Performance of Hard Red Spring Wheat Variety Blends

Jochum J. Wiersma and Douglas L. Holen

Extension Agronomist and Extension Educator

Department of Agronomy and Plant Genetics and University of Minnesota Extension

University of Minnesota, St. Paul, MN 55108

Objective

The objective of this study was to test whether the reported advantages of blending varieties of winter wheat can also be found for hard red spring wheat.

Background

Blending two or more varieties of hard red spring wheat in the same field continues to be of interest. The reasons HRSW producers express an interest are twofold. First, growers have a desire to combine high yield with high grain protein to avoid discounts. Secondly, growers want to reduce the risk of lodging by combining varieties with poorer straw strength with lodging resistant varieties .

The idea of purposely blending different varieties of wheat is more than 50 years old and was first proposed and tested to reduce the impact of stem and leaf rust. The rationale was as simple as it was elegant; by putting multiple resistance genes against the different races of rust in a field and across the landscape, a leaf rust epidemic would be slower to develop. First, there is a decreased odds that spores will land on a susceptible genotype. Secondly, the presence of susceptible genotypes decreases the selection pressure for virulence.

More recently this concept of stability has not only been applied to traits like disease resistances but also to yield and grain quality. Bowden et al. (2001) conducted a number of studies across Kansas in which a number of hard red winter wheat cultivars were blended in 2 and 3-way blends and evaluated for grain yield potential and stability. They found that a number of the blends tested showed a slight yield advantage and that the stability of the blend was slightly higher than that of the individual varieties that were part of the blend. Cowger et al. (2008) found that in North Carolina blends out yielded the pure varieties by an average of 2.3 bu/A or 3.2%. The North Carolina group also found that blends were either beneficial or neutral for incidence and severity of diseases.

Results

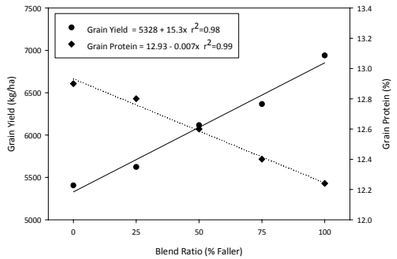

Figure 1 – Grain yield and grain protein response to blending of the HRSW varieties Faller and Glenn averaged across 3 environments.

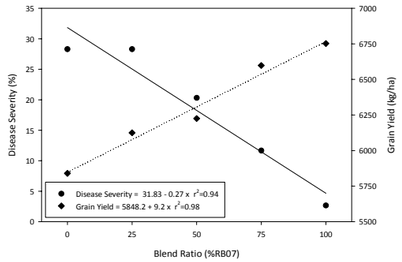

Figure 2 – Disease severity and grain yield and response to blending of the HRSW RB07 and Bigg Red in Fergus Falls in 2008.

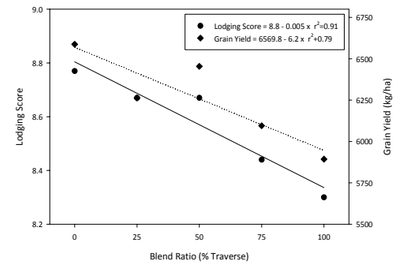

Figure 3 – Lodging score and grain yield response to blending of the HRSW varieties Rush and Traverse in Fergus Falls in 2008.

Table 1 - Standard errors of the means of blend 1 across 3 environments.

Blend (%Faller)	Grain Yield	Grain Protein
0	251.4	0.46
25	198.4	0.46
50	220.9	0.44
75	217.9	0.51
100	180.3	0.42

Conclusions

Preliminary conclusions are that:

- ✓ Grain yield, grain protein, incidence and severity of leaf diseases, and lodging all respond linearly to blending.
- ✓ Standard errors of the means of either grain yield or grain protein of the individual blends (data of blends 2 and 3 not shown) show no pattern that suggest that blends are more stable than monocultures of the individual cultivars.
- ✓ There no advantage blending HRSW cultivars to improve performance or reduce variability in comparison to pure stands.

Materials & Methods

- ✓ Three site-years as part of the Red River On-Farm Yield Trials in Fergus Falls (2008), Foxhome (2009), and Perley (2009):
  - Randomized complete block with 3 replications.
  - For each pair of varieties a 3:1, 1:1, and 1:3 blend was added to the existing variety.
- ✓ To limit confounding effects, varieties with relative similar heading dates and which contrasted significantly in only one dimension were selected:
  - Faller and Glenn (blend 1) for grain yield and grain protein.
  - Bigg Red and RB07 (blend 2) for incidence and severity of leaf diseases.
  - Rush and Traverse (blend 3) for straw strength and resistance to lodging.
- ✓ Data collection:
  - ✓ Leaf rust and leaf diseases incidence and severity were rated on 10 randomly selected flag and penultimate leafs approximately 21 days after heading as the crop approached the soft dough stage.
  - ✓ Lodging notes were taken on a plot basis just prior to harvest.
  - ✓ Grain yield, test weight, and protein concentration were also determined on a plot basis. Grain protein was determined by near infrared reflectance spectroscopy following AACC method 39-10 (American Association of Cereal Chemists, 1995).
- ✓ Data Analysis:
  - ✓ All effects, except blocks, assumed fixed.
  - ✓ Main effects, orthogonal contrasts, and interactions were tested using the appropriate error terms (McIntosh, 1983).

References:

American Association of Cereal Chemists, 1995 Approved Methods of the AACC. American Association of Cereal Chemists, Inc. St. Paul, MN.

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Cowger, C., Weisz, R. 2008. Blends of Soft Red Winter Wheat Varieties Increased Yield in North Carolina. Agronomy Journal. 100:169-177.

McIntosh, 1983. Analysis of combined experiments. Agron. J. 75: 153-155.