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Wheat Variety Test Results for South Central Kansas – 2024

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Summary

South Central Kansas is a significant wheat production region for the state. Variety selection is an important management decision to maximize profitability that growers face every season. This report summarizes the results of winter wheat variety tests for 2023-2024 in six locations.

Introduction

The success of a wheat crop is affected by several variables. Some of these variables that impact yield are beyond the control of growers (for example, rainfall and temperature conditions) (Lollato et al., 2017). However, growers can control many variables that drive grain yield, such as wheat variety selection (Lollato et al., 2020; Maeoka et al., 2020), population (Bastos et al., 2020; Jaenisch et al., 2019; Lollato et al., 2024) and fertility management (Giordano et al., 2023, 2024; Lollato et al., 2019a), disease control (Cruppe et al., 2021), and the interaction of many of these practices (Jaenisch et al., 2021; Lollato et al., 2019b). Among these decisions, wheat variety selection can lead to increased yields and affect the need for many other decisions such as pest and disease control (de Oliveira Silva et al., 2020; Jaenisch et al., 2022; Raj et al., 2023). A variety's performance varies depending on weather, soil characteristics, pest pressure, management, and timing of yield-impacting events. A variety must withstand a wide range of stressors for success in South Central Kansas, where yield-environment varies considerably even within the same county (Munaro et al., 2020; Sciarresi et al., 2019). Local variety trials are valuable to aid wheat growers in variety selection.

Procedures

The South Central Kansas Extension Wheat Variety Tests were conducted in six replicated trials: Andale, Clearwater, and Haysville in Sedgwick County; Caldwell and Belle Plaine in Sumner County; and Newton in Harvey County. The same 28 varieties were tested at each location.

Tillage practices and chemical applications were consistent with the host field and managed by the cooperating grower. The trials conducted in Clearwater, Newton, and Belle Plaine were no-till, Haysville adopted minimum tillage, and Andale and Caldwell adopted conventional tillage practices. The Andale, Newton, Belle Plaine, and Caldwell trials received a fungicide application between flag leaf emergence and heading, while the trials at Clearwater and Haysville did not receive a fungicide application. All locations were non-irrigated.

Plots, in all locations besides Haysville, consisted of six 9-inch wide rows, were about 30 feet long, and were sown using a Hege plot drill. In Haysville, rows were 7.5 inches wide, 30 feet long, and planted using a Great Plains plot drill. All locations were drilled at 1.2 million seeds per acre, adjusting for variety-specific seed size (Pinto et al., 2019). Trials were planted on the following dates: Andale (10/18/23), Clearwater (10/18/23), Newton (10/18/23), Belle Plaine (10/19/23), Caldwell (10/19/23), and Haysville (10/23/23). Harvest dates were Caldwell (6/10/24), Belle Plaine (6/12/24), Haysville (6/12/24), Andale (6/14/24), Clearwater (6/14/24), and Newton (6/17/24). A third-party research company was hired to harvest the plots using a small plot combine.

The study was a randomized complete block design with three replications and 28 varieties. All varieties were similarly managed in each location, using standard regional practices. The 28 varieties had a range of yield potentials, maturities, abiotic tolerances, disease resistances/susceptibilities, and other agronomic characteristics that one year of yield data, one planting date, and one fertilizer/fungicide/herbicide management system may not capture.

Grain yield was analyzed within each location through a one-way analysis of variance using Excel. Variety was considered a fixed effect and replications were considered a random effect. A combined analysis of variance across locations considered location and replication nested within location as random effects.

Results

The 2024 south-central Kansas wheat trials benefited significantly from timely rainfall. The three-county trial area was planted in drought conditions after a low rainfall summer. Several rainfall events after planting and into the winter improved soil moisture for green-up, but low precipitation in March and April led to some fields in the area showing symptoms of drought stress. Timely rainfall around flowering and grain fill in May resulted in good yields across most trials. The trial in Haysville did not receive fungicide and experienced an infestation of stripe rust first, then leaf rust as the crop matured. Most varieties in this trial had their leaf area devastated by these diseases, but some were resisting very well (Figure 1). Rock Star showed resistance to the infestation and displayed great leaf health late into the growing season. Other varieties displaying good resistance to stripe rust were AP18 AX, Doublestop CL Plus, LCS Atomic AX, WB4401, WB4523, among several others. Varieties showing more susceptibility to stripe rust than others were AG Radical, KS Hatchett, Kivari AX, LCS Runner, LCS Steel AX, and WB4422. The Clearwater plot also did not receive a fungicide treatment and experienced stripe rust infestation.

The timely rainfall led to an average yield across all locations of 68.8 bushels per acre, which is about 42.7 bushels per acre more than the yields harvested in 2023 (Seiler et al., 2024). The highest-yielding trial was in Newton (88.8 bushels per acre) while the lowest-yielding trial was in Caldwell (47.7 bushels per acre). Wheat yields ranged from 40.8 to 100.6 bushels per acre due to the combination of location and variety. When evaluating the average variety yield across all sites, the lowest-yielding variety was Doublestop CL Plus (61.6 bushels per acre), and the highest-yielding varieties were Rockstar (75.4 bushels per acre), KS Providence (74.8 bushels per acre), KS Bill Snyder (73.6 bushels per acre), WB4523 (73.4 bushels per acre), and LCS Atomic AX (73.4

bushels per acre). The varieties Rockstar, KS Providence, and WB4523 yielded in the top statistical group in all locations.

Conclusions

Overall, wheat yield in south central Kansas significantly benefited from precipitation events during the month of May, which led to good yields across locations. Varieties with susceptibility to stripe rust and leaf rust in Haysville and stripe rust in Clearwater were negatively impacted by disease infestation. The southernmost site, Caldwell, was the lowest-yielding location. The northernmost site, Newton, was the highest-yielding location. This might suggest that the maturity at the time of precipitation events may have played a role in yield potential. Caldwell was the earliest location in maturity, and Newton was the latest. As expected, variety-specific performance was variable across locations, although a few adapted varieties rose toward the top across sites (namely, Rockstar, KS Providence, and WB4523). One option to manage risk is for growers to sow multiple wheat varieties in their operation so that the risks of weather extremes such as spring freeze or grain fill heat stress are more likely avoided, especially considering that no two growing seasons are alike. Each year, several yield-limiting factors can stress the wheat crop, and selecting several varieties can buffer against these risks. The response of wheat to these stressors is dependent on variety.

While the trials provide valuable information for local growers, they should be utilized along with other variety selection resources. When selecting wheat varieties, it is important to use multiple years of yield data, along with information provided by Extension Specialists and seed company representatives.

References

Bastos, L.M., Carciochi, W., Lollato, R.P., Jaenisch, B.R., Rezende, C.R., Schwalbert, R., Vara Prasad, P.V., Zhang, G., Fritz, A.K., Foster, C. and Wright, Y., 2020. Winter wheat yield response to plant density as a function of yield environment and tillering potential: A review and field studies. Frontiers in plant science, 11, p.54.

Cruppe, G., DeWolf, E., Jaenisch, B.R., Onofre, K.A., Valent, B., Fritz, A.K. and Lollato, R.P., 2021. Experimental and producer-reported data quantify the value of foliar fungicide to winter wheat and its dependency on genotype and environment in the US central Great Plains. Field Crops Research, 273, p.108300.

de Oliveira Silva, A., Slafer, G.A., Fritz, A.K. and Lollato, R.P., 2020. Physiological basis of genotypic response to management in dryland wheat. Frontiers in plant science, 10, p.1644.

Giordano, N., Sadras, V.O. and Lollato, R.P., 2023. Late-season nitrogen application increases grain protein concentration and is neutral for yield in wheat. A global meta-analysis. Field Crops Research, 290, p.108740.

Giordano, N., Sadras, V.O., Correndo, A.A. and Lollato, R.P., 2024. Cultivar-specific phenotypic plasticity of yield and grain protein concentration in response to nitrogen in winter wheat. Field Crops Research, 306, p.109202.

Jaenisch, B. R., de Oliveira Silva, A., DeWolf, E., Ruiz-Diaz, D. A., & Lollato, R. P. 2019. Plant population and fungicides economically reduced the winter wheat yield gap in Kansas. *Agronomy Journal*, *111*(2), 650-665.

Jaenisch, B.R., Munaro, L.B., Bastos, L.M., Moraes, M., Lin, X. and Lollato, R.P., 2021. On-farm data-rich analysis explains yield and quantifies yield gaps of winter wheat in the US central Great Plains. Field Crops Research, 272, p.108287.

Jaenisch, B.R., Munaro, L.B., Jagadish, S.K. and Lollato, R.P., 2022. Modulation of wheat yield components in response to management intensification to reduce yield gaps. Frontiers in plant science, 13, p.772232.

Lollato, R. P., Edwards, J. T., & Ochsner, T. E. (2017). Meteorological limits to winter wheat productivity in the US Southern Great Plains. *Field Crops Research*, *203*, 212-226.

Lollato, R.P., Figueiredo, B.M., Dhillon, J.S., Arnall, D.B. and Raun, W.R., 2019a. Wheat grain yield and grain-nitrogen relationships as affected by N, P, and K fertilization: A synthesis of long-term experiments. Field Crops Research, 236, pp.42-57.

Lollato, R.P., Ruiz Diaz, D.A., DeWolf, E., Knapp, M., Peterson, D.E. and Fritz, A.K., 2019b. Agronomic practices for reducing wheat yield gaps: a quantitative appraisal of progressive producers. Crop Science, 59(1), pp.333-350.

Lollato, R.P., Roozeboom, K., Lingenfelser, J.F., da Silva, C.L. and Sassenrath, G., 2020. Soft winter wheat outyields hard winter wheat in a subhumid environment: Weather drivers, yield plasticity, and rates of yield gain. Crop Science, 60(3), pp.1617-1633.

Lollato, R.P., Pradella, L.O., Giordano, N., Ryan, L.P., Soler, J.R., Simão, L.M., Jaenisch, B.R. and Horton, R., 2024. Winter wheat response to plant density in yield contest fields. Crop Science, 64(5), pp.2877-2893.

Maeoka, R.E., Sadras, V.O., Ciampitti, I.A., Diaz, D.R., Fritz, A.K. and Lollato, R.P., 2020. Changes in the phenotype of winter wheat varieties released between 1920 and 2016 in response to in-furrow fertilizer: Biomass allocation, yield, and grain protein concentration. Frontiers in plant science, 10, p.1786.

Munaro, L.B., Hefley, T.J., DeWolf, E., Haley, S., Fritz, A.K., Zhang, G., Haag, L.A., Schlegel, A.J., Edwards, J.T., Marburger, D. and Alderman, P., 2020. Exploring long-term variety performance trials to improve environment-specific genotype × management recommendations: A case-study for winter wheat. Field Crops Research, 255, p.107848.

Pinto, J.G.C.P., Munaro, L.B., Jaenisch, B.R., Nagaoka, A.K. and Lollato, R.P., 2019. Wheat variety response to seed cleaning and treatment after Fusarium head blight infection. Agrosystems, Geosciences & Environment, 2(1), pp.1-8.

Raj, A. S., Siliveru, K., McLean, R., Prasad, P. V. V., & Lollato, R. P. (2023). Intensive management simultaneously reduces yield gaps and improves milling and baking properties of bread wheat. *Crop Science*, *63*(2), 936-955.

Sciarresi, C., Patrignani, A., Soltani, A., Sinclair, T. and Lollato, R.P., 2019. Plant traits to increase winter wheat yield in semiarid and subhumid environments. Agronomy Journal, 111(4), pp.1728-1740.

Seiler, J., Hein, R., Flaming, R., Lollato, R.P., and Pedreira, B. (2024) "Wheat Variety Test Results for South Central Kansas – 2023," Kansas Agricultural Experiment Station Research Reports: Vol. 10: Iss. 2. *https://doi.org/10.4148/2378-5977.8615*

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Table 1. Wheat grain yield (bushels per acre) results for the 2023-24 winter wheat growing season at Andale, Clearwater, Haysville, Newton, Belle Plaine, and Caldwell, Kansas, as well as the average for all sites

Variety	Source	All	Andale	Clearwater	Haysville	Newton	Belle Plaine	Caldwell
Rock Star	Polansky	75.4	78.7	72.4	85.3	94.4	74.6	47.1
KS Providence	KWA	74.8	77.5	68.7	80.8	98.3	73.7	50.0
KS Bill Snyder	KWA	**73.6**	74.3	**69.8**	**78.5**	**100.5**	**72.3**	45.9
WB4523	WestBred	73.4	77.1	71.5	74.1	91.0	80.3	45.8
LCS Atomic AX	LCS	**73.4**	**79.2**	63.4	**84.9**	**99.3**	64.9	48.6
AP Prolific	AgriPro	73.0	76.7	67.6	76.2	97.4	68.0	52.1
LCS Helix AX	LCS	**71.3**	**84.2**	**71.9**	**77.4**	84.2	61.9	48.5
WB4699	WestBred	70.6	76.5	64.4	62.8	100.6	77.6	41.5
AP24 AX	AgriPro	**70.4**	**81.3**	65.7	66.3	85.2	**71.4**	52.3
High Cotton	OGI	69.9	72.5	75.5	72.6	91.8	58.4	48.4
LCS Warbird AX	LCS	**69.4**	75.0	**68.9**	69.1	**91.2**	61.8	50.5
WB4422	WestBred	69.2	82.1	60.2	61.6	87.9	73.2	50.5
KS Ahearn	KWA	**69.0**	**78.4**	**68.6**	61.0	**88.6**	**70.1**	44.6
AP18 AX	AgriPro	68.8	74.7	57.6	78.2	86.4	65.2	50.4
Showdown	OGI	**68.5**	**78.7**	**71.9**	70.7	79.0	58.1	52.7
Bob Dole	AgriPro	68.3	71.0	66.7	69.8	85.1	68.5	49.0
KS Mako	KWA	**67.6**	67.0	**70.5**	64.1	**93.3**	64.9	46.7
AM Cartwright	AgriMaxx	67.5	70.2	66.6	69.5	92.2	65.5	40.8
Kivari AX	PlainsGold	**67.0**	**76.6**	62.7	60.3	76.0	**73.9**	52.6
WB4401	WestBred	67.0	68.2	62.7	64.1	85.2	77.7	44.2
LCS Steel AX	LCS	**66.8**	**83.1**	49.5	53.0	**97.7**	**67.9**	49.9
Gallagher	OGI	66.6	71.2	62.8	60.3	86.1	71.4	47.9
Canvas	PlainsGold	**66.5**	**77.4**	60.6	63.1	**89.9**	61.5	46.3
KS Hatchett	KWA	66.0	72.6	61.3	64.8	83.7	66.0	47.0
Strad CL+	OGI	64.7	65.6	61.2	**79.7**	83.5	56.8	41.3
AG Radical	AGSECO	63.7	82.0	60.7	49.0	72.4	69.8	47.4
LCS Runner	LCS	62.1	69.8	60.4	50.7	81.9	58.6	50.2
Doublestop CL+	OGI	61.6	68.6	60.0	60.5	84.9	51.2	**44.6**
Average		68.8	75.4	65.1	68.2	88.8	67.3	47.7
Max		75.4	84.2	75.5	85.3	100.6	80.3	52.7
Min		61.6	65.6	49.5	49.0	72.4	51.2	40.8

*Values, highlighted in gray and bold, belong statistically to the highest test weight group. We cannot say values within the group are different from each other.

Figure 1. Detailed canopy photos of wheat varieties with different levels of disease resistance to stripe and leaf rust in Haysville, KS, during the 2023-24 wheat season. The top panel depicts a susceptible variety, and the bottom panel depicts a resistant variety. Note that in this location, most varieties had a large degree of leaf area loss due to early incidence of stripe rust followed by leaf rust and were showing similar levels of incidence and severity as that in the left panel.