

WHEAT (*Triticum aestivum*, ‘multiple cultivars’)  
Fusarium head blight; *Fusarium graminearum*

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### Reaction of selected winter wheat accessions to Fusarium head blight (FHB), 2020.

The experiment was conducted in Chase silty clay loam soil at Rocky Ford Research Station, Kansas State University, Manhattan, Kansas. The experimental design of Fusarium head blight (FHB) scab Nursery was a randomized complete block with four blocks where 50 entries were randomly assigned within block. Experiment plots were single rows 2.3-m long spaced 0.51-m apart. Seeds were sown on 1 Oct 2019 with the seeding rate of 67.25 kg/ha. Corn kernels were inoculated with two aggressive isolates of *Fusarium graminearum* conidia. Air-dried kernels were spread throughout the plots at the rate 57g/m<sup>2</sup> three times on 10 Apr, 24 Apr, and 09 May 2019. During anthesis, overhead impulse sprinklers were used apply the water at the rate of 12 min every four hours overnight. Visual estimations of the percent symptomatic spikelets (FHB index) was determined on 23 May, 27 May, 29 May, 31 May, 02 Jun, 04 Jun, and 06 Jun and heading date (50% headed) per plot was also recorded. FHB index of seven different observation days were used to calculate the Area Under Disease Progressive Curve (AUDPC) by using “agricolae” package in R (R-Development Core Team). AUDPC values were analyzed by GLM procedure (SAS Institute Inc.) and Fisher’s protected least significant difference (LSD;  $P = 0.05$ ) was used for mean comparisons. Grain sub-samples per plot were sent to the North Dakota State University Wheat DON testing laboratory for determination of deoxynivalenol (DON) concentration. Correlation among AUDPC, heading date, and DON were also analyzed.

Good head blight symptoms were observed in all breeding lines. Mean AUDPC values varied with cultivars ( $F = 6.53$ ,  $P < 0.001$ ). ‘Overley’, the susceptible check had significantly high AUDPC values than other entries ( $P < 0.001$ ) except 0001\_0\_0004\_1, 0003\_0\_0004\_1, and 0001\_0\_0004\_1. Mean DON concentrations varied with cultivars ( $F = 3.06$ ,  $P < 0.001$ ). ‘LCH17-4256’ had the highest DON levels (43.15 ppm) and it was statistically similar to Overley, LCSLink, LCH17-4196, LCH17-1296, 19CP010259, 19CP010013, 00003\_0\_0004\_1, 00003\_0\_0005\_1, and 00003\_0\_0006\_1. All other entries had statistically lower DON levels than LCH17-4256 ( $P < 0.001$ ). There was a significant negative correlation between mean AUDPC and heading date (Julian) ( $n = 200$ ,  $r = -0.30$ ,  $P < 0.001$ ). Mean AUDPC was significantly correlated with mean DON levels ( $n = 200$ ,  $r = 0.32$ ,  $P < 0.001$ ).

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| NAME       | Heading date(Julian)z | Fusarium head blight Index (% killed spikelets) |       |       |       |       |       |       | Average FHB <sup>y</sup> | AUDPC <sup>x</sup> | DON (ppm) |
|------------|-----------------------|---|-------|-------|-------|-------|-------|-------|--------------------------|--------------------|-----------|
|            |                       | FHB1  | FHB 2 | FHB 3 | FHB 4 | FHB 5 | FHB 6 | FHB 7 |                          |                    |           |
| 19CP010574 | 125.3                 | 0.3   | 3.8   | 18.8  | 11.3  | 28.8  | 30.0  | 60.0  | 21.8                     | 247.3              | 8.5       |
| 19CP010078 | 125.8                 | 0.3   | 1.8   | 8.3   | 4.5   | 20.0  | 23.8  | 42.5  | 14.4                     | 160.3              | 8.8       |

| NAME           | Heading<br>date(Julian)z | Fusarium head blight Index (% killed spikelets) |       |       |       |       |       |       | Average<br>FHB <sup>y</sup> | AUDPC <sup>x</sup> | DON<br>(ppm) |
|----------------|--------------------------|---|-------|-------|-------|-------|-------|-------|-----------------------------|--------------------|--------------|
|                |                          | FHB1  | FHB 2 | FHB 3 | FHB 4 | FHB 5 | FHB 6 | FHB 7 |                             |                    |              |
| 19CP010571     | 126.0                    | 0.5   | 7.0   | 16.8  | 15.0  | 30.0  | 40.0  | 72.5  | 25.9                        | 294.3              | 9.1          |
| 00001_0_0007_1 | 131.8                    | 0.3   | 1.3   | 7.8   | 9.3   | 30.0  | 37.5  | 71.3  | 22.5                        | 243.7              | 9.3          |
| 00002_0_0001_1 | 125.8                    | 0.0   | 1.5   | 9.3   | 6.3   | 16.3  | 23.8  | 47.5  | 14.9                        | 162.3              | 9.6          |
| 19CP010569     | 125.8                    | 0.3   | 9.3   | 15.0  | 17.5  | 48.8  | 35.0  | 56.3  | 26.0                        | 312.3              | 10.0         |
| 19CP010566     | 125.3                    | 0.0   | 14.3  | 16.3  | 12.5  | 30.0  | 50.0  | 63.8  | 26.7                        | 316.9              | 10.3         |
| 19CP010588     | 125.8                    | 0.3   | 4.8   | 15.0  | 8.8   | 31.3  | 30.0  | 61.3  | 21.6                        | 243.5              | 10.4         |
| DH15HRW63-81   | 128.5                    | 0.5   | 2.5   | 10.5  | 5.5   | 18.8  | 33.8  | 51.3  | 17.5                        | 195.3              | 11.1         |
| 00005_0_0004_1 | 124.0                    | 0.5   | 14.8  | 28.8  | 23.8  | 52.5  | 65.0  | 82.5  | 38.3                        | 460.1              | 11.5         |
| 00002_0_0003_1 | 124.3                    | 0.8   | 22.5  | 32.5  | 37.5  | 50.0  | 62.5  | 71.3  | 39.6                        | 493.6              | 11.8         |
| Everest        | 122.5                    | 0.5   | 4.8   | 17.5  | 7.5   | 43.8  | 48.8  | 71.3  | 27.7                        | 318.9              | 12.0         |
| 00005_0_0007_1 | 123.8                    | 0.8   | 17.5  | 31.3  | 25.0  | 52.5  | 60.0  | 66.3  | 36.2                        | 448.6              | 12.7         |
| LCH18-7080     | 123.3                    | 0.3   | 4.8   | 16.3  | 12.5  | 48.8  | 58.8  | 73.8  | 30.7                        | 358.5              | 13.0         |
| LCH17-3118     | 131.3                    | 0.8   | 3.5   | 8.0   | 10.5  | 28.8  | 36.3  | 55.0  | 20.4                        | 231.9              | 13.3         |
| 00004_0_0007_1 | 125.3                    | 0.3   | 4.3   | 17.5  | 9.3   | 30.0  | 37.5  | 60.0  | 22.7                        | 259.5              | 13.8         |
| 19CP010506     | 123.3                    | 1.0   | 16.3  | 25.0  | 25.0  | 45.0  | 51.3  | 76.3  | 34.3                        | 410.9              | 14.0         |
| 19CP010092     | 125.3                    | 0.5   | 11.5  | 26.3  | 26.3  | 53.8  | 62.5  | 78.8  | 37.1                        | 445.8              | 15.0         |
| 19CP010586     | 125.0                    | 0.8   | 27.5  | 31.3  | 25.0  | 42.5  | 46.3  | 62.5  | 33.7                        | 422.4              | 15.2         |
| LCH17-5660     | 125.5                    | 0.5   | 11.0  | 35.0  | 26.3  | 43.8  | 63.8  | 71.3  | 35.9                        | 437.0              | 15.5         |
| 19CP010435     | 124.3                    | 0.8   | 27.5  | 37.5  | 26.3  | 56.3  | 55.0  | 77.5  | 40.1                        | 497.4              | 15.7         |
| LCH17-1850     | 126.5                    | 0.0   | 1.3   | 9.3   | 8.0   | 30.0  | 35.0  | 61.3  | 20.7                        | 228.9              | 16.9         |
| Karl92         | 122.5                    | 1.0   | 10.5  | 31.3  | 17.5  | 50.0  | 43.8  | 67.5  | 31.6                        | 380.3              | 17.0         |
| LCH17-5221     | 126.3                    | 0.0   | 2.5   | 12.5  | 12.5  | 35.0  | 46.3  | 56.3  | 23.6                        | 275.0              | 18.7         |
| 19CP010505     | 123.5                    | 1.3   | 12.5  | 22.5  | 18.8  | 50.0  | 58.8  | 61.3  | 32.1                        | 394.4              | 19.0         |
| 00006_0_0008_1 | 130.8                    | 0.0   | 1.5   | 7.5   | 5.5   | 32.5  | 42.5  | 70.0  | 22.8                        | 249.8              | 19.8         |
| SyBenefit      | 123.5                    | 1.0   | 9.0   | 15.0  | 13.8  | 31.3  | 46.3  | 71.3  | 26.8                        | 307.8              | 20.2         |
| 00003_0_0007_1 | 126.8                    | 0.0   | 1.5   | 4.3   | 6.3   | 22.5  | 31.3  | 68.8  | 19.2                        | 201.0              | 20.4         |
| LCH17-3481     | 124.3                    | 0.5   | 13.0  | 33.8  | 27.5  | 48.8  | 63.8  | 78.8  | 38.0                        | 459.5              | 20.7         |
| 00006_0_0003_1 | 131.8                    | 0.0   | 0.8   | 3.5   | 5.0   | 21.3  | 42.5  | 67.5  | 20.1                        | 213.9              | 20.9         |
| LCH18-7071     | 126.8                    | 0.0   | 5.5   | 21.3  | 20.5  | 39.3  | 36.3  | 60.0  | 26.1                        | 308.3              | 20.9         |
| 00001_0_0004_1 | 125.0                    | 1.0   | 28.8  | 42.5  | 37.5  | 63.8  | 66.3  | 75.0  | 45.0                        | 568.4              | 20.9         |
| 19CP010068     | 125.5                    | 0.0   | 3.5   | 17.5  | 11.3  | 35.0  | 56.3  | 65.0  | 26.9                        | 313.8              | 21.1         |
| 00003_0_0006_1 | 125.0                    | 0.8   | 15.0  | 28.8  | 23.8  | 56.3  | 70.0  | 85.0  | 39.9                        | 481.1              | 21.5         |
| LCH17-1765     | 124.3                    | 0.3   | 16.3  | 43.8  | 36.3  | 53.8  | 67.5  | 76.3  | 42.0                        | 519.8              | 23.5         |
| 19CP010111     | 128.0                    | 0.0   | 1.5   | 5.5   | 7.5   | 30.0  | 35.0  | 55.0  | 19.2                        | 214.8              | 23.8         |
| LCH17-093      | 126.5                    | 0.5   | 12.8  | 31.3  | 28.8  | 58.8  | 72.5  | 83.8  | 41.2                        | 498.9              | 25.0         |
| LCH17-3468     | 124.0                    | 0.0   | 6.5   | 23.8  | 20.0  | 38.8  | 58.8  | 76.3  | 32.0                        | 375.0              | 25.4         |
| 00007_0_0005_1 | 125.0                    | 0.3   | 7.8   | 16.3  | 13.8  | 61.3  | 73.8  | 81.3  | 36.3                        | 431.0              | 26.0         |
| LCH17-2444     | 128.3                    | 0.8   | 6.5   | 11.3  | 22.5  | 40.0  | 55.0  | 72.5  | 29.8                        | 347.4              | 26.4         |
| 00003_0_0005_1 | 125.3                    | 0.3   | 6.8   | 23.0  | 21.3  | 51.3  | 67.5  | 76.3  | 35.2                        | 419.5              | 29.0         |
| 00003_0_0004_1 | 122.3                    | 0.5   | 25.5  | 41.3  | 42.5  | 67.5  | 81.3  | 83.8  | 48.9                        | 613.3              | 29.6         |
| LCH17-1296     | 125.3                    | 0.0   | 6.8   | 23.8  | 21.3  | 46.3  | 58.8  | 75.0  | 33.1                        | 391.9              | 30.6         |
| 00007_0_0006_1 | 123.0                    | 1.0   | 17.5  | 40.0  | 33.8  | 65.0  | 73.8  | 81.3  | 44.6                        | 551.5              | 34.6         |
| 19CP010259     | 123.5                    | 0.5   | 6.5   | 30.0  | 22.5  | 58.8  | 63.8  | 72.5  | 36.4                        | 439.5              | 37.0         |
| Overley        | 123.8                    | 2.3   | 53.7  | 47.5  | 35.0  | 66.3  | 83.8  | 96.3  | 55.0                        | 699.0              | 37.5         |
| LCH17-4196     | 124.8                    | 0.5   | 19.7  | 30.0  | 23.8  | 52.5  | 63.8  | 80.0  | 38.6                        | 470.1              | 38.1         |
| LCSLink        | 129.3                    | 0.0   | 2.5   | 10.0  | 12.5  | 40.0  | 53.8  | 78.8  | 28.2                        | 317.5              | 39.1         |
| 19CP010013     | 127.3                    | 0.3   | 6.2   | 13.8  | 33.8  | 66.3  | 71.3  | 82.5  | 39.1                        | 468.5              | 41.8         |
| LCH17-4256     | 127.3                    | 0.3   | 9.2   | 18.8  | 30.0  | 52.5  | 56.3  | 78.8  | 35.1                        | 417.3              | 43.2         |
| Average        | 125.7                    | 0.4   | 10.5  | 21.7  | 19.2  | 43.3  | 52.5  | 70.2  | 31.1                        | 370.3              | 20.4         |
| LSD            | 1.93                     | 0.62  | 14.12 | 19.13 | 14.41 | 18.13 | 16.54 | 13.92 | 9.6                         | 134.31             | 15.22        |

<sup>z</sup>Days from January 1

<sup>y</sup>Average rating from FHB1-FHB7

<sup>x</sup>Area Under Disease Progress Curve