

# RYE CROP AND DISEASE MANAGEMENT IN KENTUCKY REPORT ON 2018-2019

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Rye as a grain crop has a potential local market with distilleries. Rye has not been grown in Kentucky since the 1920's. We have been conducting research for several years on growing rye for grain. In the 2019 harvest season, we established rye at Princeton and Lexington to test several management hypotheses and fungicide efficacy against the Fusarium head blight (FHB).

KWS Brasetto was planted in September and October at both locations. The treatments included:

1. Planting date
  - a. September
  - b. October
2. Nitrogen rates
  - a. 75 lbs of N (60 lbs of N per acre applied at Feekes 3 followed by 15 lbs of N per acre applied at Feekes 5)
  - b. 120 lbs of N (60 lbs of N per acre applied at Feekes 3 followed by 60 lbs of N per acre applied at Feekes 5)
3. Fungicide
  - a. None
  - b. Caramba (8 oz per acre applied at Feekes 10.5.1)
4. Plant growth regulator
  - a. None
  - b. Palisade (14.4 oz per acre applied at Feekes 3 in Lexington and at Princeton applied at Feekes 7)

**TABLE 1. Fungicide Rates and Timings.**

Trt no.	Treatment	Rate/A	Unit	App Timing
1	Nontreated			
2	Priaxor	2.5	fl oz	Fks 9
2	Tilt	2	fl oz	Fks 9
3	Approach	6	fl oz	Fks 9
4	Trivapro	9.4	fl oz	Fks 9
5	Priaxor	4	fl oz	Fks 9
6	Tilt	4	fl oz	Fks 9
7	Priaxor	2.5	fl oz	Fks 9
7	Tilt	2	fl oz	Fks 9
7	Caramba	13.5	fl oz	Fks 10.51
8	Caramba	13.5	fl oz	Fks 10.51
9	Tilt	4	fl oz	Fks 9
9	Miravis Ace	13.7	fl oz	Fks 10.51
10	Miravis Ace	13.7	fl oz	Fks 10.51
11	Miravis Ace	13.7	fl oz	Fks 10.5
12	Miravis Ace	13.7	fl oz	5 d after 10.51
13	Caramba	13.5	fl oz	Fks 10.5
14	Caramba	13.5	fl oz	5 d after 10.51

We also conducted a foliar fungicide trial on one hybrid (Brasetto) that evaluated different fungicide products and timings, along with a non-treated control. These treatments are listed in Table 1.

## **2018-2019 RESULTS - MANAGEMENT TRIALS**

The September planting at Lexington had extremely heavy rains within 24 hours of planting and the resulting stand was too low for reliable yield estimates. At Princeton, the September planting was successful; the rye averaged 79 bushels per acre across all treatments, compared to an average yield of 90 bushels per acre for the October planting. At Lexington, the average yield for the October planting was about 80 bushels per acre for the management study. The treatments at Lexington all yielded the same (about 80 bushels per acre; Table 2); however, the highest numerical yield occurred at 120 lb/N per acre with Palisade growth regulator applied at Feekes 3 and Caramba fungicide applied at flowering. Test weight and the number of spikes per square foot were also the same for all treatments at Lexington.

**Table 2. Yield, Test Weight, Spikes Per Square Foot, and Fusarium Head Blight (FHB) Ratings for the Hybrid Rye that was Planted in October at Lexington. No Statistical Differences were Detected.**

Total Nitrogen Rate	Fungicide	Plant Growth Regulator	Yield (bu/a)	Test Weight (lbs/bu)	Spikes per ft <sup>2</sup>
75 lbs N per acre	Caramba	Palisade	82	48.9	50
75 lbs N per acre	Caramba	none	79	49.1	43
75 lbs N per acre	none	Palisade	81	49.1	43
75 lbs N per acre	none	none	82	48.9	43
120 lbs N per acre	Caramba	Palisade	84	49.0	41
120 lbs N per acre	Caramba	none	82	48.5	39
120 lbs N per acre	none	Palisade	79	48.1	44
120 lbs N per acre	none	none	82	48.5	50

At Princeton, there were statistical differences among the treatments for yield and test weight, but not for the number of spikes per square foot (Table 3). Surprisingly, the treatment that had the greatest average yield (108 bushels per acre) was the treatment planted in September that received 75 lbs of N per acre and a fungicide at Feekes 10.5.1. Additionally, the treatments that received Palisade plant growth regulator yielded less than the treatments without Palisade: Palisade treatments averaged 77 bushels per acre while the treatments without Palisade averaged 92 bushels per acre. This is interesting, because the Lexington trial did not detect any differences in yield among the treatments with and without Palisade. However, at Lexington, Palisade was applied around Feekes 3. In contrast, at Princeton, the Palisade application was delayed until Feekes 7, because air temperatures were not greater than or equal to 50°F for five to seven consecutive days until the cereal rye was at the Feekes 7 growth stage. The dramatic yield reduction for the Palisade treatments was surprising. Additional research to determine whether this occurs again would be very important to understand and for us to be able to make better recommendations for the use of a plant growth regulator in hybrid rye production.

**Table 3. Yield, Test Weight, and Spikes Per Square Foot for the Hybrid Rye Management Trials at Princeton, 2019.**

Planting Date	Total Nitrogen Rate	Fungicide	Plant Growth Regulator	Yield (bu/a)	Test Weight (lbs/bu)	Spikes per ft <sup>2</sup>		
17 Sept	75 lbs N per acre	Caramba	Palisade	69	fg	44.9	def	48
17 Sept	75 lbs N per acre	Caramba	none	<b>108</b>	<b>a</b>	46.4	abc	52
17 Sept	75 lbs N per acre	none	Palisade	69	fg	43.4	h	47
17 Sept	75 lbs N per acre	none	none	82	cdef	45.4	cde	51
17 Sept	120 lbs N per acre	Caramba	Palisade	76	efg	44.4	efgh	55
17 Sept	120 lbs N per acre	Caramba	none	90	bcde	46.3	abc	47
17 Sept	120 lbs N per acre	none	Palisade	65	g	43.5	gh	48
17 Sept	120 lbs N per acre	none	none	75	efg	44.1	fgh	61
9 Oct	75 lbs N per acre	Caramba	Palisade	91	bcd	46.8	ab	49
9 Oct	75 lbs N per acre	Caramba	none	95	abc	47.1	a	48
9 Oct	75 lbs N per acre	none	Palisade	83	cdef	44.7	defg	54
9 Oct	75 lbs N per acre	none	none	94	abc	46.6	abc	45
9 Oct	120 lbs N per acre	Caramba	Palisade	88	bcde	46.3	abc	49
9 Oct	120 lbs N per acre	Caramba	none	99	ab	46.9	ab	46
9 Oct	120 lbs N per acre	none	Palisade	76	defg	44.5	efgh	46
9 Oct	120 lbs N per acre	none	none	97	abc	45.9	bcd	48

In the management trials at Princeton, Fusarium head blight severity, incidence, and index were all greater for the September planting than for the October planting and the use of fungicide statistically reduced the FHB severity, incidence and index. There were three treatments that had the lowest FHB incidence, eleven treatments with the lowest FHB severity, and nine treatments with the lowest FHB Index (Table 4). This firmly demonstrates that hybrid cereal rye is susceptible to Fusarium head blight. Although the Germans warned us to never spray a fungicide on flowering rye heads for fear that it would disrupt pollination, we found at Lexington that no yield differences occurred between the treatments with a fungicide and those without. Furthermore, the Princeton data strongly suggest that when FHB is present, a fungicide can increase yield by as much as 26 bushels per acre. Grain samples were collected from trials at both locations to be sent for DON testing. When these results become available, they will provide information that will be used to further consider the importance of a fungicide application to protect against FHB.

**Table 4. Fusarium Head Blight (Fhb) Incidence, Severity and Index for the Hybrid Rye Management Trials at Princeton, 2019.**

Planting Date	Total Nitrogen Rate	Fungicide	Plant Growth Regulator	FHB Incidence (%)	FHB Severity (%)	FHB Index
17 Sept	75 lbs N per acre	Caramba	Palisade	35.0	11.4	3.4
17 Sept	75 lbs N per acre	Caramba	none	45.0	5.9	2.9
17 Sept	75 lbs N per acre	none	Palisade	72.5	37.2	29.9
17 Sept	75 lbs N per acre	none	none	67.5	31.3	21.4
17 Sept	120 lbs N per acre	Caramba	Palisade	45.0	14.5	5.9
17 Sept	120 lbs N per acre	Caramba	none	27.5	57.5	12.1
17 Sept	120 lbs N per acre	none	Palisade	62.5	33.7	20.7
17 Sept	120 lbs N per acre	none	none	70.0	22.3	15.5
9 Oct	75 lbs N per acre	Caramba	Palisade	40.0	7.3	2.3
9 Oct	75 lbs N per acre	Caramba	none	12.5	2.5	0.6
9 Oct	75 lbs N per acre	none	Palisade	57.5	12.6	7.0
9 Oct	75 lbs N per acre	none	none	50.0	30.3	14.6
9 Oct	120 lbs N per acre	Caramba	Palisade	35.0	10.2	3.9
9 Oct	120 lbs N per acre	Caramba	none	22.5	12.0	2.2
9 Oct	120 lbs N per acre	none	Palisade	65.0	12.9	8.9
9 Oct	120 lbs N per acre	none	none	24.5	14.0	5.4

#### **FUNGICIDE TRIALS**

Fusarium head blight (FHB) and a fungal leaf disease were both present at the Princeton, KY field and the Lexington, KY field, and fungicides affected both of these diseases compared to the nontreated control (Tables 5 and 6). Fungicides (Caramba and Miravis Ace) applied at heading (Feekes 10.5) through 5 days after beginning anthesis (Feekes 10.51) provided the largest reduction in FHB incidence. All fungicide products and timings reduced leaf disease severity compared to the nontreated control, but there was a trend for fungicides applied at heading or later to provide the best protection against the leaf disease. This indicated that infection by the leaf disease fungus likely occurred later in the season.

These results help us determine which fungicides and timings might be appropriate for the best protection against important head and leaf diseases as well as which might be best for improving yield and grain quality. Grain samples also were collected in the fungicide trial for determination of DON. When these results are available, it will provide another piece of the puzzle in determining which products and timings rye growers in Kentucky should consider.

**Table 5. Effect of Fungicides Applied at Different Timings on Fusarium Head Blight (FHB) Incidence and Leaf Disease Severity at Princeton, KY in 2019.**

Trt no.	Treatment	Rate/A	Unit	App Timing	FHB incidence (%)	Leaf disease severity (%)
1	Nontreated				70.0	23.5
2	Priaxor	2.5	fl oz	Fks 9	47.5	7.8
2	Tilt	2	fl oz	Fks 9		
3	Aproach	6	fl oz	Fks 9	52.5	9.1
4	Trivapro	9.4	fl oz	Fks 9	42.5	6.3
5	Priaxor	4	fl oz	Fks 9	40.0	7.2
6	Tilt	4	fl oz	Fks 9	35.0	7.8
7	Priaxor	2.5	fl oz	Fks 9	22.5	6.5
7	Tilt	2	fl oz	Fks 9		
7	Caramba	13.5	fl oz	Fks 10.51		
8	Caramba	13.5	fl oz	Fks 10.51	12.5	5.8
9	Tilt	4	fl oz	Fks 9	17.5	2.5
9	Miravis Ace	13.7	fl oz	Fks 10.51		
10	Miravis Ace	13.7	fl oz	Fks 10.51	25.0	2.7
11	Miravis Ace	13.7	fl oz	Fks 10.5	20.0	1.5
12	Miravis Ace	13.7	fl oz	5 d after 10.51	27.5	1.8
13	Caramba	13.5	fl oz	Fks 10.5	17.5	5.3
14	Caramba	13.5	fl oz	5 d after 10.51	32.5	4.5
<b><i>P &gt; F</i></b>					<b>0.0002</b>	<b>0.0001</b>
<b>LSD 0.05</b>					<b>22.2</b>	<b>4.9</b>
<b>CV (%)</b>					<b>47.1</b>	<b>52.5</b>

**Table 6. Effect of Fungicides Applied at Different Timings on Fusarium Head Blight (FHB) Incidence and Leaf Disease Severity at Lexington, KY in 2019.**

Trt no.	Treatment	Rate/A	Unit	App Timing	FHB incidence (%)	Leaf disease severity (%)
1	Nontreated				75.0	96.3
2	Priaxor	2.5	fl oz	Fks 9	82.5	73.8
2	Tilt	2	fl oz	Fks 9		
3	Aproach	6	fl oz	Fks 9	65.0	94.3
4	Trivapro	9.4	fl oz	Fks 9	67.5	81.5
5	Priaxor	4	fl oz	Fks 9	70.0	76.3
6	Tilt	4	fl oz	Fks 9	65.0	93.0
7	Priaxor	2.5	fl oz	Fks 9	47.5	60.8
7	Tilt	2	fl oz	Fks 9		
7	Caramba	13.5	fl oz	Fks 10.51		
8	Caramba	13.5	fl oz	Fks 10.51	35.0	74.5
9	Tilt	4	fl oz	Fks 9	20.0	28.3
9	Miravis Ace	13.7	fl oz	Fks 10.51		
10	Miravis Ace	13.7	fl oz	Fks 10.51	22.5	36.5
11	Miravis Ace	13.7	fl oz	Fks 10.5	25.0	16.3
12	Miravis Ace	13.7	fl oz	5 d after 10.51	22.5	22.3
13	Caramba	13.5	fl oz	Fks 10.5	52.5	68.5
14	Caramba	13.5	fl oz	5 d after 10.51	32.5	57.8
				<i>P &gt; F</i>	<b>0.0001</b>	<b>0.0001</b>
				<b>LSD 0.05</b>	<b>18.1</b>	<b>24.0</b>
				<b>CV (%)</b>	<b>25.9</b>	<b>26.7</b>

### **CONCLUSIONS FOR 2018-2019**

The nitrogen rates of 75 and 120 pounds N per acre had little to no effect on rye yield. The Caramba fungicide increased yields at Princeton. The highest numerical yield for each planting date and location occurred with a Caramba application. Miravis Ace and Caramba were effective at reducing FHB and increasing yield. Fungicide timings that bracketed pollination did not disrupt pollination. This is a very encouraging development. We can use a fungicide to help control FHB and not be concerned about that fungicide disrupting pollination.