

Headline Fungicide and Cultivar Selection as Management Tools for Leaf Disease Management in Hard Red Winter Wheat, Langdon, 2003-2005

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MATERIALS AND METHODS

A study was conducted to determine the efficacy of Headline fungicide (pyraclostrobin) for control of leaf diseases on hard red winter wheat (HRWW) cultivars. The studies, conducted in 2003, 2004, and 2005, were designed as randomized complete block with a split plot arrangement with four replicates. Whole plots were HRWW cultivars with split plots fungicide or no fungicide. The cultivars were Elkhorn, Jerry, Ransom, Roughrider, and Seward. The plots were seven rows wide six-inch spacing between rows and 20 feet long. Additional plots were planted between the research plots to minimize spray drift to adjacent plots. The plots were planted in mid to late September. The ground was fallowed until July and planted to soybean or flax to provide for snow catch and minimize winter kill. A double disk type no-till drill was used to direct seed the plots. Fertilizer was spring applied by broadcast method. BASF Headline fungicide (pyraclostrobin) was applied at 6 fl oz /acre. The fungicide treatments were applied when the flag leaf was fully extended with a CO₂ backpack type sprayer with XR8001 nozzles on 20 inch spacing mounted vertically. The spray volume was 9.2 GPA. Leaf disease evaluations were made 20 days after flowering by assessing five leaves per plot visually and estimating the necrotic and infected area per leaf. The plots were harvested with a plot combine and the sample processed to determine yield, test weight, and protein. North Dakota State University Extension recommended production practices for Northeast North Dakota were followed. Data was analyzed with the general linear model (GLM) in SAS. Least significant differences (LSD) were used to compare means at the 5% probability level (Table 1).

RESULTS

Primary diseases were Septoria caused by *Stagonospora nodorum* in 2003 and Tan Spot caused by *Pyrenophora tritici-repentis* in 2004 and 2005. Leaf Rust, *Puccinia triticina* (formerly *recondita* f. sp. *tritici*) arrived late in the season but only affected some cultivars slightly. Generally disease pressure was very low in both 2003 and 2004 and development occurred near the end of the crop development. Yields and qualities reflect these environmental conditions. No winter kill was observed in any year on any of the cultivars.

Headline fungicide significantly reduced leaf disease in 2003 and 2005 (Table 3). Disease levels in 2004 were essentially non existent. In 2003 Seward and Elkhorn had the similar disease levels but Seward had lower levels than the other cultivars. No differences in disease levels were measured among cultivars in 2004. In 2005 Ransom had the greatest disease levels. Yield was not different among cultivars by fungicide treatments in any of the years but large differences between years were measured. Fusarium head blight (FHB) reduced average yields in 2005. Headline would have limited affects on FHB and the application timing would not fit the range of recommended timings for head disease control. Jerry and Ransom cultivars out yielded other cultivars in 2003 and 2004 but were not significantly different from the other cultivars in 2005.

Test weight was not affected by fungicide treatment on Elkhorn, was positively affected in Jerry, Ransom, and Roughrider, and negatively affected in Seward (Table 4). Seward was least affected of the cultivars by leaf disease. Protein was different among cultivars, greatest in Elkhorn, Jerry, and Roughrider. Fungicide significantly increased protein on Roughrider and Seward.

Table 1. Source of variation and confidence levels for significant differences among leaf disease severity, yield, test weight, and protein on winter wheat Langdon, 2003, 2004, and 2005.

| Year | Leaf Disease | Yield | Test Weight | Protein |
|-------------|--------------|---------|-------------|---------|
| Year | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Cultivar | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Yr*Cult | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Treatment | <0.0001 | <0.0001 | 0.9184 | 0.0003 |
| Yr*Trt | <0.0001 | 0.0096 | 0.1453 | 0.6976 |
| Cult*Trt | 0.3132 | 0.7593 | 0.0277 | 0.0474 |
| Yr*Cult*Trt | 0.0087 | 0.4385 | 0.8446 | 0.4872 |
| %C.V. | 39 | 5 | 1 | 2 |

Table 2. Leaf Disease, Yield, Test Weight, and Protein by Cultivar Averaged Across Fungicide Treatments, and Headline Fungicide Treatment Averaged Across Cultivars Langdon, 2003, 2004, and 2005.

| Cultivar | Treatment | Leaf Disease (%) | Yield (Bu/a) | Test Weight (Lb/bu) | Protein (%) |
|-----------------------|-----------|------------------|--------------|---------------------|-------------|
| Elkhorn | | 20.6 | 67.9 | 55.8 | 13.4 |
| Jerry | | 27.6 | 84.3 | 56.5 | 13.3 |
| Ransom | | 34.8 | 80.5 | 56.3 | 12.8 |
| Roughrider | | 33.5 | 66.6 | 57.6 | 13.6 |
| Seward | | 15.4 | 68.5 | 56.7 | 12.4 |
| | Untreated | 41.6 | 71.5 | 56.6 | 13.0 |
| | Treated | 11.2 | 75.6 | 56.6 | 13.2 |
| LSD _(0.05) | | NA | NA | NS | NA |

Table 3. Leaf Disease, Yield, Test Weight, and Protein by Year, Headline Fungicide Treatment Averaged Across Cultivars, and Cultivar Averaged Across Headline Fungicide Treatment Langdon, 2003, 2004, and 2005.

| Year | Cultivar | Treatment | Leaf Disease % | Yield Bu/A | Test Weight Lb/Bu | Protein % |
|----------------------------------------------------|------------|-----------|----------------------|---------------|-------------------------|--------------|
| <u>Treatment by Year Averaged Across Cultivars</u> | | | | | | |
| 2003 | | Untreated | 33.0 | 99.5 | 60.1 | |
| | | Treated | 13.3 | 101.9 | 59.9 | |
| 2004 | | Untreated | 11.6 | 78.6 | 54.9 | 12.1 |
| | | Treated | 2.3 | 85.6 | 54.8 | 12.4 |
| 2005 | | Untreated | 80.2 | 36.5 | 54.7 | 13.9 |
| | | Treated | 18.0 | 39.1 | 55.0 | 14.1 |
| LSD (0.05) | | | 18.3 | 8.5 | NS | 0.9 |
| <u>Cultivar by Year Averaged Across Treatments</u> | | | | | | |
| 2003 | Elkorn | | 19.6 | 90.3 | 59.9 | |
| | Jerry | | 35.1 | 116.4 | 59.5 | |
| | Ransom | | 26.5 | 110.6 | 59.4 | |
| | Roughrider | | 27.3 | 92.3 | 60.8 | |
| | Seward | | 7.3 | 94.0 | 60.3 | |
| 2004 | Elkorn | | 2.1 | 79.4 | 53.4 | 12.7 |
| | Jerry | | 2.9 | 93.9 | 54.8 | 12.6 |
| | Ransom | | 4.9 | 89.6 | 55.8 | 11.9 |
| | Roughrider | | 18.9 | 72.6 | 56.1 | 12.4 |
| | Seward | | 6.0 | 75.1 | 54.3 | 11.7 |
| 2005 | Elkorn | | 40.1 | 34.1 | 54.1 | 14.1 |
| | Jerry | | 44.9 | 42.5 | 55.3 | 14.1 |
| | Ransom | | 73.0 | 41.3 | 53.6 | 13.8 |
| | Roughrider | | 54.4 | 34.9 | 55.8 | 14.9 |
| | Seward | | 33.0 | 36.4 | 55.7 | 13.2 |
| LSD (0.05) | | | 18.3 | 8.5 | 1.5 | 0.9 |

Table 4. Leaf Disease, Yield, Test Weight, and Protein by Cultivar, and Headline Fungicide Treatment Averaged Across Years Langdon, 2003, 2004, and 2005.

| Year | Cultivar | Treatment | Leaf | Yield | Test | Protein |
|-----------------------------------------------------|------------|-----------|---------|-------|--------|---------|
| | | | Disease | Bu/A | Weight | % |
| | | | % | | Lb/Bu | |
| <u>Cultivars by Treatment Averaged Across Years</u> | | | | | | |
| | Elkhorn | Untreated | 35.5 | 66.7 | 55.8 | 13.3 |
| | | Treated | 5.7 | 69.1 | 55.8 | 13.5 |
| | Jerry | Untreated | 41.9 | 81.9 | 56.4 | 13.2 |
| | | Treated | 13.3 | 86.7 | 56.7 | 13.4 |
| | Ransom | Untreated | 48.1 | 78.1 | 56.2 | 12.9 |
| | | Treated | 21.4 | 82.9 | 56.4 | 12.7 |
| | Roughrider | Untreated | 56.1 | 64.3 | 57.5 | 13.4 |
| | | Treated | 11.0 | 68.9 | 57.6 | 13.8 |
| | Seward | Untreated | 26.4 | 66.8 | 57.1 | 12.1 |
| | | Treated | 4.4 | 70.3 | 56.4 | 12.7 |
| LSD ¹ | | | NS | NS | 0.1* | 0.4* |
| LSD ² | | | NS | NS | 0.2* | 1.0* |

¹Comparison of subplot means within same whole plot (Cultivar=whole plot, Treatment=subplot)

²Comparison of whole plot means at same or different subplot

Table 5. Leaf Disease, Yield, Test Weight, and Protein by Year, Cultivar, and Headline Fungicide Treatment Langdon, 2003, 2004, and 2005.

| Year | Cultivar | Treatment | Leaf | Yield | Test | Protein | |
|--------------------------------------|------------|-----------|-----------|-------|--------|---------|------|
| | | | Disease | Bu/A | Weight | % | |
| | | | % | | Lb/Bu | | |
| <u>Cultivar by Treatment by Year</u> | | | | | | | |
| 2003 | Elkhorn | Untreated | 32.3 | 87.9 | 59.9 | | |
| | | Treated | 6.9 | 92.7 | 59.9 | | |
| | Jerry | Untreated | 43.8 | 115.0 | 59.5 | | |
| | | Treated | 26.5 | 117.9 | 59.5 | | |
| | Ransom | Untreated | 43.5 | 109.7 | 59.5 | | |
| | | Treated | 9.5 | 11.7 | 59.4 | | |
| | Roughrider | Untreated | 36.5 | 91.7 | 60.9 | | |
| | | Treated | 18.0 | 92.8 | 60.8 | | |
| | Seward | Untreated | 9.2 | 93.5 | 60.8 | | |
| | | Treated | 5.4 | 94.5 | 59.8 | | |
| | 2004 | Elkhorn | Untreated | 2.6 | 78.9 | 53.6 | 12.6 |
| | | | Treated | 1.6 | 79.9 | 53.1 | 12.9 |
| | | Jerry | Untreated | 3.5 | 90.4 | 54.6 | 12.6 |
| | | | Treated | 2.3 | 97.4 | 55.0 | 12.7 |
| Ransom | | Untreated | 7.1 | 84.9 | 55.9 | 11.9 | |
| | | Treated | 2.7 | 94.3 | 55.8 | 11.8 | |
| Roughrider | | Untreated | 34.7 | 67.9 | 56.0 | 12.2 | |
| | | Treated | 3.1 | 77.4 | 56.3 | 12.6 | |
| Seward | | Untreated | 10.2 | 71.0 | 54.5 | 11.4 | |
| | | Treated | 1.9 | 79.2 | 54.0 | 12.0 | |
| 2005 | | Elkhorn | Untreated | 71.6 | 33.3 | 53.9 | 14.1 |
| | | | Treated | 8.6 | 34.8 | 54.3 | 14.2 |
| | | Jerry | Untreated | 78.6 | 40.4 | 55.0 | 13.9 |
| | | | Treated | 11.2 | 44.7 | 55.5 | 14.2 |
| | Ransom | Untreated | 93.9 | 40.0 | 53.1 | 14.0 | |
| | | Treated | 52.2 | 42.6 | 54.1 | 13.6 | |
| | Roughrider | Untreated | 97.0 | 33.2 | 55.6 | 14.7 | |
| | | Treated | 11.8 | 36.5 | 55.9 | 15.1 | |
| | Seward | Untreated | 60.0 | 35.8 | 56.0 | 12.8 | |
| | | Treated | 6.1 | 37.1 | 55.4 | 13.5 | |