Hybrid Rye and Nitrogen Rate Experiment- 2025

Laura Lindsey, Matthew Hankinson, and Pedro Henrique Guimarães Gimenes

Introduction

FARMERS ARE INTERESTED IN WINTER RYE FOR GRAIN TO MEET LOCAL DEMANDS AND NICHE MARKETS. In previous research, hybrid rye yielded greater than open-pollinated varieties (Lindsey, 2024). In Ohio, KWS 'Tayo' produced an average yield of 90 bu/acre across two years and several planting dates (Nye et al., 2025). However, basic management information, such as optimum nitrogen application rate, is lacking and needed for farmers to maximize their grain yield.

Methods

During the 2024-2025 growing season, an experiment was conducted to evaluate three rye hybrids from KWS ('Receptor,' 'Serafino,' and 'Tayo') and five spring nitrogen application rates (0, 30, 60, 90, and 120 lb N/acre). The experiment was conducted in two locations — the Northwest Agricultural Research Station in Wood County and the Western Agricultural Research Station in Clark County. Table 1 shows dates of field operations. The Hessian fly-free date is Sept 23 and Sept 29 in Wood and Clark County, respectively.

Data were analyzed using ANOVA at an alpha value of 0.10. Optimal N rate was determined by quadratic regression.

Table 1. Dates of field operations for a hybrid rye and nitrogen rate experiment in Wood County and Clark County, Ohio, during the 2024-2025 growing season.

	Wood	Clark
Planting	10-Oct	9-Oct
N application	9-Apr	1-Apr
Herbicide application	24-Apr	22-Apr
Fungicide application	16-May	15-May
Harvest	14-Jul	11-Jul

Figure 1. Hybrid rye was tested at two locations in Ohio during the 2024-2025 growing season.

MEASUREMENTS

Several measurements were collected throughout the growing season, including:

- Fall and spring canopy cover measured with Canopeo phone application
- Head number
- Lodging percentage
- Grain test weight
- Grain yield based on 56 lb/bushel standardized to 14% moisture concentration

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Results

CANOPY COVER

Canopy cover in the fall and spring and head number for each hybrid and N rate is shown in Table 2 and Figure 2, respectively. In Wood County, fall canopy cover was influenced by hybrid, with Serafino and Receptor having a lower canopy cover compared to Tayo. By spring, Tayo and Receptor had similar canopy cover. In June when heads were counted, there was no difference in number among the three hybrids. In Clark County, there was no difference in fall canopy cover and head number among the three hybrids. In the spring, Receptor had the lowest canopy cover.

Spring N rate influenced the number of heads (Figure 2). In Wood County, the number of heads increased with N application rate up to 60 lb N/acre. In Clark County, head number was consistent across N rates, except when no N nitrogen was applied.

Table 2. Canopy cover in the fall and spring and head number by rye hybrid at Wood County and Clark County.

	Fall canopy cover	Spring canopy cover	Head number
	%		number/ft row
	Wood County		
Receptor	3.9 B	31.7 A	31.2 A
Serafino	4.4 B	28.8 B	34.2 A
Tayo	5.2 A	33.6 A	30.7 A
	Clark County		
Receptor	14.9 A	66.9 B	47.2 A
Serafino	15.4 A	68.0 A	44.0 A
Tayo	16.0 A	71.9 A	44.0 A

LODGING

No lodging was observed at the Wood County location. At the Clark County location, lodging tended to increase with increasing N application rate. With average lodging recorded at 3%, 5%, 10%, 15%, and 19% when 0, 30, 60, 90, and 120 lb N/acre was applied, respectively. However, there was no difference in lodging among the three hybrids.

TEST WEIGHT

At the Wood County location, there was a significant hybrid by N rate interaction. However, the range in test weight was small, ranging from 54.4 lb/bu to 56.0 lb/bu (average 55.1 lb/bu) across hybrids and N application rates.

At the Clark County location, test weight was influenced by the main effect of hybrid and N rate. Test weights were 49.7, 50.7, and 51.8 lb/bu for Tayo, Receptor, and Serafino, respectively. Test weight was greatest when 0 to 30 lb N/acre was applied, resulting in a test weight of 51.8 and 51.3 lb/bu, respectively. Test weight was lowest when 90 and 120 lb N/acre was applied, resulting in test weights of 49.8 and 50.0 lb/bu, respectively.

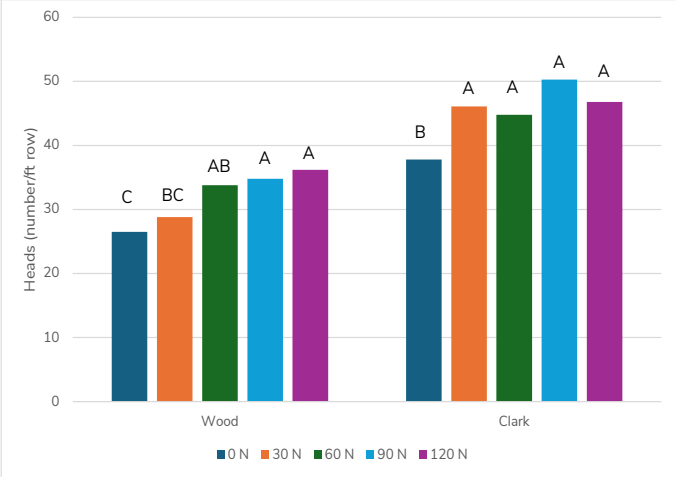

Figure 2. Number of heads by spring N application rate (lb N/acre) at Wood County and Clark County.

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GRAIN YIELD

Grain yield was influenced by hybrid and N application, but not the interaction. At the Wood County location, grain yield was greatest for Serafino (91.1 bu/acre) and Tayo (92.8 bu/acre). At the Clark County location, Serafino yielded the greatest at 110.0 bu/acre.

At both locations, grain yield increased quadratically with increasing N application rate (Figure 4). At Wood County, 85% of the variability in grain yield was explained by N application rate. To maximize grain yield, more than 120 lb N/acre was needed. At the Clark County location, 13% of the variability in grain yield was explained by N rate, with 81 lb N/acre, resulting in the greatest yield.

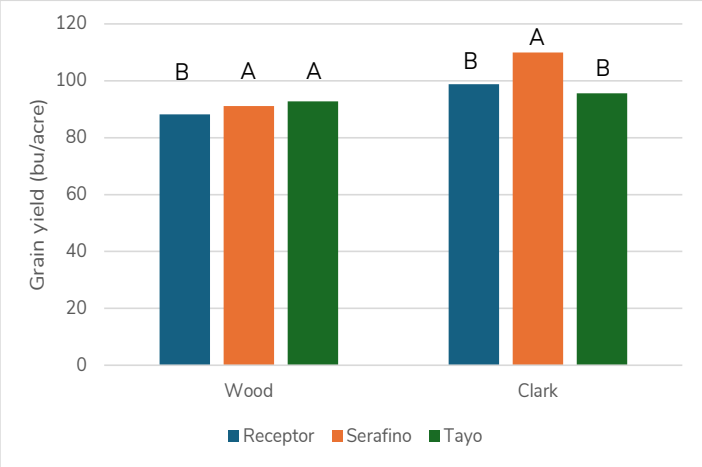

Figure 3. Grain yield by hybrid at the Wood County and Clark County locations.

Key takeaways

- Fall and spring canopy cover and head number were greater at the Clark County location compared to the Wood County location. The Clark County location was planted 10 days after the county's fly-free date while the Wood County location was planted 17 days after the fly-free date. At both locations, wet fall weather prevented earlier planting.
- Lodging was variable depending on location, with no lodging in Wood County and up to 70% lodging in Clark County. Higher lodging was associated with higher N application rates.
- At both locations, Serafino yielded the highest. Tayo yielded statistically the same as Serafino at the Wood County location.
- In Clark County, the optimum spring N application rate was 81 lb N/acre. At the Wood County location, yield increased with increasing N rate, with an optimum N rate >120 lb N/acre.
- There was no hybrid by N rate interaction, which means N application rate does not need to be different across the three hybrids.

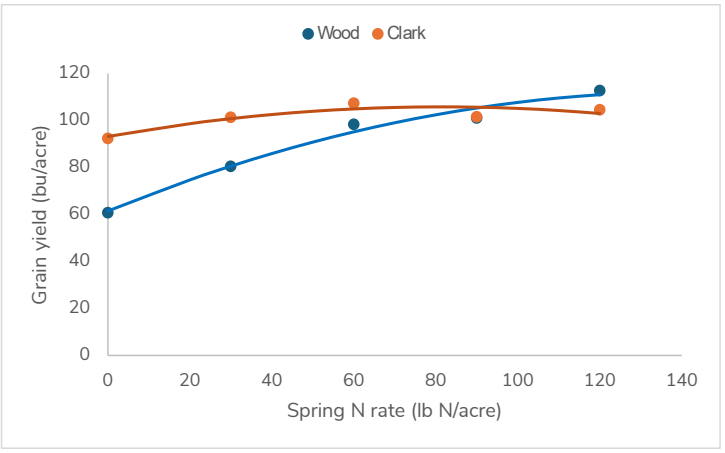

Figure 4. Effect of spring N rate on grain yield at the Wood County and Clark County locations.

Next steps

The experiment should be repeated next year as there can be year-to-year variability in results. Although grain yield increased with increasing N rate, additional analysis should be conducted considering the price of N and potential profitability.

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