2015 Hard Red Spring Wheat Field Crop Trials Results

Minnesota Agricultural Experiment Station and the College of Food, Agricultural and Natural Resource Sciences

Spring wheat varieties were sown in trial plots at Crookston, Lamberton, Morris, Roseau, St. Paul, and Waseca and on-farm sites near Benson, Fergus Falls, Hallock, Le Center, Kimball, Oklee, Perley, Stephen, and Strathcona. These plots are handled so that the factors affecting 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 alphabetical order in the tables.

Variety Selection Criteria

While grain yield is an important economic trait, return per acre is also affected by grain quality. Because Fusarium Head Blight (FHB), or scab, can reduce grain quality and yield dramatically, it is an important consideration. Disease ratings are on a 1-9 scale where 1 = most resistant and 9 = most susceptible. Rating differences of 2 or more should be considered significant.

Faller and Prosper are susceptible to leaf rust races that have increased since 2010. During the past few years, leaf rust infections throughout Minnesota were low, however Faller and Prosper were among the most susceptible cultivars. Carefully consider a variety's rating for leaf rust and plan

Table 1. Origin and agronomic characteristics of hard red spring wheat entries in Minnesota in single-year (2015) and multiple-year comparisons.

Entry	Origin[1]	PVP Status	Days to Heading[2]	Height, Inches[2]	Straw Strength[3]
Barlow	2009 NDSU	PVP (94)	64.8	35.3	7
Bolles	2015 MN	PVP (pending)	68.9	33.0	4
Chevelle	2014 Meridian Seeds	PVP (94)	64.9	31.2	4
Elgin-ND	2013 NDSU	PVP (94)	65.7	37.4	6
Faller	2007 NDSU	PVP (94)	67.6	34.2	5
Focus	2015 SDSU	PVP (pending)	62.8	36.9	7
Forefront	2012 SDSU	PVP (94)	63.6	38.9	6
Glenn	2005 NDSU	PVP (94)	63.8	36.5	5
HRS 3361	2013 CROPLAN by WinField	PVP (94)	66.8	32.2	3
HRS 3419	2014 CROPLAN by WinField	PVP (pending)	69.5	32.2	3
HRS 3504	2015 CROPLAN by WinField	PVP (pending)	67.4	30.5	3
HRS 3530	2015 CROPLAN by WinField	PVP (pending)	67.7	35.8	5
Knudson	2001 Syngenta	PVP (94)	66.3	31.6	5
LCS Albany	2009 Limagrain Cereal Seeds	PVP (94)	69.2	32.6	5
LCS Breakaway	2012 Limagrain Cereal Seeds	PVP (94)	64.3	31.0	4
LCS Iguacu	2014 Limagrain Cereal Seeds	PVP (94)	68.8	32.7	4
LCS Nitro	2015 Limagrain Cereal Seeds	PVP (pending)	68.9	31.8	5
Linkert	2013 MN	PVP (94)	65.4	29.2	2
Linkert 1.3X	30% higher seeding rate of Linkert	PVP (94)	65.5	30.1	2
Marshall	1982 MN	None	70.8	32.4	4
MS Stringray	2013 Meridian Seeds	PVP (94)	71.6	34.0	4
Norden	2012 MN	PVP (94)	67.0	32.7	3
Prevail	2014 SDSU	PVP (pending)	64.2	33.0	4
Prosper	2011 NDSU	PVP (94)	67.0	35.2	6
RB07	2007 MN	PVP (94)	65.0	32.2	5
Rollag	2011 MN	PVP (94)	65.4	30.6	3
Samson	2007 WestBred	PVP (94)	65.8	30.9	3
SY Ingmar	2014 Syngenta	PVP (94)	68.1	31.9	4
SY Rowyn	2013 Syngenta	PVP (94)	65.4	30.7	5
SY Soren	2011 Syngenta	PVP (94)	65.6	30.3	4
SY Valda	2015 Syngenta	PVP (pending)	66.2	31.4	4
WB-Mayville	2011 WestBred	PVP (94)	65.2	29.9	3
WB9507	2013 Westbred	PVP (pending)	65.3	34.1	6
WB9653	2015 Westbred	PVP (pending)	67.3	30.9	4
Mean			**66.5**	**32.7**	

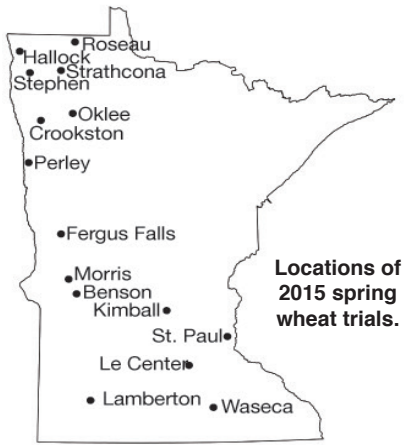
[1]Abbreviations: MN = Minnesota Agricultural Experiment Station; NDSU = North Dakota State University Research Foundation; SDSU = South Dakota Agricultural Experiment Station.

[2]2015 data

[3]1-9 scale in which 1 is the strongest straw and 9 is the weakest. Based on 2009-2015 data; the rating of newer entries may change by as much as one rating point as more data are collected.

to use a fungicide if a variety is rated 5 or higher and disease levels warrant treatment. Varieties with ratings of 4 or better should not experience economic levels of damage in most years. Stripe rust was observed at several locations in 2015 and allowed us to rate varieties for this disease. The majority of varieties are resistant or moderately resistant, but MS Stringray and WB9507 are susceptible. Stripe rust is not as widespread and does not occur as regularly as leaf rust, but can be very damaging when temperatures remain unseasonably cool into early July. Stem rust ratings are included in the disease tables because there are differences in variety reaction. However, the levels of this disease have been very low in production fields in recent years, even on susceptible varieties.

Bacterial leaf streak ratings of all varieties that have been evaluated for at least two years are presented in the disease table. This disease cannot be controlled with fungicides. Selection of more resistant varieties is the only recommend practice at this time if you have a history of problems with this disease. Bacterial leaf streak symptoms are highly variable from one environment to the next. The rating of newer varieties may change by as much as one rating point as more data is collected.



Locations of 2015 spring wheat trials.

Table 2. Grain quality of hard red spring wheat entries in Minnesota in single-year (2015) and multiple-year comparisons.

	Test Weight (lb/Bu)		Protein (%)[1]			
Entry	2015	2-Year	2015	2-Year	Baking Quality[2]	Pre-Harvest Sprouting[3]
Barlow	61.7	61.1	14.9	14.7	3	2
Bolles	60.3	60.1	15.9	15.8	1	1
Chevelle	61.0	—	13.4	—	—	—
Elgin-ND	60.0	60.0	14.7	14.6	3	2
Faller	60.4	60.3	13.6	13.5	4	2
Focus	62.2	61.9	14.9	14.9	—	—
Forefront	61.3	61.1	14.6	14.6	4	4
Glenn	62.8	62.3	15.1	14.9	1	1
HRS 3361	60.2	59.8	14.0	13.9	—	—
HRS 3419	59.1	59.2	13.4	13.1	—	—
HRS 3504	59.0	—	14.0	—	—	—
HRS 3530	60.8	—	14.4	—	—	—
Knudson	60.5	60.1	13.6	13.5	3	2
LCS Albany	60.5	60.5	13.4	13.2	6	5
LCS Breakaway	61.5	61.5	14.7	14.5	4	3
LCS Iguacu	61.3	61.2	13.2	12.9	7	2
LCS Nitro	60.5	60.3	13.3	13.0	—	—
Linkert	61.1	60.7	15.0	15.0	1	2
Linkert 1.3X	61.0	—	14.9	—	1	—
Marshall	58.8	59.1	13.7	13.5	7	2
MS Stringray	58.7	—	12.2	—	—	—
Norden	62.1	61.8	14.2	14.0	4	1
Prevail	60.9	60.7	14.1	13.9	4	5
Prosper	60.7	60.5	13.8	13.6	4	2
RB07	60.8	60.5	14.5	14.3	3	2
Rollag	61.6	61.4	15.0	14.9	6	1
Samson	59.9	59.0	13.9	14.1	4	5
SY Ingmar	61.3	61.1	14.9	14.7	—	—
SY Rowyn	60.7	60.9	13.8	13.8	4	4
SY Soren	59.8	60.2	14.7	14.6	4	1
SY Valda	60.7	—	13.9	—	—	—
WB-Mayville	60.4	59.6	14.6	14.6	3	4
WB9507	59.4	59.1	13.6	13.7	—	—
WB9653	60.2	—	13.7	—	—	—
Mean	**60.6**	**60.5**	**14.2**	**14.1**		
No. Environments	**11**	**23**	**11**	**23**		

[1]12% moisture basis.

[2]2012-2014 crop years.

[3]1-9 scale in which 1 is best and 9 is worst. Values of 1-3 should be considered as resistant.

The "Other Leaf Diseases" rating represents a combined reaction to septoria and tan spot. Although varieties may differ for their response to each of those diseases, the rating does not differentiate among them. Consequently, the rating should be used as a general indication and only for varietal selection in areas where these diseases have been a problem or if the previous crop was wheat or barley. Control of fungal leaf diseases with fungicides may be warranted, even for varieties with an above-average rating.

Prosper was the leading variety in Minnesota based on acres planted in 2015, with 16.6% of the state's wheat acres. Faller, a sister line of Prosper, came in 4th at 12.2%. WB-Mayville was the 2nd most popular variety at 13.6%, and Linkert was 3rd at 13.5%, The next four varieties, each with between 4-7% of the acres were Forefront, SY-Soren, WB9507, and Rollag. The 2014 release Chevelle (Meridian Seeds) and 2015 releases Bolles (U of MN), Focus (SDSU), HRS 3504 and HRS 3530 (CROPLAN by WinField),

LCS Nitro (Limagrain Cereal Seeds), MS Stingray (Meridian Seeds), SY Valda (Syngenta), and WB9653 (Westbred) were included and their data (multi-year for Bolles, Focus, and LCS Nitro) is presented for the first time this year. Testing of Advance, Breaker, HRS 3378, Jenna, LCS Powerplay, Vantage, and WB-Digger was discontinued.

Due to the increased use of fungicides on wheat in Minnesota, we initiated an additional variety trial in 2004 in which fungicides are applied at the time of herbicide application (Feekes 5), flag leaf emergence (Feekes 9), and at the onset of flowering (Feekes 10.51). The practice of three fungicide applications during the growing season is not recommended. This fungicide regime was implemented to measure the varieties' performance when fungal diseases were controlled to the maximum extent possible. Decisions regarding fungicide applications should be based on the available decision support systems, and used only if and when disease levels are forecasted to reach economically damaging levels. The additional performance evaluations were carried out adjacent to the conventional (no fungicides applied) trials, so results can be compared directly. Data from trials conducted in Lamberton, Morris, Crookston, and Roseau are included in the 2015 and multi-year summaries. In the two northern locations, the fungicide regime as applied in these trials increased grain yield on average by 13.4 bu/acre in 2015 and by 12.2 bu/acre over the past three years. The two southern locations, Lamberton and Morris, averaged 5.1 and 0.8 bu/acre higher grain yield when fungicide protected in 2015 and over the 3-year average, respectively. Rather than the average increases in grain yield,

Table 3. Disease reactions[1] of hard red spring wheat varieties in Minnesota in multiple-year comparisons (2011-2015).

Entry	Leaf Rust	Stripe Rust[2]	Stem Rust[3]	Bacterial Leaf Streak[4]	Other Leaf Diseases[5]	Scab
Barlow	4	1	1	4	4	4
Bolles	1	1	2	4	4	4
Chevelle	—	1	1	—	—	—
Elgin-ND	2	2	2	5	5	5
Faller	5	5	2	4	4	4
Focus	3	3	3	3	7	—
Forefront	2	2	4	3	4	3
Glenn	5	1	1	4	5	3
HRS 3361	3	3	3	4	4	—
HRS 3419	4	1	1	6	3	—
HRS 3504	—	2	1	—	—	—
HRS 3530	—	3	1	—	—	—
Knudson	2	4	3	4	3	6
LCS Albany	2	3	3	6	5	4
LCS Breakaway	3	2	2	3	5	5
LCS Iguacu	4	5	2	4	4	4
LCS Nitro	4	2	2	5	7	—
Linkert	4	1	1	4	4	5
Linkert 1.3X	4	1	1	4	4	5
Marshall	8	—	1	6	7	7
MS Stingray	—	7	2	—	—	—
Norden	2	1	1	4	4	4
Prevail	2	1	5	2	6	4
Prosper	5	5	2	4	4	5
RB07	2	2	2	6	6	4
Rollag	4	1	2	4	5	3
Samson	5	2	1	6	6	8
SY Ingmar	3	2	1	3	6	—
SY Rowyn	3	1	1	2	6	4
SY Soren	2	2	1	4	4	5
SY Valda	—	2	1	—	—	—
WB-Mayville	3	3	2	6	7	7
WB9507	8	8	3	6	3	—
WB9653	—	2	2	—	—	—

[1]1-9 scale where 1=most resistant, 9=most susceptible.
[2]Based on natural infections in 2015 at Kimball, Lamberton, and Waseca.
[3]Stem rust levels have been very low in production fields in recent years, even on susceptible varieties.
[4]Bacterial leaf streak symptoms are highly variable from one environment to the next. The rating of newer entries may change by as much as one rating point as more data are collected.
[5]Combined rating of tan spot and septoria.

the responses of individual varieties provide the most useful information; varieties rated susceptible to leaf rust, stripe rust, and other fungal leaf diseases usually benefited most from fungicide applications.

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Table 4. Relative grain yield of hard red spring wheat varieties in northern Minnesota locations in single-year (2015) and multiple-year comparisons (2013-2015).

	Crookston			Fergus Falls			Hallock			Oklee			Perley			Roseau			Stephen			Strathcona	
Entry	2015	2-Yr	3-Yr	2015	2-Yr	3-Yr	2015	2-Yr	3-Yr	2015	2-Yr	3-Yr	2015	2-Yr	3-Yr	2015	2-Yr	3-Yr	2015	2-Yr	3-Yr	2015	2-Yr
Barlow	94	89	89	97	89	91	96	98	102	100	100	97	93	93	96	98	100	97	97	98	108	99	99
Bolles	93	98	99	99	100	104	95	94	100	97	99	96	95	97	99	101	102	94	94	94	104	108	104
Chevelle	102	—	—	100	—	—	94	—	—	110	—	—	96	—	—	84	—	—	102	—	—	94	—
Elgin-ND	100	100	99	99	99	100	86	95	101	95	95	95	89	93	97	83	90	92	89	95	108	95	94
Faller	93	109	109	115	115	116	110	112	116	97	103	102	102	104	105	104	104	104	105	107	117	101	105
Focus	101	97	—	94	94	—	95	97	—	109	99	—	97	97	—	109	109	—	97	95	—	102	95
Forefront	102	103	101	93	101	102	102	103	102	101	100	98	104	103	103	94	98	92	91	98	105	103	101
Glenn	90	87	86	93	88	91	89	94	95	103	100	96	91	92	94	106	102	95	99	98	105	101	101
HRS 3361	100	100	—	105	106	—	96	97	—	104	103	—	96	97	—	92	99	—	91	93	—	105	99
HRS 3419	115	111	—	107	118	—	115	111	—	99	105	—	105	106	—	112	111	—	113	108	—	110	111
HRS 3504	102	—	—	106	—	—	97	—	—	100	—	—	100	—	—	94	—	—	109	—	—	98	—
HRS 3530	108	—	—	112	—	—	114	—	—	103	—	—	113	—	—	102	—	—	113	—	—	114	—
Knudson	96	101	100	100	100	103	98	102	106	102	100	98	94	96	99	88	92	91	97	99	107	109	100
LCS Albany	103	110	108	111	113	119	109	108	115	103	109	106	105	104	103	103	104	105	102	106	115	101	106
LCS Breakaway	104	94	93	102	91	94	91	95	101	99	101	96	107	103	104	103	100	93	104	101	105	105	101
LCS Iguacu	101	106	105	94	105	110	103	101	106	100	107	103	111	107	110	111	110	106	111	109	112	104	106
LCS Nitro	105	104	—	104	114	—	99	99	—	102	104	—	99	101	—	98	103	—	100	100	—	114	106
Linkert	108	101	99	95	90	92	101	99	104	103	99	95	95	95	98	100	102	96	105	101	106	107	103
Linkert 1.3X	104	—	—	91	—	—	91	—	—	95	—	—	95	—	—	111	—	—	103	—	—	94	—
Marshall	88	90	92	92	91	96	92	95	101	103	93	93	85	91	95	71	81	84	95	95	106	87	89
MS Stingray	103	—	—	110	—	—	120	—	—	99	—	—	115	—	—	131	—	—	109	—	—	126	—
Norden	98	97	97	100	98	99	97	98	102	99	100	98	96	97	99	114	102	99	97	98	107	84	93
Prevail	103	100	99	100	108	107	102	101	107	108	104	98	103	101	102	108	106	100	97	99	104	99	101
Prosper	100	108	107	110	113	114	109	110	114	105	108	107	104	106	108	105	106	103	105	105	119	106	107
RB07	100	101	99	97	97	99	93	95	103	106	102	98	95	98	100	91	96	92	96	99	106	97	98
Rollag	108	105	99	101	99	101	101	100	104	109	103	98	103	100	101	87	90	87	88	92	100	100	97
Samson	110	98	97	100	93	98	109	105	110	104	105	102	111	107	108	104	108	101	102	103	110	123	113
SY Ingmar	95	100	—	100	100	—	99	98	—	100	97	—	100	100	—	102	98	—	104	101	—	100	101
SY Rowyn	102	107	103	108	110	109	104	103	107	95	99	96	97	98	98	90	95	90	102	100	104	110	102
SY Soren	104	103	99	91	96	98	92	95	99	101	100	98	95	95	99	110	108	100	99	99	104	105	103
SY Valda	107	—	—	110	—	—	118	—	—	98	—	—	110	—	—	98	—	—	110	—	—	105	—
WB-Mayville	97	91	93	97	91	92	98	98	103	97	99	96	96	97	96	95	101	93	94	94	100	89	95
WB9507	94	103	—	112	113	—	110	111	—	92	100	—	106	106	—	92	98	—	98	104	—	110	104
WB9653	97	—	—	110	—	—	87	—	—	100	—	—	92	—	—	95	—	—	114	—	—	106	—
Mean (Bu/Acre)	**82.3**	**88.5**	**89.4**	**108.2**	**93.3**	**89.7**	**90.9**	**89.4**	**93.2**	**103.1**	**98.3**	**94.2**	**108.8**	**95.5**	**92.6**	**84.5**	**86.1**	**83.9**	**85.4**	**72.9**	**74.9**	**64.7**	**77.3**
LSD (0.10)	**6.6**	**11.4**	**7.9**	**7.5**	**11.3**	**7.8**	**11.4**	**6.3**	**5.3**	**11.2**	**8.7**	**6.7**	**7.4**	**5.9**	**5.3**	**12.2**	**8.5**	**8.7**	**10.7**	**8.4**	**7.6**	**14.1**	**9.4**

Table 5. Relative grain yield of hard red spring wheat varieties in southern Minnesota locations in single-year (2015) and multiple-year comparisons (2013-2015).

	Benson			Kimball			Le Center		Lamberton			Morris			St. Paul			Waseca		
Entry	2015	2-Yr	3-Yr	2015	2-Yr	3-Yr	2015	2-Yr	2015	2-Yr	3-Yr	2015	2-Yr	3-Yr	2015	2-Yr	3-Yr	2015	2-Yr	3-Yr
Barlow	94	91	90	84	87	91	100	84	97	98	89	99	98	95	93	92	100	94	89	93
Bolles	101	98	93	99	99	102	88	77	92	97	91	98	101	92	103	105	106	100	109	113
Chevelle	117	—	—	115	—	—	104	—	105	—	—	110	—	—	103	—	—	93	—	—
Elgin-ND	105	97	94	90	92	94	93	79	97	99	91	101	101	96	99	99	101	81	79	89
Faller	105	106	103	88	97	96	106	104	111	108	99	96	102	97	98	103	106	109	104	106
Focus	96	99	—	87	87	—	94	91	110	106	—	93	105	—	95	98	—	96	94	—
Forefront	95	95	94	104	104	105	108	100	108	103	95	106	108	99	86	96	100	102	107	116
Glenn	87	92	87	90	89	94	84	80	102	97	89	87	95	90	75	78	85	103	92	94
HRS 3361	88	94	—	99	102	—	106	97	101	100	—	105	101	—	99	101	—	116	113	—
HRS 3419	99	100	—	128	121	—	119	117	114	115	—	114	108	—	116	113	—	117	116	—
HRS 3504	108	—	—	104	—	—	111	—	112	—	—	116	—	—	102	—	—	101	—	—
HRS3530	115	—	—	97	—	—	108	—	106	—	—	88	—	—	104	—	—	141	—	—
Knudson	100	96	94	96	99	100	102	93	102	103	94	100	99	94	101	98	102	82	88	97
LCS Albany	113	110	106	119	115	112	107	96	104	110	105	101	107	102	115	117	118	112	121	131
LCS Breakaway	98	99	96	92	94	97	98	91	93	93	86	85	92	89	99	93	101	100	93	100
LCS Iguacu	101	103	101	105	107	105	98	99	103	102	97	98	100	97	118	118	120	77	89	110
LCS Nitro	107	110	—	116	115	—	110	110	106	107	—	113	109	—	120	117	—	98	110	—
Linkert	93	93	89	97	98	99	104	94	93	92	86	99	93	88	102	96	97	103	102	102
Linkert 1.3X	92	—	—	95	—	—	99	—	93	—	—	96	—	—	105	—	—	109	—	—
Marshall	101	102	95	79	87	88	70	67	75	82	77	97	92	86	75	80	82	40	56	70
MS Stingray	103	—	—	100	—	—	101	—	89	—	—	98	—	—	122	—	—	88	—	—
Norden	95	98	94	97	95	94	96	87	100	100	90	102	96	91	101	99	100	103	107	109
Prevail	93	100	97	115	109	109	106	103	105	101	94	101	108	102	105	109	111	122	124	136
Prosper	116	114	106	96	99	101	100	96	104	105	95	90	103	100	98	103	109	106	112	117
RB07	102	98	94	103	100	98	89	85	99	101	92	95	94	93	99	94	96	104	94	98
Rollag	101	100	93	100	99	98	91	83	94	94	84	104	98	92	92	94	92	88	85	89
Samson	96	94	93	106	99	101	109	94	106	99	93	106	96	92	114	105	104	105	103	110
SY Ingmar	103	108	—	110	107	—	110	109	103	103	—	94	101	—	90	95	—	80	86	—
SY Rowyn	102	105	100	108	106	109	98	99	109	106	96	112	116	108	100	101	106	101	109	109
SY Soren	95	97	93	99	99	100	86	83	93	100	92	83	95	90	99	99	100	78	85	93
SY Valda	110	—	—	105	—	—	116	—	113	—	—	112	—	—	107	—	—	98	—	—
WB-Mayville	92	96	95	94	92	97	107	99	95	91	85	114	96	89	106	103	103	110	97	101
WB9507	110	107	—	92	100	—	113	108	97	101	—	86	97	—	114	114	—	87	102	—
WB9653	112	—	—	112	—	—	109	—	109	—	—	123	—	—	108	—	—	111	—	—
Mean (Bu/Acre)	**102.6**	**107.8**	**105.1**	**96.4**	**92.9**	**83.9**	**86.3**	**75.6**	**94.5**	**88.0**	**81.9**	**64.9**	**72.7**	**71.6**	**88.7**	**77.9**	**76.4**	**47.7**	**42.7**	**43.1**
LSD (0.10)	**10.2**	**8.2**	**5.9**	**11.3**	**10.3**	**7.9**	**10.8**	**11.0**	**7.1**	**8.1**	**7.2**	**9.4**	**14.2**	**9.4**	**7.2**	**11.4**	**10.1**	**16.8**	**23.9**	**17.9**

Hard red spring wheat seeding rate calculator.

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 the 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:

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

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	117

Table 6. Relative grain yield of hard red spring wheat varieties in Minnesota in single-year (2015) and multiple-year comparisons (2013-2015).

	State			North			South		
Entry	2015	2-Year	3-Year	2015	2-Year	3-Year	2015	2-Year	3-Year
Barlow	95	94	95	96	95	96	94	92	95
Bolles	97	98	99	97	98	99	97	98	99
Chevelle	102	—	—	98	—	—	108	—	—
Elgin-ND	93	94	97	92	95	97	96	94	96
Faller	102	105	106	103	107	108	101	104	104
Focus	98	97	—	100	97	—	96	97	—
Forefront	99	101	101	98	100	99	101	101	103
Glenn	93	92	93	96	95	94	89	89	91
HRS 3361	99	100	—	98	99	—	100	100	—
HRS 3419	111	111	—	109	110	—	115	112	—
HRS 3504	103	—	—	100	—	—	107	—	—
HRS3530	108	—	—	109	—	—	107	—	—
Knudson	98	98	99	97	98	99	98	98	99
LCS Albany	107	109	110	105	107	109	110	111	112
LCS Breakaway	99	96	97	101	98	97	95	94	97
LCS Iguacu	103	105	106	104	106	106	102	104	107
LCS Nitro	106	107	—	102	103	—	111	111	—
Linkert	99	97	97	101	98	97	98	95	95
Linkert 1.3X	97	—	—	97	—	—	97	—	—
Marshall	85	87	90	89	90	94	79	84	85
MS Stingray	108	—	—	113	—	—	101	—	—
Norden	98	97	98	98	98	98	98	97	97
Prevail	104	104	104	102	102	101	105	106	108
Prosper	104	106	107	105	107	109	102	105	106
RB07	97	97	98	97	98	98	98	96	97
Rollag	98	97	96	99	98	97	96	95	93
Samson	106	101	102	107	103	103	105	98	100
SY Ingmar	100	101	—	100	99	—	100	103	—
SY Rowyn	102	103	103	100	101	100	104	106	107
SY Soren	96	97	98	99	99	98	92	95	97
SY Valda	108	—	—	107	—	—	109	—	—
WB-Mayville	98	96	96	95	95	95	101	96	98
WB9507	101	105	—	101	104	—	101	105	—
WB9653	105	—	—	99	—	—	111	—	—
Mean (Bu/Acre)	**87.6**	**84.1**	**82.0**	**91.4**	**88.1**	**88.4**	**83.2**	**79.5**	**74.7**
LSD (0.10)	**4.0**	**2.7**	**2.2**	**4.7**	**3.2**	**2.5**	**7.0**	**4.7**	**3.8**
No. Environments	**14**	**29**	**42**	**8**	**16**	**23**	**6**	**13**	**19**

Table 7. Grain yield (bushels per acre) of hard red spring wheat varieties grown under conventional and intensive management.

	North						South						State					
	2015		2-Yr		3-Yr		2015		2-Yr		3-Yr		2015		2-Yr		3-Yr	
Entry	Conv	Int	Conv	Int	Conv	Int	Conv	Int	Conv	Int	Conv	Int	Conv	Int	Conv	Int	Conv	Int
Barlow	80.2	91.7	82.3	96.5	80.7	93.6	77.9	82.5	78.7	82.7	73.1	72.5	79.1	87.1	80.5	89.6	76.9	83.0
Bolles	81.0	92.4	87.5	97.0	83.7	93.3	75.3	79.7	79.2	83.4	70.1	71.8	78.2	86.0	83.3	90.2	76.9	82.5
Chevelle	77.5	100.5	—	—	—	—	85.1	89.4	—	—	—	—	81.3	94.9	—	—	—	—
Elgin-ND	76.2	90.5	82.9	96.5	82.8	94.7	78.4	82.3	80.4	84.3	73.3	73.1	77.3	86.4	81.7	90.4	78.1	83.9
Faller	82.4	105.1	92.8	111.1	92.2	106.3	83.6	92.5	85.0	91.4	76.6	78.1	83.0	98.8	88.9	101.3	84.4	92.2
Focus	87.6	96.5	89.6	100.2	—	—	86.5	78.6	86.9	83.0	—	—	87.1	88.4	88.3	92.0	—	—
Forefront	82.1	83.1	87.9	94.6	83.9	90.9	93.4	85.8	88.9	85.3	77.8	74.1	86.6	84.5	87.8	89.9	80.5	82.5
Glenn	81.9	88.9	82.5	94.2	78.6	90.1	86.5	75.6	82.5	80.5	73.2	69.8	83.7	82.2	82.3	87.4	75.8	80.0
HRS 3361	79.9	91.8	86.5	100.9	—	—	88.9	79.4	84.1	81.7	—	—	83.5	85.6	84.8	91.3	—	—
HRS 3419	94.6	98.3	96.9	108.2	—	—	91.0	98.8	89.9	96.4	—	—	92.8	98.5	93.4	102.3	—	—
HRS 3504	81.6	102.5	—	—	—	—	93.6	91.0	—	—	—	—	87.1	96.7	—	—	—	—
HRS3530	87.5	99.3	—	—	—	—	78.7	88.0	—	—	—	—	83.1	93.6	—	—	—	—
Knudson	76.7	95.4	84.6	100.6	83.0	96.6	83.6	90.1	82.9	86.3	74.1	75.2	79.8	93.0	83.6	93.6	78.4	86.0
LCS Albany	85.9	101.2	93.3	106.1	92.5	104.2	85.2	95.4	89.0	91.2	80.9	79.9	85.6	98.3	91.2	98.7	86.7	92.1
LCS Breakaway	86.2	100.4	84.7	102.4	80.5	95.5	79.8	86.3	78.3	87.1	71.6	75.3	83.6	94.0	81.8	95.1	76.3	85.6
LCS Iguacu	88.8	92.8	94.2	102.4	91.5	99.3	80.4	90.2	81.4	89.3	74.9	77.4	84.6	91.5	87.8	95.9	83.2	88.4
LCS Nitro	84.6	91.1	90.2	101.9	—	—	86.7	85.6	86.6	90.9	—	—	85.6	88.4	88.4	96.4	—	—
Linkert	86.7	98.0	88.6	100.8	84.3	94.6	75.8	81.2	74.5	79.9	67.7	69.3	81.3	89.6	81.6	90.4	76.0	81.9
Linkert 1.3X	89.9	93.5	—	—	—	—	75.0	85.8	—	—	—	—	82.4	90.0	—	—	—	—
Marshall	66.5	89.6	74.8	97.6	76.4	94.3	67.4	80.4	69.8	81.3	63.6	69.7	66.9	85.0	72.3	89.5	70.0	82.0
MS Stingray	97.9	107.9	—	—	—	—	74.1	91.5	—	—	—	—	86.0	99.7	—	—	—	—
Norden	88.5	94.2	87.1	98.6	85.0	96.0	83.1	82.9	80.1	83.4	72.4	72.1	86.1	88.5	83.7	91.0	78.8	84.0
Prevail	87.7	101.6	90.0	102.4	86.1	97.1	82.4	91.7	83.6	87.2	76.6	75.6	85.1	97.1	86.8	95.0	81.3	86.5
Prosper	85.3	98.2	93.5	106.8	90.8	102.6	78.0	91.3	83.4	90.6	77.4	78.8	81.6	94.7	88.5	98.7	84.1	90.7
RB07	79.9	100.5	86.1	104.7	83.1	98.9	77.5	87.3	78.9	85.7	73.5	74.2	78.7	93.9	82.5	95.2	78.3	86.6
Rollag	81.2	98.7	85.2	101.2	80.8	95.4	78.5	80.8	77.4	80.2	69.4	68.4	79.8	89.7	81.3	90.7	75.1	81.9
Samson	89.4	105.9	90.0	104.9	85.9	98.2	84.5	88.3	78.5	87.2	71.9	77.0	86.9	97.9	84.2	96.5	78.9	87.9
SY Ingmar	82.1	100.2	86.4	101.6	—	—	75.5	83.6	80.0	86.1	—	—	79.1	91.9	83.3	93.9	—	—
SY Rowyn	80.1	100.1	88.0	103.5	83.8	97.3	95.1	86.9	92.4	89.4	83.1	76.7	86.1	93.5	89.5	96.5	82.9	87.0
SY Soren	89.4	97.1	91.9	102.1	86.7	95.9	71.0	83.7	78.5	85.0	70.4	73.7	80.2	90.4	85.2	93.6	78.5	84.8
SY Valda	85.6	99.5	—	—	—	—	89.5	93.0	—	—	—	—	87.5	96.3	—	—	—	—
WB-Mayville	80.4	102.5	83.8	103.8	80.4	97.2	83.7	90.4	76.1	85.5	67.9	73.7	81.9	96.5	79.9	94.7	74.1	85.5
WB9507	77.8	104.0	87.7	107.2	—	—	73.5	96.3	79.8	94.6	—	—	75.6	100.2	83.8	100.9	—	—
WB9653	79.9	101.6	—	—	—	—	91.3	80.4	—	—	—	—	86.1	91.0	—	—	—	—
Mean (Bu/Acre)	**83.8**	**97.2**	**87.7**	**101.8**	**84.7**	**96.9**	**81.4**	**86.5**	**81.8**	**86.2**	**73.5**	**74.3**	**82.5**	**91.9**	**84.7**	**94.0**	**79.1**	**85.6**
LSD (0.10)	**7.1**	**6.3**	**3.7**	**3.4**	**3.0**	**2.8**	**5.4**	**5.9**	**3.4**	**3.2**	**2.4**	**2.2**	**4.7**	**4.4**	**4.6**	**4.4**	**1.9**	**1.8**
No. Environments	**2**	**2**	**4**	**4**	**6**	**6**	**2**	**2**	**4**	**4**	**6**	**6**	**4**	**4**	**8**	**8**	**12**	**12**