Split Spring Nitrogen Applications in Wheat

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Objective

To evaluate the relationship between nitrogen rate and wheat yields.

Background

Cooperator:	OARDC Vegetable Farm	Soil test:	pH 6.3, P 50 ppm, K 143 ppm
County:	Sandusky		
Nearest Town:	Fremont	Fertilizer:	150 lbs/A 0-0-60
Drainage:	Tiled		150 lbs/A 18-46-0
Soil type:	Hoytville silty clay loam	Planting Date:	October 3, 2001
Tillage:	No-till	Planting Rate:	130 lb/A
Previous Crop:	Soybeans	Row Width:	7.5-inch
Variety:	Hopewell	Herbicides:	None
		Harvest Date:	July 15, 2002

Methods

Experimental design was a randomized complete block with five treatments replicated four times. Treatments were three single spring applications (80, 100, and 120 lb of nitrogen/ A) at greenup; a single application at initial stem elongation (80 lb of nitrogen/ A), and a split application (20 lb of nitrogen applied at greenup and 60 lb of nitrogen applied at initial stem elongation). Nitrogen treatments were applied as urea from a Gandy spreader. All plots received 20 lb of nitrogen from diammonium phosphate in Fall 2001. A John Deere 1550 Drill was used at planting. Plots were 10 feet wide and 70 feet long. The center five feet was harvested for grain yield. A combine scale and a Dickey John tester estimated grain weight and moisture, respectively. Yield was adjusted to 14% moisture. A Minolta Spad meter estimated nitrogen uptake at initial stem elongation and flowering, from 30 flag leaves and top collared leaves per plot, respectively. Head number was estimated by counting spikes in three-foot sections from three areas in each plot.

Results

The average wheat grain yield and other agronomic traits response to split nitrogen applications are given in Table 1.

Table 1. Average Wheat Grain Yield and Other Agronomic Traits Response to Split Nitrogen Applications.

Spring N Rate (lbs/A)	Yield (bu/A)	Harvest Moisture (%)	Spad Meter at Flowering	Spad Meter Initial Jointing	Heads (spikes/ft^2)
0/80 split	89.8 a	11.7 a	45.0 a	38.1 b	62
20/60 split	85.2 ab	11.0 b	42.1 b	40.8 b	65
120	83.5 ab	11.4 ab	43.6 ab	46.0 a	66
100	80.5 bc	11.5 ab	43.1 ab	46.2 a	69
80	73.3 c	11.5 ab	42.0 b	46.0 a	66
LSD (0.05)	9	0.6	2.2	3.4	NS
F-test	4.4	1.8	2.8	11.3	<1

[a] Means followed by the same letter in the same column are not significantly different.
NS = Not Significant

Discussion and Summary

Applying 20 lb of nitrogen at greenup followed by 60 lb of nitrogen at initial stem elongation had larger yields than applying 80 lb of nitrogen/ A at greenup. This treatment was as efficient as applying 100 lb of nitrogen at greenup. However, the largest yield was obtained by delaying spring application until initial stem elongation, and it was as efficient as applying 120 lb of nitrogen/ A at greenup. The two initial elongation treatments had significantly lower nitrogen uptake at initial stem elongation (Spad meter values) than the greenup alone treatments, but the nitrogen applied as a starter in the fall and any residual soil nitrogen prevented a significant reduction in head number. Spad meter values at flowering could not explain grain yield differences. Because head numbers were similar, yield differences between the split and single application may be attributed to seeds per head or larger kernels, which were not measured in this study.

Producers prefer a split system to reduce the chance of yield reduction in nitrogen loss years. Generally, producers apply most of their nitrogen at greenup and a smaller amount at initial stem elongation in a split program. This study would suggest that the smaller amount should be applied at greenup and the larger amount at initial stem elongation. The biggest disadvantage of two applications in the spring would be the cost of the second application, which may negate any yield advantage.

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