

Nitrogen Rate on Irrigated Hard Red Spring Wheat

Nearest Town: Staples, MN (Wadena Co.)

Soil Type: Verndale loamy sand

Previous Crop: Edible bean

Experimental Design: Factorial within a randomized complete block design with 4 replications

Factor 1: wheat variety (Faller, Mayville, and RB07)

Factor 2: nitrogen rate (0, 60, 120, 180, 240, and 300 lbs N per acre)

Nitrogen was split applied with 50% applied at emergence and 50% at the boot stage

Preliminary Soil Test: 16 lb N per acre at 2' depth

Bray P1-P: 43 ppm

Ammonium acetate K: 88 ppm

1.6% Soil organic matter

pH: 7.3

Purpose of Study: The purpose of this study was to determine optimum nitrogen rates for hard red spring wheat grown on an irrigated sandy soil. We also wanted to determine if varieties varied in their potential response to S.

Results:

The varieties were selected based on tissue analysis for a survey of HRSW varieties utilizing the variety trials. Flag leaf nitrogen concentration was surveyed. The varieties selected exhibited differences in their response to nitrogen in environments that vary in nitrogen availability. One variety was selected that responded less in a high N environment (Faller), one was deemed as average (Mayville), and one as above average (RB07).

There was no difference in the response to nitrogen among the three varieties studied. Faller did result in a greater yield per acre than Mayville or RB07 but the amount of N required to maximize yield was similar. Total protein produced per acre (protein yield) also differed for variety and nitrogen rates. Since protein yield was highly dependent on yield there was a similar lack of interaction between variety and nitrogen rate on protein yield.

Grain protein concentration was the only measured variation that exhibited an interaction between variety and nitrogen rate.

HRSW Grain Yield Data: Staples 2014

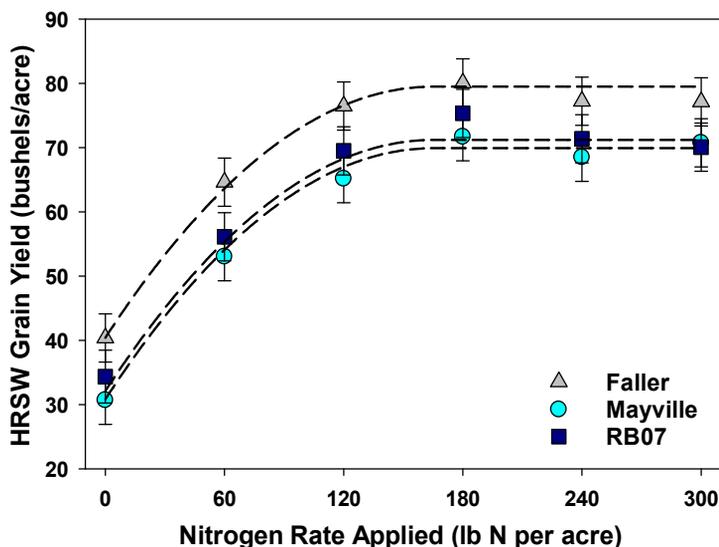


Table 1. Summary of statistical significance for grain yield and protein concentration data and protein yield per acre.

	Grain		Protein Yield
	Yield	Protein	
	-----P>F-----		
Variety	<0.001	<0.001	<0.01
Nrate	<0.001	<0.001	<0.001
Variety x N rate	0.99	0.04	0.95

N Rate on Irrigated Hard Red Spring Wheat (continued)

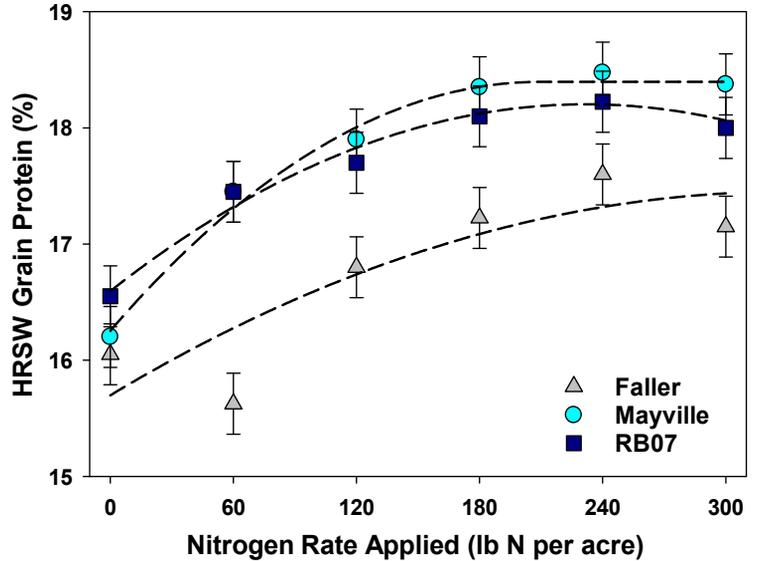
The interaction between variety and nitrogen rate that occurred for grain protein concentration could not be easily explained and was likely due to differences in the effect of variety for various nitrogen rates.

Grain protein concentration was generally maximized by around 240 lbs of applied nitrogen for all varieties. Grain protein concentration did appear to plateau around the highest nitrogen rates applied.

Grain yield was maximized by 164 lbs of applied N. Grain protein yield per acre was maximized by an additional 20-30 lbs of N which was nearly half what is usually required for field in Northwest Minnesota. Residual N was low (near 15 lbs) and likely did not contribute to the yield response. The amount of N needed to maximize yield only is comparable to the amount required for non-irrigated soil in northwest Minnesota. The major difference in nitrogen management is that split application of N should be favored for coarse textured irrigated soils to ensure adequate N is available.

Maximum return to nitrogen rates are summarized in Table 2 for various price ratios. Since grain protein concentration were relatively high in this study (greater than 14%) for all varieties discounts could not be incorporated into the economic analysis. The amount of N applied in irrigation water also should be considered. Water from the irrigation well at Staples was sampled but the data are not currently available. Nitrate applied towards the middle to end of the growing season could have resulted in the high grain protein concentration.

HRSW Grain Protein Data: Staples 2014



HRSW Grain Protein Yield Data: Staples 2014

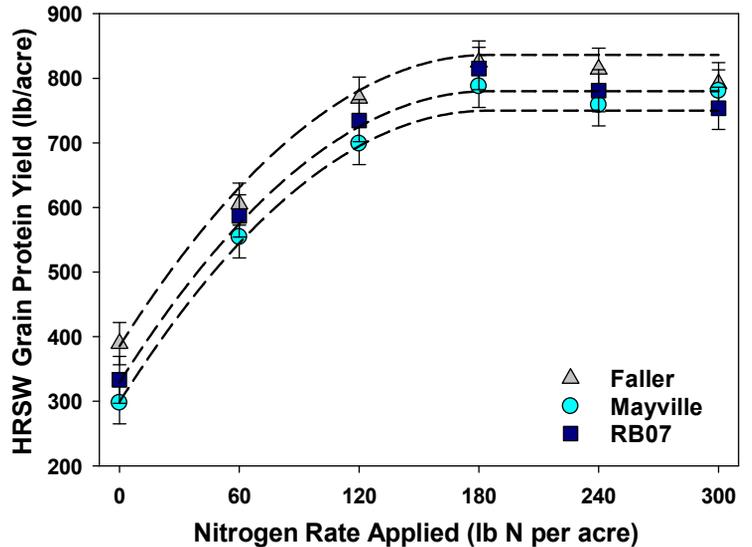


Table 2. Maximum return to nitrogen data for irrigated wheat summarized for various price ratios (price of N: value per bushel HRSW) based on data collected in 2014 at Staples, MN.

Price Ratio	MRTN		
	-\$1	lb N/ac	+\$1
0.00	153	164	na
0.05	136	148	160
0.10	118	130	142
0.15	101	113	125
0.20	83	95	107

For Additional Information:
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