Southeast Kansas Wheat Variety Test Results - 2020

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**Recommended Citation**
Sassenrath, G. F.; Mengarelli, L.; Lingenfelser, J.; and Lin, X. (2021) "Southeast Kansas Wheat Variety Test Results - 2020," *Kansas Agricultural Experiment Station Research Reports*: Vol. 7: Iss. 2. https://doi.org/10.4148/2378-5977.8049

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Cover Page Footnote
This work is supported by the U.S. Department of Agriculture National Institute of Food and Agriculture, Hatch project 1018005. These data are part of the 2020 Kansas Performance Tests with Winter Wheat Varieties, SRP1158 (https://bookstore.ksre.ksu.edu/pubs/SRP1158.pdf).

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Summary
This is a summary of the winter wheat production conditions in southeast Kansas in 2019-2020 and the results of the variety testing. Fifteen hard red and ten soft red winter wheat varieties were compared for yield and test weight. High spring rainfall increased disease pressure; cultivars were rated for Fusarium head blight and stripe rust. Average yield of hard red wheat varieties was above average at 81.1 bu/acre across all varieties. Soft red wheat yield was 102.4 bu/acre across all varieties. For comparison, previous variety yield results are reported from 2016, 2017, and 2018.

Introduction
Crop production is dependent on many factors including cultivar selection, environmental conditions, soil, and management practices. This report summarizes the environmental conditions during the 2019-2020 winter wheat growing season in comparison to previous years and the historical averages. Fifteen hard red and ten soft wheat varieties were tested at Parsons.

Experimental Procedures
The Kansas State University Crop Performance Tests were conducted in replicated research fields throughout the state. This report summarizes winter wheat production for Parsons, KS. Wheat varieties were tested in a Parsons silt loam soil (fine, mixed, active, thermic Mollic Albaqualfs) at the Southeast Research and Extension Center in Parsons. All crop variety trials are managed with conventional tillage. Individual variety results are available at the K-State Crop Performance Test web page (http://www.agronomy.k-state.edu/services/crop-performance-tests/).

Wheat was drilled in 7-in. rows at 1.2 million seed/acre (approximately 90 lb/acre) in conventional tillage with an Almaco plot drill on October 23, 2019 in Parsons and harvested June 18, 2020. Plots were 7-ft wide by 27.5-ft long. Fertilizer was applied before planting at a rate of 50-46-30 lb/acre N-P-K (dry), with an additional 60-46-30 lb/acre N-P-K (dry) applied on February 7, 2020, for both hard red and soft red cultivars. No fungicide or herbicides were applied. Historical weather data from the Parsons and Columbus mesonet stations were used (http://mesonet.k-state.edu/weather/historical/) and are reported separately (Sassenrath et al., 2021).
Results and Discussion

Rainfall during the 2019-2020 water year (WY) was near record highs (Sassenrath et al., 2021). Beginning in early January, regular high rainfall events increased the cumulative rainfall to well above average. During April, the cumulative rainfall exceeded that received during the previous WY19. On May 15, 2020, Parsons received 4.7 in. of rain in one 24-hr period. After a very wet spring, however, the rain stopped; Parsons received only 1.18 in. of rain in all of June. This dry weather coincided perfectly with wheat harvest. Wet conditions during wheat flowering contribute to fungal disease, in particular Fusarium head blight or scab (De Wolf et al., 2003). There was heavy infestation of scab in some cultivars and wheat fields (Table 1 and 2). The dry conditions at wheat maturity allowed timely harvesting, resulting in little dockage due to scab in 2020.

Winter wheat was planted on 6.6 million acres in Kansas in 2020. In the variety trials, heading notes were taken on individual varieties. Heading is defined as the date when 50% of the plot had heads emerged. Heading in the hard red varieties began April 25, 2020, and was complete by April 30. Heading in the soft red varieties occurred between April 28 and May 1, 2020. Yields in all varieties were very good in 2020 (Figures 1A and 2, and Table 1). The highest yield in the hard red wheat varieties was measured in WB4401 at 108.8 bu/acre. This is well above the 12-year average yield of 53.1 bu/acre in the variety trials, and the 12-year average yield of 40.7 bu/acre across the state.

Cultivars varied in their susceptibility to disease. High rainfall around flowering and heading increases disease pressure (De Wolf et al., 2003). Fungal disease ratings were measured in all varieties as the percent infection and the extent of infection, with 0 being no damage and 10 being the highest infection rate. Fusarium head blight (FHB) and stripe rust were both present in the variety trials and showed differences across the varieties (Figure 4B and C). Stripe rust showed greater infection rates than FHB. Varieties with higher yields tended to have better resistance to the fungal diseases.

Yields in soft red varieties were higher than the hard red varieties, as has been observed previously (Figures 1). No information on state-wide yields for soft red wheat is available, as soft red wheat production occurs primarily in the southeast region of the state, so hard red wheat variety yields are given for the KS state average. Soft red yield of 102.4 bu/acre across all varieties in 2020 was much higher than the 11-year average of 64 bu/acre for soft red wheats in the variety trials. The yields were similar to those harvested in soft red wheat in 2012 in the variety trials. The highest yield of 113.9 bu/acre was measured in AgriMaxx 503, but several other varieties had yields greater than 100 bu/acre (Table 2). One advantage of soft red wheat is greater resistance to disease. This was observed in the FHB and stripe rust disease ratings (Figure 5B and C). As with the hard red varieties, those varieties that had greater resistance to diseases tended to have higher yields.

Conclusions

Wheat produced exceptionally well in 2020. The planting conditions in the fall and relatively mild winter led to good plant stands. Notably, many plots were thinner than expected. However, ideal dry conditions during harvest made optimal and timely
harvest possible. The high probability of rainfall around May 31 in Parsons often confounds wheat harvest, making fields inaccessible and increasing disease damage.

Comparing variety performance across different growing seasons gives an understanding of how a variety responds under different growing conditions. For ease of comparison, variety testing results from the previous 5 years are provided for hard red (Table 1) and soft red (Table 2) varieties at Parsons. Note, no data were available from 2019 due to poor plant stand.

No herbicides or fungicides are normally used in the variety trials to provide an equal comparison based only on genetics. However, timely application of fungicide has been shown to be especially important in high rainfall areas such as southeast Kansas in order to control fungal diseases (De Wolf et al., 2003). Application of appropriate fungicides around flowering is especially important to control FHB (Onofre and De Wolf, 2020).

Acknowledgments
This work is supported by the U.S. Department of Agriculture National Institute of Food and Agriculture, Hatch project 1018005. These data are part of the 2020 Kansas Performance Tests with Winter Wheat Varieties, SRP1158 (https://bookstore.ksre.ksu.edu/pubs/SRP1158.pdf).

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Table 1. Multiyear comparison of hard red winter wheat yields from variety trials at Parsons, KS

| Hard red wheat varieties, Parsons, KS | 2016 | 2017 | 2018 | 2020 |
|-------------------------------------|------|------|------|------|
| Company                             | Yeild, bu/a | Yeild, bu/a | Test weight, lb/bu | Yeild, bu/a | Test weight, lb/bu | Fusarium rating | Stripe rust rating |
| AgriMAXX AM Cartwright              | 47.2 | 55.5 | 56.8 | 58.5 | 67.2 | 57.9 | 3 | 8 |
| AgriMAXX AM Eastwood                | 56.8 | 57.9 | 57.4 | 57.1 | 77.5 | 59.5 | 1 | 7 |
| Syngenta AgriPro SY Benefit         | 61.9 | 50.0 | 56.5 | 65.1 | 57.5 | 3 | 3 |
| Syngenta AgriPro SY Wolf            | 52.1 | 59.0 | 76.1 | 56.6 | 0 | 3 |
| Syngenta AgriPro SY Llano           | 61.8 | 36.5 | 57.5 | 56.9 | 58.1 | 57.6 |
| Syngenta AgriPro Bob Dole           | 49.0 | 57.4 | 83.5 | 60.2 | 5 | 1 |
| Syngenta AgriPro Jackpot            | 66.2 | 69.5 | 57.7 | 45.1 | 58.9 | 60.0 | 2 | 4 |
| AGSECO AG Gallant                   | 57.0 | 69.5 | 57.7 | 45.1 | 58.9 | 60.0 | 2 | 4 |
| AGSECO AG Icon                      | 56.9 | 52.6 | 57.5 | 47.5 | 58.6 | 60.0 | 2 | 4 |
| AGSECO AG Robust                    | 56.9 | 52.6 | 57.5 | 47.5 | 58.6 | 60.0 | 2 | 4 |
| AGSECO EXP 52-5                     | 76.1 | 56.6 | 76.1 | 56.6 | 0 | 3 |
| AGSECO Hot Rod                      | 56.9 | 56.9 | 58.1 | 57.6 | 86.1 | 60.8 | 1 | 8 |
| AGSECO TAM 205                      | 60.6 | 58.8 | 60.6 | 58.8 | 60.8 | 60.8 | 1 | 2 |
| Croplan EXP 26-16                   | 60.6 | 58.8 | 60.6 | 58.8 | 60.8 | 60.8 | 1 | 2 |
| Croplan EXP 69-16                   | 53.9 | 57.9 | 53.9 | 57.9 | 58.4 | 58.4 | 1 | 2 |
| Dyna-Gro Long Branch                | 56.9 | 55.6 | 56.0 | 41.4 | 57.8 | 58.4 | 1 | 2 |
| KWA Wildcat Genetics Everest        | 70.5 | 60.5 | 58.1 | 48.6 | 59.3 | 78.9 | 60.8 | 1 | 8 |
| KWA Wildcat Genetics Zenda          | 66.0 | 60.7 | 58.4 | 43.5 | 59.7 | 86.1 | 60.8 | 1 | 8 |
| Wildcat Genetics KanMark            | 66.1 | 63.8 | 57.5 | 63.8 | 57.5 | 63.8 | 57.5 | 63.8 | 57.5 | 63.8 | 57.5 |
| KWA Wildcat Genetics KS061193K-2    | 63.8 | 57.5 | 63.8 | 57.5 | 63.8 | 57.5 | 63.8 | 57.5 | 63.8 | 57.5 | 63.8 | 57.5 |
| KWA Wildcat Genetics KS080448C*102  | 52.4 | 58.4 | 52.4 | 58.4 | 52.4 | 58.4 | 52.4 | 58.4 | 52.4 | 58.4 | 52.4 | 58.4 |
| KWA Wildcat Genetics KS060143K-2 “Larry” | 65.4 | 53.7 | 56.8 | 65.4 | 53.7 | 56.8 | 65.4 | 53.7 | 56.8 | 65.4 | 53.7 | 56.8 |
| Limagrain LCS Chrome                 | 71.9 | 55.4 | 58.7 | 62.9 | 57.5 | 62.9 | 57.5 | 62.9 | 57.5 | 62.9 | 57.5 |

continued
Table 1. Multiyear comparison of hard red winter wheat yields from variety trials at Parsons, KS

| Hard red wheat varieties, Parsons, KS | 2016 | 2017 | 2018 | 2020 |
|---------------------------------------|------|------|------|------|
| | Yield, bu/a | Yield, bu/a | Test weight, lb/bu | Yield, bu/a | Test weight, lb/bu | Yield, bu/a | Test weight, lb/bu | Fusarium rating | Stripe rust rating |
| OGI | Doublestop CL+ | 66.1 | | | | | | |
| OGI | Gallagher | 72.8 | 49.6 | 55.3 | | | | |
| OGI | Iba | 74.8 | | | | | | |
| OGI | OK09915C-1 | 57.1 | | | | | | |
| OGI | OK13209 | | 54.3 | 56.7 | | | | |
| OGI | Ruby Lee | 64.1 | 58.5 | 57.8 | 56.9 | 58.9 | | |
| OGI | Smith’s Gold | | 84.5 | 60.1 | 2 | 1 | | |
| Polansky | Rock Star | | 79.2 | 58.3 | 3 | 2 | | |
| Scott Seed | TAM 304 | 70 | 58.5 | 57 | | | | |
| Scott Seed | TAM 305 | 75.8 | 62.8 | 57.1 | | | | |
| WestBred | WB4269 | 55 | 57 | 48.5 | 58.9 | 86.8 | 60.3 | 2 | 3 |
| WestBred | WB4303 | | | | | 67.2 | 55.4 | 4 | 6 |
| WestBred | WB4401 | | 108.8 | 61.5 | 1 | 1 | | |
| WestBred | WB4458 | 62.2 | | | | | | |
| WestBred | WB4515 | 60.5 | 58.4 | 59.7 | 58.4 | | | |
| WestBred | WB4699 | | | | 94.5 | 58.7 | 2 | 2 |
| WestBred | WB-Cedar | 66 | 57.6 | 58 | 42.9 | 59.1 | | | |
| WestBred | WB-Grainfield | 73.8 | | | | | | |
| Overall average | 66 | 57.1 | 57.4 | 51.7 | 58.1 | 81.1 | 59.2 | | |

Yields above average are highlighted in bold. Test weights were not available for hard red wheat in 2016.
Table 2. Multiyear comparison of soft red winter wheat yields from variety trials at Parsons, KS

| Soft red wheat varieties, Parsons, KS | 2016 | 2017 | 2018 | 2020 |
|--------------------------------------|------|------|------|------|
| Company                              | Year | Year | Year | Year |
| AgriMAXX 415                         | 82.7 | 91.9 | 56.7 | 102.7 |
| AgriMAXX 444                         | 77.0 | 77.8 | 58.6 | 56.7 |
| AgriMAXX 454                         | 56.6 | 62.5 | 56.7 | 58.1 |
| AgriMAXX 463                         | 81.6 | 58.4 | 55.9 | 57.3 |
| AgriMAXX 473                         | 83.2 | 65.1 | 57.3 | 106.1 |
| AgriMAXX 475                         | 56.4 | 56.7 | 57.3 | 59.0 |
| AgriMAXX Exp 1663                    | 96.2 | 61.9 | 0.0  | 0.0  |
| Croplan 9101                         | 60.0 | 60.0 | 59.0 | 59.0 |
| Croplan 9201                         | 52.8 | 63.0 | 59.0 | 59.0 |
| Croplan 9301                         | 76.0 | 58.0 | 59.0 | 59.0 |
| Croplan HRW 9415                     | 72.9 | 65.0 | 59.0 | 59.0 |
| Croplan HRW 9434                     | 67.6 | 58.0 | 59.0 | 59.0 |
| Croplan SRW 8550                     | 64.1 | 64.7 | 64.7 | 64.7 |
| Croplan SRW 9415                     | 72.9 | 65.0 | 59.0 | 59.0 |
| Croplan SRW 9606                     | 55.9 | 55.7 | 59.0 | 59.0 |
| Pioneer 25R25                        | 69.7 | 59.0 | 55.9 | 55.9 |
| DuPont Pioneer 25R40                 | 82.5 | 79.5 | 66.1 | 105.8 |
| DuPont Pioneer 25R46                 | 56.3 | 70.4 | 56.7 | 58.1 |
| DuPont Pioneer 25R50                 | 57.1 | 97.5 | 59.0 | 59.0 |
| DuPont Pioneer 25R61                 | 71.4 | 61.6 | 87.5 | 58.3 |
| DuPont Pioneer 25R74                 | 80.8 | 65.4 | 61.6 | 61.6 |
| DuPont Pioneer 25R77                 | 79.6 | 54.2 | 103.0 | 103.0 |

continued
Table 2. Multiyear comparison of soft red winter wheat yields from variety trials at Parsons, KS

| Soft red wheat varieties, Parsons, KS | 2016 | 2017 | 2018 | 2020 |
|-------------------------------------|------|------|------|------|
| Company                             |      |      |      |      |
| Frontier                            |      |      |      |      |
| Magnus 1069                         |      |      |      |      |
| MFA 2166                            | 61.5 | 55.8 |      |      |
| MFA 2250                            | 63.3 | 57.0 |      |      |
| MFA XP 2431                         | 80.9 | 60.0 | 60.9 | 56.5 |
| MFA 2449                            | 73.1 | 59.0 |      |      |
| MFA XP 2474                         | 79.9 | 57.0 | 65.1 | 57.2 |
| MFA XP 2479                         | 75.1 | 59.0 | 76.3 | 57.6 |
| MFA XP 2538                         | 75.8 | 57.6 |      |      |
| MFA XP 2539                         | 84.6 | 57.9 |      |      |
| MFA XP 2542                         | 81.3 | 57.6 | 63.0 | 58.6 |
| MFA 2622                            | 58.3 | 57.8 |      |      |
| MFA 2633                            | 59.7 | 56.7 |      |      |
| OGI OCW035580S-8WF                   | 84.4 | 56.8 | 2    | 4.75 |
| OGI OK11311F                        | 65.8 | 59.0 |      |      |
| OGI OK11754WF                       | 55.2 | 59.0 |      |      |
| Average                             | 71.0 | 59.0 | 78.2 | 57.5 |

Yields above average are highlighted in bold.
Figure 1. Winter wheat yield for (A) hard red wheat and (B) soft red wheat from variety trials in southeast and eastern Kansas from 2008 through 2020. In 2019, variety testing at both Ottawa and Parsons were abandoned due to flooding and poor stands. The line in the middle of the box plots is the median yield of all varieties. The upper and lower quartiles are given by the upper and lower edges of the boxes. The maximum and minimum values are given by the upper and lower “whiskers” extending from the box. Outliers are given as solid circles. For comparison, average reported state yields from Kansas are highlighted as a red X.