

Rye Crop and Disease Management in Kentucky 2019-2020

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Introduction

Hybrid rye studies testing management strategies and fungicides were conducted at Princeton and Lexington during the 2019-2020 season. Hybrids Brasetto and KWS Serafino were planted in Princeton and hybrids Brasetto and KWS Bono were planted in Lexington in September and October at both locations. Seeding rate was 750,000 seeds per acre. Management included two nitrogen rates (75 and 120 lb/acre), plus or minus fungicide (Caramba at Feekes 10.51 (anthesis)) for control of Fusarium head blight and plus or minus plant growth regulator (Palisade applied at Feekes 3).

Management Results

Average yields were 87 and 83 bushels per acre for the September and October plantings at Lexington and 114 and 104 bushels per acre for the September and October plantings at Princeton (Table 1). At Lexington, Treatment 8 and Treatment 5 were highest yielding for the September and October plantings. Both of these treatments included the higher Nitrogen rate. At Princeton, Treatment 2 (lower nitrogen rate, fungicide and no plant growth regulator) was the highest -yielding treatment for both planting dates. For the October planting at Princeton, Treatment 4 (lower N rate, no fungicide and no PGR) tied for highest yielding.

Table 1. Management impact on rye yield at Lexington and Princeton across two planting dates.

TRT No.	TREATMENT	LEXINGTON		PRINCETON	
		Planting Date		Planting Date	
		September Yield, bu/A	October Yield, bu/A	September Yield, bu/A	October Yield, bu/A
1	75 lb N/A, FUNG, PGR †	84 b	87 ab	115 b	102 b
2	75 lb N/A, FUNG, No PGR	79 b	85 b	128 a	112 a
3	75 lb N/A, No FUNG, PGR	85 a	80 cd	106 b	100 b
4	75 lb N/A, No FUNG, No PGR	83 b	78 d	118 a	112 a
5	120 lb N/A, FUNG, PGR	93 a	90 a	111 b	101 b
6	120 lb N/A, FUNG, No PGR	85 a	86 ab	120 a	107 a
7	120 lb N/A, No FUNG, PGR	91 a	83 b	104 c	89 c
8	120 lb N/A, No FUNG, No PGR	95‡ a	78 d	109 b	107 a
LSD (0.10)		11	5	12	8
p value		0.2842	0.0010	0.0357	0.0012
average		87	83	114	104

† FUNG = Caramba applied at 8 fl oz/A at Feekes 10.51; PGR = Palisade applied at 14.4 fl oz/A at Feekes 3 (Lexington) and Feekes 7 (Princeton).

‡ The highest yield at one planting date and location is highlighted in bold.

To provide more analysis of the specific management components, we analyzed for nitrogen rate only, fungicide only and plant growth regulator only. The higher nitrogen rate resulted in higher yields at Lexington and lower yields at Princeton (Figure 1). Caramba did not increase yield at either location (Figure 2). The plant growth regulator slightly increased yields at Princeton and had no effect at Lexington (Figure 3).

Nitrogen has been one of the more challenging components to understand. We suspect that the aggressive roots of rye are taking up excess nitrate at deeper soil levels. Perhaps Princeton had more nitrate nitrogen deeper in the soil than the Lexington location.

Fungicide Trial Results

At Lexington, Tilt followed by Miravis Ace resulted in the highest yield (108.8 bu/A) and three other treatments resulted in similar yields (Priaxor at Feekes 9, Miravis Ace at Feekes 10.51 and Miravis Ace at 5 days after Feekes 10.51) (Table 2). Interestingly, the fungicides all did not significantly reduce Fusarium Head Blight Index or Leaf Disease Severity ratings. At Princeton, fungicides did affect the disease ratings but not grain yield. At Princeton, fungicides applied at Feekes 10.51 or 5 days after resulted in the lowest Fusarium head blight index values, and all but Tilt alone resulted in lower leaf disease severity ratings compared to the nontreated check. Three treatments that included Miravis Ace increased test weight.

At Lexington, as leaf disease severity increased, hybrid rye grain yield decreased (Figure 4). Fusarium head blight index values were greater at Princeton, but that severity did not affect grain yield. Data from DON analysis on harvested grain samples were not yet available at the time this report was written.

Final Comments

Yields were extremely good at both locations and both planting dates. The September planting resulted in higher yields, which is consistent with observations in previous years. We still need to understand nitrogen management in hybrid rye. This season, the high rate was more effective at Lexington and the low rate was more effective at Princeton. For now, we suggest applying a maximum of 75 pounds nitrogen per acre from an economic perspective. The fungicides were not as effective this season, but disease pressure was low. Fungicides did reduce disease pressure and some increased test weight at Princeton. Based on these observations and observations from previous years, we will still suggest applying a fungicide for FHB. Encouragingly, applying fungicides during anthesis (flowering) do not appear to affect pollination. This was the first year that PGR improved yield at a location. There was no lodging in any of the trials this year. Hybrid rye is supposed to lodge less than forage rye. To date, PGR has had minimal effect on lodging in previous years. The observations suggest that a PGR probably will not pay in hybrid rye. We thank the Kentucky Small Grain Growers for their continued support.

Table 2. Fungicide effect on hybrid rye yield at Lexington, 2020.

Trt No.	Lexington Treatments	Application Timing	Leaf disease		Yield at 14% Moisture, bu/A	Grain Moisture, %		Test Weight, lb/bu		
			FHB index, 0-100	severity, %						
1	Nontreated		3.1	91.8	88.1	F	15.1	BC	62.1	AB
2	Nexicor†	Fks 9§	3.2	39.5	94.9	BCDEF	15.1	BC	62.1	AB
3	Aproach	Fks 9	2.7	59.5	93.7	DEF	15.1	BC	62.1	AB
4	Trivapro	Fks 9	3.0	42.8	96.4	BCDE	15.1	BC	62.1	AB
5	Priaxor	Fks 9	2.4	23.5	101.5	ABC	14.9	BC	62.2	AB
6	Tilt	Fks 9	2.3	70.0	91.5	EF	14.7	C	62.4	A
7	Nexicor fb Caramba	Fks 9 fb 10.51	1.2	8.5	99.4	BCD	14.8	C	62.4	A
8	Caramba	Fks 10.51	1.3	13.0	101.0	BCD	15.0	BC	62.2	AB
9	Tilt fb Miravis Ace	Fks 9 fb 10.51	1.4	5.0	108.8^Δ	A	15.8	A	61.6	C
10	Miravis Ace	Fks 10.51	1.0	7.3	101.5	ABC	15.4	AB	61.9	BC
11	Miravis Ace	Fks 10.1	2.7	74.0	88.9	F	14.9	BC	62.3	AB
12	Miravis Ace	5 d after 10.51	1.7	33.5	101.6	AB	14.9	BC	62.3	AB
13	Caramba	Fks 10.1	1.7	52.0	94.3	CDEF	15.0	BC	62.2	AB
14	Caramba	5 d after 10.51	1.5	32.0	91.1	EF	15.0	BC	62.2	AB
LSD (0.10)			ns	ns	7.4		0.5		0.4	
p value			0.2857	0.103	0.0011		0.0165		0.0024	
CV			44.7	52.4	6.5		0.5		2.7	

Trt no.	Princeton Treatments	Application Timing	Leaf disease		Yield at 14% moisture, bu/A	Grain Moisture, %		Test Weight, lb/bu		
			FHB index, 0-100	severity, %						
1	Nontreated		10.2^Δ	25.8	97.3		9.6		46.3	
2	Nexicor †	Fks 9§	7.5	17.8	100.3		9.9		46.5	
3	Aproach	Fks 9	7.4	16.5	105.2		10.0		46.7	
4	Trivapro	Fks 9	7.2	11.8	102.3		9.9		46.7	
5	Priaxor	Fks 9	7.9	11.0	109.9		9.9		46.9	
6	Tilt	Fks 9	7.2	19.5	98.3		9.6		46.1	
7	Nexicor fb Caramba	Fks 9 fb 10.51	2.2	6.3	115.2		10.0		47.1	
8	Caramba	Fks 10.51	2.7	1.0	95.8		9.8		46.5	
9	Tilt fb Miravis Ace	Fks 9 fb 10.51	3.9	9.0	97.7		10.1		47.4	
10	Miravis Ace	Fks 10.51	1.6	5.5	105.7		10.2		47.6	
11	<i>BAS 840</i> ‡	Fks 10.51	2.9	7.0	100.7		10.1		46.6	
12	Miravis Ace	5 d after 10.51	2.0	3.5	115.8		10.6		48.2	
13	<i>Caramba</i>	Fks 10.51	1.2	6.0	103.9		10.0		47.0	
14	<i>Caramba</i>	5 d after 10.51	1.6	10.5	87.1		9.7		45.9	
LSD (0.10)			2.7	7.5	NS		0.5		1.0	
p value			0.0001	0.0001	0.1258		0.0196		0.002	
CV			40.7	45.1	11.8		3.6		1.5	

† Induce surfactant was applied at 0.125 %v/v with all fungicides. fb = “followed by”. Fungicides were applied at the following rates: Nexicor (7 fl oz/A), Aproach (6 fl oz/A), Trivapro (9.4 fl oz/A), Priaxor Xemium (4 fl oz/A), Tilt (4 fl oz/A), Caramba (13.5 fl oz/A), Miravis Ace (13.7 fl oz/A), BAS 640 (7.3 fl oz/A).

‡ Treatments 11 and 13 at Princeton are different from Treatments 11 and 13 at Lexington. BAS 840 is an experimental product. Treatment 13 at Princeton is Caramba applied at a higher rate (17 fl oz/A).

§ Fks 9 = flagleaf, Fks 10.1 = heading, Fks 10.51 = anthesis, 5 d after 10.51 = 5 days after anthesis

Δ When results are significantly different, the highest value is bold and highlighted. All other values within 1 LSD of the highest yield are bold.

Figure 1. Nitrogen rate (nr) effect on hybrid rye yield at Lexington (A) and Princeton (B), where 1 = 75 lb N/acre and 2 = 120 lb N/acre. Averaged across hybrids, planting dates, fungicide and plant growth regulator treatments, the higher N rate resulted in higher yields in Lexington ($p = 0.0046$) while the lower N rate resulted in higher yields in Princeton ($p=0.0089$).

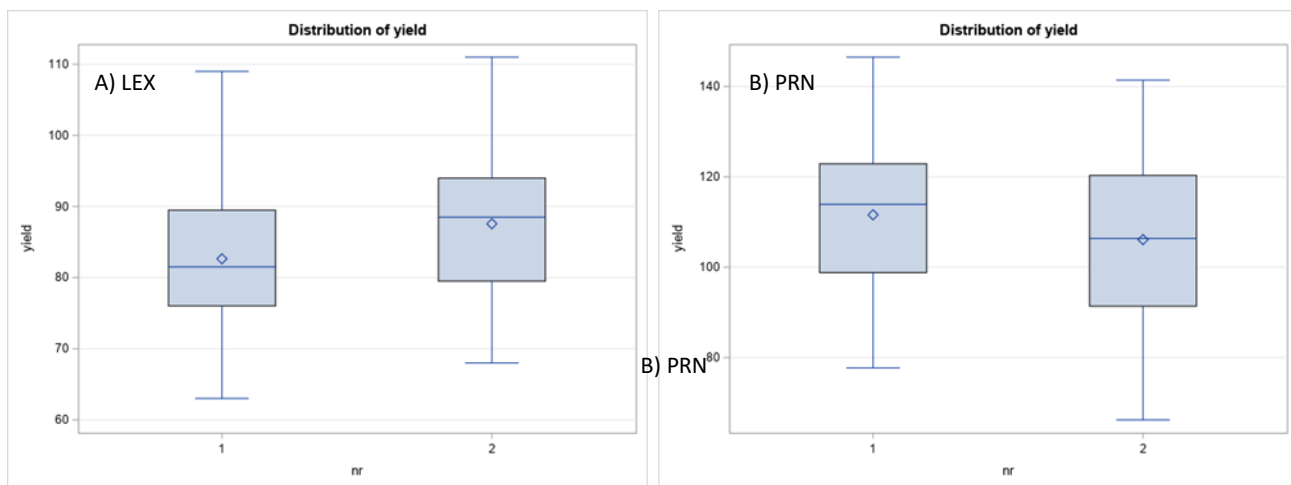


Figure 2. Fungicide effect on hybrid rye yield at Lexington (A) and Princeton (B), where 1 = Caramba applied at 8 fl oz/A at Feekes 10.51 and 2 = no fungicide applied. Averaged across hybrids, planting dates, nitrogen rates and plant growth regulator treatments, fungicide did not increase yield at Lexington ($p=0.1856$) and decreased yields slightly

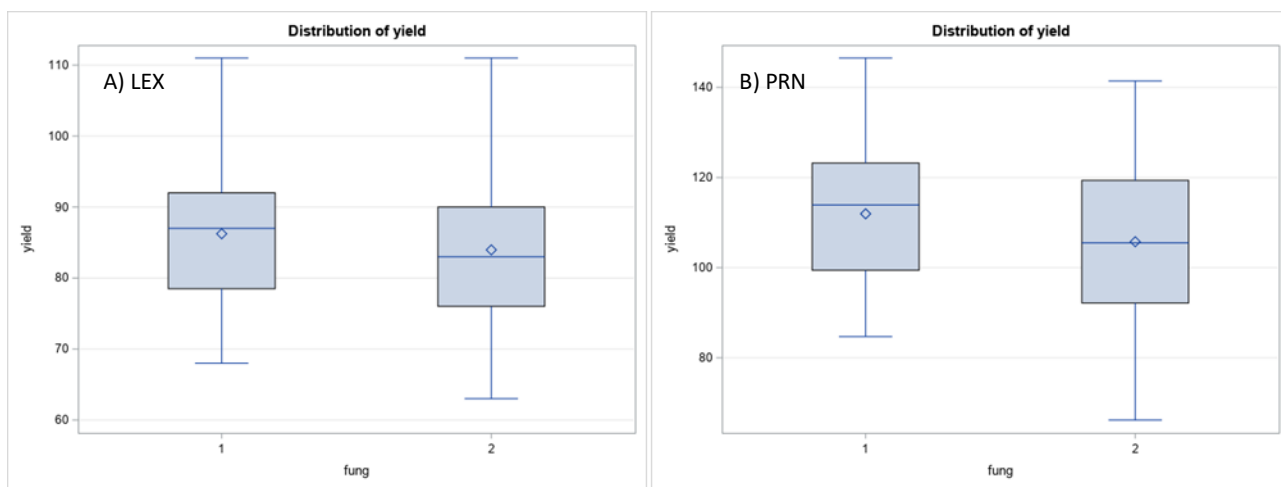


Figure 3. Plant growth regulator (PGR) effect on hybrid rye yield at Lexington (A) and Princeton (B), where 1 = Pali-sade applied at 14.4 fl oz/A at Feekes 3 and 2 = no PGR applied. Averaged across hybrids, planting dates, nitrogen rates and fungicide treatments, PGR at Lexington did not affect yields ($p=0.0790$), while PGR at Princeton slightly increased yield ($<.0001$).

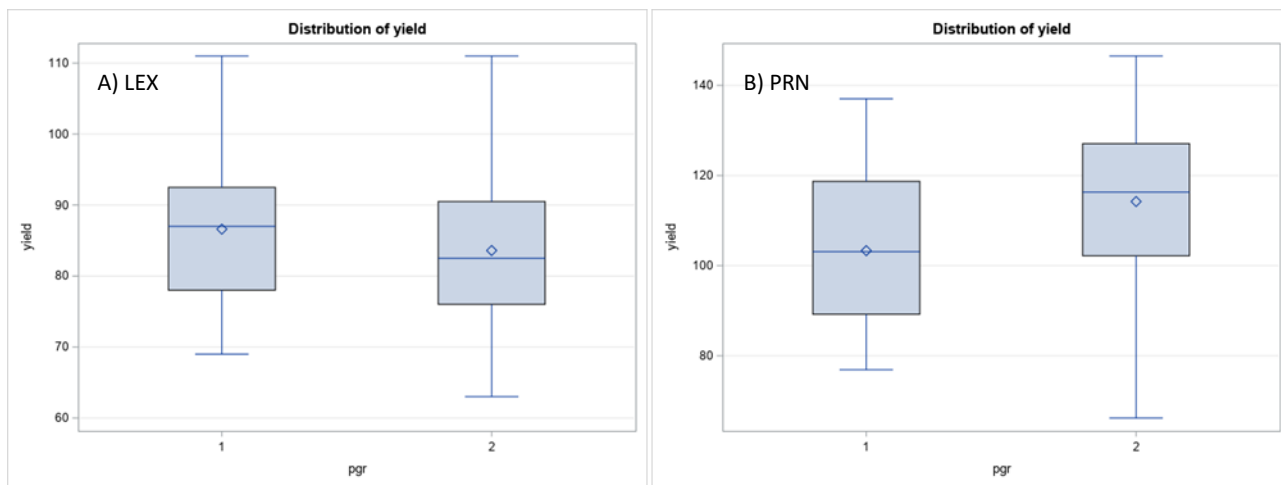


Figure 4. Rye grain yield versus leaf disease severity and Fusarium head blight index for Lexington and Princeton, 2020.

