# Minnesota Wheat Research and Promotion Council
# CROP YEAR 2013 RESEARCH REPORTING FORM
# Form Due November 15, 2013

**1. PROJECT TITLE**
**University of Minnesota Wheat Breeding Program**

**2. PRINCIPAL INVESTITAGATOR (S)**

**A. Pli# 1 Name:**
James A. Anderson

**b. PI # 2 Name:**
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**4. REPORT DATE**

November 15, 2013

**5. REPORTING PERIOD**

January 1, 2013 – December 31, 2013

**6. TERMINAL REPORT** _____ **PROGRESS REPORT** ___X___

**7. AMOUNT OF GRANT** **$** 146,584

**8. PUBLICATIONS**

Anderson, J.A., J.J. Wiersma, S. Reynolds, and C. Springer. 2013. Hard Red Spring Wheat. In Minnesota Varietal Trials Results, University of Minnesota Extension Service.

Mergoum, M., R.C. Frohberg, R.W. Stack, S. Simsek, T.B. Adhikari, J.W. Rasmussen, M.S. Alamri, T.L. Friesen, and J. Anderson. 2013. 'Prosper': a high-yielding hard red spring wheat cultivar adapted to the north central plains of the USA. J. Plant Registrations 7:75-80.

**9: EXECUTIVE SUMMARY**

**Research Question:**

The objectives of this proposal are to i) develop improved varieties and germplasm combining high grain yield, disease resistance, and end-use quality; and ii) provide performance data on wheat varieties adapted to the state of Minnesota.

**Results:**

During the 2012/2013 crossing cycle, 282 crosses were made. The State Variety Trial, which contained 28 released varieties, 14 University of Minnesota experimental lines, and 6 experimental lines from other programs was grown at a total of 14 locations in 2013. During the 2013 growing season, another 228 advanced experimental lines were evaluated in advanced yield trials at 8-10 locations. An additional 612 lines were evaluated in preliminary yield trial at 2 locations. A total of 6,086 yield plots were harvested in 2013. Fusarium-inoculated, misted nurseries were established at Crookston and St. Paul. Inoculated leaf rust nurseries were conducted at Crookston and St. Paul and a stem rust nursery was also conducted at St. Paul. The disease nurseries involve collaboration with agronomists and pathologists at Crookston and with personnel from the Plant Pathology Department and the USDA-ARS. Data from the yield and scab nurseries are summarized and published in Prairie Grains and the MAES's Minnesota Varietal Trials Results.

One advanced experimental line, MN06028, was released as 'Linkert' in 2013. Linkert, is a mid-maturity hard red spring wheat with excellent straw strength, high grain protein content, and competitive grain yields. The pedigree of Linkert is MN97695-4/Ada. Linkert has moderate resistance to Fusarium head blight and prevalent races of leaf rust. Linkert is resistant to preharvest sprouting and has exhibited good end-use quality characteristics. Other advanced experimental lines that are candidates for release in the next 1-2 years are MN07098-6 and MN08165-8. MN07098-6 (SD3696/Ulen sel) has overall good disease resistance and adaptation to the entire state. MN08165-8 (MN02268-1/MN01333-A-1) has higher protein and grain yield than Vantage. Data of these two experimental lines, recent U of MN releases, and popular varieties are shown in Table 1.

**Table 1. Comparison of MN07098-6 and MN08165-8 with other wheat varieties. Varieties are sorted from highest to lowest yielding.**

| Line | Release Year | % MN Acreage 2013 | Grain Yield % of mean) North 3 Yr* | Protein | Test Wt. | Straw Strength (1-9) | Scab (1-9) | Leaf Rust (1-9) |
|---|---|---|---|---|---|---|---|---|
| LCS Albany | 2009 | 6.1 | 79.9 | 13.4 | 60.3 | 5 | 4 | 2 |
| Prosper | 2011 | 17.3 | 74.6 | 14.1 | 60.3 | 5 | 5 | 5 |
| Samson | 2007 | 6.5 | 74.0 | 14.3 | 59.8 | 3 | 8 | 5 |
| Faller | 2007 | 17.3 | 73.3 | 14.0 | 60.2 | 5 | 4 | 5 |
| Forefront | 2012 | 0.9 | 72.0 | 14.8 | 61.0 | 4 | 3 | 2 |
| **MN07098-6** | – | – | **71.2** | **14.1** | **60.8** | **4** | **4** | **4** |
| SY-Soren | 2011 | 6.4 | 70.3 | 14.8 | 60.6 | 4 | 4 | 3 |
| **MN08165-8** | – | – | **70.1** | **15.8** | **60.1** | **4** | **4-5** | **1** |
| WB-Mayville | 2011 | 13.3 | 69.2 | 15.0 | 60.3 | 3 | 7 | 3 |
| Norden | 2012 | 2.7 | 68.6 | 14.3 | 61.8 | 3 | 5 | 2 |
| RB07 | 2007 | 4.2 | 68.1 | 14.8 | 60.4 | 5 | 4 | 2 |
| Linkert | 2013 | 0.4 | 67.6 | 15.4 | 60.5 | 2 | 5 | 3 |
| Vantage | 2007 | 4.4 | 67.5 | 15.5 | 61.5 | 2 | 5 | 6 |
| Rollag | 2011 | 5.4 | 65.4 | 15.1 | 60.9 | 3 | 3 | 4 |

**Application/Use:**

Experimental lines that show improvement over currently available varieties are recommended for release. Improved germplasm is shared with other breeding programs in the region. Scientific information related to efficiency of breeding for particular criteria is presented at local, regional, national, and international meetings and published.

**Materials and Methods:**

All yield nurseries are grown in small, replicated plots (typically 40-75 sq. ft. harvested area per plot). Fusarium-inoculated nurseries at Crookston and St. Paul consist of single 4 to 6 ft. rows, with 1 to 3 replications. Fusarium-infected corn seed or spray-applied macroconidia are used as inoculum. The plot areas are misted periodically to maintain a high humidity environment for at least three weeks after anthesis. Leaf and stem rust nurseries are spray inoculated with spore suspensions and surrounded by a border seeded to mixture of susceptible varieties to further increase disease pressure.

**Economic Benefit to a Typical 500 Acre Wheat Enterprise:**

Choice of variety is one of the most important decisions growers make each year. The development of high-yielding varieties that are resistant to the prevalent diseases and have good end-use quality are necessary to increase grower profit and protect against constantly changing pathogens and pests. As an example, a new variety that yields 4% higher will produce 3 extra bushels in a field that averages 75 bu/A.

**10: RELATED RESEARCH**

These funds provide general support for our breeding/genetics program. Additional monetary support for breeding-related research in 2013 came from the Minnesota Agricultural Experiment Station, the U.S. Wheat and Barley Scab Initiative via USDA-ARS, and **N**ational Research Initiative Competitive Grant no. 2011-68002-30029 (Triticeae-CAP) from the USDA National Institute of Food and Agriculture.

**11: RECOMMENDED FUTURE RESEARCH**

We will continue to operate the breeding program using similar methodologies in the future. In 2013 we will have all the data we need for the genomic selection process. If successful, I anticipate genomic selection being a routine feature of our breeding program, using even lower cost DNA marker systems in the future.