



HARD RED SPRING WHEAT

yield and other characteristics are as nearly the same for all varieties at each location as possible. These hard red spring wheat trials are not designed for crop (species) comparisons, because the various crops are grown on different fields or with different management. The data should only be used to compare varieties within a table.

Tested hard red spring wheat varieties are listed in the order of their flowering date in the tables and year of release within variety categories. Only new varieties or those varieties with better than susceptible reaction to scab are being tested.

Variety Selection Criteria

Although all data presented should be considered when choosing wheat varieties, the scab epidemics in the hard red spring wheat growing areas of the state have demonstrated the clear need to give greater weight to selecting varieties for their tolerance to this devastating disease. Scab evaluations include *disease severity*, based on visual spread of the disease on the spike, and *grain soundness*, which reflects the variety's ability to maintain plump, sound kernels. These ratings should be considered together to reduce risk of loss. The use of more than one variety to provide different days to

Spring wheat varieties are compared in trial plots at Waseca, Lamberton, Morris, Crookston, Stephen, Roseau and St. Paul. Wheat varieties are grown in replicated plots at each location. These plots are handled so that the factors affecting

Characteristics of hard red spring wheat varieties.

| Variety | Days to Heading ¹ | Height, Inches ¹ | Straw Strength ² | Test Weight (Lb/Bu) | | Protein (%) ³ | | Baking Quality ⁴ | Pre-Harvest Sprouting |
|----------|------------------------------|-----------------------------|-----------------------------|---------------------|--------|--------------------------|--------|-----------------------------|-----------------------|
| | | | | 2003 | 2-year | 2003 | 2-year | | |
| Ingot | 63 | 38 | Medium | 64.2 | 62.4 | 15.2 | 15.1 | Medium-High | Susceptible |
| Briggs | 63 | 35 | Medium | 62.7 | 61.0 | 14.7 | 14.9 | — | — |
| Oklee | 64 | 32 | Medium | 63.4 | 61.7 | 15.3 | 15.2 | Low-Medium | Resistant |
| Walworth | 65 | 34 | Medium | 61.7 | 59.8 | 15.0 | 15.0 | Medium-High | Resistant |
| Dapps | 65 | 37 | Medium | 61.8 | — | 16.5 | — | — | Resistant |
| Oxen | 65 | 32 | M. Strong | 61.9 | 59.7 | 14.7 | 14.8 | High-Medium | Resistant |
| Alsen | 66 | 33 | Strong | 62.7 | 61.3 | 15.3 | 15.6 | High | Resistant |
| Reeder | 66 | 34 | Strong | 62.3 | 60.5 | 14.9 | 14.8 | Medium-High | Resistant |
| Knudson | 66 | 32 | M. strong | 62.3 | 60.7 | 14.0 | 14.4 | Medium-High | Resistant |
| Mercury | 66 | 29 | Strong | 61.8 | 59.8 | 14.3 | 14.5 | Medium | Mod. Susceptible |
| Parshall | 66 | 39 | Strong | 63.4 | 61.9 | 15.1 | 15.2 | High-Medium | Resistant |
| Russ | 66 | 36 | M. Strong | 62.1 | 59.7 | 14.1 | 14.4 | High-Medium | Resistant |
| Hanna | 66 | 38 | M. Strong | 61.9 | 60.4 | 14.6 | 14.9 | High | Resistant |
| 2375 | 67 | 32 | Medium | 62.2 | 60.4 | 14.9 | 14.9 | Medium | Resistant |
| Dandy | 67 | 36 | V. Strong | 63.2 | 61.5 | 14.3 | 14.5 | Low | Mod. Susceptible |
| HJ98 | 67 | 32 | Medium | 61.8 | 59.8 | 14.3 | 14.5 | Medium-Low | Resistant |
| NorPro | 68 | 31 | Strong | 61.6 | 59.8 | 14.5 | 14.7 | Medium | Resistant |
| Verde | 68 | 32 | M. Strong | 61.6 | 59.8 | 13.9 | 14.3 | Low-Medium | Resistant |
| Granite | 69 | 33 | V. Strong | 63.7 | 62.2 | 15.3 | 15.4 | — | Resistant |
| Ivan | 69 | 31 | V. Strong | 61.2 | 60.0 | 13.2 | 13.7 | Low | Resistant |
| Marshall | 69 | 31 | Strong | 61.7 | 59.6 | 13.5 | 13.8 | Low | Resistant |
| Mean | 66 | 34 | — | 62.5 | 60.7 | 14.8 | 14.8 | | |
| LSD | 1 | 1 | — | 0.6 | 0.6 | 0.5 | 0.4 | | |

¹ 2003 data. ² 2000-2003 data. ³ 12% moisture basis. ⁴ 2001 & 2002 crop.

Disease reactions of hard red spring wheat varieties.

| Variety | Leaf Rust ¹ | Stem Rust ¹ | Other Leaf Diseases ¹ | Scab | |
|----------|------------------------|------------------------|----------------------------------|-------------------------------|------------------------------|
| | | | | Disease Severity ¹ | Grain Soundness ² |
| Ingot | MS | R | MS | MR-MS | 2.0 |
| Briggs | MR-MS | R | MR | MR-MS | 3.0 |
| Oklee | MS | R | MR | MR-MS | 2.5 |
| Walworth | MS | R | MS | MR-MS | 2.5 |
| Dapps | MR | R | MR-R | — | — |
| Oxen | MS | R | MS | MS-S | 3.0 |
| Alsen | MR | R | MR-R | MR | 2.0 |
| Reeder | MS | R | MR-R | MS | 3.5 |
| Knudson | R | R | MR-R | MR-MS | 2.5 |
| Mercury | MS | R | MR | S | 5.0 |
| Parshall | MS | R | MR-R | MR-MS | 2.0 |
| Russ | MS | R | MS | MR-MS | 3.0 |
| Hanna | MS | R | MR | MR | 2.0 |
| 2375 | MS | R | S | MR-MS | 2.5 |
| Dandy | MS | R | MR | MS | 3.5 |
| HJ98 | MS | R | MS | MS | 3.0 |
| NorPro | MR | R | MR-R | MS | 3.5 |
| Verde | MR-MS | R | MR-R | MS | 3.5 |
| Granite | MS | R | MR | MR-MS | 2.5 |
| Ivan | R | R | MR-R | MS-S | 4.0 |
| Marshall | MS | R | MS | MS | 3.5 |

¹ R = resistant, MR = moderately resistant, MS = moderately susceptible, S = susceptible.

² Ability to maintain plump, sound kernels under scab epidemics: 1=good, 5=poor.

heading and use of different seeding dates is highly recommended to reduce risk. Variety descriptions do not provide information on scab resistance. Table information should be used.

General Purpose Varieties

Oklee – Awned, early-midseason maturity, medium height. Resistant to stem rust and moderately susceptible to leaf rust. Moderately resistant to other leaf diseases. Medium yield and high test weight. Medium straw strength and high protein percent. Released by Minn. AES and USDA-ARS in 2003.

ƆVƆ (pending)

Hanna – Awned, midseason maturity, tall. Resistant to stem rust and moderately susceptible to leaf rust. Moderately resistant to other leaf diseases. Low to medium yield and medium test weight. Moderately strong straw. Medium to high protein percent. Released by AgriPro in 2001. **ƆVƆ (94)**

Knudson – Awned, midseason-late maturity, semidwarf. Resistant to stem

rust and to leaf rust. Moderately resistant to other leaf diseases. High yield and medium test weight. Moderately strong straw. Medium protein percent. Released by AgriPro in 2001. **ƆVƆ (94)**

NorPro – Awned, midseason-late maturity, semidwarf. Resistant to stem rust and moderately resistant to leaf rust. Moderately resistant to other leaf diseases. Medium to high yield and low to medium test weight. Strong straw. Medium protein percent. Released by AgriPro in 1999. **ƆVƆ (94)**

Parshall – Awned, midseason maturity, tall. Resistant to stem rust and moderately susceptible to leaf rust. Moderately resistant to other leaf diseases. Low to medium yield and high test weight. Strong straw. High protein percent. Released by N.D. AES in 1999.

ƆVƆ (94)

Reeder – Awned, midseason maturity, medium height. Resistant to stem rust and moderately susceptible to leaf rust. Moderately resistant to other leaf

diseases. Medium to high yield and medium test weight. Strong straw. Medium protein percent. Released by N.D. AES in 1999. **ƆVƆ (94)**

HJ98 – Awned, midseason-late maturity, semidwarf. Resistant to stem rust and moderately susceptible to leaf rust. Moderately susceptible to other leaf diseases. High yield and low to medium test weight. Medium straw strength. Medium protein percent. Released by Minn. AES and USDA-ARS in 1998. **ƆVƆ (94)**

Ingot – Awned, early, tall. Resistant to stem rust and moderately susceptible to leaf rust. Moderately susceptible to other leaf diseases. Low to medium yield and high test weight. Moderately strong straw. Medium to high protein percent. Released by S.D. AES in 1998.

ƆVƆ (94)

Ivan – Awned, late maturity, semidwarf. Resistant to stem rust and to leaf rust. Moderately resistant to other leaf diseases. Medium to high yield and medium test weight. Very strong straw. Low to medium protein percent. Released by AgriPro in 1998. **ƆVƆ (94)**

Mercury – Awned, midseason maturity, semidwarf. Resistant to stem rust. Moderately susceptible to leaf rust. Moderately resistant to other leaf diseases. High yield and low to medium test weight. Strong straw. Medium protein percent. Released by NorthStar Genetics in 1997.

Oxen – Awned, early-midseason, semidwarf. Resistant to stem rust and moderately susceptible to leaf rust. Moderately susceptible to other leaf diseases. High yield and low to medium test weight. Moderately strong straw. Medium protein percent. Released by S.D. AES in 1996. **ƆVƆ (94)**

Russ – Awned, early-midseason maturity, medium height. Resistant to stem rust and moderately susceptible to leaf rust. Moderately susceptible to other leaf diseases. Medium yield and low to medium test weight. Moderately strong straw. Medium to low protein percent. Released by S.D. AES in 1995.

ƆVƆ (94)

Verde – Awned, late maturity, semi-dwarf. Resistant to stem rust and moderately resistant to leaf rust. Moderately resistant to other leaf diseases. Medium yield and low to medium test weight. Moderately strong straw. Medium protein percent. Released by Minn. AES and USDA-ARS in 1995. **PVP (94)**

2375 – Awned, midseason maturity, medium height. Resistant to stem rust and moderately susceptible to leaf rust. Susceptible to other leaf diseases. Low to medium yield and medium test weight. Medium straw strength. Tolerant to loose smut. Moderately susceptible to shattering. Medium protein percent. Released by Pioneer Hi-Bred in 1988. Sold by N.D. State University Research Foundation 1990. **PVP (94)**

Marshall – Awned, late maturity, semi-dwarf. Resistant to stem rust and moderately susceptible to leaf rust. Moderately susceptible to other leaf diseases. Low to medium yield and test weight. Strong straw. Low to medium protein percent. Released by Minn. AES and USDA-ARS in 1982.

Walworth – Awned, early maturity, medium height. Resistant to stem rust and moderately susceptible to leaf rust. Moderately susceptible to other leaf diseases. Medium to high yield and low to medium test weight. Medium straw strength. Medium protein percent. Released by S.D. AES in 2001. **PVP (94)**

Alsen – Awned, midseason maturity, medium height. Resistant to stem rust and moderately resistant to leaf rust. Moderately resistant to other leaf diseases. Low to medium yield and high test weight. Strong straw. High protein percent. Released by N.D. AES in 2000. **PVP (94)**

Dandy – Awned, midseason-late maturity, medium height. Resistant to stem rust and moderately susceptible to leaf rust. Moderately resistant to other leaf diseases. High yield and high test weight. Very strong straw. Medium to low protein percent. Released by NorthStar Genetics in 1999. **PVP (94)**

Grain yield (percent of the mean) of hard red spring wheat varieties in Minnesota, northern locations.

| Variety | Crookston | | | Roseau ¹ | | Stephen | | |
|----------------|-----------|--------|--------|---------------------|--------|---------|--------|--------|
| | 2003 | 2-year | 3-year | 2003 | 2-year | 2002 | 2-year | 3-year |
| Ingot | 92 | 93 | 94 | 102 | 103 | 99 | 92 | 94 |
| Briggs | 91 | 100 | - | 110 | - | 105 | 103 | - |
| Oklee | 97 | 104 | 107 | 95 | 100 | 96 | 95 | 95 |
| Walworth | 94 | 99 | 100 | 104 | 103 | 95 | 99 | 102 |
| Dapps | 98 | - | - | 94 | - | 97 | - | - |
| Oxen | 92 | 93 | 95 | 101 | 101 | 97 | 97 | 99 |
| Alsen | 91 | 97 | 95 | 92 | 95 | 100 | 103 | 104 |
| Reeder | 92 | 96 | 100 | 99 | 103 | 104 | 102 | 103 |
| Knudson | 102 | 103 | 102 | 107 | 107 | 106 | 104 | 102 |
| Mercury | 102 | 106 | 107 | 104 | 108 | 94 | 104 | 102 |
| Parshall | 98 | 101 | 98 | 96 | 100 | 85 | 83 | 87 |
| Russ | 98 | 95 | 95 | 112 | 102 | 108 | 103 | 103 |
| Hanna | 97 | 98 | 95 | 93 | 91 | 105 | 102 | 105 |
| 2375 | 107 | 99 | 100 | 101 | 99 | 90 | 93 | 97 |
| Dandy | 117 | 111 | 110 | 101 | 102 | 90 | 92 | 94 |
| HJ98 | 113 | 107 | 101 | 110 | 99 | 115 | 112 | 107 |
| NorPro | 93 | 92 | 93 | 98 | 97 | 106 | 104 | 100 |
| Verde | 106 | 101 | 102 | 94 | 89 | 93 | 99 | 99 |
| Granite | 93 | 89 | - | 87 | - | 101 | 97 | - |
| Ivan | 101 | 102 | 102 | 104 | 104 | 112 | 114 | 111 |
| Marshall | 99 | 87 | 85 | 100 | 98 | 107 | 102 | 100 |
| Mean (Bu/Acre) | 82.9 | 73.5 | 73.3 | 93.5 | 74.6 | 74.9 | 60.3 | 51.3 |
| LSD | 11 | 8 | 7 | 12 | 11 | 14 | 11 | 11 |

¹ Roseau 2002 was flooded. 2-year data are 2001 and 2003.

Varieties Not Adequately Tested

Granite – Awned, late maturity, semi-dwarf. Resistant to stem rust and moderately susceptible to leaf rust. Moderately resistant to other leaf diseases. Medium yield and high test weight. Very strong straw. High protein. Released by Western Plant Breeders in 2002. **PVP (94)**

Briggs – Awned, early maturity, medium height. Resistant to stem rust and moderately resistant to leaf rust. Moderately resistant to other leaf diseases. Medium yield and high test weight. Medium straw strength. High protein percent. Released by S.D. AES in 2002.

PVP (94)

Dapps – Awned, midseason maturity, tall. Resistant to stem rust and moderately resistant to leaf rust and other leaf diseases. Low yield and medium test weight. Medium straw strength and high protein percent. Released by NDSU Research Foundation in 2003.

PVP (pending)

Grain yield (percent of the mean) of hard red spring wheat varieties in Minnesota, southern locations.

| Line | Lamberton | | | Morris | | | St. Paul | | | Waseca | | |
|----------------|-----------|--------|--------|--------|--------|--------|----------|--------|--------|--------|--------|--------|
| | 2003 | 2-year | 3-year | 2003 | 2-year | 3-year | 2003 | 2-year | 3-year | 2003 | 2-year | 3-year |
| Ingot | 91 | 87 | 96 | 96 | 99 | 96 | 98 | 99 | 92 | 97 | 95 | 94 |
| Briggs | 95 | 95 | — | 87 | 94 | — | 96 | 95 | — | 96 | 97 | — |
| Oklee | 98 | 103 | 97 | 85 | 92 | 93 | 84 | 94 | 95 | 101 | 107 | 103 |
| Walworth | 95 | 94 | 97 | 109 | 103 | 104 | 109 | 106 | 106 | 96 | 104 | 104 |
| Dapps | 86 | — | — | 84 | — | — | 96 | — | — | 94 | — | — |
| Oxen | 111 | 103 | 107 | 115 | 110 | 108 | 111 | 113 | 113 | 108 | 113 | 112 |
| Alsen | 95 | 89 | 96 | 89 | 87 | 82 | 95 | 92 | 93 | 85 | 84 | 88 |
| Reeder | 107 | 99 | 104 | 110 | 107 | 109 | 109 | 107 | 105 | 99 | 102 | 101 |
| Knudson | 113 | 109 | 108 | 103 | 105 | 101 | 109 | 103 | 106 | 111 | 111 | 108 |
| Mercury | 102 | 102 | 109 | 114 | 107 | 103 | 108 | 107 | 112 | 107 | 105 | 105 |
| Parshall | 76 | 74 | 85 | 90 | 90 | 91 | 108 | 100 | 93 | 99 | 100 | 96 |
| Russ | 102 | 97 | 101 | 100 | 99 | 104 | 105 | 100 | 99 | 97 | 99 | 101 |
| Hanna | 80 | 75 | 80 | 93 | 89 | 89 | 98 | 90 | 87 | 91 | 87 | 89 |
| 2375 | 97 | 86 | 92 | 97 | 97 | 98 | 81 | 83 | 88 | 82 | 82 | 88 |
| Dandy | 108 | 111 | 110 | 106 | 106 | 103 | 110 | 113 | 109 | 106 | 102 | 100 |
| HJ98 | 110 | 107 | 108 | 108 | 102 | 102 | 114 | 107 | 106 | 103 | 101 | 104 |
| NorPro | 113 | 108 | 111 | 101 | 103 | 108 | 104 | 105 | 111 | 100 | 101 | 103 |
| Verde | 107 | 98 | 95 | 103 | 98 | 102 | 104 | 98 | 99 | 100 | 100 | 100 |
| Granite | 121 | 110 | — | 112 | 108 | — | 99 | 104 | — | 101 | 95 | — |
| Ivan | 116 | 108 | 107 | 106 | 104 | 106 | 88 | 87 | 91 | 101 | 98 | 100 |
| Marshall | 92 | 79 | 88 | 102 | 100 | 99 | 89 | 94 | 96 | 89 | 83 | 90 |
| Mean (Bu/Acre) | 50.9 | 43.6 | 51.7 | 77.8 | 63.7 | 61.9 | 85.4 | 77.7 | 73.6 | 89.1 | 61.0 | 61.2 |
| LSD | 14.2 | 10.3 | 8.5 | 11.7 | 9.4 | 8.4 | 12.1 | 9.8 | 9.4 | 12.6 | 11.1 | 9.1 |

Grain yield (percent of the mean) of hard red spring wheat varieties in Minnesota.

| Variety | State | | | North ¹ | | | South ² | | | On-Farm | | |
|----------------|-------|--------|--------|--------------------|--------|--------|--------------------|--------|--------|---------|--------|--------|
| | 2003 | 2-year | 3-year | 2003 | 2-year | 3-year | 2003 | 2-year | 3-year | 2003 | 2-year | 3-year |
| Ingot | 97 | 96 | 95 | 98 | 95 | 96 | 96 | 96 | 94 | 95 | 90 | 93 |
| Briggs | 98 | 99 | — | 102 | 103 | — | 94 | 97 | — | 101 | 104 | — |
| Oklee | 94 | 99 | 99 | 96 | 99 | 101 | 92 | 99 | 97 | 104 | 103 | 102 |
| Walworth | 101 | 102 | 102 | 98 | 100 | 102 | 103 | 103 | 103 | 101 | 101 | 103 |
| Dapps | 93 | — | — | 96 | — | — | 91 | — | — | 88 | — | — |
| Oxen | 105 | 105 | 105 | 97 | 97 | 98 | 111 | 111 | 110 | 110 | 108 | 107 |
| Alsen | 92 | 92 | 93 | 94 | 98 | 98 | 90 | 89 | 90 | 95 | 96 | 95 |
| Reeder | 103 | 102 | 103 | 99 | 99 | 102 | 106 | 105 | 105 | 100 | 99 | 101 |
| Knudson | 107 | 106 | 105 | 105 | 105 | 103 | 109 | 107 | 106 | 102 | 110 | — |
| Mercury | 105 | 106 | 107 | 101 | 105 | 106 | 108 | 106 | 107 | 101 | 105 | 105 |
| Parshall | 94 | 93 | 93 | 93 | 94 | 95 | 95 | 93 | 92 | 95 | 90 | 91 |
| Russ | 103 | 100 | 100 | 106 | 102 | 99 | 101 | 99 | 101 | — | — | — |
| Hanna | 95 | 91 | 91 | 98 | 98 | 97 | 92 | 87 | 87 | 97 | 90 | — |
| 2375 | 93 | 91 | 94 | 100 | 97 | 99 | 88 | 87 | 91 | — | — | — |
| Dandy | 105 | 106 | 104 | 103 | 102 | 103 | 107 | 108 | 105 | — | — | — |
| HJ98 | 110 | 107 | 104 | 112 | 109 | 102 | 109 | 105 | 105 | — | — | — |
| NorPro | 102 | 102 | 103 | 99 | 98 | 96 | 104 | 105 | 108 | 103 | 94 | 97 |
| Verde | 100 | 99 | 98 | 97 | 99 | 97 | 103 | 99 | 99 | 105 | 107 | 102 |
| Granite | 101 | 99 | — | 93 | 91 | — | 106 | 104 | — | 96 | 97 | — |
| Ivan | 103 | 102 | 102 | 105 | 106 | 105 | 101 | 98 | 100 | — | — | — |
| Marshall | 97 | 93 | 94 | 102 | 95 | 93 | 93 | 91 | 94 | — | — | — |
| Mean (Bu/Acre) | 79.2 | 65.7 | 63.4 | 83.7 | 72.3 | 65.4 | 75.8 | 61.5 | 62.1 | 85.2 | 59.7 | 60.3 |
| LSD | 5.2 | 4.3 | 3.5 | 7.1 | 7.3 | 5.5 | 4.9 | 5.2 | 4.5 | 9.6 | 8.2 | 5.8 |

¹ 2-year data are from 2003 Crookston, Roseau and Stephen and 2002 Crookston and Stephen; 3-year data add 2001 Crookston, Roseau and Stephen.

² Data from Lamberton, Morris, St. Paul and Waseca.

Hard Red Spring Wheat Planting Rate and Date.

Calculating and seeding the appropriate amount of seed is an important first step towards maximizing yield. The seeding rate is a function of the number of kernels per pound of seed, the percent germination of the lot, the expected stand loss as a function of the quality of seedbed, and the desired stand. In Minnesota, an average optimum stand for hard red spring wheat when planted early is between 28 to 30 plants per square foot or approximately 1.25 million plants per acre. This number should increase by 1 to 2 plants per square foot for every week planting is delayed past the early, optimum seeding date. Expected stand loss even under good seedbed conditions is between 10 to 20% and will increase with a poor seedbed or improper seed placement due to poor depth control.

The general formula for calculating a seeding rate is:

$$\text{Seeding Rate (Pounds/Acre)} = \frac{\text{Desired stand (Plants/Acre)} \times (1 + \text{Expected Stand Loss})}{(\text{Seeds/Pound} \times \text{Percentage Germination})}$$

Calculate the seeding rate for every single seed lot and calibrate the drill accordingly.

Example: Early variety.

| Desired Stand, (Plants/Acre) | Expected Stand Loss | Seeds per Pound | Percentage Germination | Seeding Rate, (Lb/Acre) |
|---------------------------------|------------------------|--------------------|---------------------------|----------------------------|
| 1.25 million | 0.20 | 14,000 | 0.95 | 113 |