WHEAT VARIETAL RESPONSE TO A LOW INPUT PRODUCTION ENVIRONMENT

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INTRODUCTION / OBJECTIVE

Most of Kentucky's wheat acreage is grown using intensive management practices, which is associated with high production costs. Recent high input costs have caused some growers to consider whether it is economically feasible to grow wheat. Fertilizer, fuel, pesticides and labor costs have dramatically increased in recent years making wheat production profitability dependent on high yields, high commodity prices or both.

Variety selection is a simple and cost effective way to maximize wheat production profitability. Identifying varieties with superior yield performance across all environments is of primary importance, but identifying varieties that have a high percent proportion of yield in a low input environment to that in a high input environment would allow growers to utilize seed genetics to maximize yield potential in a low input management environment.

Some wheat varieties are marketed as high input varieties. Varieties with strong straw strength may be able to handle high levels of nitrogen fertilizer to maximize yield. Additionally, use of specific high yielding varieties that have notable disease issues may require multiple fungicides to achieve maximum yield potential. There is however, little information on wheat seed marketed as low input/management varieties.

Use of fewer pesticide or fertilizer applications/rates reduce environmental costs and financial costs. Wheat serves as an important cover crop and identification of high performing low input varieties may facilitate wheat production using less inputs which may be defined as a sustainable practice.

The objective: to evaluate wheat varietal differences in the percent proportion of grain yields in a low input to a high input production environment**.**

MATERIALS AND METHODS

Seventy-six wheat variety / breeding lines were evaluated under both high and low management practice environments. The low input trial had all the herbicide and insecticide applications as the high input trial, but the low input trial did not have a fungicide application and utilized a single nitrogen application of 60 lbs N at Feekes 5 rather than a split 40/60 lbs N applications at Feekes 3 and 5. The low and high input trials were planted side by side at Princeton, KY on 10/9/2022 and harvested on 6/15/2023. Trials were laid out in a randomized complete block design with 4 replication per entry. 15 x 4 ft plots were planted in a conventionally tilled seedbed. Percent proportion of low input to high input grain yields were calculated by dividing the low input yield value by the high input yield value and multiplying by 100 for each variety.

RESULTS AND DISCUSSION

The grain yield proportion of low input to high input production environments among varieties ranged from 73.5 to 102.4 % and averaged 87.7 % (Table 1.). The percent proportion values for varieties in Table 1 was conditionally formatted with green having a higher percent proportion and red having a low percent proportion of yield. The wide range in percent proportion values indicate that there are genetic yield potential differences among varieties in high and low input environments.

When comparing the average yield in the high input environment for the top and bottom 15 proportion (%) values,

the top 15 proportion average yield was 102.5 bu/a and the bottom 15 was 110.7 bu/a. This suggests that varieties with lower proportion values benefited more than varieties with a high proportion when grown in a high input environment. It could also suggest that varieties with lower yield potential may not be penalized as much in a low input environment. There were however, several examples of varieties with above average high input yield values that also had high proportion values such as AgriMaxx EXP 2302, USG EXP 3354 and Dyna-Gro 9231 which had high proportion values, but also had above average yields (109.0, 108.6, 111.7 bu/a, respectively compared to the average 106.7 bu/a) in the high input environment. These examples could be varieties worth marketing to growers interested in producing wheat with good yield potential using low input or non-intensive management practices. This type of experiment would need to be repeated before identifying varieties that have a higher potential to yield well in low input environments.

Table 1. Wheat varietal grain yield percent proportion of low input to high input environments.

VARIETY	High Input Yield (bu/a)	Low Input Yield (bu/a)	Percent Proportion	VARIETY	High Input Yield (bu/a)	Low Input Yield (bu/a)	Percent Proportion
Dyna-Gro 9120	100.0	102.5	102.4	PEMBROKE 2021	105.9	92.5	87.4
Croplan CP8022	102.9	103.5	100.5	Dyna-Gro 9290	99.0	86.1	87.0
X14-1107-182-13-3	99.5	98.7	99.2	KAS 23X01	106.0	92.1	87.0
AgriMAXX EXP 2302	109.0	104.4	95.8	AgriMAXX 454	114.6	99.6	86.9
USG EXP 3354	108.6	103.5	95.4	USG 3472	106.0	91.9	86.7
KWS459	101.8	95.9	94.1	AgriMAXX 525	111.8	96.8	86.6
X11-0120-12-4-3	103.0	96.4	93.6	Growmark FS WX23B	113.6	98.2	86.4
X14-1209-141-18-3	106.7	99.3	93.1	Growmark FS 600	112.0	96.8	86.4
Dyna-Gro 9231	111.7	103.7	92.9	X14-1147-131-6-3	108.1	93.3	86.3
AgriMAXX 514	106.0	98.2	92.6	PEMBROKE 2014	89.8	77.5	86.3
Growmark FS 597	95.0	88.0	92.6	X14-1141-172-14-5	100.9	86.9	86.0
X14-1205-147-13-5	94.6	87.4	92.4	Dyna-Gro 9393	107.5	92.1	85.6
AgriMAXX 511	108.0	99.6	92.2	KAS 23X02	118.1	100.9	85.5
KWS482	103.5	94.5	91.4	Growmark FS 603	98.1	83.6	85.2
Truman	86.5	79.1	91.4	AgriMAXX EXP 2301	108.5	92.3	85.1
AgriMAXX 535	109.9	100.3	91.2	AgriMAXX 513	114.2	97.1	85.0
KWS490	107.9	98.2	91.0	USG 3463	110.3	93.7	85.0
Dyna-Gro WX23444	111.9	101.8	91.0	Dyna-Gro 9481	102.4	86.8	84.7
Croplan CPX92394	98.5	89.5	90.8	KWS453	105.8	89.5	84.6
Dyna-Gro 9151	108.1	98.1	90.8	Croplan CP8045	105.0	88.6	84.4
USG 3234	103.4	93.8	90.7	KAS Monroe	115.8	97.7	84.3
KWS397	99.5	90.2	90.7	KWS472	111.5	93.8	84.1
Growmark FS 606	103.1	93.4	90.7	X14-1031-103-4-1	107.1	90.0	84.1
Go Wheat 6056	102.4	92.8	90.6	Growmark FS 617	106.9	89.7	83.9
Growmark FS 623	106.8	96.7	90.6	Croplan CP8081	107.0	89.7	83.9
PEMBROKE 2016	94.7	85.2	90.0	X11-0039-1-17-5	112.2	94.1	83.8
X14-1147-158-14-5	103.2	92.5	89.6	KAS Reagan	113.0	93.8	83.0
Dyna-Gro 9422	113.4	101.6	89.6	Dyna-Gro 9172	111.3	92.2	82.8
AgriMAXX 505	111.0	99.3	89.5	KWS369	112.6	93.0	82.6
KAS Washington	111.5	99.5	89.3	X14-1009-84-4-3	119.8	97.6	81.5
USG EXP 3574	106.5	95.0	89.2	Growmark FS 624	117.6	95.0	80.8
X14-1049-27-10-1	103.9	92.4	88.9	Growmark FS WX23A	106.6	86.0	80.6
Croplan CP8224	115.0	102.1	88.8	KWS477	108.4	87.4	80.6
USG 3783	105.9	93.8	88.6	USG 3352	110.5	88.5	80.1
AgriMAXX 503	107.2	95.0	88.6	Revere 2169	110.0	88.0	80.0
Go Wheat 4059S	101.9	89.5	87.8	X14-1008-92-13-3	111.9	86.3	77.1
AgriMAXX 531	104.5	91.6	87.6	KWS495	99.4	75.1	75.6
AgriMAXX 516	108.1	94.6	87.5	Growmark FS 745	113.3	83.3	73.5
				Average	**106.7**	**93.4**	**87.7**