-95 |
|---|---|---|---|---|---|
| 1 | BORDER<br>BROADCAST<br>60 #/A | 50.0 | 61.8 | 13.73 | 40.6 |
| 2 | BORDER<br>BROADCAST<br>110 #/A | 56.5 | 62.5 | 12.70 | 40.6 |
| 3 | BORDER<br>BROADCAST<br>150 #/A | 57.5 | 62.4 | 14.55 | 41.5 |
| 4 | BORDER<br>6" DRILL<br>60 #/A | 61.4 | 61.7 | 12.88 | 39.1 |
| 5 | BORDER<br>6" DRILL<br>110 #/A | 60.2 | 61.5 | 12.83 | 39.6 |
| 6 | BORDER<br>6" DRILL<br>150 #/A | 50.4 | 61.0 | 12.50 | 39.1 |
| 7 | FORTUNA<br>BROADCAST<br>60 #/A | 55.6 | 61.6 | 13.05 | 40.5 |
| 8 | FORTUNA<br>BROADCAST<br>110 #/A | 51.5 | 60.6 | 12.95 | 39.3 |
| 9 | FORTUNA<br>BROADCAST<br>150 #/A | 58.1 | 60.8 | 12.67 | 38.0 |
| 10 | FORTUNA<br>6" DRILL<br>60 #/A | 53.5 | 60.9 | 13.07 | 39.8 |
| 11 | FORTUNA<br>6" DRILL<br>110 #/A | 46.9 | 60.5 | 13.40 | 38.9 |
| 12 | FORTUNA<br>6" DRILL<br>150 #/A | 52.2 | 60.4 | 13.13 | 37.7 |
| 13 | McNEAL<br>BROADCAST<br>60 #/A | 74.3 | 61.5 | 12.20 | 38.3 |
| 14 | McNEAL<br>BROADCAST<br>110 #/A | 63.4 | 61.6 | 11.03 | 37.4 |

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# Montana State University
## SPRING WHEAT RESPONSE TO SEEDING RATES AND PATTERNS

Project Code:SW POP
Cooperator :

Location :KALISPELL, MT
By:Bob Stougaard

| Trt No | Treatment Nmae | SPWHEAT YIELD BU/A 8-24-95 | SP WHEAT TEST WT LB/BU 8-25-95 | SP WHEAT PROTEIN % | SP WHEAT 1000 KWT LAB CNT 10-31-95 |
|---|---|---|---|---|---|
| 15 | McNEAL BROADCAST 150 #/A | 76.7 | 61.3 | 10.88 | 35.8 |
| 16 | McNEAL 6" DRILL 60 #/A | 60.3 | 61.1 | 10.95 | 36.5 |
| 17 | McNEAL 6" DRILL 110 #/A | 61.3 | 60.9 | 11.40 | 36.2 |
| 18 | McNEAL 6" DRILL 150 #/A | 61.9 | 60.7 | 11.20 | 34.8 |
| 19 | PONDERA BROADCAST 60 #/A | 58.3 | 61.5 | 12.48 | 32.8 |
| 20 | PONDERA BROADCAST 110 #/A | 53.6 | 61.5 | 12.30 | 32.8 |
| 21 | PONDERA BROADCAST 150 #/A | 59.8 | 61.4 | 12.48 | 31.5 |
| 22 | PONDERA 6" DRILL 60 #/A | 58.7 | 61.0 | 12.17 | 31.3 |
| 23 | PONDERA 6" DRILL 110 #/A | 59.3 | 60.9 | 11.92 | 31.7 |
| 24 | PONDERA 6" DRILL 150 #/A | 52.5 | 61.3 | 11.72 | 31.7 |
| LSD (.05) = | | 11.8 | 1.0 | 1.30 | 1.8 |
| Standard Dev.= | | 8.33290 | .690215 | .921157 | 1.25343 |
| CV = | | 14.35 | 1.13 | 7.41 | 3.40 |
| Block F | | 1.941 | 1.096 | 1.553 | 5.880 |
| Block Prob(F) | | 0.1311 | 0.3566 | 0.2100 | 0.0012 |
| Treatment F | | 2.752 | 2.506 | 3.932 | 28.134 |
| Treatment Prob(F) | | 0.0006 | 0.0018 | 0.0001 | 0.0001 |

# Montana State University
## SPRING WHEAT RESPONSE TO SEEDING RATES AND PATTERNS

Project Code:SW POP
Cooperator :

Location :KALISPELL, MT
By:Bob Stougaard

| Trt No | Treatment Name | SP WHEAT PLANTS/ 2 SQ FT 8-24-95 | SP WHEAT GM PLTWT 2 SQ FT 8-24-95 STR+HEAD | SP WHEAT NO.HEADS 2 SQ FT 8-24-95 | SP WHEAT GM GRAIN 2 SQ FT 8-24-95 | SP WHEAT GM STRAW 2 SQ FT 8-24-95 |
|---|---|---|---|---|---|---|
| 1 | BORDER<br>BROADCAST<br>60 #/A | 30.3 | 207.80 | 107.5 | 96.70 | 111.1 |
| 2 | BORDER<br>BROADCAST<br>110 #/A | 40.3 | 191.32 | 110.0 | 87.82 | 103.5 |
| 3 | BORDER<br>BROADCAST<br>150 #/A | 60.3 | 230.23 | 135.3 | 99.18 | 131.1 |
| 4 | BORDER<br>6" DRILL<br>60 #/A | 38.5 | 183.08 | 101.0 | 84.00 | 99.1 |
| 5 | BORDER<br>6" DRILL<br>110 #/A | 49.3 | 186.00 | 116.0 | 80.38 | 105.6 |
| 6 | BORDER<br>6" DRILL<br>150 #/A | 60.5 | 167.95 | 129.0 | 71.65 | 96.3 |
| 7 | FORTUNA<br>BROADCAST<br>60 #/A | 26.5 | 191.13 | 105.3 | 86.50 | 104.6 |
| 8 | FORTUNA<br>BROADCAST<br>110 #/A | 29.8 | 196.25 | 113.3 | 89.18 | 107.1 |
| 9 | FORTUNA<br>BROADCAST<br>150 #/A | 48.5 | 202.17 | 140.3 | 87.38 | 114.8 |
| 10 | FORTUNA<br>6" DRILL<br>60 #/A | 26.5 | 173.60 | 93.3 | 79.65 | 93.9 |
| 11 | FORTUNA<br>6" DRILL<br>110 #/A | 40.3 | 164.43 | 125.5 | 71.70 | 92.7 |
| 12 | FORTUNA<br>6" DRILL<br>150 #/A | 46.8 | 188.43 | 121.3 | 81.07 | 107.4 |
| 13 | McNEAL<br>BROADCAST<br>60 #/A | 31.5 | 278.95 | 115.8 | 137.78 | 141.2 |
| 14 | McNEAL<br>BROADCAST<br>110 #/A | 37.0 | 195.40 | 93.0 | 91.48 | 103.9 |

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# Montana State University
## SPRING WHEAT RESPONSE TO SEEDING RATES AND PATTERNS

Project Code:SW POP
Cooperator :

Location :KALISPELL, MT
By:Bob Stougaard

| Trt No | Treatment Name | SP WHEAT PLANTS/ 2 SQ FT 8-24-95 | SP WHEAT GM PLTWT 2 SQ FT 8-24-95 STR+HEAD | SP WHEAT NO.HEADS 2 SQ FT 8-24-95 | SP WHEAT GM GRAIN 2 SQ FT 8-24-95 | SP WHEAT GM STRAW 2 SQ FT 8-24-95 |
|---|---|---|---|---|---|---|
| 15 | McNEAL BROADCAST 150 #/A | 71.8 | 278.63 | 150.3 | 126.40 | 152.2 |
| 16 | McNEAL 6" DRILL 60 #/A | 38.8 | 181.50 | 94.0 | 85.90 | 95.6 |
| 17 | McNEAL 6" DRILL 110 #/A | 51.8 | 188.67 | 95.8 | 89.82 | 98.9 |
| 18 | McNEAL 6" DRILL 150 #/A | 64.5 | 204.68 | 105.0 | 92.10 | 112.6 |
| 19 | PONDERA BROADCAST 60 #/A | 40.0 | 240.55 | 135.3 | 111.35 | 129.2 |
| 20 | PONDERA BROADCAST 110 #/A | 41.3 | 188.98 | 116.8 | 89.25 | 99.7 |
| 21 | PONDERA BROADCAST 150 #/A | 48.3 | 224.05 | 159.3 | 99.98 | 124.1 |
| 22 | PONDERA 6" DRILL 60 #/A | 39.5 | 183.32 | 105.5 | 82.30 | 101.0 |
| 23 | PONDERA 6" DRILL 110 #/A | 49.5 | 198.65 | 123.3 | 87.35 | 111.3 |
| 24 | PONDERA 6" DRILL 150 #/A | 61.0 | 177.70 | 118.0 | 76.13 | 101.6 |
| LSD (.05) = | | 15.3 | 56.47 | 41.0 | 26.01 | 31.4 |
| Standard Dev.= | | 10.7991 | 39.9283 | 28.9874 | 18.3885 | 22.1775 |
| CV = | | 24.18 | 19.87 | 24.76 | 20.20 | 20.17 |
| Block F | | 1.993 | 2.559 | 1.289 | 2.728 | 2.304 |
| Block Prob(F) | | 0.1231 | 0.0621 | 0.2850 | 0.0506 | 0.0845 |
| Treatment F | | 5.232 | 2.267 | 1.515 | 2.860 | 1.907 |
| Treatment Prob(F) | | 0.0001 | 0.0048 | 0.0953 | 0.0004 | 0.0211 |

# Montana State University
## SPRING WHEAT RESPONSE TO SEEDING RATES AND PATTERNS

Project Code: SW POP
Cooperator:

Location: KALISPELL, MT
By: Bob Stougaard

| Trt No | Treatment Name | SP WHEAT LAI 5-25-95 | SP WHEAT LAI 6-2-95 | SP WHEAT LAI 6-12-95 | SP WHEAT LAI 6-21-95 |
|---|---|---|---|---|---|
| 1 | BORDER<br>BROADCAST<br>60 #/A | 1.085 | 1.738 | 2.030 | 2.523 |
| 2 | BORDER<br>BROADCAST<br>110 #/A | 1.795 | 2.385 | 2.535 | 3.148 |
| 3 | BORDER<br>BROADCAST<br>150 #/A | 1.593 | 2.440 | 2.320 | 3.713 |
| 4 | BORDER<br>6" DRILL<br>60 #/A | 1.165 | 1.668 | 1.763 | 2.755 |
| 5 | BORDER<br>6" DRILL<br>110 #/A | 1.203 | 1.798 | 1.950 | 2.543 |
| 6 | BORDER<br>6" DRILL<br>150 #/A | 1.380 | 1.590 | 1.875 | 2.630 |
| 7 | FORTUNA<br>BROADCAST<br>60 #/A | 0.688 | 1.290 | 2.178 | 3.255 |
| 8 | FORTUNA<br>BROADCAST<br>110 #/A | 0.968 | 1.373 | 1.883 | 3.050 |
| 9 | FORTUNA<br>BROADCAST<br>150 #/A | 1.448 | 1.903 | 2.490 | 3.453 |
| 10 | FORTUNA<br>6" DRILL<br>60 #/A | 0.588 | 1.310 | 1.468 | 2.333 |
| 11 | FORTUNA<br>6" DRILL<br>110 #/A | 0.820 | 1.398 | 1.580 | 2.328 |
| 12 | FORTUNA<br>6" DRILL<br>150 #/A | 0.905 | 1.428 | 1.693 | 2.293 |
| 13 | McNEAL<br>BROADCAST<br>60 #/A | 0.933 | 1.758 | 2.530 | 3.613 |
| 14 | McNEAL<br>BROADCAST<br>110 #/A | 1.555 | 2.043 | 2.578 | 3.725 |

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Montana State University

# SPRING WHEAT RESPONSE TO SEEDING RATES AND PATTERNS

Project Code: SW POP
Cooperator:

Location: KALISPELL, MT
By: Bob Stougaard

| Trt No | Treatment Name | SP WHEAT LAI 5-25-95 | SP WHEAT LAI 6-2-95 | SP WHEAT LAI 6-12-95 | SP WHEAT LAI 6-21-95 |
|---|---|---|---|---|---|
| 15 | McNEAL<br>BROADCAST<br>150 #/A | 2.308 | 2.723 | 3.077 | 4.025 |
| 16 | McNEAL<br>6" DRILL<br>60 #/A | 0.725 | 1.360 | 1.693 | 2.373 |
| 17 | McNEAL<br>6" DRILL<br>110 #/A | 1.063 | 1.405 | 1.795 | 2.403 |
| 18 | McNEAL<br>6" DRILL<br>150 #/A | 1.298 | 1.625 | 2.190 | 2.883 |
| 19 | PONDERA<br>BROADCAST<br>60 #/A | 1.010 | 1.630 | 2.148 | 3.108 |
| 20 | PONDERA<br>BROADCAST<br>110 #/A | 1.343 | 1.610 | 2.238 | 2.815 |
| 21 | PONDERA<br>BROADCAST<br>150 #/A | 1.755 | 1.998 | 2.238 | 3.280 |
| 22 | PONDERA<br>6" DRILL<br>60 #/A | 0.663 | 1.295 | 1.403 | 2.273 |
| 23 | PONDERA<br>6" DRILL<br>110 #/A | 0.978 | 1.420 | 1.640 | 2.253 |
| 24 | PONDERA<br>6" DRILL<br>150 #/A | 1.010 | 1.465 | 1.495 | 2.283 |
| LSD (.05) = | | 0.341 | 0.434 | 0.511 | 0.657 |
| Standard Dev.= | | .240867 | .306687 | 0.36145 | .464465 |
| CV = | | 20.45 | 18.11 | 17.78 | 16.14 |
| Block F | | 17.228 | 3.342 | 12.329 | 1.336 |
| Block Prob(F) | | 0.0001 | 0.0241 | 0.0001 | 0.2699 |
| Treatment F | | 11.826 | 6.375 | 5.461 | 5.574 |
| Treatment Prob(F) | | 0.0001 | 0.0001 | 0.0001 | 0.0001 |

# Montana State University
# SPRING WHEAT RESPONSE TO SEEDING RATES AND PATTERNS

Project Code:SW POP
Cooperator :

Location :KALISPELL, MT
By:Bob Stougaard

| Trt No | Treatment Name | SP WHEAT %LP 5-25-95 | SP WHEAT %LP 6-2-95 | SP WHEAT %LP 6-12-95 | SP WHEAT %LP 6-21-95 |
|---|---|---|---|---|---|
| 1 | BORDER<br>BROADCAST<br>60 #/A | 0.4580 | 0.3103 | 0.2145 | 0.1185 |
| 2 | BORDER<br>BROADCAST<br>110 #/A | 0.2723 | 0.1720 | 0.1403 | 0.0925 |
| 3 | BORDER<br>BROADCAST<br>150 #/A | 0.3080 | 0.1715 | 0.1550 | 0.0545 |
| 4 | BORDER<br>6" DRILL<br>60 #/A | 0.4298 | 0.2875 | 0.2560 | 0.1183 |
| 5 | BORDER<br>6" DRILL<br>110 #/A | 0.4230 | 0.2620 | 0.2263 | 0.1568 |
| 6 | BORDER<br>6" DRILL<br>150 #/A | 0.3685 | 0.3078 | 0.1926 | 0.1495 |
| 7 | FORTUNA<br>BROADCAST<br>60 #/A | 0.6065 | 0.4150 | 0.1958 | 0.0803 |
| 8 | FORTUNA<br>BROADCAST<br>110 #/A | 0.5058 | 0.3833 | 0.2468 | 0.0973 |
| 9 | FORTUNA<br>BROADCAST<br>150 #/A | 0.3513 | 0.2678 | 0.1645 | 0.0753 |
| 10 | FORTUNA<br>6" DRILL<br>60 #/A | 0.6418 | 0.3598 | 0.2821 | 0.1940 |
| 11 | FORTUNA<br>6" DRILL<br>110 #/A | 0.5470 | 0.3600 | 0.2918 | 0.1948 |
| 12 | FORTUNA<br>6" DRILL<br>150 #/A | 0.5213 | 0.3495 | 0.2825 | 0.1860 |
| 13 | McNEAL<br>BROADCAST<br>60 #/A | 0.5148 | 0.2735 | 0.1590 | 0.0588 |
| 14 | McNEAL<br>BROADCAST<br>110 #/A | 0.3215 | 0.1965 | 0.1433 | 0.0560 |

(Cont'd onnext page)

# Montana State University
## SPRING WHEAT RESPONSE TO SEEDING RATES AND PATTERNS

Project Code:SW POP
Cooperator :

Location :KALISPELL, MT
By:Bob Stougaard

| Trt No | Treatment Name | SP WHEAT %LP 5-25-95 | SP WHEAT %LP 6-2-95 | SP WHEAT %LP 6-12-95 | SP WHEAT %LP 6-21-95 |
|---|---|---|---|---|---|
| 15 | McNEAL BROADCAST 150 #/A | 0.1840 | 0.1488 | 0.1115 | 0.0500 |
| 16 | McNEAL 6" DRILL 60 #/A | 0.6025 | 0.3613 | 0.2730 | 0.1788 |
| 17 | McNEAL 6" DRILL 110 #/A | 0.4468 | 0.3715 | 0.2643 | 0.1705 |
| 18 | McNEAL 6" DRILL 150 #/A | 0.3888 | 0.2995 | 0.2093 | 0.1270 |
| 19 | PONDERA BROADCAST 60 #/A | 0.4875 | 0.3305 | 0.2040 | 0.0935 |
| 20 | PONDERA BROADCAST 110 #/A | 0.3635 | 0.3298 | 0.1775 | 0.1188 |
| 21 | PONDERA BROADCAST 150 #/A | 0.2818 | 0.2178 | 0.1850 | 0.0783 |
| 22 | PONDERA 6" DRILL 60 #/A | 0.6245 | 0.3910 | 0.3079 | 0.1868 |
| 23 | PONDERA 6" DRILL 110 #/A | 0.4765 | 0.3518 | 0.2668 | 0.1993 |
| 24 | PONDERA 6" DRILL 150 #/A | 0.4993 | 0.3320 | 0.3012 | 0.1933 |
| LSD (.05) = | | 0.1120 | 0.0954 | 0.0801 | 0.0680 |
| Standard Dev.= | | .079216 | .067433 | .056638 | .048113 |
| CV = | | 17.89 | 22.32 | 25.89 | 38.13 |
| Block F | | 17.526 | 1.431 | 12.561 | 1.204 |
| Block Prob(F) | | 0.0001 | 0.2414 | 0.0001 | 0.3148 |
| Treatment F | | 9.317 | 4.937 | 4.122 | 4.750 |
| Treatment Prob(F) | | 0.0001 | 0.0001 | 0.0001 | 0.0001 |

Montana State University

# SPRING WHEAT RESPONSE TO SEEDING RATES AND PATTERNS

Project Code: SW POP
Cooperator:

Location: KALISPELL, MT
By: Bob Stougaard

## Site Description

Crop: Spring Wheat  Variety: Various  Planting Date: 4-20-95
Planting Method: Brdcst or Drill  Rate, Unit: 60,110,150 lb/a  Depth, Unit: 1.5"
Perennial Age, Unit:  ,  Row Spacing, Unit: 6" or broadcast
Soil Temp., Unit:  ,  Soil Moisture:  Emergence Date: 4-28-95
Plot Width/Area, Unit: 10  , FT  Plot Length, Unit: 15  , FT  Reps: 4
Site Type:  Seed Bed Desc.:  Ground Cover:
Tillage Type:  Study Design:
Field Preparation/Plot Maintenance: Fall plow and disc. Spring cultivation and packing. Drill seeding was accomplished using a research plot, double-disk drill. Broadcast seeding was completed by hand dissemination and harrowing twice in opposite directions.

## Soil Description

Texture: Silt Loam  % OM: 1.3  % Sand: 50  % Silt: 40  % Clay: 10
pH: 7.9  CEC:  Soil Name: Creston Silt Loam  Fertility Level:

## Moisture Conditions

Overall Moisture Conditions: Good spring moisture with abundant June precip.

# Montana State University
# SPRING WHEAT ROW SPACING STUDY

Project Code:ROWSPACE
Cooperator :

Location :KALISPELL, MT
By:Bob Stougaard

Summary Comments:

Four spring cultivars were established at a standard seeding rate of 60 lb/A. The difference being that 12 and 6 inch row spacing were compared. Early season vegetation characteristics were enhanced under the more competitive 6 inch system. Yield differences were very pronounced, with the 6 inch row spacing providing on average a 14% yield increase. However, the amount of yield increases varied from 9 to 15% depending upon the cultivar. The yield enhancement with 6 inch row spacings is due to a more uniform distribution of the seed, resulting in less crop to crop competition within the row. Although the relative yield ranking of cultivars did not vary between row spacings, the order of magnitude did differ. This resulted in a regrouping of the cultivars in terms of relative yield potential and ultimately would affect which materials get recommended. In the future we will be growing all our variety evaluations with 6 inch row spacings.

# Montana State University
## SPRING WHEAT ROW SPACING STUDY

Project Code:ROWSPACE  Location :KALISPELL, MT
Cooperator :  By:Bob Stougaard

| Trt No | Treatment Name | SP WHEAT YIELD BU/A 8-3-95 | SP WHEAT T WT LB/BU 8-3-95 | SP WHEAT HT.(IN) 8-1-95 | SP WHEAT HEADING DATE | SP WHT % LAI 6-13-95 | SP WHT % LP 6-13-95 | SP WHT % MTA 6-13-95 |
|---|---|---|---|---|---|---|---|---|
| 1 | BORDER SIX INCHES | 99.0 | 60.92 | 33.0 | 170.5 | 2.225 | 0.1770 | 49.8 |
| 2 | FORTUNA SIX INCHES | 92.7 | 59.25 | 41.3 | 177.3 | 2.258 | 0.1713 | 51.3 |
| 3 | PONDERA SIX INCHES | 99.4 | 60.92 | 34.0 | 175.0 | 2.338 | 0.1750 | 55.3 |
| 4 | McNEAL SIX INCHES | 110.1 | 61.27 | 34.9 | 176.5 | 2.500 | 0.1418 | 49.8 |
| 5 | BORDER TWELVE INCHES | 85.6 | 61.03 | 33.5 | 170.0 | 1.685 | 0.2535 | 47.0 |
| 6 | FORTUNA TWELVE INCHES | 79.1 | 59.97 | 40.9 | 177.0 | 1.788 | 0.2433 | 49.8 |
| 7 | PONDERA TWELVE INCHES | 90.4 | 61.63 | 33.5 | 174.5 | 1.843 | 0.2300 | 51.8 |
| 8 | McNEAL TWELVE INCHES | 95.8 | 62.45 | 35.4 | 176.5 | 2.183 | 0.1838 | 50.0 |
| LSD (.05) = | | 10.2 | 2.05 | 1.5 | 1.6 | 0.282 | 0.0499 | 8.8 |
| Standard Dev.= | | 6.95178 | 1.39581 | .986593 | 1.07252 | .191972 | .033898 | 6.00843 |
| CV = | | 7.39 | 2.29 | 2.76 | 0.61 | 9.13 | 17.21 | 11.88 |
| Block F | | 0.335 | 0.635 | 4.657 | 0.752 | 0.842 | 0.689 | 0.428 |
| Block Prob(F) | | 0.8002 | 0.6007 | 0.0120 | 0.5336 | 0.4863 | 0.5687 | 0.7349 |
| Treatment F | | 7.404 | 1.955 | 46.176 | 28.871 | 9.300 | 5.568 | 0.615 |
| Treatment Prob(F) | | 0.0002 | 0.1109 | 0.0001 | 0.0001 | 0.0001 | 0.0010 | 0.7376 |

# Montana State University
# SPRING WHEAT ROW SPACING STUDY

Project Code:ROWSPACE
Cooperator :
Location :KALISPELL, MT
By:Bob Stougaard

## Site Description

Crop: SPRING WHEAT Variety: VARIOUS Planting Date: 4-18-95
Planting Method: Research Rate, Unit: 60 , lb/A Depth, Unit: 1.5 , "
Perennial Age, Unit: , Row Spacing, Unit: 6 12, "
Soil Temp., Unit: , Soil Moisture: Emergence Date: 5-1-95
Plot Width/Area, Unit: 4 , FT Plot Length, Unit: 10 , FT Reps: 4
Site Type: Seed Bed Desc.: Ground Cover:
Tillage Type: Study Design:
Field Preparation/Plot Maintenance: Fall plow, spring disc and cultivation. Vibra-shank and culti-pack prior to seeding.

## Soil Description

Texture: Silt Loam % OM: 5.6 % Sand: 40 % Silt: 50 % Clay: 10
pH: 7.8 CEC: Soil Name: Creston S L Fertility Level:

## Moisture Conditions

Overall Moisture Conditions: Good moisture in spring, abundant June precip.

**YEAR/PROJECT: 1995/758** **Western Regional Dry Pea & Lentil Yield Trials - Dryland**

PERSONNEL: Leon Welty, NWARC
Louise Prestbye, NWARC
In cooperation with Dr. Fred Muehlbauer, WSU

Twelve dry pea and lentil varieties were seeded on April 14, 1995. Excellent stands were obtained. High moisture conditions resulted in excessive vegetative growth with poor pod and seed development. Mean seed yield for the peas was 1401 lbs/acre and for the lentils only 831 lbs/acre. The highest yielding pea varieties were 'PS110374', 'PS110028', and 'Umatilla' with over 1500 lbs/acre. Highest yielding lentil varieties were 'Eston' and 'Palouse' with over 1000 lbs/acre.

The lentil varieties were differentially affected by Sclerotinea mold. All cultivars were pulled on August 14 although none had fully matured. 'Crimson', 'LC260520', and 'Pardina' were most heavily infested, with at least 65% of the plot showing symptoms. 'Eston', 'Laird', and 'LC060144' had less than 50% of their plot areas infested.

## WESTERN REGIONAL LENTIL YIELD TRIAL
## KALISPELL, MT - 1995

| VARIETY | STAND | FIRST FLOWER | SCLEROTINEA | HEIGHT | SEED SIZE | YIELD |
|---|---|---|---|---|---|---|
| | % | day[1] | % [2] | inches | #/lb | lbs/acre |
| Eston | 89 | 64 | 40 | 21.8 | 12820 | 1168 |
| Palouse | 93 | 60 | 58 | 23.0 | 6473 | 1018 |
| LC960254 | 94 | 60 | 55 | 22.3 | 6792 | 967 |
| Crimson | 88 | 63 | 65 | 19.5 | 12130 | 942 |
| LC260520 | 90 | 60 | 75 | 23.3 | 7387 | 854 |
| LC160008 | 91 | 58 | 55 | 22.0 | 8037 | 805 |
| Brewer | 94 | 58 | 50 | 21.0 | 7766 | 802 |
| Redchief | 93 | 59 | 55 | 24.0 | 8694 | 801 |
| Pardina | 90 | 61 | 69 | 20.3 | 11810 | 732 |
| Laird | 94 | 68 | 43 | 25.8 | 7350 | 715 |
| LC060143 | 93 | 59 | 58 | 25.3 | 7396 | 591 |
| LC060144 | 95 | 59 | 40 | 24.3 | 7446 | 580 |
| mean | 92 | 61 | 55 | 22.7 | 8675 | 831 |
| LSD(0.05) | NS | 1 | 24 | 4.2 | 907 | 153 |
| | | | *(P=0.10)* | *(P=0.10)* | | |
| CV(s/mean | 4.0 | 1.0 | 30.0 | 12.9 | 7.3 | 12.8 |

*[1] days after seeding*
*[2] % of plot showing symptoms*

Seeding date: 4/14/95
Harvest area = 40 sqft
Irrigation: none
Fertilizer: none
Weed control: by hand
Growing season precipitation (Apr 95-Aug 95): 12.70", avg.9.86"
Crop year precipitation (Sep 94 - Aug 95): 22.64", avg.19.71"
Last spring frost: 5/27/95, 32 degrees F
First fall frost: 9/21/95, 22 degrees F
Avg. frost free period: 112 days
Soil series: Creston Silt Loam
Elevation: 2,940 ft.

*All cultivars pulled 8/14 because of disease.*
*High moisture conditions resulted in excessive vegetative growth and poor pod and seed development.*

## WESTERN REGIONAL DRY PEA YIELD TRIAL
## KALISPELL, MT - 1995

| VARIETY | STAND | FIRST FLOWER | NODES to 1st FLOWER | MATURITY | HEIGHT | SEED SIZE | YIELD |
|---|---|---|---|---|---|---|---|
| | % | day [1] | # | day [1] | inches | #/lb | lbs/acre |
| PS110374 | 99 | 61 | 12 | 110 | 52.3 | 2021 | 1792 |
| PS110028 | 98 | 59 | 11 | 111 | 51.8 | 2202 | 1632 |
| Umatilla | 98 | 61 | 12 | 111 | 56.8 | 1991 | 1535 |
| Alaska 81 | 96 | 56 | 9 | 114 | 55.3 | 2455 | 1495 |
| Trapper | 94 | 69 | 13 | 116 | 54.5 | 3581 | 1480 |
| Columbian | 98 | 49 | 7 | 109 | 55.8 | 2440 | 1448 |
| PS810106 | 96 | 54 | 9 | 112 | 58.0 | 2144 | 1439 |
| Rex | 96 | 63 | 12 | 115 | 42.8 | 1981 | 1289 |
| Latah | 95 | 59 | 10 | 114 | 62.0 | 2435 | 1253 |
| Radley | 96 | 64 | 15 | 117 | 39.5 | 2822 | 1216 |
| PS010603 | 98 | 62 | 12 | 109 | 59.0 | 2061 | 1175 |
| PS210308 | 95 | 55 | 8 | 112 | 53.5 | 1963 | 1061 |
| mean | 96 | 59 | 11 | 112 | 53.4 | 2341 | 1401 |
| LSD(0.05) | NS | 1 | 1 | 4 | 6.3 | 213 | 276 |
| CV(s/mean) | | 1.6 | 8.6 | 2 | 12.1 | 6 | 14 |

[1] *days after seeding*

Seeding date: 4/14/95
Harvest area: 40 sqft
Irrigation: none
Fertilizer: none
Weed control: by hand
Growing season precipitation (Apr 95-Aug 95): 12.70", avg.9.86"
Crop year precipitation (Sept 94 - Aug 95): 22.64", avg.19.71"
Last spring frost: 5/27/95, 32 degrees F
First fall frost: 9/21/95, 22 degrees F
Avg. frost free period: 112 days
Soil series: Creston Silt Loam
Elevation: 2,940 ft.

*High moisture conditions resulted in excessive vegetative growth and poor pod and seed development.*

**YEAR/PROJECT: 1995/758** **Spring Canola Variety Trial - Dryland**

PERSONNEL: Leon Welty, NWARC
Louise Prestbye, NWARC
In cooperation with Dr. Jack Brown, Univ. of Idaho

Twenty-five varieties were evaluated for the 1995 PNW Canola Variety Trial and eight for Svalof Weibull Seed Ltd. The two nurseries were seeded next to each other in separate RCB designs with four replicates on April 25, 1995. Maturation time ranged from 103 to 118 days after seeding. Three varieties, which were hybrids of winter and spring types, never reached maturity and were still flowering after 126 days. Many plants showed Sclerotinea symptoms, due to the wet, cool season. Four varieties produced over 4000 lbs/acre of seed: 'Hyola.X045' and 'Hyola.401' from the PNW entries and 'Garrison' and 'Bullet' from Svalof. Mean yields were 2792 lbs/acre for PNW and 2961 lbs/acre for Svalof.

# 1995 PNW CANOLA VARIETY TRIAL - KALISPELL, MONTANA

| VARIETY | EMERGENCE | VIGOR 1/ | HEIGHT | MATURITY | YIELD |
|---|---|---|---|---|---|
| | *days after seeding* | *(0-5)* | *inches* | *days after seeding* | *lbs/acre* |
| Hyola.X045 | 9.5 | 4.0 | 56.6 | 112 | 4416 |
| Hyola.401 | 9.5 | 5.0 | 55.0 | 118 | 4240 |
| Star | 10.5 | 3.8 | 61.0 | 112 | 3817 |
| Helios | 10.3 | 4.3 | 68.5 | 118 | 3753 |
| Drakkar | 9.5 | 3.3 | 61.0 | 114 | 3702 |
| HN.9462 | 9.3 | 3.9 | 69.0 | 112 | 3652 |
| UI92.SN.80.6 | 9.0 | 3.6 | 60.0 | 118 | 3417 |
| UI92.SN.88.1 | 10.8 | 2.5 | 59.8 | 113 | 3414 |
| HN.9465 | 9.0 | 3.7 | 64.0 | 112 | 3261 |
| Profit | 10.3 | 3.3 | 61.3 | 113 | 3057 |
| Legend | 10.8 | 3.3 | 54.0 | 106 | 2983 |
| HN.9466 | 9.5 | 4.6 | 56.6 | 111 | 2933 |
| Frontier | 9.5 | 5.0 | 55.9 | 106 | 2930 |
| HN.9452 | 9.0 | 4.7 | 64.3 | 111 | 2900 |
| HN.9464 | 9.8 | 3.3 | 65.1 | 110 | 2766 |
| HN.9460 | 9.5 | 3.3 | 63.1 | 111 | 2744 |
| Bounty | 10.0 | 3.3 | 62.3 | 108 | 2698 |
| HYSIN.110 | 8.0 | 4.7 | 49.3 | 104 | 2403 |
| Springfield | 9.3 | 4.3 | 52.0 | 107 | 2398 |
| Westar | 14.5 | 1.5 | 57.5 | 107 | 2059 |
| Tobin | 8.5 | 4.8 | 50.3 | 105 | 1591 |
| Goldrush | 9.0 | 4.5 | 43.8 | 104 | 1411 |
| HN.9331 | 10.0 | 4.3 | 76.5 | 127 | 1359 |
| HN.9332 | 9.3 | 4.5 | 70.0 | 126 | 1047 |
| HN.090.91 | 8.8 | 4.5 | 71.0 | 127 | 838 |
| mean | 9.7 | 3.9 | 60.3 | 112 | 2792 |
| LSD (0.05) | 0.7 | 0.8 | 7.7 | 5 | 741 |

*1/*
*5 =high vigor; 0=dead*

*Location: Northwestern Agricultural Research Center, Kalispell, Montana, USA*
*Latitude: 48 degrees N; Longitude: 114 degrees W*
*Crop year precipitation (Sept. 1994 - Aug. 1995): 22.6 inches*
*Season precipitation (Apr.-Aug. 1995): 12.7 inches*
*Last frost in spring: May 27 (32 degrees F)*
*Maximum summer temperature: 88 degrees F (Aug. 6)*
*Irrigation: none*
*Fertilizer: none*
*Weed control: by hand*
*Previous crop: fallow*
*Seeding date: 4/25/95*
*Seeding rate: 7 lbs/acre*
*Design: RCB with 4 replicates*
*Plots: four 8 ft rows spaced 12 in apart; 18 in between plots*
*Harvest area: 39 sq ft*

# 1995 CANOLA VARIETY TRIAL - KALISPELL, MONTANA

Entries submitted by Svalof Weibull Seed Ltd.

| VARIETY | EMERGENCE | VIGOR [1/] | HEIGHT | MATURITY | YIELD |
|---|---|---|---|---|---|
| | *days after seeding* | *(0-5)* | *inches* | *days after seeding* | *lbs/acre* |
| Garrison | 9.0 | 4.3 | 63.7 | 112 | 4260 |
| Bullet | 9.0 | 3.4 | 54.2 | 106 | 3688 |
| Battalion | 10.0 | 4.5 | 61.8 | 114 | 3352 |
| Legacy | 9.0 | 4.1 | 52.8 | 107 | 3345 |
| Crusher | 11.0 | 2.5 | 57.8 | 112 | 3171 |
| Princeton | 11.0 | 2.8 | 61.1 | 110 | 2888 |
| Horizon | 9.0 | 4.8 | 45.3 | 104 | 1651 |
| Maverick | 8.0 | 4.5 | 45.5 | 103 | 1336 |
| mean | 9.5 | 3.9 | 55.3 | 108 | 2961 |
| LSD (0.05) | 0.6 | 0.7 | 5.5 | 5 | 745 |

*1/*
*5 =high vigor; 0=dead*

*Location: Northwestern Agricultural Research Center, Kalispell, Montana, USA*
*Latitude: 48 degrees N; Longitude: 114 degrees W*
*Crop year precipitation (Sept. 1994 - Aug. 1995): 22.6 inches*
*Season precipitation (Apr.-Aug. 1995): 12.7 inches*
*Last frost in spring: May 27 (32 degrees F)*
*Maximum summer temperature: 88 degrees F (Aug. 6)*
*Irrigation: none*
*Fertilizer: 80 lbs N + 40 lbs P2O5 / acre on 4/26/95*
*Weed control: by hand*
*Previous crop: fallow*
*Seeding date: 4/25/95*
*Seeding rate: 7 lbs/acre*
*Design: RCB with 4 replicates*
*Plots: four 8 ft rows spaced 12 in apart; 18 in between plots*
*Harvest area: 39 sq ft*

**YEAR/PROJECT: 1995/758** **Peppermint Double Cut Study: 1994-1995**

**PERSONNEL:** Leon E. Welty, NWARC
Louise S. Prestbye, NWARC

At the Northwestern Agricultural Research Center at Kalispell, MT in spring of 1994, plots 10' wide by 15' long were delineated within a third year stand of meristem derived Black Mitcham peppermint (root source - Glacier Mint). Four replicates of 12 plots representing 11 double cut harvests and a single cut control were assigned in a randomized complete block design. In the fall of 1994, the area was fertilized with 17 lbs N, 78 lbs $P_2O_5$, and 120 lbs $K_2O$/a. In 1995, a total of 310 lbs N/a was applied. Sinbar was applied at 1.0 lb AI/a on May 2. Orthene, at 1.0 lb AI/a, was sprayed on June 29 for cutworm control.

Stolons were dug from a 15-inch square area in each plot on May 16, 1995 to determine how spring stolon mass was affected by 1994 double cutting. The entire nursery was harvested once on August 3, 1995 at full bud. Ten to 17 pounds of green hay was air dried and later distilled. Samples were sent to A.M. Todd for quality analyses.

In 1994 all double cut treatments produced more oil than a single harvest (49 lbs/a). Harvesting on 7/12 and again on 9/1 produced the most oil of all double cuts tested. There were significant differences in 1995 spring stolon weight among 1994 cutting treatments. The most vigorous stolons, judging by total fresh weight, were found in the plots harvested 6/28 + 9/1. For all first cutting dates, an early second cutting (9/1) resulted in more stolon mass than a late second cutting (9/27). We expected that stolon mass would be greater for the later second harvest date because these plots had an additional 26 days to photosynthesize and replenish root reserves. Stolon vigor/growth may not be related to carbohydrate root replenishment. Two different systems may be involved. This has some implications for stolon/root production practices. Research is being designed to examine these factors in 1996.

Although there were observable differences in stolon mass, there were no significant differences in hay yield, oil content, or oil yield among the different 1994 double cut treatments or the single cut control when the plots were cut once in 1995. Oil yield averaged only 39.9 lbs/a. Oil yields from our experimental still are about 70% of commercial distillation.

Oil quality component analyses showed no significant differences among 1994 double cut treatments or the single cut control. Menthol level was 48%, which is acceptable for prime grade peppermint oil.

The important result of this study was that double cutting had no deleterious effect on the subsequent year's oil yield compared to a single cutting. It must be noted that we had about 2 inches of snow cover during the cold weather. Also, we did not have the wind that was experienced in other parts of the Flathead Valley. There was also no obvious relationship between stolon mass in the spring and crop performance in the growing season, which refutes the assumption that "vigorous" looking stolons predict crop performance.

**Performance of meristem Black Mitcham in 1995 as affected by 1994 double cutting.**

| 1994 HARVESTS | | | 1995 Data [3] | | |
|---|---|---|---|---|---|
| First Cutting | Second Cutting | STOLON [2] WEIGHT | HAY YIELD | OIL CONTENT | OIL YIELD |
| | | *gms* | *t/a* | *ml/lb* | *lbs/a* |
| 6/21 | 9/1 | 230 | 3.63 | 2.9 | 39.8 |
| 6/21 | 9/27 | 198 | 3.67 | 2.7 | 36.3 |
| 6/28 | 9/1 | 253 | 3.87 | 3.1 | 44.8 |
| 6/28 | 9/27 | 199 | 3.54 | 3.5 | 45.9 |
| 7/5 | 9/1 | 202 | 3.59 | 3.0 | 41.3 |
| 7/5 | 9/27 | 158 | 3.51 | 3.2 | 42.6 |
| 7/12 | 9/1 | 209 | 3.91 | 2.8 | 42.3 |
| 7/12 | 9/27 | 90 | 3.27 | 2.9 | 35.9 |
| 7/19 | 9/1 | 163 | 3.54 | 3.3 | 44.4 |
| 7/19 | 9/27 | 115 | 3.46 | 3.4 | 43.3 |
| 8/1[1] | | 220 | 3.49 | 3.0 | 38.0 |
| 8/1 | 9/27 | 79 | 3.26 | 3.4 | 41.9 |
| mean | | 150 | 3.37 | 3.2 | 39.9 |
| LSD(0.10) | | 86 | NS | NS | NS |
| CV(s/mean*100) | | 33.7 | 10.3 | 15.3 | 12.8 |

*[1] Check - cut once at 10% bloom*

*[2] Dug 5/16/95*

*[3] All plots cut once at full bud on 8/3/95.*

**1995 quality components of Black Mitcham peppermint double cut in 1994.**

| 1994 HARVESTS | | 1995 Data [2] | | | | | |
|---|---|---|---|---|---|---|---|
| First Cutting | Second Cutting | TOTAL HEADS | TOTAL KETONES | TOTAL MENTHOL | MFURAN | ESTERS | PULEGONE |
| | | % | % | % | % | % | % |
| 6/21 | 9/1 | 7.8 | 27.9 | 48.7 | 1.7 | 4.5 | 0.2 |
| 6/21 | 9/27 | 7.8 | 27.3 | 48.0 | 1.6 | 4.5 | 0.2 |
| 6/28 | 9/1 | 8.2 | 29.0 | 47.8 | 1.7 | 4.2 | 0.4 |
| 6/28 | 9/27 | 8.3 | 28.0 | 47.4 | 1.8 | 4.3 | 0.3 |
| 7/5 | 9/1 | 8.0 | 27.8 | 47.7 | 1.8 | 4.4 | 0.4 |
| 7/5 | 9/27 | 8.5 | 29.1 | 46.5 | 1.8 | 4.2 | 0.4 |
| 7/12 | 9/1 | 7.8 | 30.6 | 47.0 | 1.8 | 4.1 | 0.4 |
| 7/12 | 9/27 | 7.8 | 27.6 | 47.8 | 1.8 | 4.4 | 0.3 |
| 7/19 | 9/1 | 7.6 | 28.3 | 48.4 | 1.8 | 4.5 | 0.3 |
| 7/19 | 9/27 | 8.0 | 26.9 | 48.5 | 1.9 | 4.4 | 0.4 |
| 8/1[1] | | 7.8 | 29.0 | 47.5 | 1.7 | 4.2 | 0.3 |
| 8/1 | 9/27 | 8.4 | 27.6 | 49.2 | 1.6 | 4.3 | 0.3 |
| mean | | 8.0 | 28.2 | 47.9 | 1.7 | 4.3 | 0.3 |
| LSD(0.10) | | NS | NS | NS | NS | NS | NS |
| CV(s/mean*100) | | 7.5 | 8.2 | 4.0 | 8.0 | 7.1 | 37.2 |

*[1] Check - cut once at 10% bloom*

*[2] All plots cut once at full bud on 8/3/95.*

**YEAR/PROJECT: 1995/758 Effect of Second Harvest Date on Hay and Oil Yield and Oil Quality of Double Cut Peppermint**

**PERSONNEL:** Leon E. Welty, NWARC
Louise S. Prestbye, NWARC

In spring of 1995, plots 10' wide by 15' long were delineated within a fourth year stand of meristem derived Black Mitcham peppermint (root source - Glacier Mint). Four replicates of 5 plots representing 4 second cut harvest dates and a single cut control were assigned in a randomized complete block design. Harvest area was approximately 70 square feet. The area was irrigated to prevent moisture stress. In fall, 1994 the area was fertilized with 17 lbs N, 78 lbs $P_2O_5$, and 120 lbs $K_2O$/a. A total of 360 lbs N/a was applied in 1995. Sinbar was applied at 1.0 lb AI/a on 5/2/95, and Orthene, at 1.0 lb/a, was sprayed on 6/29 for cutworm control. The first cutting for all 4 double cut treatments was harvested on 7/11/95. This date was chosen because it resulted in the highest total oil yield in the 1994 study. The single cut control was harvested 8/7/95. Second cuttings were made on 9/1, 9/8, 9/15, and 9/22/95, bracketing the second cutting dates from last year's study. Approximately 20 pounds of green hay was air dried and later distilled. Samples were sent to A.M. Todd for quality analyses.

The first cutting, at prebud on 7/11, yielded 2.52 tons/acre of dry matter and 33.8 lbs/acre oil. For the second cuttings, both hay and oil yields increased significantly with each weekly delay in harvest from 9/1 to 9/15. On 9/21 a hard freeze caused considerable leaf drop, resulting in a major decrease in both hay and oil yield for the 9/22 harvest. The single harvest control on 8/7 (prebloom) produced 3.41 tons/acre dry matter and 46.3 lbs/a of oil.

The double cut schedule of 7/11 and 9/15 produced the highest amount of total oil per acre - 71.1 lbs/a, 54% more than the single cut control. This schedule allowed the maximum regrowth period between cuttings before freeze damage occurred. Since this area usually experiences its first fall frost in mid-September, postponing the second cutting beyond 9/15 could result in significant yield loss, as evidenced in this study.

Oil analyses of first cutting and the single cut control samples was puzzling, because the earlier cut, less mature plants had higher menthol and ester levels than the more mature control. Oil from the second cuttings showed significant decreases in ketones and increases in menthol and esters as harvest was delayed from 9/1 to 9/15. This corresponds with expected changes in maturation of the oil. Quality components did not change following the 9/21 frost.

Double cutting was successful again in 1995, although the average yield was only 74% that of 1994. Growing degree days (GDD) were 18% lower than in 1994, so lower yields would be expected.

## Hay yield, oil content, and oil yield of Black Mitcham peppermint double cut in 1995.

| First Cutting 7/11 [1] | Hay Yield t/a | Oil Content ml/lb | Oil Yield lbs/a | Second Cutting [3] | Hay Yield t/a | Oil Content ml/lb | Oil Yield lbs/a | 1995 Total Oil lbs/a |
|---|---|---|---|---|---|---|---|---|
| *mean* | 2.52 | 3.5 | 33.8 | 9/1 | 1.27 | 5.3 | 25.2 | 58.2 |
| *SE(mean)* | 0.04 | 0.1 | 0.8 | 9/8 | 1.64 | 5.0 | 30.9 | 66.0 |
| **Control** | | | | 9/15 | 1.97 | 4.9 | 36.5 | 71.1 |
| 8/7 [2] | | | | 9/22 * | 1.55 | 4.5 | 26.4 | 59.1 |
| *mean* | 3.41 | 3.6 | 46.3 | Control[2] | | | | 46.3 |
| *SE(mean)* | 0.17 | 0.4 | 3.7 | | | | | |
| | | | | *mean* | 1.60 | 4.9 | 29.8 | 60.1 |
| | | | | *LSD(0.10)* | 0.13 | NS | 4.6 | 7.7 |

*[1] Prebud*

*[2] Cut once at prebloom*

*[3] Vegetative*

** Considerable leaf drop due to hard freeze*

## Quality components of Black Mitcham peppermint double cut in 1995.

| First Cutting 7/11 [1] | Total Heads | Total Ketones | Total Menthol | Mentho-furan | Esters | Pulegone |
|---|---|---|---|---|---|---|
| *mean* | 7.9 | 22.9 | 54.3 | 1.2 | 5.7 | 0.9 |
| *SE(mean)* | 0.1 | 0.2 | 0.2 | 0.0 | 0.1 | 0.0 |
| **Control** 8/7 [2] | | | | | | |
| *mean* | 8.7 | 23.5 | 52.3 | 2.6 | 5.1 | 0.8 |
| *SE(mean)* | 0.3 | 0.2 | 1.2 | 0.2 | 0.0 | 0.0 |

*[1] Prebud*

*[2] Cut once at prebloom*

| Second Cutting [1] | Total Heads | Total Ketones | Total Menthol | Mentho-furan | Esters | Pulegone |
|---|---|---|---|---|---|---|
| 9/1 | 6.5 | 28.0 | 55.2 | 2.6 | 5.6 | 0.5 |
| 9/8 | 7.4 | 24.5 | 57.9 | 2.6 | 5.8 | 0.5 |
| 9/15 | 7.0 | 20.5 | 62.2 | 2.4 | 7.5 | 0.5 |
| 9/22 | 7.3 | 20.3 | 62.6 | 2.4 | 7.4 | 0.4 |
| *mean* | 7.0 | 23.3 | 59.4 | 2.5 | 6.5 | 0.4 |
| *LSD(0.10)* | NS | 2.2 | 1.7 | NS | 0.6 | NS |

*[1] All vegetative*

**YEAR/PROJECT: 1995/758 Evaluation of Mint Cultivars in the Presence and Absence of *V. dahliae.***

**PERSONNEL:** Leon E. Welty, Professor of Agronomy, MSU, Kalispell, MT
Louise S. Prestbye, Research Technician, MSU, Kalispell, MT

Peppermint and spearmint cultivars were established in Creston silt loam soils at the Northwestern Agricultural Research Center at Kalispell, MT in spring of 1994. The experiment was planted at two sites: one infected with *Verticillium* wilt in fall, 1994, and one kept free of the disease. Nuclear plants were obtained from three different sources. Black Mitcham, nodal tissue derived, and grown in soil plugs was obtained from Lakes, Ronan, MT. Meristem Black Mitcham and meristem Native and Scotch spearmints were obtained from Starkels, Ronan, MT. All other entries (stem-tip propagated) were provided by MIRC from Don Roberts' breeding program. Plants were placed on one foot centers. Each plot consisted of four rows spaced 20 inches apart, 20 feet in length. Harvest area for hay yield was 96.5 square feet. The peppermint and spearmint experiments were arranged separately in randomized complete block designs with four replicates. Each nursery was sprinkler irrigated to insure maximum growth. Each experimental site was fertilized with 129 lbs N, 56 lbs $P_2O_5$, 60 lbs $K_2O$, and 24 lbs $SO_2$/acre on Apr. 5; 50 lbs N/acre on June 2; 70 lbs N and 15 lbs $SO_2$/acre on July 14; and 50 lbs N/acre on Aug. 31, 1995. Sinbar was applied at 1 lb AI/acre on May 2, and Orthene was applied at 1 lb AI/acre on June 29, 1995.

Cultivars were evaluated for agronomic characteristics and disease symptoms. Because very little disease was observed in the Vert wilt nursery, data were pooled allowing 8 replicates per treatment. Twenty stems were pulled from each plot at one site prior to each harvest. Leaves were removed from each stem, and wet and dry weight of leaves and stems, number of leaves, total stem length, and length from base of stem to first leaf node was recorded for each. Dry matter yields of peppermint cultivars were obtained on Aug. 10 and of spearmint on July 24 and Sept. 13, 1995. Twelve to 15 pounds of green hay was air dried and later distilled. Samples were sent to Wm. Leman Co. for quality analyses.

Spring vigor, as indicated by row cover on 5/19, and fall regrowth after harvest (observed) were greater for Black Mitcham (BM)-nodal and BM-meristem than for other cultivars. Black Mitcham-nodal was actually more vigorous than BM-meristem, which is contrary to past observations. This may indicate that additional factors may be involved in the very vigorous growth of meristem BM other than the meristem process itself.

Hay yields were not necessarily related to spring vigor. Hay yields were greatest for M-83-7, Roberts Mitcham and Murray Mitcham. Lower hay yields for BM-nodal and BM-meristem may be attributed to bare stems left in the plot after harvest because of severe lodging. These stems were completely devoid of leaves; therefore, material left in the plot did not affect oil yield. Peppermint oil yields were greatest for BM-MIRC and lowest for BM meristem. Oil yields were not related to hay yields and were inversely related to vigor, indicating that some stress may be needed to produce high oil yields. It is surprising and somewhat alarming that BM-nodal had lower oil yields than BM-MIRC. In May of 1994 the BM-nodal nuclear plants were much more vigorous and healthy looking than the BM-MIRC nuclear plants.

Peppermint rust was evident on all cultivars by mid-July, with the Black Mitchams appearing most heavily infected. By harvest time, all cultivars showed symptoms throughout most of the plot area.

The meristem-derived spearmint covered the rows more completely and had more stolon spread than stem tip spearmint. Scotch spearmint had a higher leaf to stem ratio than Native. It also had significantly more leaves per stem in the first growth cycle, but not the second. Unlike the peppermints, amount of leaf biomass correlated with oil production. Scotch had slightly higher dry matter content in the first harvest, but Native was higher in the second harvest. All spearmint cultivars had significant levels of rust by the September harvest.

Native meristem had the highest dry matter production and Scotch stem-tip the least. Some stems devoid of leaves were left in the Scotch plots, which may have reduced overall hay yields. Scotch spearmint produced more oil than Native spearmint. Meristem derived spearmint produced more oil than stem tip spearmint.

There were significant differences among peppermint cultivars in all major oil quality components except esters. BM-MIRC (stem) and BM-Starkel (meristem) had the highest menthol and menthofuran levels and the lowest menthone. All cultivars were at the mid- to late-bud stage at harvest. Scotch spearmint had significantly higher levels of heads, limonene, octanol, and carvone than Native.

**Agronomic characteristics of mint cultivars at Kalispell, MT in 1995.**

| CULTIVAR | 8/1/95 HEIGH inches | 5/19/95 ROW COVER (1-5) 1/ | 5/19/95 STOLON SPREAD (1-5) 2/ | 7/21/95 RUST % 3/ | 8/1/95 RUST % 3/ |
|---|---|---|---|---|---|
| **Peppermint** | | | | | |
| Black Mitcham - MIRC - Roberts | 36 | 2.8 | 2.3 | 50 | 81 |
| Black Mitcham - Lake - *in vitro* | 35 | 4.0 | 2.7 | 65 | 83 |
| Black Mitcham - Starkel - meristem | 37 | 3.5 | 1.7 | 52 | 90 |
| Murray Mitcham | 37 | 2.8 | 1.8 | 29 | 77 |
| Roberts Mitcham | 35 | 3.0 | 1.5 | 38 | 81 |
| M-83-7 | 38 | 2.7 | 1.8 | 25 | 81 |
| T-84-5 | 37 | 2.0 | 1.7 | 35 | 81 |
| LSD(0.10) | 2 | 0.6 | NS | 23 | NS |

| | 7/13/95 HEIGHT inches | 9/13/95 HEIGHT inches | 5/19/95 ROW COVER (1-5) 1/ | 5/19/95 STOLON SPREAD (1-5) 2/ | 9/5/95 RUST % 3/ |
|---|---|---|---|---|---|
| **Spearmint** | | | | | |
| Native - stem - MIRC | 33 | 20 | 3.3 | 3.0 | 65 |
| Native - meristem - Starkel | 33 | 21 | 4.3 | 4.1 | 44 |
| Scotch - stem - MIRC | 30 | 21 | 3.3 | 3.1 | 52 |
| Scotch - meristem - Starkel | 30 | 19 | 4.0 | 3.6 | 52 |
| LSD(0.10) | 2 | 1 | 0.8 | NS | NS |

*1/ 1=plot area very sparsely covered; 5=plot area totally covered.*

*2/ 1=no stolon spread; 5=extensive stolon spread.*

*3/ Visual estimate of percent of plot showing symptoms.*

## MINT CULTIVAR EVALUATION

**R-8** Stem/Leaf Data

| **PEPPERMINT** Sampled 7/10/95 | LEAF WWT | STEM WWT | LEAF DWT | STEM DWT | LEAVES | STEM HT | 1st LEAF HT | OIL YIELD |
|---|---|---|---|---|---|---|---|---|
| | ----------gms---------- | | | | no. | ----------in---------- | | *lbs/a* |
| BM-S-MIRC | 106.5 | 192.8 | 41.0 | 48.2 | 47.3 | 76.5 | 36.3 | 54.0 |
| BM-S-L | 99.1 | 207.8 | 38.2 | 48.9 | 47.1 | 83.6 | 45.6 | 45.0 |
| BM-MS | 105.4 | 190.0 | 42.0 | 50.6 | 47.0 | 78.7 | 40.8 | 35.5 |
| MM | 82.8 | 147.1 | 35.5 | 43.5 | 29.1 | 69.6 | 36.1 | 43.2 |
| M-83-5 | 84.0 | 148.6 | 36.6 | 46.7 | 33.3 | 70.9 | 36.8 | 47.4 |
| M-83-7 | 97.6 | 165.5 | 39.8 | 47.9 | 43.7 | 73.1 | 36.2 | 48.5 |
| T-84-5 | 97.7 | 167.3 | 40.1 | 48.8 | 43.0 | 73.6 | 34.6 | 44.2 |
| LSD(0.10) | 17.3 (P=0.16) | 29.6 | 4.5 (P=0.20) | NS | NS | 7.0 | 6.9 (P=0.14) | 4.4 |
| **SPEARMINT** Sampled 7/24/95 | | | | | | | | |
| NATIVE-S | 66.7 | 137.1 | 22.2 | 38.6 | 37.1 | 66.8 | 21.3 | 65.0 |
| NATIVE-MS | 73.6 | 145.9 | 24.1 | 40.2 | 42.2 | 73.2 | 28.9 | 72.7 |
| SCOTCH-S | 120.4 | 180.1 | 37.1 | 53.3 | 70.8 | 68.5 | 29.0 | 97.1 |
| SCOTCH-MS | 94.3 | 160.6 | 30.8 | 50.2 | 45.5 | 66.2 | 35.3 | 114.5 |
| LSD(0.10) | 20.2 | 26.2 | 4.6 | 7.2 | 14.1 | 5.1 (P=0.12) | 4.7 | 8.5 |
| **SPEARMINT** Sampled 9/13/95 | | | | | | | | |
| NATIVE-S | 19.7 | 19.8 | 12.2 | 12.1 | 15.4 | 34.1 | 12.7 | |
| NATIVE-MS | 25.1 | 27.0 | 13.5 | 13.6 | 16.4 | 43.1 | 19.2 | |
| SCOTCH-S | 29.7 | 29.8 | 14.7 | 14.1 | 18.9 | 43.3 | 23.3 | |
| SCOTCH-MS | 25.5 | 22.3 | 13.6 | 12.6 | 17.9 | 36.2 | 18.8 | |
| LSD(0.10) | 3.4 | 6.0 | 0.8 | 1.1 | NS | 5.7 | 4.5 | |

# MINT CULTIVAR EVALUATION KALISPELL, 1995

| PEPPERMINT[1] | HAY YIELD t/a | OIL CONTENT ml/lb | OIL YIELD lbs/a |
|---|---|---|---|
| BM-S-MIRC | 4.44 | 3.2 | 54.0 |
| BM-S-L | 4.58 | 2.6 | 45.0 |
| BM-MS | 4.63 | 2.0 | 35.5 |
| MM | 4.90 | 2.3 | 43.2 |
| M-83-5 | 4.99 | 2.5 | 47.4 |
| M-83-7 | 5.02 | 2.6 | 48.5 |
| T-84-5 | 4.77 | 2.4 | 44.2 |
| LSD(0.10) | 0.37 | 0.3 | 4.4 |

| | HAY YIELD t/a | | | OIL CONTENT ml/lb | | OIL YIELD lbs/a | | |
|---|---|---|---|---|---|---|---|---|
| SPEARMINT | Harv-1 | Harv-2 | Total | Harv-1 | Harv-2 | Harv-1 | Harv-2 | Total |
| NATIVE-S | 3.11 | 2.65 | 5.76 | 1.7 | 2.7 | 35.0 | 30.0 | 65.0 |
| NATIVE-MS | 3.62 | 3.16 | 6.78 | 1.8 | 2.4 | 38.9 | 33.8 | 72.7 |
| SCOTCH-S | 2.85 | 2.29 | 5.14 | 3.0 | 4.1 | 56.5 | 40.6 | 97.1 |
| SCOTCH-MS | 3.22 | 2.34 | 5.56 | 3.1 | 4.5 | 67.5 | 47.0 | 114.5 |
| LSD(0.10) | 0.31 | 0.29 | 0.41 | 0.4 | 0.5 | 7.7 | 4.6 | 8.5 |

*Nuclear plants established Spring, 1994.*
*Peppermint harvested 8/1/95 (reps 1 & 2) and 8/10/95 (reps 3 & 4).*
*Spearmint harvested 7/12/95 and 9/13/95.*

[1]BM-S-MIRC = Black Mitcham, stem cut, MIRC; BM-S-L = Black Mitcham, stem cut, Lake; BM-MS = Black Mitcham, meristem, Starkel; MM = Murray Mitcham

**Quality components of mint cultivars at Kalispell, MT in 1995.**

| CULTIVAR | Total Heads | Total Ketones | Total Menthol | Mentho-furan | Menthone | Menthol | Esters | Pulegone |
|---|---|---|---|---|---|---|---|---|
| **Peppermint** | % | % | % | % | % | % | % | % |
| Black Mitcham-MIRC-stem | 9.5 | 23.6 | 45.6 | 3.4 | 19.9 | 39.1 | 3.4 | 0.8 |
| Black Mitcham-Lake-nodal | 8.4 | 27.4 | 44.2 | 3.0 | 23.5 | 37.9 | 3.3 | 0.7 |
| Black Mitcham-Starkel-meristem | 8.1 | 24.7 | 46.3 | 3.1 | 21.1 | 39.7 | 3.4 | 0.8 |
| Murray Mitcham-MIRC-stem | 9.1 | 26.7 | 44.5 | 2.2 | 22.9 | 38.1 | 3.3 | 0.6 |
| Roberts Mitcham-MIRC-stem | 9.4 | 26.9 | 44.9 | 2.2 | 23.1 | 38.5 | 3.2 | 0.6 |
| M-83-7 -MIRC-stem | 9.3 | 26.1 | 44.7 | 2.8 | 22.2 | 38.2 | 3.4 | 0.8 |
| T-84-5 -MIRC-stem | 8.9 | 28.5 | 44.0 | 2.7 | 24.6 | 37.4 | 3.4 | 0.8 |
| LSD(0.05) | 0.5 | 1.8 | 1.5 | 0.4 | 1.8 | 1.2 | NS | 0.1 |

| **Spearmint** | Total Heads | b-Pinene | Limonene | Cineole | Octanol | Dihydro-carvone | Carvone |
|---|---|---|---|---|---|---|---|
| *First Harvest - 7/12/95* | % | % | % | % | % | % | % |
| Native-stem-MIRC | 18.3 | 1.1 | 7.9 | 1.8 | 0.9 | 2.1 | 53.4 |
| Native-meristem-Starkel | 17.9 | 1.1 | 7.5 | 2.0 | 1.0 | 2.7 | 54.8 |
| Scotch-stem-MIRC | 19.2 | 1.0 | 12.8 | 1.0 | 2.3 | 1.0 | 68.3 |
| Scotch-meristem-Starkel | 19.5 | 1.1 | 13.1 | 0.9 | 2.2 | 1.3 | 68.0 |
| LSD(0.05) | 1.2 | 0.1 | 0.9 | 0.2 | 0.1 | 0.4 | 2.2 |
| *Second Harvest - 9/13/95* | | | | | | | |
| Native-stem-MIRC | 22.0 | 1.5 | 9.4 | 2.0 | 0.9 | 3.0 | 52.4 |
| Native-meristem-Starkel | 21.3 | 1.3 | 9.0 | 2.2 | 0.9 | 4.1 | 52.8 |
| Scotch-stem-MIRC | 26.2 | 1.4 | 17.5 | 1.4 | 2.3 | 2.4 | 60.0 |
| Scotch-meristem-Starkel | 25.3 | 1.4 | 18.0 | 1.0 | 2.3 | 2.7 | 62.2 |
| LSD(0.05) | 2.5 | NS | 1.8 | 0.2 | 0.2 | 0.7 | 3.0 |

**YEAR/PROJECT: 1995/758** **Peppermint Propagation Evaluation**

**PERSONNEL:** Leon E. Welty, NWARC
Louise S. Prestbye, NWARC

The experiment was established in 1995 on a Creston silt loam soil that was plowed out of alfalfa the previous fall. Nuclear plants of Black Mitcham peppermint were obtained from three sources: Lakes, of Ronan, MT provided nodal tissue derived plants in soil plugs from both 1992 and 1994 cultures, and plants grown with bare roots in growth medium from 1994; Summit Labs, the MIRC propagator, provided plants derived from stem tip cuttings. On May 23, 1995 the plants were placed on one foot centers in four rows spaced 20 inches apart, 20 feet in length. Harvest area for hay yield was 100 square feet. Propagation lines were arranged in a randomized complete block design with four replicates. The site was fertilized with 23 lbs N, 52 lbs $P_2O_5$, and 21 lbs $SO_2$ per acre on Oct.2, 1994, and with 87 lbs N, 52 lbs $P_2O_5$, 48 lbs $SO_2$, and 120 lbs $K_2O$ per acre on June 12, 1995. No pesticides were applied in 1995.The nursery was sprinkler irrigated to insure maximum growth. Entries were evaluated for agronomic characteristics and disease. Dry matter yields were obtained on Sept.13. Approximately 15 pounds of green hay was air dried and later distilled. Oil samples were sent to Wm. Leman Co. for quality analysis.

The material from Lakes had the more vigorous growth as of early August, as evidenced by row coverage. The nodal tissue propagated plants from Lakes had more height, row cover, vigor, and stolon spread than the stem tip propagated plants from Summit. Powdery mildew began to appear in early August and was in most plots by mid-September. The plug-grown plants from Lakes tended to have the most infestation. Peppermint rust had infected large areas of the plots by September.

The 3 nodal lines from Lakes produced more oil than the stem tip line from Summit. They also produced more dry matter during this establishment year. There were significant oil quality differences among propagation lines in total heads, menthol, and menthofuran. Soil plug grown plants derived from the 1992 nodal culture had significantly higher menthol and menthofuran than the stem tip propagated line from Summit.

**Agronomic characteristics of Black Mitcham propagation lines at Kalispell, MT on 8/2/95.**

| PROPAGATION SOURCE | HEIGHT | ROW COVER | VIGOR | STOLON SPREAD |
|---|---|---|---|---|
| | *inches* | *(1-5) 3/* | *(1-5) 4/* | *(1-5) 5/* |
| Lake - plug - 1994 1/ | 13.0 | 4.3 | 3.8 | 4.5 |
| Lake - plug - 1992 1/ | 13.8 | 4.8 | 4.4 | 4.8 |
| Lake - bare root - 1994 1/ | 14.5 | 4.6 | 4.4 | 4.5 |
| Summit - bare root 2/ | 11.0 | 3.5 | 2.3 | 3.5 |
| LSD(0.10) | 1.6 | 0.6 | 0.7 | NS |

*1/ in vitro nodal*

*2/ stem tip*

*3/ 1=plot area very sparsely covered; 5=plot area totally covered.*

*4/ 1=poor; 5=highly vigorous.*

*5/ 1=no stolon spread; 5=extensive stolon spread.*

**Agronomic characteristics of Black Mitcham propagation lines at Kalispell, MT on 9/11/95.**

| PROPAGATION SOURCE | HEIGHT | ROW COVER | VIGOR | STOLON SPREAD | RUST |
|---|---|---|---|---|---|
| | *inches* | *(1-5) 3/* | *(1-5) 4/* | *(1-5) 5/* | *% 6/* |
| Lake - plug - 1994 1/ | 24.5 | 5.0 | 4.0 | 4.3 | 70.0 |
| Lake - plug - 1992 1/ | 23.3 | 4.3 | 4.0 | 4.0 | 95.0 |
| Lake - bare root - 1994 1/ | 25.5 | 4.8 | 3.8 | 4.0 | 77.5 |
| Summit - bare root 2/ | 22.8 | 3.8 | 2.5 | 3.0 | 100.0 |
| LSD(0.10) | NS | 0.4 | 0.9 | NS | NS |

*1/ in vitro nodal*

*2/ stem tip*

*3/ 1=plot area very sparsely covered; 5=plot area totally covered.*

*4/ 1=poor; 5=highly vigorous.*

*5/ 1=no stolon spread; 5=extensive stolon spread.*

*6/ Visual estimate of percent of plot showing symptoms.*

**Hay yield, oil content, and oil yield for Black Mitcham propagation lines at Kalispell, MT in 1995.**

| PROPAGATION SOURCE | HAY YIELD | OIL CONTENT | OIL YIELD |
|---|---|---|---|
| | *tons DM/a* | *ml/lb* | *lbs/a* |
| Lake - plug - 1994 [1] | 2.51 | 3.6 | 33.9 |
| Lake - plug - 1992 [1] | 2.43 | 3.4 | 30.7 |
| Lake - bare root - 1994 [1] | 2.47 | 3.8 | 33.5 |
| Summit - bare root [2] | 1.55 | 4.4 | 26.3 |
| LSD(0.10) | 0.40 | NS | 5.0 |

*[1] in vitro nodal*
*[2] stem tip*

**Quality components of Black Mitcham propagation lines at Kalispell, MT in 1995.**

| PROPAGATION SOURCE | Total Heads | Total Ketones | Total Menthol | Mentho-furan | Menthone | Menthol | Esters | Pulegone |
|---|---|---|---|---|---|---|---|---|
| | % | % | % | % | % | % | % | % |
| Lake - plug - 1994 [1] | 9.2 | 15.6 | 60.2 | 2.2 | 13.1 | 46.1 | 10.2 | 0.2 |
| Lake - plug - 1992 [1] | 7.7 | 14.9 | 62.2 | 2.7 | 12.5 | 46.7 | 11.2 | 0.2 |
| Lake - bare root - 1994 [1] | 9.1 | 15.6 | 60.8 | 2.2 | 13.2 | 46.7 | 10.1 | 0.2 |
| Summit - bare root [2] | 9.0 | 15.5 | 60.0 | 2.4 | 13.1 | 45.5 | 10.4 | 0.2 |
| LSD(0.05) | 0.6 | NS | 1.6 | 0.2 | NS | 1.0 | NS | 0.0 |

*[1] in vitro nodal*
*[2] stem tip*

*Oil analysis by Wm. Leman Company.*