WHEAT VARIETAL DIFFERENCES IN DISEASE REACTION

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OBJECTIVE

Wheat variety selection is the simplest, most cost effective way to maximize production profitability. One component of production profitability is potential yield and seed quality reductions associated with disease. Selection of varieties with good levels of disease resistance is a sustainable practice and may eliminate the need for fungicide applications. Utilization of wheat variety disease rating data may also help growers determine if their wheat crop is susceptible to a particular pathogen that is present in the region and assist in the decision making process as to whether a fungicide may be needed or not.

METHODS & MATERIALS

Eighty-three wheat varieties were rated for disease reaction at 2 Kentucky locations as part of the 2022 Kentucky Small Grain Variety Trials. The experimental design was a randomized complete block. The trials had four replications per entry, and the data presented are the average response from the four replications.

The plots were planted with specially built multi-row cone seeders in a conventionally tilled field. The trial plots consisted of six rows to form a plot 4 feet wide and 15 feet long, which was later trimmed to 12 feet in length. The preceding crop for both trials was corn.

Trials were conducted using intensive management practices. Herbicide (Harmony Extra) for broadleaf weed control was applied in the spring. Fungicides were intentionally not applied at these two locations to conduct disease ratings. Seeds were treated with a fungicide and systemic insecticide and an insecticide for aphid control was applied in the spring. Nitrogen was applied in a February/March split application at a rate of approximately 30/60 pounds per acre.

Disease ratings: Leaf rust, leaf blotch and head scab were rated at both the Fayette county and the Logan county trials. Powderly mildew, glume blotch and stripe rust were rated at the Fayette county trial. Rating scale (1-9) was used to indicate “1” having no infection or completely resistant and “9” indicating very high infection levels or extreme susceptibility.

RESULTS AND DISCUSSION

Leaf Blotch Complex infection consisted primarily of *Septoria tritici* which causes brown, elongated rectangular lesions with irregular borders and to lesser extent *Stagonospora nodorum* which causes lens-shaped, tan-brown lesions of varying sizes with regular border. Damage results in reductions in yield and test weight. Management includes planting disease resistant varieties, using fungicide treated seed and applying a foliar fungicide after the flag leaf has emerged. 2022 Leaf Blotch ratings (Table 1) ranged from 2.6 to 8.4 and averaged 5.4.

Fusarium Head Blight (Head Scab) is caused by the pathogen *Fusarium graminearum* and causes spikelets to turn white or creamy on otherwise green heads (Image 1). Damage causes reductions in yield and test weight and grain vomitoxin accumulation. Management includes planting varieties with higher levels of resistance and the application of a recommended fungicide during early flowering. 2022 Head Scab ratings (Table 1) ranged from 1.5 to 7.6 and averaged 4.0.

Glume blotch is caused by the pathogen *Stagonospora nodorum* and causes glumes and awns to develop gray-brown blotches, usually starting at the tips of the glumes. Damage causes reductions in test weight and seed quality. Management includes planting moderately resistant varieties and foliar fungicides applied during early heading. 2022 Glume Blotch ratings (Table 1) ranged from 1.5 to 7.5 and averaged 3.0.

Powdery mildew is caused by the pathogen *Podosphaera xanthii* and causes white, powdery patches predominantly on leaves in the lower canopy, but can spread to the entire plant. Damage can result in reductions in yield and test

weight. Management includes planting resistant varieties and using a foliar fungicide on susceptible varieties. Powdery Mildew ratings (Table 1) ranged from 1.0 to 8.5 and averaged 2.5.

Leaf Rust is caused by the pathogen *Puccinia triticina* and causes small rusty-orange pustules on the upper surface of leaves. Infection can results in reductions in yield and test weight. Management includes planting resistant varieties and using a foliar fungicide on susceptible varieties. 2022 Leaf Rust ratings (Table 1) ranged from 1.0 to 6.2 and averaged 2.2. Stripe Rust is caused by the pathogen *Puccinia graminis* and causes bright yellow-orange pustules that appear in linear rows along leaf veins. Infection can result in reductions in yield and test weight. Management includes planting resistant varieties and using a foliar fungicide on susceptible varieties. In 2022 there was insufficient Stripe Rust pressure to make ratings, but varieties with symptoms in more than one replicated plot was noted and considered susceptible.

Image 1. Fusarium Head Scab infection in wheat.

CONCLUSION

As is evident by the 2022 disease ratings in table 1, there are wide levels of resistance or susceptibility among wheat varieties to various pathogens. When making variety selection decisions, disease reaction should be considered as the primary step in protecting the wheat crop, and thereby potentially avoiding the need for a fungicide application. This practice is a simple, sustainable and a highly effective management practice.

Table 1. 2022 Kentucky Wheat Variety Disease Ratings.

Variety	Leaf Blotch	Head Scab	Glume Blotch	Powdery Mildew	Leaf Rust	Stripe Rust
AgriMAXX 454	5.3	3.6	2.0	6.5	4.2	**
AgriMAXX 492	8.4	5.7	2.0	1.0	1.2	
AgriMAXX 503	4.3	2.0	2.8	3.8	1.5	
AgriMAXX 505	4.5	3.5	4.3	3.0	4.0	
AgriMAXX 511	4.1	2.4	2.9	3.0	1.3	
AgriMAXX 513	5.3	2.3	3.0	1.0	2.0	
AgriMAXX 514	6.0	3.5	3.4	1.3	2.0	
AgriMAXX 516	5.5	3.5	2.8	3.0	2.2	
AgriMAXX 525	4.4	3.3	2.3	2.0	2.2	
AgriMAXX EXP 2105	3.6	4.0	3.3	1.5	1.2	
CROPLAN CP8022	3.8	3.9	2.0	2.3	2.5	
CROPLAN CP8045	5.5	3.1	3.3	3.8	1.5	
CROPLAN CP8081	5.3	5.1	2.0	6.3	2.5	
Dyna-Gro 9002	5.4	5.2	2.8	5.5	1.8	
Dyna-Gro 9120	5.6	4.6	3.3	1.3	1.8	
Dyna-Gro 9151	4.9	3.2	5.3	2.8	1.8	
Dyna-Gro 9172	6.0	4.0	2.8	2.5	1.6	
Dyna-Gro 9352	5.8	3.4	5.8	2.3	2.8	
Dyna-Gro 9393	6.5	4.9	2.0	3.5	1.2	
Dyna-Gro 9692	5.3	4.3	2.0	8.5	3.8	
Dyna-Gro WX20738	7.0	4.3	2.8	2.5	1.0	
Dyna-Gro WX21741	4.5	3.3	5.0	3.0	2.0	
Dyna-Gro WX22793	4.5	4.9	2.0	2.3	4.2	**
Go Wheat 2058	7.0	6.1	3.0	1.0	2.0	
Go Wheat 2059	6.0	2.0	2.3	3.3	2.3	
Go Wheat 4059S	4.9	2.5	3.8	2.0	1.5	
Go Wheat 6056	5.9	3.2	3.3	2.3	1.8	
GP 348	5.6	6.1	4.8	1.3	2.8	
GP 381	5.0	5.0	3.8	1.3	3.3	
GP 463	5.1	2.9	3.0	4.5	1.5	**
GP 709	5.9	5.3	3.0	1.0	2.7	
GP 747	4.3	4.4	2.3	4.0	2.3	
GROWMARK FS 597	6.8	4.3	3.0	3.8	1.3	
GROWMARK FS 600	4.8	3.6	4.8	3.3	3.5	
GROWMARK FS 603	5.3	2.5	5.3	5.3	2.2	
GROWMARK FS 616	4.6	3.8	5.8	2.3	2.1	
GROWMARK FS 623	4.1	1.6	2.8	3.5	1.5	
GROWMARK FS 624	6.4	3.8	7.5	5.5	1.7	
GROWMARK FS 745	5.3	3.8	2.8	2.5	2.8	
GROWMARK FS WX22A	4.8	3.3	4.0	1.3	1.5	
GROWMARK FS WX22B	5.0	3.1	4.5	2.3	1.2	
KAS 20X29	4.4	3.2	3.5	1.3	2.2	
KAS 21X56	5.3	3.8	3.5	1.3	1.7	
KAS 21X60	5.1	4.4	1.8	2.0	3.5	**
KAS 21X61	5.5	3.8	5.5	2.3	2.5	
KAS Reagan	5.8	3.6	4.3	1.8	1.5	

Table 1. 2022 Kentucky Wheat Variety Disease Ratings (continued).

Variety	Leaf Blotch	Head Scab	Glume Blotch	Powdery Mildew	Leaf Rust	Stripe Rust
KWS394	3.6	2.2	2.5	1.8	2.3	**
KWS398	4.7	2.0	2.0	3.5	1.3	
KWS403	3.3	2.6	3.0	1.0	3.8	**
KWS405	4.4	3.8	4.0	4.8	1.3	
KWS411	5.8	4.8	2.3	1.3	2.9	
KWS419	5.1	2.4	1.8	1.8	2.0	
Liberty 5658	6.1	4.4	3.3	3.0	1.7	
MI19R0003	8.4	7.6	3.3	1.3	2.0	
MI19R0347	4.6	4.0	3.3	2.3	2.3	
PEMBROKE 2016	7.1	4.7	2.3	2.5	2.2	
PEMBROKE 2021	6.4	5.5	2.5	2.0	3.2	
Revere 2169	5.6	3.2	3.0	3.5	2.8	
Revere 2266	5.6	3.6	5.3	1.0	2.3	
SY 100	6.3	5.3	4.0	2.7	2.1	
SY 547	4.1	4.8	2.5	1.0	3.2	
SY Viper	6.3	5.3	2.5	2.0	2.2	
Truman	5.0	1.5	2.0	1.5	3.7	
USG 3352	4.3	3.5	3.0	2.3	1.5	
USG 3472	5.1	3.2	2.3	4.5	3.0	
USG 3783	6.1	4.3	3.0	3.8	2.0	
VA17W-75	5.9	5.1	2.5	1.0	1.0	
WSC 2720	6.5	5.5	1.5	1.3	4.0	
WSC 3400	3.8	3.6	2.5	1.8	3.5	
WSC 3506	4.8	5.9	3.5	2.8	6.2	
X11-0039-1-17-5	7.3	5.3	2.0	2.0	3.5	
X11-0120-12-4-3	5.1	3.2	1.5	1.8	1.5	
X11-0170-52-3-3	5.6	3.0	2.3	4.5	1.0	
X11-0414-116-11-3	7.0	6.3	2.5	1.8	1.2	
X12-265-56-8-1	5.4	3.2	1.5	3.3	3.5	
X12-3010-4-4-1	2.6	4.2	2.5	1.3	1.2	**
X12-3014-46-7-3	5.8	4.6	2.0	1.0	1.0	
X12-3024-47-4-5	5.3	4.3	2.0	1.5	1.0	
X12-3048-52-18-3	5.5	5.4	2.5	2.0	2.7	
X12-3051-53-17-3	5.1	5.2	2.0	1.8	2.8	
X12-3072-55-13-5	5.0	4.5	2.5	1.0	1.0	
X12-3114-65-7-1	5.9	5.5	2.5	2.5	1.2	
X12-924-40-7-5	6.6	3.6	2.5	2.3	1.2	
Average	**5.4**	**4.0**	**3.0**	**2.5**	**2.2**	

Disease Rating scale: 1 = resistant; 9 = susceptible.

Leaf Blotch, Head Scab and Leaf Rust rated at Fayette and Logan Co., KY.

Powdery Mildew, Glume Blotch and Stripe Rust rated at Lexington, KY

** Stripe Rust observed in multiple plots.