

# Southern Minnesota Small Grains Research & Outreach Project

Jared Goplen, Morris Regional Extension Office

## Research Questions

The objectives of this grant were to:

1. Evaluate variety performance for Hard Red Spring Wheat (HRSW) and Hard Red Winter Wheat (HRWW) varieties across southern Minnesota with locations at Benson, Kimball, and Le Center
2. Organize extension programming for small grain production and management in southern Minnesota using summer field days and winter meetings.

## Results

The “Southern Wheat Tour” characterized the winter extension programming efforts for central and southern Minnesota small grains. Meetings were held in Benson, Cold Spring, New Prague, and Slayton, MN. Attendance has been strong in recent years, with 135 farmers and crop consultants attending these meetings in 2018. The summer field days were held the last week of June at Benson, Le Center, New Ulm, and Kimball. Summer field days had over 120 farmers and consultants in attendance. The variety trial results can be found in tables 1 and 2 (Appendix I). The average yield across all locations was 68 bu/ac for HRWW and 67 bu/ac for HRSW. Plots were also used as sentinel plots for summer scouts to monitor disease and insect pests during early-season, and were also used for pest identification and demonstration during summer field days.

## Application and Use

Central and southern Minnesota have not had large small grain acreages in recent decades. Small grains have often been grown in this region for reasons other than maximized production, such as manure applications, straw production, forage/cover-crop establishment, or tiling projects. The combination of low commodity crop prices, weed and insect resistance issues, and interest in diversifying crop rotations to improve soil health has inspired more farmers in these regions to consider growing small grains. Our research and demonstration plots have documented the ability to grow small grains in central and southern Minnesota with high yield and quality that can maximize profitability. Our results have been echoed by reports from farmers in these regions who utilize advanced management tools and genetics despite the added production risks of heat and disease stressors that are more prevalent in southern Minnesota.

## Materials and Methods

The winter wheat and rye variety trials had 26 and 18 entries, respectively. Plots were seeded on September 29, 2017 near Le Center and Kimball, MN. The spring wheat, oats, and barley variety trials had 38, 20, and 14 entries, respectively. Trials at Montgomery and Kimball were seeded on May 1<sup>st</sup>, and the plot near Benson, MN was seeded on April 30<sup>th</sup>. Trials were all a randomized complete block design with 3 replications. Field preparations and fertility management were completed by plot cooperators. Planting, weed control, data collection, and harvest were completed by the research group.

## Economic Benefit to a Typical 500 Acre Wheat Enterprise

Variety selection is one of the most critical decisions made on a wheat enterprise. A well-adapted versus a poorly-adapted variety can be the difference in farm profitability. In the 2018 on-farm trials, there was a 27 bu/ac difference between the highest-yielding 10% of varieties and the lowest-yielding 10% of varieties. This 27 bu/ac difference in yield could increase returns by over \$140 per acre, or over \$70,000 in gross returns for a 500 acre wheat enterprise. All with only changing variety selection. Even just increasing yield by 10% can increase gross returns by nearly \$40 per acre. Variety trials are especially valuable in southern Minnesota, where variety trial information is otherwise limited. The ability to recommend varieties adapted to southern Minnesota as well as for farmers to see varieties firsthand before planting them has an invaluable impact on current and future wheat farmers in southern Minnesota. These trials also influence the spring wheat, barley, and oat breeding programs at the University of Minnesota, by allowing on-farm assessments of yield, disease, lodging and other agronomic characteristics that are used to influence future varietal releases and agronomic ratings. These factors further add to the impact that this project has on a typical wheat farm in Minnesota.

## Related Research

This research is integrally linked with the small grain breeding programs at the University of Minnesota. The spring wheat, barley, and oat breeding programs utilize the data generated in these trials as part of their southern small grain variety performance evaluations, which expands the

geographical coverage of small grain variety trials as well as provides on-farm credibility to the variety evaluations. The rye variety trials also link with this project and are part of a Minnesota Department of Agriculture grant titled “The Flavor and Agronomic Performance of Winter Rye for the Craft Distillers in Minnesota.”

## **Recommended Future Research**

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Variety trial data is much more valuable when it is aggregated with ongoing variety trials. Just because a variety performed well one year does not mean it will repeat the same trend in the future. Variety selections should be based on multiple years of data from multiple locations. This is why these variety trials should be continued into the future so that farmers can continue to refine their variety selections as new genetics become available.

## **Publications**

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Results of yield trials for spring and winter wheat, barley, oats, and winter rye are part of the variety trial results that will be published in the on-line publication ‘2018 Minnesota Field Crop Trials’. The 2017 trial results were published in:

1. Anderson J.A, J.J. Wiersma, S. Reynolds, N. Stuart, H. Lindell, R. Dill-Macky, J. Kolmer, M. Rouse, Y. Jin, M. Smith, and L. Dykes. 2017. Hard Red Spring Wheat. *In*: 2017 Minnesota Field Crop Trials. Minnesota Agricultural Experiment Station Publication MP 121-2018. University of Minnesota, St. Paul, MN.
2. Smith, K., E. Schiefelbein, J.J. Wiersma, R. Dill-Macky, M. Smith, and B. Steffenson. 2017. Barley. *In*: 2017 Minnesota Field Crop Trials. Minnesota Agricultural Experiment Station Publication MP 121-2018. University of Minnesota, St. Paul, MN.
3. Case, A., R. Dill-Macky, J. Heuschele, H. Rines, D. von Ruckert, J.J Wiersma, and K. Smith. 2017. Oat. *In*: 2017 Minnesota Field Crop Trials. Minnesota Agricultural Experiment Station Publication MP 121-2018. University of Minnesota, St. Paul, MN.
4. Wiersma, J.J. and J.A. Anderson. 2017. Hard Red Winter Wheat. *In*: 2017 Minnesota Field Crop Trials. Minnesota Agricultural Experiment Station Publication MP 121-2018. University of Minnesota, St. Paul, MN.
5. Wiersma, J.J., S. Wells, and A. Garcia y Garcia. 2017. Winter Rye. *In*: 2017 Minnesota Field Crop Trials. Minnesota Agricultural Experiment Station Publication MP 121-2018. University of Minnesota, St. Paul, MN.

**Table 1** – Grain yield (bu/ac), grain protein (%), and test weight (lbs/bu) of Hard Red Spring Wheat varieties at three on-farm trial locations in southern Minnesota in 2018.

Variety	Benson				Le Center				Kimball		
	Grain Yield	Grain Protein	Test Weight		Grain Yield	Grain Protein	Test Weight		Grain Yield	Grain Protein	Test Weight
	(bu/ac)	(%)	(lbs/bu)		(bu/ac)	(%)	(lbs/bu)		(bu/ac)	(%)	(lbs/bu)
Bolles	72.0	16.4	59.5		36.8	19.3	54.5		66.6	17.4	60.5
Boost	77.9	14.4	59.4		59.3	15.9	55.8		52.6	16.4	56.4
Chevelle	76.5	13.9	59.0		48.3	14.3	57.6		60.8	14.5	60.5
CP3419	84.6	12.9	59.2		80.4	15.0	58.3		78.1	15.5	59.1
CP3504	80.0	14.2	58.9		54.3	16.4	55.5		66.3	14.5	57.5
CP3530	82.1	15.1	59.8		72.5	16.6	56.1		68.9	16.1	58.2
CP3616	83.5	15.1	59.1		46.3	16.8	56.0		57.8	16.7	59.6
Dyna-Gro Ambush	74.8	15.0	60.5		57.9	17.9	53.9		76.8	16.3	60.8
Dyna-Gro Ballistic	84.6	14.0	58.9		56.5	16.8	52.2		73.0	15.8	58.9
Dyna-Gro Caliber	63.4	15.8	59.7		48.2	16.7	57.2		70.6	16.0	58.6
Faller	89.6	14.8	60.0		59.7	16.0	54.7		76.7	15.6	59.3
Forefront	74.0	15.1	59.6		62.7	15.8	57.1		75.6	16.6	60.1
Lang-MN	85.5	15.2	61.0		55.8	17.1	53.7		73.8	16.4	60.5
LCS Breakaway	73.2	15.2	61.3		41.1	16.9	57.0		76.0	15.7	61.8
LCS Cannon	71.5	14.7	61.3		65.3	15.4	59.4		79.2	14.9	62.9
LCS Rebel	74.2	15.3	60.4		52.0	17.7	55.0		59.6	16.3	61.7
LCS Trigger	87.7	12.4	60.1		70.1	13.9	56.9		61.7	13.9	57.7
Linkert	68.7	15.7	59.4		47.1	17.5	56.4		70.5	16.1	61.0
MS Barracuda	72.2	15.6	60.2		60.5	16.3	58.6		72.1	16.9	61.2
MS Camaro	68.2	15.3	59.5		54.3	15.1	56.8		67.1	16.2	59.9
ND-VitPro	74.3	15.5	62.1		52.4	16.5	58.9		65.9	16.6	62.3
Prevail	84.0	14.7	59.4		58.8	15.3	54.6		78.4	14.7	60.1
Prosper	90.0	13.8	59.9		57.9	16.7	53.4		76.1	15.4	59.7
Rollag	70.9	15.8	61.2		36.2	19.2	56.0		67.7	16.8	61.1
Shelly	87.9	13.8	59.7		64.2	15.6	55.8		66.3	14.9	60.0
Surpass	73.1	15.3	58.5		46.1	17.6	52.8		67.0	16.5	60.7
SY Ingmar	80.6	15.3	60.6		58.9	16.3	59.7		71.5	16.3	59.5
SY Rowyn	73.5	14.3	60.2		52.5	15.9	56.0		55.9	15.2	60.6
SY Soren	73.4	15.0	60.3		49.3	16.1	57.2		70.9	16.1	60.9
SY Valda	92.1	14.6	60.6		56.6	15.9	55.0		75.3	15.9	59.6
TCG-Climax	75.3	16.0	62.4		61.7	17.6	60.6		72.8	16.9	62.4
TCG-Glennville	64.2	16.3	60.6		45.8	17.4	53.5		59.9	16.6	61.6
TCG-Spitfire	83.9	13.9	59.5		68.6	14.9	58.0		72.8	14.5	58.5
WB9479	74.5	15.7	59.5		57.8	17.1	58.4		77.1	16.5	60.4
WB9590	68.1	15.4	59.5		52.4	16.9	57.5		78.2	15.8	61.1
WB9653	79.9	14.1	58.9		41.9	16.9	56.2		57.9	14.4	58.0
WB9719	78.0	14.7	62.4		68.0	15.5	55.6		73.3	15.2	61.6
WB-Mayville	67.4	16.1	60.4		55.6	16.3	58.0		67.1	16.7	61.0
<b>LSD (0.05)</b>	<b>8.0</b>				<b>9.5</b>				<b>11.0</b>		

**Table 2** – Grain yield (bu/ac) of Hard Red Winter Wheat (A), and Winter Rye (B) varieties at two on-farm trial locations in southern Minnesota in 2018.

A. Hard Red Winter Wheat			B. Winter Rye		
Variety	Kimball	Le Center	Variety	Kimball	Le Center
	Grain Yield	Grain Yield		Grain Yield	Grain Yield
	(bu/ac)	(bu/ac)		(bu/ac)	(bu/ac)
AAC Gateway	53.6	70.4	Claudius*	82.6	105.3
AC Broadview	49.8	88.0	Danko	84.5	85.6
AC Emerson	58.3	91.2	Elbon	42.8	52.3
CDC Chase	75.0	73.0	Hazlet	69.4	70.4
Flourish	49.6	82.4	KWS Bintó	99.3	100.6
Freeman	59.9	80.1	KWS Bono	103.8	103.6
Jerry	63.7	77.5	KWS Brasetto	105.2	86.9
Keldin	46.4	74.4	KWS Dolaro	79.2	94.2
LCS Chrome	47.1	86.8	KWS Serafino	116.2	107.1
LCS Link	41.9	77.7	Musketeer	45.2	55.6
LCS Mint	54.5	78.4	ND Dylan	68.0	77.6
Loma	30.3	82.1	Prima	72.2	67.5
Minter	60.2	75.8	Raptus*	52.1	82.6
Moats	74.8	81.9	Rymin	58.4	75.5
Northern*	48.1	80.1	Spooner	48.0	77.4
Oahe*	60.7	83.8	SU Cossani	83.4	85.7
Overland	50.2	85.8	SU Forsetti	100.7	114.2
Redfield	62.1	82.9	SU Performer	93.7	101.0
Ruth	58.6	80.0	<b>LSD (0.1)</b>	<b>10.4</b>	<b>14.0</b>
SY Sunrise	23.7	78.4	* = Winter Triticale		
SY Wolf	47.1	84.5			
Thompson	59.4	88.7			
Warhorse*	50.8	86.5			
WB-Grainfield	58.7	87.2			
WB-Matlock	70.9	86.9			
WB4462	47.7	77.9			
<b>LSD (0.1)</b>	<b>14.0</b>	<b>11.1</b>			
* Solid stem varieties					