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Wheat Variety Test Results for South Central Kansas – 2023

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Summary

Sedgwick and Sumner County are two of the highest producing wheat counties in Kansas. This report summarizes the results of winter wheat variety tests for 2022-2023 in four locations. The year 2023 was the second consecutive growing season with drought in Kansas that caused significant impacts on the wheat crop. Precipitation from sowing to harvest was minimal. A number of wheat acres in the state were terminated before harvest because of their poor potential. Yields in the four trial locations were below average.

Introduction

Wheat variety selection is an important step toward producing a wheat crop (Munaro et al., 2020; Jaenisch et al., 2022; Raj et al., 2023). In order for a variety to be successful in South Central Kansas, it must be able to withstand the wide range of weather conditions the region experiences from year to year (Lollato et al., 2017; 2020). This variability determines if, what, and/or when the crop will face yield-limiting factors such as drought, extreme temperatures, disease, weeds, insects, and nutrient issues, along with others (Giordano et al., 2024; Jaenisch et al., 2021; Lollato et al., 2013; 2019). Regional variety trials are a valuable tool to assist wheat growers in selecting the best varieties for their fields (de Oliveira Silva et al., 2020).

Procedures

The Sedgwick and Sumner County Extension Wheat Variety Tests were conducted in four replicated trials: Andale and Clearwater, in Sedgwick County, and Caldwell and Belle Plaine, Sumner 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 in Clearwater and Belle Plaine were no-till; minimum tillage in Caldwell; and conventional till in Andale. The Andale trial received a fungicide application on May 18. Clearwater, Belle Plaine, and Caldwell did not receive a fungicide application. All locations were non-irrigated.

Plots consisted of six 9-inch wide rows, about 30 feet long, and sown using a Hege plot drill. All locations were drilled at 1.2 million seeds/acre. Trials were planted on the following dates: Andale (10/11/22), Caldwell (10/11/22), Clearwater (11/2/22), Belle Plain (11/2/22). Harvest dates were: Andale (6/27/23), Clearwater (6/28/23), Belle

Plaine (6/28/23), Caldwell (6/30/23). A third-party research company was hired to harvest the plots using a small plot combine.

The study was established as a randomized complete block design with 3 replications and 28 varieties. In each location, all 28 varieties (recommended for the area) were similarly managed, using common practices for the region. 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 highlight.

Grain yield was analyzed for each individual location through a one-way analysis of variance using Excel. Varieties were considered fixed factors and replications were random effects. A combined analysis across locations was performed, considering location and replication nester within location as random factors.

Results

For the second consecutive growing season, most of the wheat crop in central Kansas suffered from drought stress. The drought of the 2022 growing season had left soil profiles depleted of moisture going into wheat drilling in the fall. Thus, much of the wheat drilled in fall of 2022 was sown into soil with little to no moisture available, resulting in delayed and prolonged emergence. After sowing, precipitation did little to replenish soil moisture. Besides a wetter than normal November, in which areas of Sedgwick and Sumner County received approximately 2.5 inches to 3.75 inches of moisture, precipitation was minimal through physiological maturity of the wheat crop. In the months December through February, areas in the two counties received between ~2.25 inches to ~4 inches of moisture. The wheat crop broke dormancy and geared into two months of very dry conditions. Much of the wheat growing areas in the two counties received 0 to .25 inch of moisture in March and only ~0.4 inch to ~1.61 inches in April, according to CoCoRahs reports. At this point in the growing season, a number of farmers in the area, and across the state, were making the decision to terminate the wheat crop because of poor yield potential due to drought. By May, wheat yields were significantly impacted by drought. We also note that south-central Kansas suffered from a heat wave that occurred in early May, which seemed especially impactful in early maturing varieties that may have been at more sensitive stages of development during the heat stress. Several mid-May rains did little to benefit the struggling crop. Double-crop wheat fields were impacted more by the lack of precipitation. Most fields harvested were well below their average yields. None of the trials experienced yield limiting disease infestations. However, the plot in Clearwater was very thin, making conditions conducive to chinch bugs (Figure 1). The high numbers of chinch bugs in the field could have resulted in a decrease in plant health to the wheat crop already suffering from drought.

All sites were impacted by drought, which led to an average yield across all locations of 26.1 bu/a, which was 21.3 bu/a less than the yields harvested in 2022 and 31.8 bu/a less than those harvested in 2021 (though we note that the 2021 and 2022 results contained additional locations) (Table 2). The highest yielding trial was Andale (36.6 bu/a) (Table 1). The lowest yielding trial was Clearwater (12.1 bu/a). Overall, wheat yields ranged from 5.9 to 42.7 bu/a. The maximum yield difference between the highest and lowest yielding varieties in one location was 18.4 bu/a in Caldwell.

When evaluating the average variety yield across all sites, the five highest yields varied from 27.9 bu/a (WB4699) to 33.7 bu/ac (LCS Steel AX.) Sixteen varieties yielded in the top fourth in at least one of the four locations (Table 1). AP Prolific and LCS Helix AX yielded in the top fourth in three locations. LCS Steel AX yielded in the top fourth in all four locations. In the combined analysis, 19 varieties were in the highest statistical yielding group. Nine varieties did not reach the top statistical group when yields were averaged across all locations. Many of the varieties that did not reach the highest yielding group were early maturing, including varieties that had a good yield record in previous years in the region such as LCA Atomic AX.

Conclusions

Overall, wheat varieties were significantly impacted by drought. The lack of precipitation resulted in below average yields across locations and the heat wave compromised the performance of early maturing varieties. Several varieties handled the drought better than others. LCS Steel AX possibly benefited from its later maturity, along with its drought tolerance. Results were variable across locations. One option to manage risk is for growers to sow multiple wheat varieties in their operation. No two growing season are alike. Each year, a number of yield limiting factors can stress the wheat crop. 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

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. *https://doi.org/10.3389/fpls.2019.01644*

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. *https://doi.org/10.1016/j.fcr.2023.109202*

Jaenisch, B. R., Munaro, L. B., Bastos, L. M., Moraes, M., Lin, X., & 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, 108287. *https://doi.org/10.1016/j.fcr.2021.108287*

Jaenisch, B.R., Munaro, L.B., Jagadish, S.V. 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. *https://doi.org/10.3389/fpls.2022.772232*

Lollato, R.P., Edwards, J.T. and Zhang, H., 2013. Effect of alternative soil acidity amelioration strategies on soil pH distribution and wheat agronomic response. Soil Science Society of America Journal, 77(5), pp.1831-1841. *https://doi.org/10.2136/sssaj2013.04.0129*

Lollato, R.P., Edwards, J.T. and Ochsner, T.E., 2017. Meteorological limits to winter wheat productivity in the US southern Great Plains. Field Crops Research, 203, pp.212-226. https://doi.org/10.1016/j.fcr.2016.12.014

Lollato, R. P., Ochsner, T. E., Arnall, D. B., Griffin, T. W., & Edwards, J. T. (2019). From field experiments to regional forecasts: Upscaling wheat grain and forage yield response to acidic soils. Agronomy Journal, 111(1), 287-302. https://doi.org/10.2134/agronj2018.03.0206

Lollato, R. P., Bavia, G. P., Perin, V., Knapp, M., Santos, E. A., Patrignani, A., & DeWolf, E. D. (2020). Climate-risk assessment for winter wheat using long-term weather data. *Agronomy Journal*, *112*(3), 2132–2151. https://doi.org/10.1002/agj2.20168

Munaro, L. B., Hefley, T. J., DeWolf, E., Haley, S., Fritz, A. K., Zhang, G., ... & Lollato, R. 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, 107848. https://doi.org/10.1016/j.fcr.2020.107848

Raj, A.S., Siliveru, K., McLean, R., Prasad, P.V.V. and Lollato, R.P., 2023. Intensive management simultaneously reduces yield gaps and improves milling and baking properties of bread wheat. Crop Science, 63(2), pp.936-955. https://doi.org/10.1002/csc2.20906

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Figure 1. High chinch bug pressure was observed in the trial near Clearwater. Photo by Romulo Lollato, Extension Wheat and Forage Specialist, Kansas State University.

Table 1. Wheat grain yield (bu/a) results for 2022 at Andale, Clearwater, Caldwell, Newton, Arkansas City, Harper, and the average for all sites

Variety	Source	All	Andale	Clear-water[1]	Belle Plaine[1]	Caldwell
LCS Steel AX	LCS	33.7	40.7	20.9	35.8	38.3
WB4523	WestBred	28.9	35.7	17.6	32.2	30.2
AP Prolific	AgriPro	28.3	41.4	15.5	24.2	32.0
WB4422	WestBred	28.3	34.3	14.6	32.5	31.5
WB4699	WestBred	27.9	33.5	20.7	26.0	31.4
WB4401	WestBred	27.8	42.7	11.5	32.0	25.1
WB4269	WestBred	27.7	35.3	16.7	30.0	28.8
AG Radical	AGSECO	27.6	38.2	11.8	27.6	33.0
AP18 AX	AgriPro	27.5	40.4	6.9	33.3	29.5
KS Providence	KWA	27.5	38.2	11.1	27.8	32.8
Bob Dole	AgriPro	27.4	39.3	11.4	27.9	31.1
LCS Helix AX	LCS	26.8	39.4	14.8	29.9	28.3
Rock Star	Polansky	26.8	35.2	12.4	26.7	32.9
Zenda	KWA	26.8	35.8	14.7	23.4	33.1
Doublestop CL+	OGI	26.7	36.2	13.8	27.1	29.8
Showdown	OGI	25.9	38.2	5.9	26.1	33.3
KS Ahearn	KWA	25.8	41.7	12.7	21.6	27.3
LCS Valiant	LCS	25.8	33.0	13.3	28.1	28.9
Paradise	Polansky	25.7	35.4	12.0	27.9	27.4
LCS Atomic AX	LCS	25.1	38.3	10.0	27.7	24.4
LCS Photon AX	LCS	25.0	35.0	10.6	24.5	29.9
KS Hatchett	KWA	23.8	38.6	10.9	24.7	20.9
Strad CL+	OGI	23.4	36.0	8.3	23.0	26.2
Uncharted	OGI	23.1	30.6	9.9	27.4	24.5
Smith's Gold	OGI	22.8	33.2	9.7	25.6	22.6
AM Cartwright	AgriMaxx	22.5	31.6	7.7	26.9	28.5
AP EverRock	AgriPro	22.0	34.3	6.4	27.3	19.9
AP Bigfoot	AgriPro	20.8	31.3	6.0	23.2	23.4
Average		26.1	36.6	12.1	27.5	28.8
Max		33.7	42.7	20.9	35.8	38.3
Min		20.8	30.6	5.9	21.6	19.9

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

1) Issues with a sensor at Clearwater and Belle Plaine resulted in moistures not being collected from a number of plots at harvest. The average moistures that were collected for a location were averaged and used across all repetitions without moisture readings.

Table 2. Multiyear comparison of wheat grain yield from variety trials in south central Kansas

Variety	Source	2019	2020	2021	2022	2023
		----------	----------	bu/a	----------	----------
AM Cartwright	AgriMaxx		62.8	55.8	41.0	22.5
AP Bigfoot	AgriPro				45.8	20.8
AP EverRock	AgriPro			54.1	45.8	22.0
AP Prolific	AgriPro					28.3
AP18 AX	AgriPro				50.6	27.5
Bob Dole	Agripro	71.8	62.3	62.0	47.5	27.4
SY Achieve CL2	Agripro	58.5	57.8	56.3		
SY AP18 AX	AgriPro			67.0		
SY Benefit	Agripro	51.9				
SY Flint	Agripro	55.9				
SY Monument	Agripro	57.4	61.7	55.6	49.6	
SY Wolverine	AgriPro		61.2		47.4	
AG Icon	AGSECO		61.2	55.9	47.9	
AG Radical	AGSECO			60.7	48.7	27.6
1863	KWA	67.0				
Everest	KWA	55.4	60.2			
KS Ahearn	KWA		56.9		47.1	25.8
KS Hatchett	KWA		57.0	54.4	47.2	23.8
KS Providence	KWA				51.7	27.5
KS Western Star	KWA		58.1	52.2		
Larry	KWA	59.0	59.6	58.1		
Zenda	KWA	59.7	58.8	55.4	44.4	26.8
LCS Atomic AX	LCS		65.0	60.6	50.4	25.1
LCS Helix AX	LCS		62.4	57.8	51.5	26.8
LCS Julep	LCS			56.0	45.6	
LCS Photon AX	LCS			56.6	47.1	25.0
LCS Steel AX	LCS					33.7
LCS Valiant	LCS		65.0		50.2	25.8
LCS Chrome	Limagrain	63.8	61.9	58.4		
LCS Fusion AX	Limagrain	53.6	54.5			
LCS Mint	Limagrain	59.2				
Bentley	OGI	58.5				
Butler's Gold	OGI			49.5	39.9	
Doublestop CL Plus	OGI	59.9	58.4	56.1	47.6	26.7
Gallagher	OGI	62.0	60.4	61.7		
Green Hammer	OGI		57.4	57.5		

continued

Table 2. Multiyear comparison of wheat grain yield from variety trials in south central Kansas

Variety	Source	2019	2020	2021	2022	2023
				bu/a		
Showdown	OGI		66.4	64.2		25.9
Smith's Gold	OGI	55.7	60.3	61.1	46.9	22.8
Spirit Rider	OGI	53.1				
Strad CL+	OGI			57.2	45.1	23.4
Uncharted	OGI			56.7	42.4	23.1
Paradise	Polansky		62.6	62.8	47.0	25.7
Rock Star	Polansky		69.0	64.9	49.3	26.8
WB4269	WestBred	56.6	63.6	53.2	47.4	27.7
WB4303	WestBred	61.8	60.5			
WB4401	WestBred			61.9	52.7	27.8
WB4422	WestBred					28.3
WB4458	WestBred	63.1				
WB4515	WestBred	56.9	56.6			
WB4523	WestBred					28.9
WB4699	WestBred		64.5	53.9	48.4	27.9
WB-Grainfield	WestBred	60.3				
Average		59.2	60.9	57.9	47.4	26.1

2019 Locations: Andale, Caldwell
2020 Locations: Andale, Clearwater, Belle Plaine, Caldwell, Newton
2021 Locations: Clearwater, Belle Plaine, Caldwell, Arkansas City, Harper
2022 Locations: Andale, Clearwater, Caldwell, Newton, Harper, Arkansas City
2023 Locations: Andale, Clearwater, Belle Plaine, Caldwell