

Nitrogen Management for Winter Wheat in Missouri

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Abstract

Eight site years of data have been collected to evaluate nitrogen rate and timing for intensively managed winter wheat in Missouri. Variables have included rates up 160 lbs N per acre applied as all fall, all spring, or split in a fall and spring or fall plus two spring applications. Results have pointed to the split applications of rates at 80 to 120 lbs N per acre as providing greatest consistency and economic return to the grower. Maximum yield has generally been obtained with the 3 way split of 160 lbs N per acre though economic benefit has seldom been greatest with that treatment. Yields over all sites have been nearly double the statewide average showing the great potential for yield improvement of winter wheat for the Missouri wheat producer.

Introduction

A goal of many Missouri wheat producers is to attain high yields through improved efficiency in fertilizer nitrogen inputs along with other management techniques shown to be key in production. The objective of this research project was to evaluate a series of nitrogen application timings with various rates of nitrogen fertilizer across several environments. Included with the nitrogen variables was a fungicide evaluation.

Materials and Methods

Four locations at research stations were selected for the intensive wheat management project. The research stations were located near Columbia (EC), Novelty (NE), Mt. Vernon (SW), and Portageville (SE), Missouri. Two site years of data were collected on each plot.

The study was designed in a randomized complete block with four replications of all treatments. Treatments included nitrogen rate (40, 80, 120, and 160 lbs N/a), splits in nitrogen application (all applied at planting, all applied in spring at Feeke's growth stage 3, a two way split of 1/3 applied at planting and 2/3 applied at Feeke's growth stage 3, and a three way split of 1/3 at planting, 1/3 at Feeke's growth stage 3, and 1/3 at Feeke's growth stage 8), and fungicide application (with or without the labeled rate of *Tilt* at Feeke's growth stage 8). A no nitrogen check was also included with and without the fungicide.

The soft red winter wheat variety was Pioneer 2551 drilled at a rate of 110 pounds seed per acre.

In addition to the yield information presented in this report, test weight,

stand density, leaf tissue N, grain N, and residual soil nitrate-N are also being evaluated.

Results and Discussion

Two year average yields for each of the main effects of fertilizer nitrogen are presented in Table 1. Excellent yield response is evident at each site with yields on some of the better treatments nearly doubling the statewide yield average for winter wheat in those years.

Table 1. Influence of nitrogen rate and nitrogen timing on winter wheat yields averaged over two years at each location.

| Nitrogen Rate | Locations | | | |
|-----------------------|----------------|------|------|------|
| | E.C. | N.E. | S.W. | S.E. |
| lbs N/a | -----bu/a----- | | | |
| 0 | 55 | 41 | 41 | 29 |
| 40 | 76 | 55 | 50 | 51 |
| 80 | 90 | 65 | 54 | 67 |
| 120 | 91 | 67 | 57 | 74 |
| 160 | 87 | 65 | 55 | 79 |
| ===== | | | | |
| Nitrogen Timing | ===== | | | |
| All at planting | 84 | 60 | 52 | 64 |
| All at Feeke's 3 | 86 | 60 | 54 | 68 |
| 1/3 pltg, 2/3 F3 | 85 | 65 | 54 | 69 |
| 1/3 pltg, 1/3 F3 & F8 | 88 | 65 | 56 | 69 |
| ===== | | | | |

Consistency is an important management goal in reducing risk. The most consistent high yields were obtained when the fertilizer nitrogen was applied in either a 2-way and 3-way split (Figure 1). The relative yields were calculated using the highest yielding treatment combination within each location and year as 100 % relative yield. Relative yields were then calculated for all other treatment combinations within that year of data. Those two relative yield values across years were then averaged.

Optimum yields were generally achieved with 80 or 120 pounds N per acre in the split application treatments where best consistency in high yield could be expected (Figure 2).

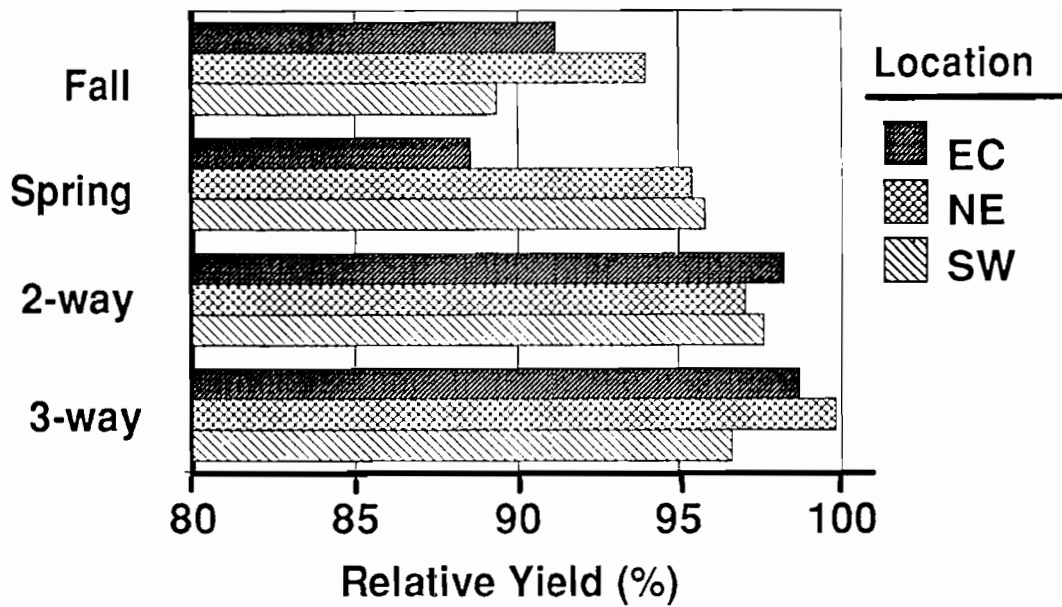


Figure 1. Effect of nitrogen timing on relative yield of winter wheat (2 year average).

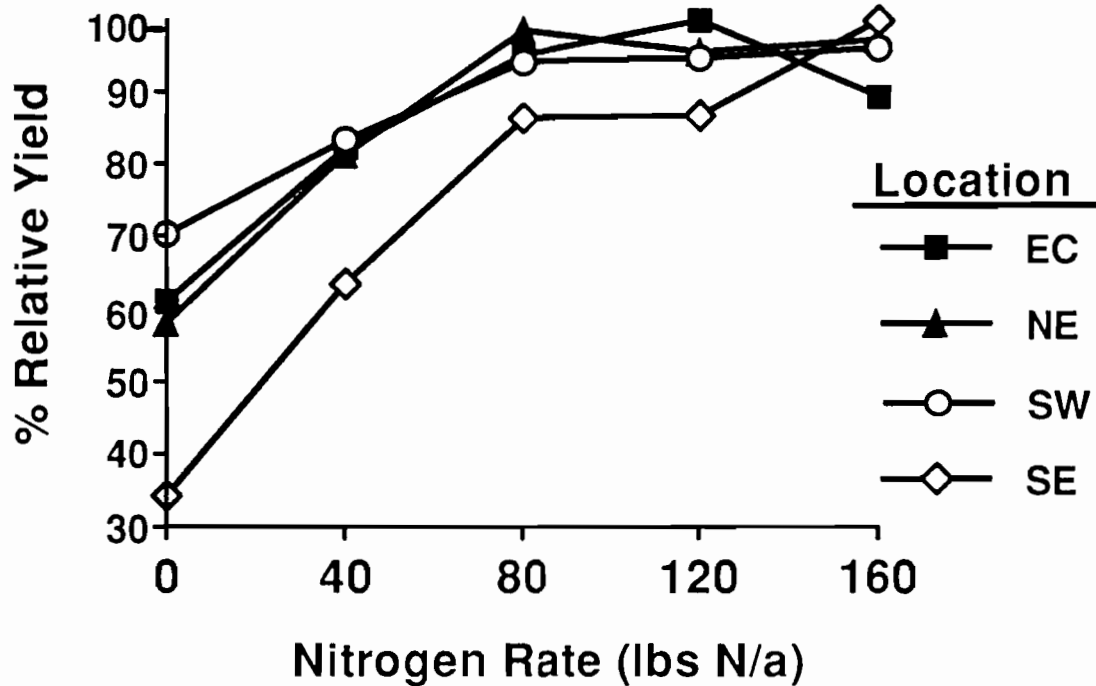


Figure 2. Effect of nitrogen rate on relative yield of winter wheat (averaged over 2 way N fertilizer split and 2 years at each location).

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