

Rye Crop and Disease Management in Kentucky, 2020-2021

Co-PI's: Chad Lee, Carrie Knott and Carl Bradley

Technicians: Maria Julia Santoro, Kelsey Mehl, Conner Raymond, and John Walsh

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Image 1 Hybrid Rye mostly prostrate in early March 2021 at Lexington, Kentucky.

Methods and Materials

Lexington

At Lexington, planting dates occurred September 22, 2020 and October 15, 2020. The soil type is a Bluegrass Maury silt loam (Fine-silty, mixed, active, mesic Typic Paleudalfs) at 2 to 6% slopes. Muriate of potash (0-0-60) was applied to the field before planting according to soil test recommendations and nitrogen rates were applied at Feekes 3 growth stage (March 17, 2021).

Miravis Ace fungicide (pydiflumetofen and propiconazole) was applied at anthesis (Feekes 10.51, May 17, 2021) at 13.7 fluid ounces per acre (1.0 L per hectare).

Princeton

Rye was harvested on June 29, 2021 with a Wintersteiger Delta combine using a Harvest Master weighing system that also measured moisture and test weight (seed density).

At Princeton, rye trials were planted September 16 and 17, 2020 at the Crider silt loam and Zanesville silt loam locations, respectively. The October planting took place on the 9th at both sites.

Nitrogen rates were applied at Feekes 3 (March 4, 2020) and Feekes 5 (March 24, 2020) growth stages at Princeton. Prosaro (prothioconazole and tebuconazole) fungicide was applied on May 13, 2020 at 8.2 fluid ounces per acre with 1% NIS (Non Ionic Surfactant).

Cereal rye plots were harvested on July 7, 2021 at the Princeton sites.

Results

Seed Rate and Nitrogen Rate Effect on Yields

Rye yields at Lexington averaged 100 bushels per acre and ranged from the 96.4 to 107.5 bushels per acre when averaged by seeding rates (Table 1). Rye yields averaged by nitrogen rates ranged from 94.2 to 103.9 bushels per acre. For the September planting, the highest N rate resulted in the most plant lodging. However, lodging was low across the entire location. The highest seeding rate in October increased yields compared with the two lower rates. Nitrogen rates did not affect yield for either planting date.

Rye yields at Princeton averaged 67.8 and 35.9 bushels per acre for the Crider and Zanesville soils, respectively. Neither seeding rate nor nitrogen rates affected yield at Princeton for either soil type and planting rates.

Nitrogen rates effect on rye has been a challenging effort. For example, in 2017, rye yields at Lexington ranged from 89 to 107 bushels per acre across N rates of 0 to 120 lb N per acre with no significant differences, but in 2016, the yields ranged from 39 to 86 bushels per acre and mostly followed the nitrogen rates. However, the nitrogen rate effect in 2021 is perhaps more surprising since there were two planting dates and a total of three soil types evaluated.

Fungicide Effect on Diseases and DON

For the fungicide trial at Princeton, all fungicide treatments reduced the severity of leaf blotch, regardless of product or application timing (Table 3). The greatest reduction in Fusarium head blight (FHB) index scores and deoxynivalenol (DON) levels, compared to the nontreated control occurred when fungicide applications of either Caramba or Miravis Ace were made anywhere from heading (Feekes 10.5) to 5 days after anthesis (5 days after Feekes 10.51). The effect of fungicides on grain moisture was significant, but grain moistures ranged from only 12.0% to 12.3%. Fungicide treatments that resulted in yields significantly greater than the nontreated control were Tilt applied at Feekes 9 followed by Miravis Ace at Feekes 10.51, Miravis Ace at either Feekes 10.5 or 10.51, and Caramba at 5 days after Feekes 10.51. Fungicide treatments that resulted in test weights significantly greater than the nontreated control were Tilt at Feekes followed by Miravis Ace at Feekes 10.51, Miravis Ace at Feekes 10.5, 10.51, or 5 days after Feekes 10.51, and Caramba at 5 days after Feekes 10.51.



Image 2 Rye near harvest at Lexington, Kentucky 2021.

Table 1. Hybrid Rye Seeding Rates and Nitrogen Rates Effects Lodging and Yields, Lexington, Kentucky 2021

Treatment	September Planting	October Planting	September Planting	October Planting
	Lodging (0.0-9.0), 9.0 = every plant lodged		Yield, Bu/A	
Seed Rate Effect				
400K seeds/A	0.40	0.60	101.9	96.4 b
575K Seeds/A	0.73	0.86	100.7	97.0 b
750K Seeds/A	0.53	1.40	96.5	107.5 a
N Rate Effect				
0 lb N/A	0.06 b	1.06	94.2	95.8
40 lb N/A	0.53 ab	1.26	102.9	103.9
75 lb N/A	1.06 a	0.53	102.1	101.2
<i>LSD (0.10) SR</i>	<i>0.703</i>	<i>0.812</i>	<i>11.9</i>	<i>8.0</i>
<i>LSD (0.10) NR</i>	<i>0.703</i>	<i>0.812</i>	<i>11.9</i>	<i>8.0</i>
<i>P value SR</i>	<i>0.7248</i>	<i>0.2512</i>	<i>0.7283</i>	<i>0.0409</i>
<i>P value NR</i>	<i>0.0686</i>	<i>0.3004</i>	<i>0.3980</i>	<i>0.2366</i>
<i>P value SR*NR</i>	<i>0.8242</i>	<i>0.1578</i>	<i>0.7603</i>	<i>0.1735</i>

Means are compared within each planting date and within seed and N rates.

Means in the same column with different letters are significantly different ($p \leq 0.10$).

Table 2. Seeding Rates and Nitrogen Rates did not Affect Yields on Either Soil Type at Princeton, Kentucky, 2021.

Treatment	Crider Soil		Zanesville Soil	
	September Planting	October Planting	September Planting	October Planting
	Yield, Bu/A			
Seed Rate Effect				
400K seeds/A	64.8	70.2	37.0	33.9
750K Seeds/A	70.1	66.2	39.8	32.7
N Rate Effect				
0 lb N/A	68.8	73.3	33.1	33.7
40 lb N/A	65.9	68.6	39.4	29.7
75 lb N/A	67.6	62.7	42.8	36.4
<i>LSD (0.10) SR</i>	<i>12.2</i>	<i>12.7</i>	<i>8.7</i>	<i>6.9</i>
<i>LSD (0.10) NR</i>	<i>15.0</i>	<i>15.6</i>	<i>10.6</i>	<i>8.5</i>
<i>P value SR</i>	<i>0.4686</i>	<i>0.5935</i>	<i>0.5817</i>	<i>0.7648</i>
<i>P value NR</i>	<i>0.9457</i>	<i>0.5149</i>	<i>0.3005</i>	<i>0.4076</i>
<i>P value TRT</i>	<i>0.1582</i>	<i>0.1716</i>	<i>0.5909</i>	<i>0.8993</i>

Table 3. Effect of Fungicides on Disease and Deoxynivalenol (DON) Grain Contamination at Princeton, Kentucky 2021

Trt no.	Treatment	Fluid Ounces /A	Fungicide Timing†	Leaf Blotch Severity (%)‡	FHB index (0-100)	DON (ppm) (ppm)	Grain Moisture %	Test Weight lb/bu	Yield bu/A
1	Non-treated			33.5	9.7	1.3	12.1	48.8	74.1
2	Nexicor	7	Fks 9	18.8	8.5	1.3	12.0	48.7	71.6
3	Aproach	6	Fks 9	14.3	6.5	1.2	12.0	48.5	67.3
4	Trivapro	9.4	Fks 9	9.4	4.6	1.6	12.1	49.3	80.5
5	Priaxor	4	Fks 9	17.3	5.3	1.5	12.1	48.8	71.2
6	Tilt	4	Fks 9	10.5	5.7	1.1	12.2	48.9	71.2
7	Nexicor	7	Fks 9	9.7	2.9	0.5	12.1	49.0	80.8
7	Caramba	13.5	Fks 10.51						
8	Caramba	13.5	Fks 10.51	16.0	2.0	0.2	12.1	49.1	78.0
9	Tilt	4	Fks 9	5.8	1.9	0.7	12.3	49.7	85.2
9	Miravis Ace	13.7	Fks 10.51						
10	Miravis Ace	13.7	Fks 10.51	8.6	3.3	0.5	12.2	50.0	87.7
11	Miravis Ace	13.7	Fks 10.5	6.9	3.1	0.6	12.2	50.1	86.6
12	Miravis Ace	13.7	5 d after 10.51	10.1	2.9	0.6	12.2	50.2	82.6
13	Caramba	13.5	Fks 10.5	15.3	4.7	0.5	12.0	48.8	79.3
14	Caramba	13.5	5 d after 10.51	11.2	2.9	0.5	12.1	49.6	87.0
			<i>P value</i>	0.0001	0.0008	0.0001	0.0055	0.0006	0.0349
			<i>LSD 0.10</i>	7.9	3.0	0.2	0.1	0.7	10.9
			<i>CV (%)</i>	49.5	54.4	23.5	0.8	1.2	11.6

† Application Timings are at Feekes 9: flag leaf ligule and collar visible; Feekes 10.5: Head completely emerged; Feekes 10.51: Beginning flowering (anthesis).

‡ The highest value in each column and every other value that is within one LSD 0.10 in that column is in bold.

Final Observations

Fungicides applied from heading to a few days after anthesis tended to provide the greatest control of Fusarium head blight and DON and resulted in the greatest yields and test weights. Current recommendations for rye are a seeding rate of 750,000 seeds per acre and about 75 to 85 pounds nitrogen per acre. While these results implied we could plant less seeds and use less nitrogen, we would need to observe more fields with similar results before adjusting the current recommendations. Perhaps rye is extremely good at root exploration in wetter winters like we experienced in 2020-2021.

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