Technical Report - TR24-5

COLORADO STATE UNIVERSITY

Agricultural Experiment Station

College of Agricultural Sciences - Department of Soil & Crop Sciences - Extension

2024

WINTER WHEAT VARIETY PERFORMANCE TRIALS

Making Better Decisions

CROPS TESTING PROGRAM

Table of Contents

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Additional Resources

Colorado State University Crop Variety Testing Program: www.csucrops.org and on X (formerly Twitter) with the handle @CSUCrops

Colorado State University Wheat Breeding Program: www.agsci.colostate.edu/wheat/

Wheat Variety Performance Database: www.wheattrials.com

Colorado Wheat Administrative Committee (CWAC), Colorado Association of Wheat Growers (CAWG), and Colorado Wheat Research Foundation (CWRF): www.coloradowheat.org

Overview of 2023-2024 Eastern Colorado Winter Wheat Trials

Sally Jones-Diamond

Colorado State University researchers strive to provide current, reliable, and unbiased wheat variety information to Colorado producers. Support of our research keeps public variety testing thriving in Colorado. Our work is possible due to the support and cooperation of the entire Colorado wheat industry, the Colorado Wheat Administrative Committee, the Colorado Wheat Research Foundation, seed companies who enter varieties, and farmers who donate their land and time to host the replicated wheat variety trials.

The eastern Colorado winter wheat trials are conducted under a broad range of environmental conditions to best determine the expected performance of new and common varieties. We have a regional uniform variety testing program, meaning the dryland varieties entered in our northeast region are tested across seven test locations in Northeast Colorado, and varieties entered in the southeast region are tested across six test locations in Southeast Colorado. All irrigated varieties are tested in three irrigated trials spread across Northeast Colorado. In the dryland trials, there were 50 total varieties tested, including experimental lines across the two regions of the 13 total trial locations. The three irrigated trials had 24 varieties. The variety trials included a combination of public and private varieties and experimental lines. Seed companies with entries in the variety trials included AgriPro Syngenta, CROPLAN by WinField United, Limagrain Cereal Seeds, and Frenchman Valley Coop. There were entries from the marketing organizations of Colorado State University (PlainsGold), Kansas State University (Kansas Wheat Alliance), University of Nebraska-Lincoln (NU Horizon Genetics), Oklahoma State University (Oklahoma Genetics), and the Crop Research Foundation of Wyoming.

All dryland and irrigated trials were planted in a randomized complete block design with three replicates. Plot sizes were approximately 150 ft^2 except the Fort Collins irrigated trial, which was 80 ft^2. All varieties were planted at 700,000 seeds per acre for dryland trials and 2 million seeds per acre for irrigated trials except Fort Collins, which was planted at 1.2 million seeds per acre. Individual location management data is listed in the 2024 Wheat Trial Management and Characteristics table in this report. Grain yield and protein was corrected to 12% moisture content. Variety trial grain weight, test weight, and grain moisture content information were obtained from a HarvestMaster H2 GrainGage™ weigh system on a modified Case IH plot combine. Protein content was obtained using a FOSS Infratec™ NOVA grain analyzer. All trials are statistically analyzed using a spatial mixed model with the best fit for each location using SAS 9.4.

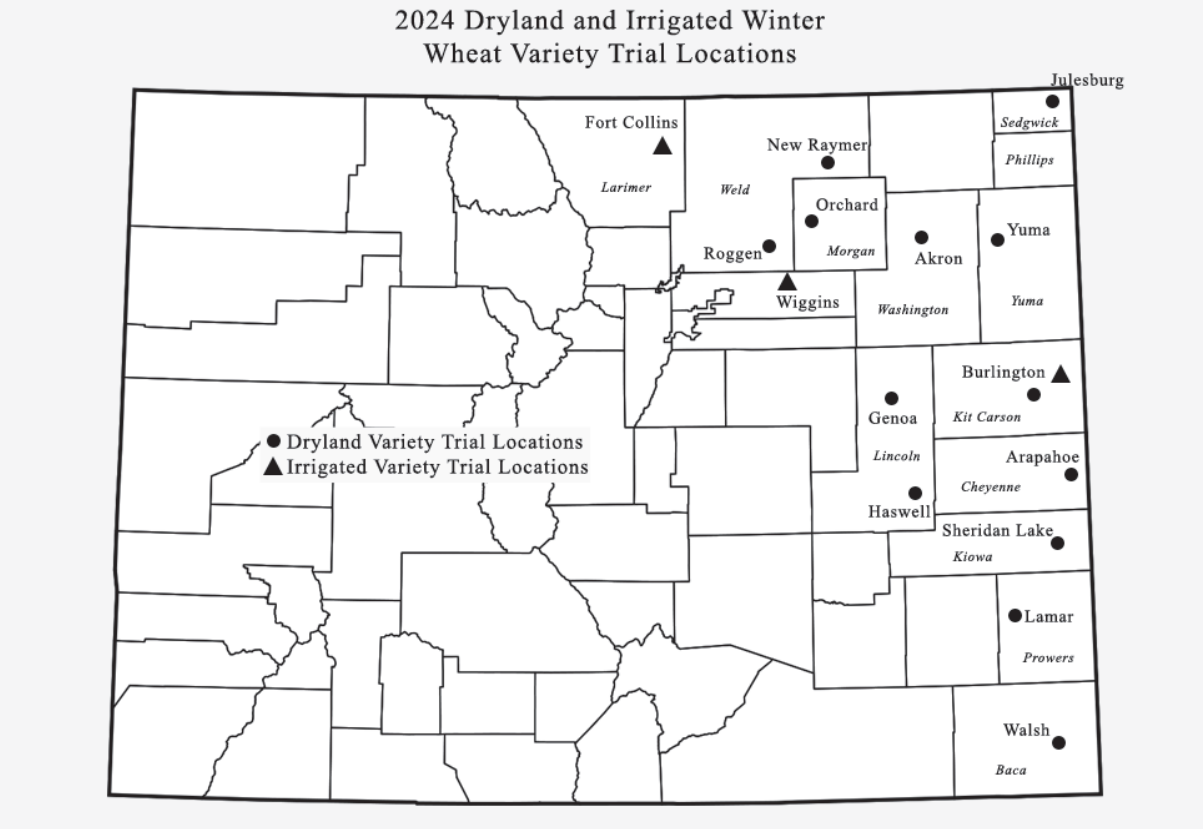
General Growing Conditions Affecting the 2024 Colorado Wheat Crop

Wheat planting conditions in fall of 2023 were average for the region, although some areas had a short window for planting in adequate moisture. During early stand establishment, what started as a few abnormally dry pockets along the eastern border

of Colorado led to widespread drought everywhere but Baca County by late November. Consistent winter precipitation diminished drought conditions across the majority of eastern Colorado. By early April, southeastern Colorado, including Cheyenne, Kiowa, Prowers, and Baca counties, was abnormally dry and experiencing a moderate drought, which persisted through June. Northeast Colorado received timely and frequent rainfall throughout the spring, lasting until harvest, preventing drought conditions. Parts of Adams and Weld counties were abnormally dry from May through harvest (UNL Drought Monitor). Isolated hail events either destroyed or severely damaged wheat fields for a number of producers, especially in Washington and Yuma counties in late May.

Stripe rust disease was not an issue until June, when frequent precipitation and high humidity favored the spread of the disease along the I-70 corridor. Many growers sprayed fungicides if the crop was not yet in the grain-fill period. Brown wheat mites were observed at moderate levels in east-central Colorado in the early spring, while higher levels that required chemical control were noted in southeast Colorado. Cutworms were widespread in northeast Colorado at varying levels of infestation. Wheat Stem Sawfly (WSS) is widespread across many northeast Colorado counties and continues to spread south and east.

Harvest occurred about 2 weeks earlier than normal in Colorado this year due to warmer than average temperatures in late winter and early spring. Wheat yields were mostly above average and test weights were generally very good across the state.



2024 Wheat Trial Management and Characteristics

		Dryland Locations													Irrigated Locations		
		Akron	**Arapahoe**	**Burlington**	**Genoa**	**Haswell**	**Julesburg**	**Lamar**	**New Raymer**	**Orchard**	**Roggen**	**Sheridan Lake**	**Walsh**	**Yuma**	**Burlington**	**Fort Collins**	**Wiggins**
	Average Yield (bu/ac)	90	Lost to Poor Stands	Lost to Poor Stands	Lost to Poor Stands	Lost to Drought	63	43	Lost to Poor Stands	56	Lost to Poor Stands	37	39	Lost to Hail	89	117	151
Location	**GPS Coordinates (Lat/Long)**	40.14928, -103.14352	38.90997, -102.26053	39.30252, -102.29688	39.35565, -103.49227	38.63859, -103.26592	40.85231, -102.38116	38.0034, -102.55723	(40.572458, -103.899)	40.52082, -104.07153	40.08154, -104.30167	38.53114, -102.47207	37.43416, -102.31022	40.19047, -102.66101	39.40977, -102.15246	40.653, -104.99	40.00743, -104.1009
	County	Washington	Cheyenne	Kit Carson	Lincoln	Lincoln	Sedgewick	Prowers	Weld	Morgan	Weld	Kiowa	Baca	Yuma	Kit Carson	Larimer	Adams
Soil	**Soil Type**	Rago silt loam	Wiley complex	Kuma and Keith silt loams	Weld silt loam	Bacid silt loam	Rago and Kuma silt loams	Baca silt loam	Olney fine sandy loam	Ascalon sandy loam	Weld loam	Olney sandy loam	Wiley loam	Platner loam	Kuma-Keith silt loams	Fort Collins loam	Heldt clay loam
	Soil Organic Matter	2.2%	2.1%	1.9%	2.2%	2.1%	1.6%	1.6%	-	1.6%	1.7%	1.6%	-	1.6%	2.9%	-	2.0%
	Soil pH	7.2	8.3	7.8	7.6	7.9	5.8	8.4	-	6.1	7	8.1	-	7.5	7	-	7.9
	Soil Nutrients at planting (N-P lb/ac)	182-17	1-12	104-15	42-16	33-17	92-15	30-17	-	163-21	118-17	3-21	-	84-18	5-13	-	32-10
Management	**Tillage**	No-Till	Tilled	Tilled	Tilled	Tilled	No-Till	Tilled	No-Till	No-Till	No-Till	Tilled	No-Till	No-Till	Tilled	Tilled	Tilled
	Previous Crop	Fallow	Corn	-	-	Sorghum	Corn	Wheat	-	Proso Millet	Fallow	Sorghum	Grain Sorghum	Fallow	Corn	-	Pinto Beans
	Planting Date	9/26/2023	9/19/2023	9/19/2023	9/21/2023	9/8/2023	9/22/2023	9/8/2023	9/22/2023	9/21/2023	9/21/2023	9/7/2023	9/19/2023	9/22/2023	10/9/2023	9/27/2023	10/3/2024
	Harvest Date	7/14/2024	N/A	N/A	N/A	N/A	7/3 & 7/8/2024	6/21/2024	N/A	7/2/2024	N/A	6/25/2024	6/24/2024	N/A	7/9/2024	7/12/2024	7/15/2024
Environment	**Biotic Stress**	Yellowing disease, wheat stem sawfly	N/A	N/A	N/A	N/A	Wheat stem sawfly	brown wheat mite	N/A	Root rot and wheat stem sawfly	N/A	Brown wheat mite	Cutworm	N/A	Wheat stem sawfly	None	Minor wheat stem sawfly
	Abiotic Stress	N/A	Drought	Drought	Drought	Drought	Minor Drought	Drought	Drought	Drought	Drought	Drought	Drought	Hail	Minor Hail	None	None
	Total Rainfall: January 1 to Harvest	10.7"	N/A	N/A	N/A	N/A	9.1"	5.1"	N/A	7.3"	N/A	5.4"	5"	N/A	9.9"	4.7"	8.9"
	Growing Degree-Days (Jan 1 - Harvest, 32°F base)	3,854	N/A	N/A	N/A	N/A	3,451	3,683	N/A	3,253	N/A	3,767	3,990	N/A	3,745	3,461	3,954
	General Comments	Planted 1" deep into moisture and millet residue. Fall emergence was good, although minimal growth occurred. Timely rainfall received in spring and early summer. Moderate wheat stem sawfly pressure, although minimal lodging was noted in the trial at harvest.	N/A	N/A	N/A	N/A	Planted 2" deep into moisture and corn residue. Fall emergence was good, although minimal growth occurred. Timely rainfall received in spring. Light wheat stem sawfly pressure.	Planted 2" deep into moisture and tilled wheat residue. Fall emergence and growth was good. Trial was showing symptoms of drought stress by mid-spring.	N/A	Planted 1.5" deep into moisture and millet residue. Fall emergence and growth was good. Timely rainfall received in spring. Pythium was found in white heads (sporadic) in June. Moderate wheat stem sawfly pressure.	N/A	Planted 1.5" deep into moisture and tilled sorghum residue. Fall emergence and growth was very good. Good growth in the spring. Brown wheat mites noted in early spring along with drought stress symptoms. Timely rainfall received in May and early June.	Planted 1.5" deep into moisture and no-till wheat residue. Fall emergence and growth was very good. Lush growth in the spring. Cutworm damage noted in early spring, trial sprayed with insecticide on April 22.	N/A	Planted 1.5" deep into good moisture after corn harvest. Field had water applied immediately after planting. Good fall emergence and very late to green-up in the spring due to later planting date. Wheat stem sawfly present at low levels, but lodging was due to high yield.	Planted about 1.5" deep into moisture. Good fall emergence. Trial irrigated as needed starting in late spring.	Planted 1.5" deep into dry bean residue. Field had water applied immediately after planting. Good fall emergence and very late to green-up in the spring due to later planting date. Wheat stem sawfly was present at low levels, but lodging was due to high yield. Palisade plant growth regulator was applied in spring.

8 and 28 lb/ac of N and P were applied at planting as starter by Crops Testing.
Dashes denote missing information, N/A means not applicable

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Summary of 2024 Dryland Winter Wheat Variety Performance Results

Crops Testing
www.csucrops.com

Brand/Source	Market Class	Variety[a]	2024 Multi-Location Average Yield[b]	Yield	Test Weight	Protein[c]	Heading[d]	Sawfly Cutting[c]	2024 Individual Trial Yield[b] Akron	Julesburg	Lamar	Orchard	Sheridan Lake	Walsh
			bu/ac	percent of average	lb/bu	percent	days from average	rating (1-9)	bu/ac					
PlainsGold	HRW	Whistler	***59.5***	*109%*	*58.6*	*12.0*	*2*	*6*	95.5	68.5	48.5	54.5	**49.5**	41.5
PlainsGold	HRW	Avery	***58.7***	*107%*	*58.6*	*11.3*	*0*	*5*	97.0	63.5	45.0	59.0	38.5	**45.0**
PlainsGold	**HWW**	Monarch	***58.4***	*107%*	*59.7*	*11.7*	*1*	*4*	**99.5**	**74.0**	44.0	58.0	34.0	42.0
PlainsGold	HRW	Kivari AX	***58.3***	*107%*	*58.0*	*11.5*	*0*	*6*	90.5	62.0	**52.0**	61.5	40.5	41.5
AgriPro	HRW	AP Sunbird	***57.8***	*106%*	*60.3*	*11.7*	*-2*	*9*	**101.0**	**75.0**	43.0	62.0	34.0	31.5
PlainsGold	HRW	Byrd	***56.9***	*104%*	*59.4*	*11.9*	*-1*	*6*	93.5	67.0	43.0	60.5	35.5	41.0
CROPLAN	HRW	CP7017AX	*56.7*	*104%*	*59.5*	*12.1*	*-1*	*8*	89.5	67.5	47.5	55.0	40.5	**46.0**
PlainsGold	**HWW**	Breck	*56.6*	*103%*	*59.7*	*12.0*	*0*	*6*	90.0	65.5	46.0	59.5	39.5	38.5
PlainsGold	HRW	Canvas	*56.5*	*103%*	*59.4*	*12.2*	*1*	*4*	95.0	64.5	40.5	60.0	37.5	42.0
PlainsGold	HRW	Crescent AX	*56.2*	*103%*	*58.9*	*11.2*	*-1*	*7*	94.0	66.0	43.0	63.5	32.5	40.5
PlainsGold	HRW	Langin	*56.2*	*103%*	*58.8*	*11.6*	*-2*	*8*	98.0	70.0	40.0	60.0	33.5	34.0
PlainsGold	**HWW**	Snowmass 2.0	*55.7*	*102%*	*59.3*	*11.3*	*-2*	*5*	96.0	66.5	46.0	60.0	31.5	34.5
PlainsGold	HRW	Byrd CL Plus	*53.5*	*98%*	*58.8*	*11.6*	*-1*	*3*	89.0	64.0	36.5	60.0	34.0	37.0
PlainsGold	HRW	Amplify SF	*52.8*	*96%*	*59.5*	*12.2*	*2*	*1*	86.5	58.5	41.0	55.5	36.5	36.5
PlainsGold	**HWW**	Windom SF	*52.5*	*96%*	*56.2*	*12.3*	*1*	*2*	83.0	56.0	47.0	51.0	38.5	37.0
PlainsGold	HRW	Guardian	*51.6*	*94%*	*60.0*	*12.3*	*0*	*6*	86.0	59.0	41.0	54.0	36.0	38.5
PlainsGold	HRW	Fortify SF	*51.1*	*93%*	*59.1*	*12.3*	*0*	*2*	94.0	59.0	41.5	54.0	26.5	32.5
CROPLAN	HRW	CP7220	*48.0*	*88%*	*57.4*	*12.7*	*0*	*5*	77.5	63.0	40.0	52.0	27.0	29.5
Experimentals														
Colorado State University exp.	HRW	CO19D087R	***58.9***	*108%*	*58.4*	*11.3*	*-2*	*7*	**102.0**	66.5	43.0	61.0	37.5	42.0
Colorado State University exp.	HRW	CO19410R	***58.6***	*107%*	*60.1*	*12.0*	*0*	*6*	**102.0**	71.5	40.0	59.5	40.0	37.5
Colorado State University exp.	**HWW**	CO18D007W	***58.6***	*107%*	*59.5*	*11.6*	*-1*	*6*	94.0	69.0	47.0	58.0	45.0	39.5
Colorado State University exp.	HRW	CO19D304R	***57.8***	*106%*	*58.2*	*11.7*	*0*	*7*	93.5	69.0	48.5	52.0	42.0	42.0
Colorado State University exp.	HRW	CO18D297R	***57.8***	*106%*	*60.0*	*12.2*	*1*	*6*	96.0	64.5	45.0	54.5	43.5	**44.0**
Colorado State University exp.	HRW	CO18042RA	*55.7*	*102%*	*58.6*	*11.5*	*-2*	*5*	90.0	64.0	44.5	59.0	38.5	40.0
Colorado State University exp.	HRW	CO20SFD020R	*55.4*	*101%*	*60.3*	*11.3*	*1*	*2*	98.0	67.0	40.5	54.5	37.5	37.5
Colorado State University exp.	HRW	CO20D108R	*55.1*	*101%*	*59.8*	*11.2*	*0*	*3*	93.0	65.5	42.0	55.5	35.5	43.0
Colorado State University exp.	**HWW**	CO19S129W	*54.8*	*100%*	*59.7*	*12.2*	*1*	*4*	91.0	62.5	46.0	56.0	36.5	35.0
Colorado State University exp.	HRW	CO20022RC	*54.2*	*99%*	*59.2*	*11.8*	*2*	*7*	91.0	63.5	40.5	59.5	32.5	40.0
Colorado State University exp.	**HWW**	CO20SF014W	*53.7*	*98%*	*56.6*	*11.3*	*-1*	*1*	86.5	59.0	46.0	51.0	39.0	41.0
Colorado State University exp.	HRW	CO20SF141R	*52.7*	*96%*	*57.5*	*11.7*	*0*	*1*	81.0	59.0	47.0	54.0	37.0	38.0
Colorado State University exp.	HRW	CO19393R	*52.6*	*96%*	*59.8*	*11.9*	*1*	*5*	88.0	57.5	45.5	52.5	32.0	37.5
Colorado State University exp.	HRW	CO200037R	*51.9*	*95%*	*59.2*	*12.0*	*-1*	*2*	94.0	60.5	37.0	56.0	32.5	34.0
Colorado State University exp.	HRW	CO18035RA	*50.9*	*93%*	*59.3*	*11.6*	*0*	*5*	81.5	58.5	38.5	49.5	37.0	**43.5**
Colorado State University exp.	HRW	CO20SFD019R	*50.5*	*92%*	*60.3*	*12.4*	*-2*	*2*	92.5	66.0	36.0	53.0	26.0	31.5
Colorado State University exp.	HRW	CO21SF191RA	*48.6*	*89%*	*57.3*	*12.0*	*2*	*2*	75.0	56.5	40.0	49.0	42.0	32.5
Colorado State University exp.	HRW	CO21SF263RA	*45.7*	*83%*	*57.3*	*12.9*	*2*	*2*	70.0	49.0	37.5	40.5	39.5	35.5
		Average	***54.7***	***100%***	***59***	***11.8***	***0***	***4***	**91.0**	**64.0**	**43.0**	**56.0**	**36.5**	**38.5**
		[f]LSD (0.30)	2.6		0.6				3.6	2.7	2.8	2.9	3.3	2.6
		[f]LSD (0.05)	5.0		1.1				6.9	5.1	5.4	5.5	6.3	4.9

[a]Varieties grouped according to released varieties or experimentals, and then ranked from highest to lowest yield across six trials. Varieties not entered all dryland locations were not included to provide fair comparisons. Varieties entered in a single testing region (southeast or northeast Colorado) appear in the 2024 Colorado regional tables.

[b]Yield adjusted to 12% moisture content. Variety yield values in the top least significant difference (LSD) yield group across the locations and within each location are in bold. Multi-location yield values for each variety are least squares means and not arithmetic averages.

[c]Protein adjusted to 12% moisture content and averaged across six trials in 2024.

[d]Varieties with positive values headed later than the trial averages and varieties with negative values headed earlier than average. Based on three trials in 2023.

[e]Wheat Stem Sawfly cutting score: 1 equals no cutting and 9 is severe cutting. Scores are averaged across three replicates at Roggen (site not harvested for yield).

[f]Farmers selecting a variety based on yield should use the LSD (.30) to protect themselves from false negative conclusions (concluding varieties are the same when they are actually different). Companies or researchers may use the LSD (.05) to avoid false positive conclusions (concluding varieties are different when they are actually the same).

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Summary of 2024 Dryland Winter Wheat Variety Performance Results - Northeast Region

Crops Testing www.csucrops.com

Brand/Source	Market Class	Variety[a]	2024 Multi-Location Average Yield[b]	Yield	Test Weight	Protein[c]	Heading[d]	2024 Individual Trial Yield[b] Akron	Julesburg	Orchard
			bu/ac	percent of average	lb/bu	percent	days from average	bu/ac		
AgriPro	HRW	AP Sunbird	*79.3*	*114%*	*58.6*	*10.6*	*-2*	**101.0**	**75.0**	62.0
PlainsGold	**HWW**	Monarch	*77.2*	*111%*	*58.2*	*11.1*	*1*	**99.5**	**74.0**	58.0
PlainsGold	HRW	Langin	*76.0*	*109%*	*57.5*	*10.4*	*-2*	98.0	70.0	60.0
PlainsGold	HRW	Crescent AX	*74.5*	*107%*	*57.6*	*11.0*	*-1*	94.0	66.0	63.5
PlainsGold	**HWW**	Snowmass 2.0	*74.2*	*107%*	*57.9*	*11.1*	*-2*	96.0	66.5	60.0
Crop Research Foundation of WY	HRW	Steamboat	*73.8*	*106%*	***60.2***	*10.7*	*0*	94.0	60.5	**67.0**
PlainsGold	HRW	Byrd	*73.7*	*106%*	*58.0*	*10.8*	*-1*	93.5	67.0	60.5
AgriPro	HRW	AP Bigfoot	*73.3*	*105%*	*59.0*	*11.4*	*-1*	94.0	65.5	60.5
PlainsGold	HRW	Avery	*73.2*	*105%*	*57.3*	*10.3*	*0*	97.0	63.5	59.0
PlainsGold	HRW	Canvas	*73.2*	*105%*	*57.2*	*11.1*	*1*	95.0	64.5	60.0
PlainsGold	HRW	Whistler	*72.8*	*105%*	*56.9*	*11.3*	*2*	95.5	68.5	54.5
PlainsGold	**HWW**	Breck	*71.7*	*103%*	*58.3*	*11.0*	*0*	90.0	65.5	59.5
PlainsGold	HRW	Kivari AX	*71.3*	*103%*	*55.8*	*10.9*	*0*	90.5	62.0	61.5
PlainsGold	HRW	Byrd CL Plus	*71.0*	*102%*	*57.5*	*10.9*	*-1*	89.0	64.0	60.0
CROPLAN	HRW	CP7017AX	*70.7*	*102%*	*57.6*	*12.0*	*-1*	89.5	67.5	55.0
PlainsGold	HRW	Fortify SF	*69.0*	*99%*	*57.9*	*11.5*	*0*	94.0	59.0	54.0
Frenchman Valley Coop	**HWW**	Valley	*68.2*	*98%*	*57.9*	*11.0*	*0*	90.0	63.5	51.0
Limagrain	HRW	LCS Radar	*67.8*	*98%*	*57.5*	*12.0*	*-1*	84.5	66.5	52.5
AgriPro	HRW	AP Solid	*67.3*	*97%*	*58.8*	*12.1*	*1*	79.5	63.5	59.0
PlainsGold	HRW	Amplify SF	*66.8*	*96%*	*57.9*	*11.1*	*2*	86.5	58.5	55.5
PlainsGold	HRW	Guardian	*66.3*	*95%*	*58.4*	*11.4*	*0*	86.0	59.0	54.0
NU Horizon Genetics	HRW	NHH19668	*66.3*	*95%*	***59.6***	*11.9*	*-1*	88.0	56.5	54.5
Kansas Wheat Alliance	HRW	KS Territory	*66.2*	*95%*	*56.2*	*11.9*	*1*	85.5	61.0	52.0
Limagrain	HRW	LCS Atomic AX	*65.3*	*94%*	*58.9*	*11.4*	*2*	88.0	55.5	52.5
Limagrain	**HWW**	LCS White Lightning	*64.5*	*93%*	*59.3*	*11.7*	*-1*	84.0	58.5	51.0
CROPLAN	HRW	CP7220	*64.2*	*92%*	*56.8*	*12.2*	*0*	77.5	63.0	52.0
PlainsGold	**HWW**	Windom SF	*63.3*	*91%*	*53.0*	*11.8*	*1*	83.0	56.0	51.0
Limagrain	HRW	LCS Steel AX	*57.2*	*82%*	*57.2*	*11.0*	*2*	69.0	54.0	48.5
Experimentals										
Colorado State University exp.	HRW	CO19410R	*77.7*	*112%*	*58.9*	*10.9*	*0*	**102.0**	71.5	59.5
Colorado State University exp.	HRW	CO19D087R	*76.5*	*110%*	*57.1*	*10.5*	*-2*	**102.0**	66.5	61.0
Colorado State University exp.	**HWW**	CO18D007W	*73.7*	*106%*	*58.1*	*10.8*	*-1*	94.0	69.0	58.0
Colorado State University exp.	HRW	CO20SFD020R	*73.2*	*105%*	*58.9*	*11.1*	*1*	98.0	67.0	54.5
Colorado State University exp.	HRW	CO18D297R	*71.7*	*103%*	*59.0*	*11.6*	*1*	96.0	64.5	54.5
Colorado State University exp.	HRW	CO19D304R	*71.5*	*103%*	*56.1*	*10.9*	*0*	93.5	69.0	52.0
Colorado State University exp.	HRW	CO20D108R	*71.3*	*103%*	*58.0*	*10.5*	*0*	93.0	65.5	55.5
Colorado State University exp.	HRW	CO20022RC	*71.3*	*103%*	*56.7*	*11.2*	*2*	91.0	63.5	59.5
Colorado State University exp.	HRW	CO18042RA	*71.0*	*102%*	*57.1*	*10.1*	*-2*	90.0	64.0	59.0
Colorado State University exp.	HRW	CO20SFD019R	*70.5*	*101%*	***60.2***	*11.4*	*-2*	92.5	66.0	53.0
Colorado State University exp.	HRW	CO200037R	*70.2*	*101%*	*56.9*	*11.6*	*-1*	94.0	60.5	56.0
Colorado State University exp.	**HWW**	CO19S129W	*69.8*	*100%*	*58.2*	*11.6*	*1*	91.0	62.5	56.0
Colorado State University exp.	HRW	CO19393R	*66.0*	*95%*	*58.3*	*11.1*	*1*	88.0	57.5	52.5
Colorado State University exp.	**HWW**	CO20SF014W	*65.5*	*94%*	*53.5*	*11.2*	*-1*	86.5	59.0	51.0
Colorado State University exp.	HRW	CO20SF141R	*64.7*	*93%*	*55.0*	*10.8*	*0*	81.0	59.0	54.0
Colorado State University exp.	HRW	CO18035RA	*63.2*	*91%*	*57.6*	*10.5*	*0*	81.5	58.5	49.5
Colorado State University exp.	HRW	CO21SF191RA	*60.2*	*87%*	*55.3*	*11.9*	*2*	75.0	56.5	49.0
Colorado State University exp.	HRW	CO21SF263RA	*53.2*	*76%*	*55.5*	*12.3*	*2*	70.0	49.0	40.5
		Average	***69.6***	***100%***	***57.6***	***11.2***	***0***	**90.0**	**63.0**	**55.5**
		[e]LSD (0.30)			0.7			3.6	2.7	2.9
		[e]LSD (0.05)			1.3			6.9	5.1	5.5
		Coeffecient of Variation (CV)			1.1			5.1	6.5	8.2

[a]Varieties grouped according to released varieties or experimentals, and then ranked from highest to lowest yield across three northeast Colorado region trials in 2024.

[b]Yield adjusted to 12% moisture content. Variety yield and test weight values in the top least significant difference (LSD) yield group are in bold. Multi-location test weight values for each variety are least squares means across the three sites and not arithmetic averages. Multi-location yield values for each variety are arithmetic averages from across the three sites and could not be statistically analyzed due to the wide variation among locations.

[c]Protein adjusted to 12% moisture content and averaged across three trials in 2024.

[d]Varieties with positive values headed later than the trial averages and varieties with negative values headed earlier than average. Based on three trials.

[e]Farmers selecting a variety based on yield should use the LSD (.30) to protect themselves from false negative conclusions (concluding varieties are the same when they are actually different). Companies or researchers may use the LSD (.05) to avoid false positive conclusions (concluding varieties are different when they are actually the

COLORADO STATE UNIVERSITY EXTENSION

Summary of 2024 Dryland Winter Wheat Variety Performance Results - Southeast Region

Crops Testing
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Brand/Source	Market Class	Variety[a]	2024 Multi-Location Average Yield[b]	Yield	Test Weight[b]	Protein[c]	2024 Individual Trial Yield[b] Lamar	Sheridan Lake	Walsh
			bu/ac	percent of average	lb/bu	percent	bu/ac		
PlainsGold	HRW	Whistler	***45.7***	*118%*	*60.2*	*12.7*	48.5	**49.5**	41.5
PlainsGold	HRW	Kivari AX	***44.0***	*114%*	*60.3*	*12.2*	**52.0**	40.5	41.5
PlainsGold	**HWW**	Telluride	***43.5***	*112%*	*60.8*	*12.4*	47.0	45.0	39.5
PlainsGold	HRW	Avery	***43.1***	*111%*	*59.9*	*12.3*	45.0	38.5	**45.0**
CROPLAN	HRW	CP7017AX	*42.5*	*110%*	***61.5***	*12.1*	47.5	40.5	**46.0**
PlainsGold	HRW	Sheridan	*42.5*	*110%*	*60.7*	*12.9*	45.0	43.5	**44.0**
PlainsGold	**HWW**	Breck	*41.4*	*107%*	*61.1*	*13.0*	46.0	39.5	38.5
PlainsGold	HRW	Byrd	*40.3*	*104%*	*60.8*	*13.0*	43.0	35.5	41.0
PlainsGold	**HWW**	Windom SF	*39.8*	*103%*	*59.4*	*12.8*	47.0	38.5	37.0
PlainsGold	HRW	Canvas	*39.3*	*102%*	***61.5***	*13.2*	40.5	37.5	42.0
PlainsGold	**HWW**	Monarch	*39.2*	*101%*	***61.3***	*12.2*	44.0	34.0	42.0
PlainsGold	HRW	Crescent AX	*38.3*	*99%*	*60.2*	*11.7*	43.0	32.5	40.5
PlainsGold	HRW	Guardian	*37.8*	*98%*	***61.6***	*13.1*	41.0	36.0	38.5
PlainsGold	HRW	Amplify SF	*37.6*	*97%*	*61.1*	*13.4*	41.0	36.5	36.5
PlainsGold	**HWW**	Snowmass 2.0	*36.8*	*95%*	*60.7*	*11.7*	46.0	31.5	34.5
PlainsGold	HRW	Byrd CL Plus	*36.0*	*93%*	*60.2*	*12.3*	36.5	34.0	37.0
PlainsGold	HRW	Langin	*35.1*	*91%*	*60.1*	*12.8*	40.0	33.5	34.0
AgriPro	HRW	AP Sunbird	*34.6*	*89%*	***61.9***	*12.9*	43.0	34.0	31.5
PlainsGold	HRW	Fortify SF	*34.3*	*89%*	*60.2*	*13.0*	41.5	26.5	32.5
Limagrain	HRW	LCS Julep	*33.8*	*87%*	***61.5***	*13.6*	34.0	34.0	36.0
CROPLAN	HRW	CP7220	*31.0*	*80%*	*58.0*	*13.2*	40.0	27.0	29.5
Experimentals									
Colorado State University exp.	HRW	CO19D304R	***44.4***	*115%*	*60.4*	*12.4*	48.5	42.0	42.0
Colorado State University exp.	**HWW**	CO20SF014W	*41.4*	*107%*	*59.8*	*11.4*	46.0	39.0	41.0
Colorado State University exp.	HRW	CO19D087R	*41.3*	*107%*	*59.7*	*12.0*	43.0	37.5	42.0
Colorado State University exp.	HRW	CO18042RA	*41.3*	*107%*	*60.2*	*12.9*	44.5	38.5	40.0
Colorado State University exp.	HRW	CO20SF141R	*39.6*	*102%*	*60.0*	*12.6*	47.0	37.0	38.0
Colorado State University exp.	HRW	CO18035RA	*39.5*	*102%*	*61.0*	*12.7*	38.5	37.0	**43.5**
Colorado State University exp.	HRW	CO19410R	*38.7*	*100%*	***61.3***	*13.0*	40.0	40.0	37.5
Colorado State University exp.	HRW	CO20D108R	*38.2*	*99%*	***61.5***	*11.8*	42.0	35.5	43.0
Colorado State University exp.	HRW	CO20SFD020R	*38.1*	*98%*	***61.5***	*11.6*	40.5	37.5	37.5
Colorado State University exp.	HRW	CO20022RC	*37.7*	*98%*	***61.7***	*12.3*	40.5	32.5	40.0
Colorado State University exp.	HRW	CO21SF191RA	*37.7*	*98%*	*59.3*	*12.1*	40.0	42.0	32.5
Colorado State University exp.	HRW	CO19393R	*37.5*	*97%*	***61.2***	*12.6*	45.5	32.0	37.5
Colorado State University exp.	HRW	CO21SF263RA	*37.5*	*97%*	*59.2*	*13.5*	37.5	39.5	35.5
Colorado State University exp.	**HWW**	CO19S129W	*37.1*	*96%*	*61.1*	*12.7*	46.0	36.5	35.0
Colorado State University exp.	HRW	CO200037R	*34.3*	*89%*	***61.5***	*12.3*	37.0	32.5	34.0
Colorado State University exp.	HRW	CO20SFD019R	*30.4*	*79%*	*60.4*	*13.4*	36.0	26.0	31.5
		Average	***38.7***	***100%***	***60.6***	***12.6***	**43.0**	**36.5**	**38.5**
		[d]LSD (0.30)	2.7		0.7		2.8	3.3	2.6
		[d]LSD (0.05)	5.1		1.2		5.4	6.3	4.9
		Coeffecient of Variation (CV)	7.1		1.7		5.4	7.2	13.0

[a]Varieties grouped according to released varieties or experimentals, and then ranked from highest to lowest yield across three southeast Colorado trials in 2024.

[b]Yield adjusted to 12% moisture content. Variety yield and test weight values in the top least significant difference (LSD) yield group are in bold. Multi-location yield and test weight values for each variety are least squares means across the three sites and not arithmetic averages.

[c]Protein adjusted to 12% moisture content and averaged across three trials in 2024.

[d]Farmers selecting a variety based on yield should use the LSD (.30) to protect themselves from false negative conclusions (concluding varieties are the same when they are actually different). Companies or researchers may use the LSD (.05) to avoid false positive conclusions (concluding varieties are different when they are actually the same).

COLORADO STATE UNIVERSITY EXTENSION

Summary of 2-Year (2023-2024) Dryland Winter Wheat Variety Performance Results

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Brand/Source	Market Class[b]	Variety[c]	2-Year Average[a] Yield	Yield	Test Weight	Test Weight	Plant Height	Protein
			bu/ac	% trial average	lb/bu	% trial average	in	percent
PlainsGold	**HWW**	Monarch	69.9	108%	58.3	101%	28	11.0
Colorado State University exp.	HRW	CO19410R	69.3	107%	58.6	101%	29	11.4
Colorado State University exp.	**HWW**	CO18D007W	67.5	104%	58.1	101%	29	10.9
Colorado State University exp.	HRW	CO19D087R	67.5	104%	56.8	98%	27	11.1
Colorado State University exp.	HRW	CO19D304R	67.2	104%	56.6	98%	31	11.1
CROPLAN	HRW	CP7017AX	67.1	104%	58.7	102%	28	11.3
Colorado State University exp.	HRW	CO18D297R	66.8	103%	58.8	102%	30	11.6
PlainsGold	HRW	Whistler	66.8	103%	56.8	98%	31	11.0
PlainsGold	**HWW**	Snowmass 2.0	66.4	102%	57.8	100%	28	11.0
Colorado State University exp.	HRW	CO20D108R	66.1	102%	58.0	101%	29	10.9
PlainsGold	HRW	Avery	65.6	101%	57.1	99%	30	10.6
Colorado State University exp.	HRW	CO19393R	65.5	101%	57.9	100%	30	11.3
Colorado State University exp.	**HWW**	CO19S129W	65.1	101%	58.1	101%	29	11.3
PlainsGold	HRW	Crescent AX	64.9	100%	58.3	101%	30	11.1
PlainsGold	HRW	Kivari AX	64.6	100%	56.3	97%	29	10.8
PlainsGold	HRW	Byrd	64.5	100%	58.1	101%	30	11.0
PlainsGold	HRW	Canvas	63.8	99%	57.7	100%	29	11.6
Colorado State University exp.	HRW	CO18042RA	63.7	98%	57.5	100%	30	10.9
PlainsGold	**HWW**	Breck	63.4	98%	58.7	102%	29	11.3
PlainsGold	HRW	Amplify SF	62.9	97%	57.9	100%	30	11.7
PlainsGold	HRW	Byrd CL Plus	62.7	97%	57.4	99%	31	11.0
PlainsGold	HRW	Langin	62.5	97%	57.1	99%	28	11.2
Colorado State University exp.	HRW	CO18035RA	62.2	96%	57.6	100%	28	11.3
Colorado State University exp.	HRW	CO200037R	61.7	95%	57.7	100%	28	11.4
PlainsGold	HRW	Guardian	61.7	95%	58.8	102%	28	11.6
PlainsGold	**HWW**	Windom SF	60.0	93%	56.4	98%	27	11.4
PlainsGold	HRW	Fortify SF	59.0	91%	57.6	100%	30	11.3
		Average	**64.7**	**100%**	**58**	**100%**	**29**	**11.2**

[a]The 2-year average yield and test weight are based on 13 trials (six 2024 and ten 2023 trials). Plant heights and protein are based on 13 trials (six 2024 and seven 2023 trials).

[b]Market class: HRW=hard red winter wheat; **HWW**=hard white winter wheat.

[c]Varieties ranked from highest to lowest average 2-year yield.

COLORADO STATE UNIVERSITY EXTENSION

Summary of 3-Year (2022-2024) Dryland Winter Wheat Variety Performance Results

Crops Testing www.csucrops.com

Brand/Source	Market Class[b]	Variety[c]	3-Year Average[a] Yield	Yield	Test Weight	Test Weight	Plant Height	Protein
			bu/ac	% trial average	lb/bu	% trial average	in	percent
PlainsGold	**HWW**	Monarch	64.4	109%	58.4	101%	27	11.5
Colorado State University exp.	**HWW**	CO18D007W	62.1	105%	58.3	101%	28	11.5
PlainsGold	HRW	Whistler	61.6	104%	57.1	98%	29	11.5
Colorado State University exp.	HRW	CO18D297R	61.5	104%	58.9	102%	28	12.1
CROPLAN	HRW	CP7017AX	61.4	104%	58.9	102%	26	11.7
PlainsGold	HRW	Avery	60.8	103%	57.4	99%	28	11.1
PlainsGold	**HWW**	Snowmass 2.0	60.3	102%	58.0	100%	26	11.4
PlainsGold	HRW	Crescent AX	60.0	101%	58.4	101%	28	11.7
PlainsGold	HRW	Kivari AX	60.0	101%	56.7	98%	27	11.3
PlainsGold	HRW	Byrd	59.7	101%	58.3	100%	28	11.4
PlainsGold	HRW	Canvas	59.0	100%	58.1	100%	27	12.0
Colorado State University exp.	HRW	CO18042RA	58.9	99%	57.7	100%	28	11.4
PlainsGold	**HWW**	Breck	58.5	99%	59.0	102%	27	11.8
PlainsGold	HRW	Amplify SF	58.1	98%	58.2	100%	28	12.1
Colorado State University exp.	HRW	CO18035RA	57.9	98%	57.8	100%	27	11.6
PlainsGold	HRW	Byrd CL Plus	57.8	97%	57.5	99%	29	11.5
PlainsGold	HRW	Langin	57.7	97%	57.4	99%	26	11.7
PlainsGold	HRW	Guardian	57.0	96%	58.9	102%	27	12.0
PlainsGold	**HWW**	Windom SF	55.1	93%	56.6	98%	26	12.0
PlainsGold	HRW	Fortify SF	54.2	91%	57.9	100%	28	11.8
		Average	**59.3**	**100%**	**58**	**100%**	**27**	**11.7**

[a]The 3-year average yield and test weight are based on 19 trials (six 2024, ten 2023, and three 2022). Plant heights and protein are based on 16 trials (six 2024, seven 2023, and three 2022).

[b]Market class: HRW=hard red winter wheat; **HWW**=hard white winter wheat.

[c]Varieties ranked from highest to lowest average 3-year yield.

2024 Collaborative On-Farm Test (COFT) Variety Peformance Results

Sally Jones-Diamond, Jason Webb, Ron Meyer, Michaela Mattes, Kat Caswell, and Catie Green

The COFT program is in its 28th year and the majority of Colorado's winter wheat acreage is planted to varieties that have been tested in the program. On-farm testing leads to more rapid replacement of old inferior varieties and wider and faster adoption of improved varieties. It also brings Colorado State University wheat results to rural communities. The varieties tested in COFT this year fit different farmer needs and producers are encouraged to study the tables in the Description of Winter Wheat Varieties in Eastern Colorado and the Dryland Decision Tree for more information.

In the fall of 2023, twenty-five eastern Colorado wheat producers received seed of five varieties of wheat and planted them in side-by-side strips under the same conditions as the wheat in the rest of the field. Eighteen viable harvest results were obtained. The objective of our on-farm testing program is to compare the performance of wheat varieties of interest for Colorado farmers under their field conditions. Each of the five varieties tested has potential advantages for farmers and should be chosen on a case-by-case basis depending on the specific farm needs. There was a sixth 'treatment' this year, which was a biological seed treatment from Indigo Ag. applied to Amplify SF. For an accurate comparison of the seed treatment, Amplify SF was included twice in the strips, once as regular variety treated only with the regular fungicide seed treatment (e.g. Cruiser Maxx Cereals) and again with the regular fungicide seed treatment and the Indigo Ag. bacterial biological treatment added.

The same six varieties/treatments were included in all tests. Amplify SF (regular and treated with Indigo seed treatment), AP Solid, Guardian, Kivari AX, and KS Territory are all hard red winter wheat varieties. Two semi-solid stemmed varieties were included in the test to help combat the wheat stem sawfly (WSS): Amplify SF and AP Solid. One CoAXium® variety was also included for grass weed control, Kivari AX. Two regular hard red varieties were included for their excellent Wheat streak mosaic virus resistance Guardian and KS Territory.

Amplify SF is a CSU release (2021), marketed by PlainsGold. Amplify SF has a semi-solid stem, is medium maturity, and has good standability under severe WSS pressure with an average yield. The Indigo Ag. seed treatment used was W13, which is a dry powder containing beneficial, naturally occurring microbes to help improve plant growth and productivity throughout the season. The product was applied to dry seed at the labeled application rate of 1 volume ounce per 100 pounds of seed.

AP Solid is an AgriPro release (2021). AP Solid is a medium-late semi-solid stem variety that stands up well to heavy WSS pressure. It has very good test weight and straw strength.
Kivari AX is a CSU release (2020) marketed by PlainsGold. Higher yielding and slightly later maturing than Crescent AX, it shows intermediate reaction to stripe rust and carries wheat curl mite resistance. The CoAXium® Wheat Production System is based on the Aggressor® herbicide, a different class of compounds from Beyond®, and provides excellent control of winter annual grasses.

Guardian is a CSU release (2019), marketed by PlainsGold. It is medium maturing, has average straw strength, and has good stripe and stem rust resistance. It has excellent wheat curl mite resistance from the Byrd parent and excellent resistance to WSMV. It is below-average yield in the three-year trial average but has very good test weight.

KS Territory is a Kansas State University release (2022), marketed by the Kansas Wheat Alliance. It is medium maturing, has very good straw strength, and resistance to WSMV and Triticum mosaic virus, and excellent stripe rust tolerance.

COLORADO STATE UNIVERSITY EXTENSION

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Summary of 2024 Collaborative On-Farm Test (COFT) Winter Wheat Variety Results (18 tests included)

Variety	Yield[a]	Test Weight	Protein[a]
	bu/ac	lb/bu	percent
Kivari AX	**48.8**	59.9	11.4
Amplify SF + Indigo Seed Trt.	**47.6**	61.1	12.0
Amplify SF	46.5	61.1	12.0
AP Solid	46.5	61.6	12.1
Guardian	45.5	60.6	12.4
KS Territory	44.2	58.9	12.4
Average	**46.5**	**60.5**	**12.1**
$LSD_{(0.30)}$	1.5	0.5	0.2
Coefficient of Variation (CV)	9.3%	2.4%	4.5%

[a]Yield and protein corrected to 12% moisture.

COLORADO STATE UNIVERSITY EXTENSION

Summary of 2024 Collaborative On-Farm Test (COFT) Winter Wheat Variety Performance Results

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2024 Varieties (ranked left to right by highest yield)

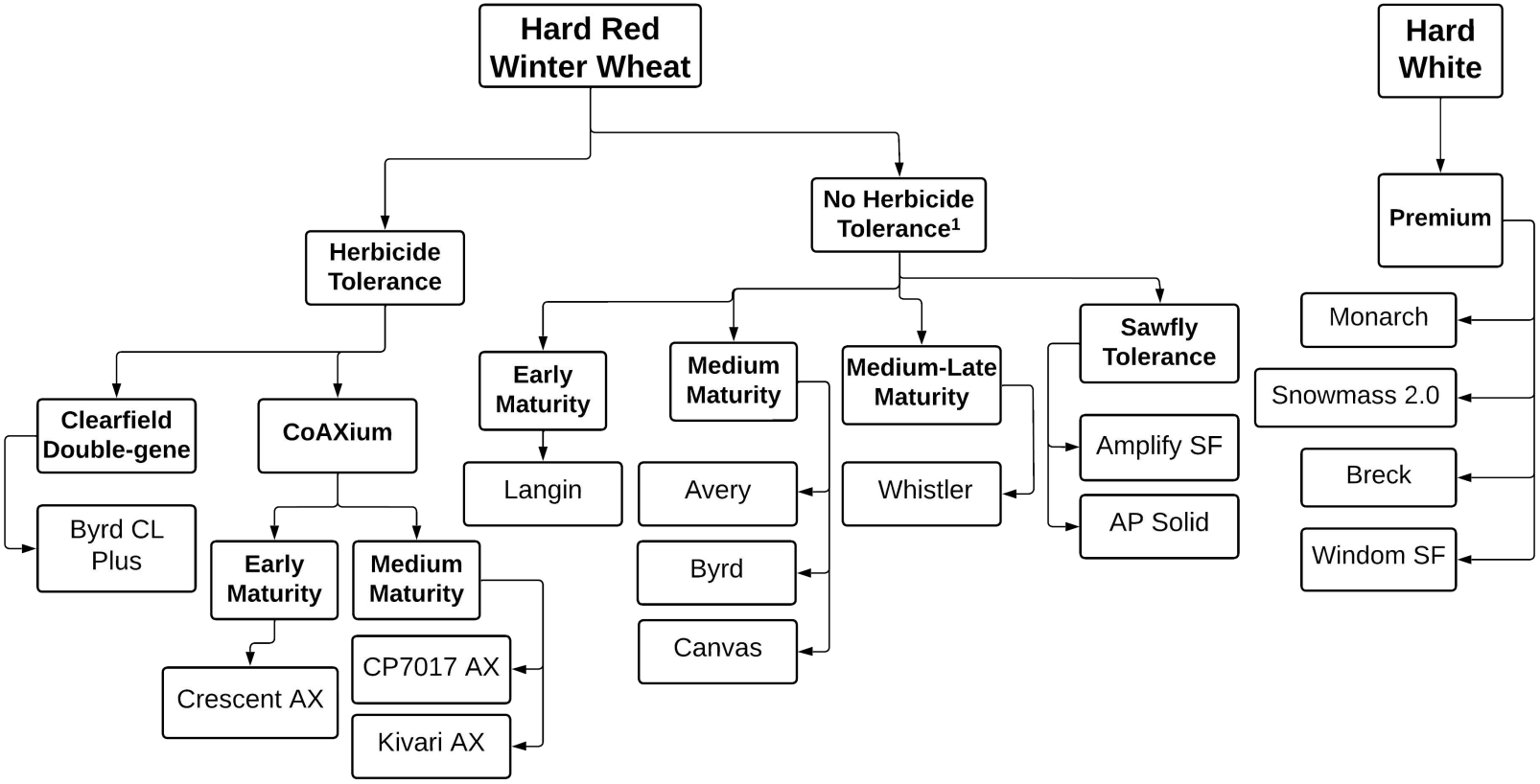
	Kivari AX			Amplify SF with Indigo Seed Treatment			Amplify SF			AP Solid			Guardian			KS Territory			COFT Average		
Nearest Town/County	Yield[a]	Test Weight	Protein	Yield[a]	Test Weight	Protein	Yield[a]	Test Weight	Protein	Yield[a]	Test Weight	Protein	Yield[a]	Test Weight	Protein	Yield[a]	Test Weight	Protein	Yield[a]	Test Weight	Protein
	bu/ac	lb/bu	percent	bu/ac	lb/bu	percent	bu/ac	lb/bu	percent	bu/ac	lb/bu	percent	bu/ac	lb/bu	percent	bu/ac	lb/bu	percent	bu/ac	lb/bu	percent
Anton/Washington	53	58	14	53	59	14	53	59	15	52	60	14	48	58	16	46	56	16	**51**	**58**	**15**
Arriba/Lincoln	54	61	11	68	60	11	56	60	11	57	57	11	66	62	11	45	58	11	**58**	**60**	**11**
Bennett/Adams	72	59	11	66	60	12	65	61	11	64	61	11	62	60	12	62	58	12	**65**	**60**	**11**
Bethune/Kit Carson	47	61	14	43	62	15	41	63	15	43	63	15	37	63	15	41	55	15	**42**	**61**	**15**
Burlington/Kit Carson	49	63	12	32	62	13	36	63	13	34	63	13	40	62	13	39	61	13	**38**	**62**	**13**
Byers/Adams	59	63	12	52	64	13	58	64	13	58	64	13	58	64	13	63	63	13	**58**	**64**	**13**
Cheyenne Wells/Cheyenne	57	61	11	59	61	12	54	61	12	52	63	13	55	60	13	55	62	12	**55**	**61**	**12**
Eads/Kiowa	20	60	9	23	63	9	21	63	9	25	64	9	24	63	9	21	62	10	**22**	**62**	**9**
Julesburg/Sedgwick	42	60	11	39	62	12	39	61	12	37	63	12	37	63	12	43	60	12	**40**	**61**	**12**
Lamar S/Prowers	46	61	10	41	63	11	43	62	12	42	63	13	42	62	12	36	63	11	**42**	**62**	**11**
Lamar SW/Bent	27	58	11	30	58	12	27	58	12	30	60	12	29	60	12	33	57	12	**29**	**58**	**12**
Leroy/Logan	49	55	12	54	59	13	49	60	12	53	60	13	43	59	13	47	56	14	**49**	**58**	**13**
Otis/Washington	41	56	13	51	60	13	49	59	14	48	60	14	39	57	15	45	51	15	**46**	**57**	**14**
Prospect Valley/Adams	33	61	11	34	62	11	36	62	12	35	60	11	29	57	11	24	62	11	**32**	**61**	**11**
Severance/Weld (Irrigated)	137	64	13	122	61	12	126	62	12	118	62	11	135	61	12	116	59	13	**126**	**61**	**12**
Vilas/Baca	20	58	9	15	58	11	17	59	10	20	59	9	11	58	12	14	58	10	**16**	**58**	**10**
Walsh/Baca	43	62	-	41	63	-	37	63	-	38	64	-	39	64	-	38	62	-	**39**	**63**	**-**
Yuma/Yuma	29	58	12	32	63	11	30	62	11	31	63	12	25	60	12	28	59	12	**29**	**61**	**12**
Average	**48.8**	**59.9**	**11.4**	**47.6**	**61.1**	**12.0**	**46.5**	**61.1**	**12.0**	**46.5**	**61.6**	**12.1**	**45.5**	**60.6**	**12.4**	**44.2**	**58.9**	**12.4**	**46.5**	**60.5**	**12.1**
Yield Significance[b]	A			A,B			B,C			B,C			C,D			D					

LSD $_{(P<0.30)}$ for yield = 1.5 bu/ac, for test weight = 0.5 lb/bu, and for protein = 0.2 percent

[a]All yield and protein data are corrected to 12% moisture.

[b]Yield significance: varieties with different letters have yields that are significantly different from one another.

CSU Fall 2024 Dryland Winter Wheat Decision Tree



[1]No tolerance to herbicides used in Clearfield or CoAXium wheat production systems.
In categories with two or more varieties, they are listed from highest to lowest yield based on the 3-year CSU trial averages.

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Summary of 2024 Irrigated Winter Wheat Variety Performance Results

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Brand/Source	Market Class	Variety[a]	2024 Multi-Location Average						2024 Individual Trial Yield[b]		
			Yield[b]	Yield	Test Weight	Protein[c]	Lodging	Heading[d]	Burlington	Fort Collins	Wiggins
			bu/ac	percent of average	lb/bu	percent	score (1-9)[e]	days from average	bu/ac		
Colorado State University exp.	HRW	CO19D304R	***129.0***	*109%*	*60.1*	*12.5*	*1*	*3*	**100.5**	**126.0**	163.0
Colorado State University exp.	HRW	CO20022RC	*123.3*	*104%*	***61.5***	*12.8*	*1*	*0*	94.0	122.0	156.0
PlainsGold	HRW	Crescent AX	*123.3*	*104%*	*59.9*	*13.0*	*7*	*-2*	**100.5**	115.5	153.0
PlainsGold	**HWW**	Monarch	*123.2*	*104%*	*60.1*	*12.6*	*1*	*0*	94.5	121.0	152.0
Colorado State University exp.	HRW	CO20SFD020R	*122.9*	*104%*	***61.3***	*12.4*	*1*	*2*	94.0	111.5	**167.5**
Colorado State University exp.	**HWW**	CO18D007W	*122.3*	*103%*	*59.9*	*12.6*	*1*	*-1*	86.0	**127.0**	150.5
Colorado State University exp.	HRW	CO18D297R	*121.9*	*103%*	***60.7***	*12.7*	*1*	*0*	88.0	**123.5**	155.0
CROPLAN	HRW	CP7017AX	*121.6*	*103%*	*60.6*	*12.9*	*2*	*-1*	94.0	122.5	145.5
PlainsGold	HRW	Canvas	*121.4*	*102%*	***60.9***	*13.0*	*1*	*0*	95.5	122.5	148.5
AgriPro	HRW	SY Wolverine	*121.2*	*102%*	*58.6*	*13.6*	*1*	*2*	92.0	**125.0**	151.0
PlainsGold	**HWW**	Windom SF	*120.1*	*101%*	*59.0*	*12.9*	*2*	*-2*	91.5	115.5	153.5
PlainsGold	**HWW**	Breck	*120.0*	*101%*	***61.0***	*13.7*	*3*	*0*	90.0	115.5	155.0
PlainsGold	HRW	Kivari AX	*119.5*	*101%*	*58.5*	*12.2*	*7*	*0*	95.5	119.0	144.5
PlainsGold	HRW	Byrd CL Plus	*118.4*	*100%*	*60.1*	*13.2*	*3*	*0*	84.5	110.5	161.5
PlainsGold	HRW	Amplify SF	*118.2*	*100%*	*60.3*	*13.1*	*1*	*1*	86.5	108.5	158.5
PlainsGold	HRW	Guardian	*116.2*	*98%*	*60.2*	*13.5*	*1*	*1*	87.0	113.0	147.5
PlainsGold	**HWW**	Snowmass 2.0	*116.2*	*98%*	*59.8*	*12.9*	*1*	*-3*	92.0	114.0	143.0
Limagrain	HRW	LCS Radar	*114.6*	*97%*	*59.7*	*13.8*	*1*	*-4*	86.5	116.5	141.5
Limagrain	HRW	LCS Steel AX	*114.1*	*96%*	*58.9*	*13.2*	*1*	*4*	80.0	122.0	139.0
Colorado State University exp.	HRW	CO21SF191RA	*113.2*	*96%*	*58.1*	*14.1*	*2*	*3*	75.5	109.0	153.0
Limagrain	HRW	LCS Atomic AX	*113.0*	*95%*	*60.3*	*13.0*	*2*	*0*	86.0	106.5	145.0
NU Horizon Genetics	HRW	NE Prism CL2	*112.8*	*95%*	*60.2*	*13.7*	*1*	*0*	77.0	114.5	146.5
Colorado State University exp.	HRW	CO20SFD019R	*111.0*	*94%*	***60.9***	*13.3*	*1*	*-4*	85.5	106.0	145.0
CROPLAN	HRW	CP7266AX	*106.1*	*90%*	*60.2*	*12.6*	*2*	*0*	73.5	109.0	137.5
		Average	***118.5***	***100%***	***60***	***13.1***	***2***	***0***	**89.0**	**116.5**	**150.5**
		[f]LSD (0.30)	5.1		0.8				3.4	4.4	2.9
		[f]LSD (0.05)	9.7		1.6				6.6	8.4	5.6

[a]Varieties ranked from highest to lowest yield across three irrigated trials in 2024.

[b]Yield adjusted to 12% moisture content. Variety yield values in the top least significant difference (LSD) yield group across the locations and within each location are in bold. Multi-location yield values for each variety are least squares means and not arithmetic averages.

[c]Protein adjusted to 12% moisture content and averaged across two trials in 2024.

[d]Varieties with positive values headed later than the trial averages and varieties with negative values headed earlier than average. Based on one trial.

[e]Lodging score: 1 equals no lodging and 9 is severe lodging. Scores from three trials in 2024.

[f]Farmers selecting a variety based on yield should use the LSD (.30) to protect themselves from false negative conclusions (concluding varieties are the same when they are actually different). Companies or researchers may use the LSD (.05) to avoid false positive conclusions (concluding varieties are different when they are actually the same).

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Summary of 2-Year (2023-2024) Irrigated Winter Wheat Variety Performance Results

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Brand/Source	Market Class[b]	Variety[c]	2-Year Average[a] Yield	Yield	Test Weight	Test Weight	Plant Height	Protein
			bu/ac	% trial average	lb/bu	% trial average	in	percent
Colorado State University exp.	HRW	CO19D304R	114.8	106%	58.8	100%	33	12.2
Colorado State University exp.	HRW	CO18D297R	114.6	105%	59.8	102%	31	12.5
PlainsGold	**HWW**	Monarch	114.3	105%	59.2	101%	30	12.0
PlainsGold	HRW	Crescent AX	111.2	102%	59.4	101%	31	12.6
CROPLAN	HRW	CP7017AX	110.8	102%	59.5	101%	30	12.4
PlainsGold	HRW	Amplify SF	110.8	102%	59.1	101%	33	12.8
Colorado State University exp.	**HWW**	CO18D007W	110.3	101%	58.2	99%	31	12.3
PlainsGold	HRW	Byrd CL Plus	110.1	101%	58.5	100%	33	12.5
PlainsGold	HRW	Canvas	110.0	101%	59.1	101%	30	12.7
AgriPro	HRW	SY Wolverine	109.3	101%	57.3	98%	30	13.1
PlainsGold	HRW	Guardian	108.9	100%	59.4	101%	32	13.1
PlainsGold	**HWW**	Snowmass 2.0	106.7	98%	58.1	99%	29	12.6
PlainsGold	**HWW**	Windom SF	106.3	98%	57.6	98%	29	12.6
PlainsGold	**HWW**	Breck	106.0	98%	59.2	101%	31	13.0
Limagrain	HRW	LCS Steel AX	105.6	97%	58.7	100%	32	12.9
PlainsGold	HRW	Kivari AX	103.7	95%	57.1	97%	31	11.7
Limagrain	HRW	LCS Atomic AX	102.8	95%	59.3	101%	31	12.6
CROPLAN	HRW	CP7266AX	100.3	92%	59.1	101%	30	12.4
		Average	**108.7**	**100%**	**58.8**	**100%**	**31**	**12.6**

[a]The 2-year average yield, test weight, and protein are based on six trials (three 2024 and three 2023). Plant heights are based on five trials (three 2024 and two 2023).

[b]Market class: HRW=hard red winter wheat; **HWW**=hard white winter wheat.

[c]Varieties ranked from highest to lowest average 2-year yield.

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Summary of 3-Year (2022-2024) Irrigated Winter Wheat Variety Performance Results

Crops Testing www.csucrops.com

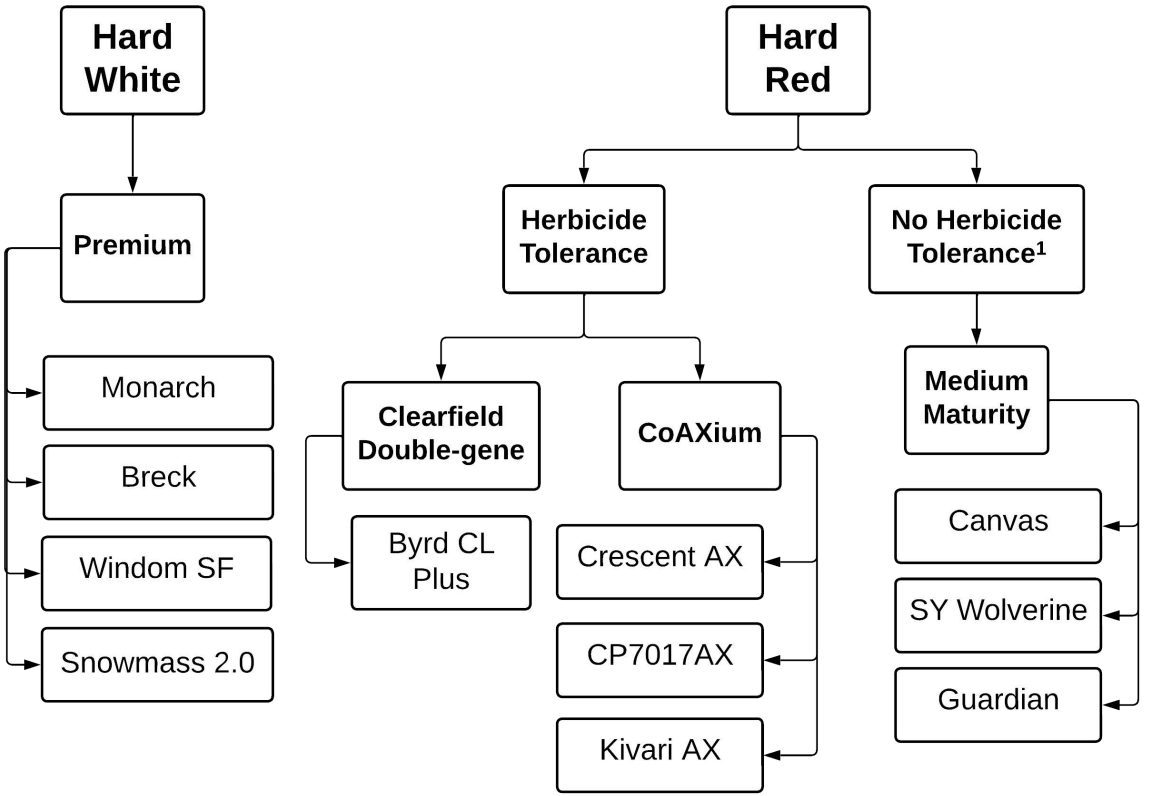
Brand/Source	Market Class[b]	Variety[c]	3-Year Average[a] Yield	Yield	Test Weight	Test Weight	Plant Height	Protein
			bu/ac	% trial average	lb/bu	% trial average	in	percent
Colorado State University exp.	HRW	CO18D297R	105.1	106%	60.1	101%	29	13.0
PlainsGold	**HWW**	Monarch	103.2	104%	59.6	100%	29	12.5
Colorado State University exp.	**HWW**	CO18D007W	102.3	104%	59.3	100%	29	13.0
PlainsGold	HRW	Crescent AX	101.0	102%	60.0	101%	30	13.2
CROPLAN	HRW	CP7017AX	100.9	102%	60.2	101%	28	13.1
PlainsGold	HRW	Canvas	100.5	102%	59.7	100%	29	13.3
PlainsGold	HRW	Byrd CL Plus	99.2	100%	59.2	99%	32	13.2
PlainsGold	**HWW**	Breck	97.7	99%	60.1	101%	29	13.7
PlainsGold	**HWW**	Windom SF	97.7	99%	58.7	99%	27	13.2
PlainsGold	HRW	Guardian	97.5	99%	60.0	101%	31	13.8
PlainsGold	HRW	Kivari AX	95.9	97%	58.3	98%	30	12.3
PlainsGold	**HWW**	Snowmass 2.0	93.5	95%	58.9	99%	29	13.4
CROPLAN	HRW	CP7266AX	90.9	92%	59.6	100%	29	13.2
		Average	**98.9**	**100%**	**59.5**	**100%**	**29**	**13.1**

[a]The 3-year average yield, test weight, and protein are based on nine trials (three each year). Plant heights are based on seven trials (three 2024, two 2023 and three 2022).

[b]Market class: HRW=hard red winter wheat; **HWW**=hard white winter wheat.

[c]Varieties ranked from highest to lowest average 2-year yield.

CSU Fall 2024 Irrigated Winter Wheat Decision Tree



[1]No tolerance to herbicides used in Clearfield or CoAXium wheat production systems.
In categories with two or more varieties, they are listed from highest to lowest yield based on the 2 or 3-year CSU trial averages.

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Wheat Production Management Tips

Sally Jones-Diamond and Tyler Benninghoven

hese tips are designed to help farmers make better management decisions for their fields and rm as a whole. Although wheat is a commonly grown crop in our region, sometimes basic gronomic practices that can vastly improve the production of the crop are ignored or forgotten. hese are also tips that can help prevent problems during the growing season when it's often too te to fix, such as with wheat viral diseases.

- **Focus on multi-year and location yield summary results when selecting a variety**. Use results from the two or three-year variety performance trials. Results across years and locations are a better predictor of how a variety will perform on your farm than looking at single year or location data. All CSU replicated wheat variety trial results can be accessed at our Crops Testing Program website at www.csucrops.org. You can also use the wheat variety database, which is an excellent resource for regional and multi-state data found at www.wheattrials.com.

- **Plant multiple varieties with different maturity and agronomic qualities to spread and reduce the risk of crop damage from environmental issues (drought, pests, etc.).** Planting a single variety across your whole farm can pose undue risk to your production as no single variety is best suited for all of your acres. Focus on a few important characteristics and find varieties that are best suited to each of them (examples could be high yielding, sawfly tolerance, virus resistance, early maturity, etc).

- **Plant in seeds per acre and not in pounds per acre.** Different varieties and seed lots can vary widely in seed size. Reassess and adjust your seeding rate as necessary when changing varieties, switching seed lots, and as planting season progresses. Plant population is very impactful to success with all crop production, and it's a factor we can control so we should aim to be accurate.

- **Control volunteer wheat and weeds to avoid loss of valuable soil moisture and to avoid creating a green bridge.** A green bridge is an area where the presence of weeds or volunteer wheat allows for unimpeded disease spread. Green bridges can lead to serious virus disease infections vectored by the wheat curl mite (wheat streak mosaic virus, High Plains wheat mosaic virus, and Triticum mosaic virus) or vectored by aphids (barley yellow dwarf virus and cereal yellow dwarf virus).

- **Plant nutrition is vital to produce healthy, high yielding, protein-rich grain.** Whether using conventional or organic sources, always aim to understand plant nutrition better each season. Never stop experimenting - incremental changes in plant available macronutrients like nitrogen, phosphorous, potassium, and sulfur are a great place to start. Nothing proves the success of a practice better than seeing the difference on your own farm.

- **Soil sample periodically to determine optimum fertilizer application rates.** Sampling should be done prior to planting. Soil samples can be sent to the CSU Soil, Water, and Plant Testing Laboratory, or the lab of your choice. Make sure the lab uses the correct testing methods for your soil. An example is using the Olsen bicarbonate test for accurate phosphorus levels in high pH soils.
- **Banded phosphate (MAP/40 rock/etc.) with or nearby the seed is recommended for optimum seedling health.** If banding phosphate has not been a common practice in your operation, consider trying 50 lb/acre of actual product on a few drill-fills next to your usual planting practice and see the difference for yourself.
- **Scout your fields throughout the season.** Noticing issues as they occur can help tremendously in avoiding bigger problems later in the season. If you don't have the time to scout all your acres, consider hiring a consultant to monitor a few fields and/or consult with your local CSU Extension agronomy agent for assistance.
- **Although tempting, do not try to spray for wheat stem sawfly.** There are no effective insecticides for WSS at this time.
- **Crop rotation is imperative to help control diseases and pests in wheat.** When considering rotational options, keep in mind that rotating to broadleaf crops is the best way to combat disease and weed problems.

Two Drill Calibration Methods to Improve Seeding Rate Accuracy

Sally Jones-Diamond

One of the many questions I get as an agronomist is "*what seeding rate should I use when drilling wheat - and please, in pounds per acre?*". I always take the opportunity to highlight the vast difference in seed size among varieties and seed lots, and encourage folks to plant using seeds per acre. It is not unusual to have seed lots with 12,000 seeds per pound, and some above 20,000 seeds per pound. A farmer planting 50 pounds per acre could be planting 600,000 seeds per acre (at 12k seeds/lb) or 1,000,000 seeds per acre (at 20k seeds/lb). If you are purchasing certified seed, the seeds/lb should be printed on the certification tag. If you are using bin-run seed, you can count out and weigh 100 seeds (grams is most accurate) and convert the 100 seed weight to seeds/lb by dividing the weight by 100 (to get weight per seed) and then dividing 453.6 (grams in a lb) by the weight per seed (let's say we get 0.035 g/seed) to get your seeds/lb (e.g. 12,960 seeds/lb). See Method 1 below for calibration using seeds/lb.

An advantage of planting seeds per acre is that you know how many seeds were planted per linear foot of row so stand counts can be taken after emergence to determine what percent of planted seed emerged. It is surprising that actual stands often turn out to be much lower than expected – even under seemingly good planting conditions. You don't have to know how many seeds per pound to be able to plant seeds per acre (see method 2 on next page).

Method 1: Seeding Rate (lb. Seed/Acre) Based on Seeds/lb. and Desired Final Population

		Desired Population (plants/acre)					
Seeds/lb.	**Emergence**	**400,000**	**500,000**	**600,000**	**700,000**	**800,000**	**900,000**
		actual seeding rate in lb/ac					
12,000	**80%**	42	52	63	73	83	94
14,000	**80%**	36	45	54	63	71	80
16,000	**80%**	31	39	47	55	63	70
18,000	**80%**	28	35	42	49	56	63
20,000	**80%**	25	31	38	44	50	56
12,000	**90%**	37	46	56	65	74	83
14,000	**90%**	32	40	48	56	63	71
16,000	**90%**	28	35	42	49	56	63
18,000	**90%**	25	31	37	43	49	56
20,000	**90%**	22	28	33	39	44	50

<u>Method 2</u>: Seeding Rate in Seeds/Foot of Row (No Seed Size Information Needed)

Instructions for chart below:

Step 1: Determine desired plant population depending on the date of planting. For example, if planting in early September, you might want 500,000 plants per acre to avoid having too many plants and tillers the next spring that might deplete available soil moisture

Step 2: Read across the row in the chart at your desired population and find the row spacing for your drill.

Step 3: Continue reading across the row from step 2 and estimate your percent emergence rate based upon your planting conditions. Set your drill accordingly to match up with the suggested seeds per linear foot of row.

Step 4: Validate your seeds/foot of row before entering the field.

			***<u>Step 3:</u>* Emergence Percent**		
	<u>Step 1:</u>	***<u>Step 2:</u>***	**Average**	**Excellent**	
Seeding Date	**Plant Population**	**Row Spacing**	**70%**	**80%**	**90%**
	plants/acre	**inches**	**seeds/linear foot of row**		
Late Aug.	**300,000**	**6.0**	5	4	4
	300,000	**7.5**	6	5	5
	300,000	**10.0**	8	7	6
	300,000	**12.0**	10	9	8
Early Sept.	**500,000**	**6.0**	8	7	6
	500,000	**7.5**	10	9	8
	500,000	**10.0**	14	12	11
	500,000	**12.0**	16	14	13
Mid-Sept.	**700,000**	**6.0**	11	10	9
	700,000	**7.5**	14	13	11
	700,000	**10.0**	19	17	15
	700,000	**12.0**	23	20	18
Late Sept./ Early Oct.	**900,000**	**6.0**	15	13	11
	900,000	**7.5**	18	16	14
	900,000	**10.0**	25	22	19
	900,000	**12.0**	30	26	23

Source: Jones-Diamond and Johnson, 2012

Description of Winter Wheat Varieties in Eastern Colorado Dryland and Irrigated Trials (2023-2024)

Name/Class/Pedigree	Origin	HD	HT	SS	COL*	YR	LR	SR	WSMV**	TW	WSS+	PRO++	MILL	BAKE	Comments
Amplify SF Hard red winter Bearpaw/Antero//Antero	CSU 2021	6	7	4	7	6	3	2	6	4	1	5	4	5	CSU release (2021), marketed by PlainsGold. Medium height, medium maturity. Carries the semi-solid stem trait (17 out of 25 rating) for partial resistance to the wheat stem sawfly. Certified seed only.
AP Bigfoot Hard red winter Undisclosed	AgriPro 2022	4	5	3	3	6	2	2	4	1	7	5	4	6	Agripro release (2021). First entered in CSU variety trials in 2022. Early to med-early variety with very good test weight and WSMV tolerance.
AP Solid Hard red winter Undisclosed	AgriPro 2021	7	3	3	5	7	6	5	5	2	1	3	2	6	Agripro release (2021). First entered in CSU variety trials in 2020. Medium-late semi-solid stem variety for use in managing wheat stem sawfly. Very good test weight and straw strength.
Avery Hard red winter TAM 112/Byrd	CSU 2015	5	7	7	4	6	8	8	2	5	6	6	3	3	CSU release (2015), marketed by PlainsGold. Doubled haploid-derived line, similar to Byrd with higher yield potential, larger kernels and slightly improved quality. Carries wheat curl mite resistance from TAM 112 parent. Susceptible to stripe rust.
Brawl CL Plus Hard red winter Teal 11A/Above//CO99314	CSU 2011	2	7	1	7	6	6	7	5	4	6	1	4	5	CSU release (2011), marketed by PlainsGold. Two-gene Clearfield wheat. Excellent test weight, straw strength, milling and baking quality. Early maturity, medium height, long coleoptile. Intermediate reaction to both stripe rust and leaf rust. Certified seed only.
Breck Hard white winter Denali/HV9W07-482W//Antero	CSU 2017	5	6	5	8	7	5	2	4	2	7	2	2	4	CSU release (2017), marketed by PlainsGold in CWRF-Ardent Mills UltraGrain Premium Program. Good stripe rust resistance, sprouting tolerance, straw strength, grain protein deviation, and quality. Very high test weight, lower polyphenol oxidase (PPO) activity for improved whole grain bread and noodle quality. Certified seed only.
Byrd Hard red winter TAM 112/CO970547-7	CSU 2011	4	6	6	4	8	7	8	2	5	8	5	3	3	CSU release (2011), marketed by PlainsGold. Excellent drought tolerance (from TAM 112) and quality. Average test weight and straw strength. Moderately susceptible to stripe rust. Carries wheat curl mite resistance from TAM 112 parent.
Byrd CL Plus Hard red winter CO06072/4*Byrd	CSU 2018	5	8	5	7	5	5	8	5	5	3	6	3	5	CSU release (2018), marketed by PlainsGold. Two-gene Clearfield wheat in Byrd background. Highly similar to Byrd with exception of tolerance to Beyond herbicide. Has shown some non solid-stem based tolerance to wheat stem sawfly. Certified seed only.
Canvas Hard red winter Denali/Antero//Byrd	CSU 2018	5	4	2	5	3	6	2	3	4	5	4	2	3	CSU release (2018), marketed by PlainsGold. Hard red winter, medium maturing, medium-short, good straw strength. Good stripe and stem rust resistance and carries wheat curl mite resistance from Byrd parent. Good test weight and milling and baking quality.

Column Key - heading date (HD), plant height (HT), straw strength (SS), coleoptile length (COL), stripe rust resistance (YR), leaf rust resistance (LR), stem rust resistance (SR), wheat streak mosaic virus tolerance (WSMV), wheat stem sawfly tolerance (WSS), test weight (TW), protein (PRO), milling (MILL) and baking quality (BAKE). Rating scale: 1 - very good, very resistant, very early, or very short to 9 - very poor, very susceptible, very late, or very tall/long. A priority is given to data collected in Colorado. Regional data or developer input is utilized when Colorado specific data is unavailable.

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+WSS ratings are based on field evaluation of tolerance to wheat stem sawfly cutting in Colorado. Values do not represent the level of stem solidness expression. See comments for solidness rating.
++ PRO ratings represent “grain protein deviation” (relative grain protein level accounting for differences in grain yield).

Description of Winter Wheat Varieties in Eastern Colorado Dryland and Irrigated Trials (2023-2024)

Name/Class/Pedigree	Origin	HD	HT	SS	COL*	YR	LR	SR	WSMV**	TW	WSS+	PRO++	MILL	BAKE	Comments
CO18035RA Hard red winter (AF28/Byrd//AF26/Byrd)//2*Byrd/(AF28/Byrd//AF10 M3/2*Byrd)//2*Byrd/Byrd//(AF10 M3/2*Byrd//AF26/Byrd)//2*Byrd/(AF28/Byrd//AF26/Byrd)//2*Byrd/Langin	CSU EXP	2	4	6	4	4	7	6	4	5	6	4	3	2	CSU experimental line. Three gene CoAXium wheat for winter annual grassy weed control. Wheat curl mite resistance from Byrd. Very good milling and baking quality. Potential release in 2024.
CO18042RA Hard red winter (AF28/Byrd//AF26/Byrd)//2*Byrd/(AF28/Byrd//AF10 M3/2*Byrd)//2*Byrd/Byrd//(AF10 M3/2*Byrd//AF26/Byrd)//2*Byrd/(AF28/Byrd//AF26/Byrd)//2*Byrd/Langin	CSU EXP	4	7	7	5	3	8	7	4	5	6	6	3	3	CSU experimental line. Three gene CoAXium wheat for winter annual grassy weed control. Acidic soil tolerance. Wheat curl mite resistance from Byrd. Very good milling and baking quality. Potential release in 2024.
CO18D007W Hard white winter CO12D906/CO07W722-F5	CSU EXP	4	4	2	5	7	6	1	4	5	8	2	3	3	CSU release (2023), not yet commercially available. Hard white winter wheat. Mid to early maturity and slightly short stature. Excellent straw strength and overall yield performance in irrigated and dryland environments. Excellent grain protein deviation. Very good milling and baking quality.
CO18D297R Hard red winter CO12D906/CO11D1353//Monarch	CSU EXP	5	6	5	8	2	5	1	5	3	8	3	3	4	CSU release (2023), not yet commercially available. Medium maturity and height and moderate straw strength. Good overall yield performance in irrigated and dryland environments. Good resistance to stripe rust, stem rust, and moderate for leaf rust. Excellent grain protein deviation. Good milling and baking quality.
CO19393R Hard red winter CO12D1614/KS11HW39-6	CSU EXP	6	7	5	4	1	8	2	4	4	5	4	4	4	CSU experimental line, first entered into the CSU trials in 2023. Performed at 107% of the trial mean for yield in 2023. *Wsm2* for resistance to WSMV. Excellent resistance to stripe rust and stem rust. Above average milling and baking. Potential release in 2024 or 2025.
CO19410R Hard red winter Avery/CO07W722-F5//CO11D1316W	CSU EXP	5	6	6	5	4	8	2	2	5	5	5	3	3	CSU experimental line, first entered into the CSU trials in 2023. Performed at 110% of the trial mean for yield in 2023. Resistant to the wheat curl mite which vectors the mosaic virus complex. Moderate resistance to stripe rust and good resistance to stem rust. Good milling and baking quality. Potential release in 2024 or 2025.
CO19D087R Hard red winter CO12D1777/Langin	CSU EXP	3	2	4	4	2	7	2	2	4	6	4	4	3	CSU experimental line, first entered into the CSU trials in 2023. Performed at 115% of the trial mean for yield in southeastern Colorado in 2023. Resistant to the wheat curl mite which vectors the mosaic virus complex. Good resistance to stripe rust and stem rust. Good milling and baking quality. Acid soil tolerant. Potential release in 2024 or 2025.
CO19D304R Hard red winter Snowmass 2.0/CO13D1164	CSU EXP	7	8	6	5	2	8	8	6	7	7	7	3	3	CSU experimental line, first entered into the CSU trials in 2023. Performed at 111% of the trial mean for yield in southeastern Colorado in 2023. Good resistance to stripe rust. Good milling and baking quality. Potential release in 2024 or 2025.
CO19S129W Hard white winter CO13D1638/Snowmass 2.0	CSU EXP	6	5	4	4	2	9	5	4	5	2	5	5	2	CSU experimental line, first entered into the CSU trials in 2023. Hard white winter wheat. Performed at 104% of the trial mean for yield in 2023. *Wsm2* for resistance to WSMV. Good resistance to stripe rust. Excellent baking quality. Potential release in 2024 or 2025.

Column Key - heading date (HD), plant height (HT), straw strength (SS), coleoptile length (COL), stripe rust resistance (YR), leaf rust resistance (LR), stem rust resistance (SR), wheat streak mosaic virus tolerance (WSMV), wheat stem sawfly tolerance (WSS), test weight (TW), protein (PRO), milling (MILL) and baking quality (BAKE). Rating scale: 1 - very good, very resistant, very early, or very short to 9 - very poor, very susceptible, very late, or very tall/long. A priority is given to data collected in Colorado. Regional data or developer input is utilized when Colorado specific data is unavailable.

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Description of Winter Wheat Varieties in Eastern Colorado Dryland and Irrigated Trials (2023-2024)

Name/Class/Pedigree	Origin	HD	HT	SS	COL*	YR	LR	SR	WSMV**	TW	WSS+	PRO++	MILL	BAKE	Comments
CO200037R Hard red winter Canvas//X170868/Canvas	CSU EXP	6	4	4	6	4	5	1	2	4	6	4	3	4	CSU experimental line, first entered into the CSU trials in 2023. Similar performance as Canvas. Resistant to the wheat curl mite and contains a new gene, *Wsm3,* with broad resistance against the mosaic virus complex. Moderate resistance to stripe rust and stem rust. Good milling and baking quality. Acid soil tolerant. Potential release in 2024 or 2025.
CO20D108R Hard red winter CO13D1320/CO13D1479//Canvas	CSU EXP	7	6	4	6	4	5	1	2	6	5	6	4	2	CSU experimental line, first entered into the CSU trials in 2023. Performed at 106% of the trial mean for yield in 2023. Resistant to the wheat curl mite which vectors the mosaic virus complex. Moderate resistance to stripe rust and good resistance to stem rust. Good milling and excellent baking quality. Potential release in 2024 or 2025.
CP7017AX Hard red winter Undisclosed	Croplan 2020	4	2	7	5	3	4	1	2	4	6	6	3	7	CROPLAN by WinField United release (2020). First entered into CSU trials in 2020. CoAXium wheat for winter annual grassy weed control. Strong yield potential, strong drought tolerance, tolerates acid soils and resistant to soilborne mosaic virus. Certified seed only.
CP7220 Hard red winter Undisclosed	Croplan 2024	6	5	--	--	4	4	--	--	1	--	3	4	4	CROPLAN by WinField United release (2024). First entered into the CSU trials in 2024. Adapted to Northern Central Plains, with excellent test weight.
CP7266AX Hard red winter Undisclosed	Croplan EXP	5	5	5	6	2	1	5	--	5	5	6	2	7	CROPLAN by WinField United release (2021). First entered into CSU trials in 2022. CoAXium wheat for winter annual grassy weed control. Medium height and maturity, good resistance to stripe rust and leaf rust.
Crescent AX Hard red winter (AF28/Byrd)//(AF10/2*Byrd)	CSU 2018	3	7	8	5	4	6	--	2	4	6	7	2	2	CSU release (2018), marketed by PlainsGold. CoAXium wheat for winter annual grassy weed control. Approximately 66% Byrd and 34% Hatcher parentage. Earlier and much improved yield and test weight relative to Incline AX. Intermediate reaction to stripe rust and carries wheat curl mite resistance from Byrd parent. Certified seed only.
Fortify SF Hard red winter Byrd/Bearpaw//Byrd	CSU 2019	4	6	5	6	7	7	4	2	3	2	5	2	6	CSU release (2019), marketed by PlainsGold. Medium height, medium maturity. Carries wheat curl mite resistance from Byrd parent and semi-solid stem trait (13 out of 25 rating) for partial resistance to the wheat stem sawfly. Certified seed only.
Guardian Hard red winter Antero/Snowmass//Byrd	CSU 2019	6	7	7	8	3	4	2	1	3	7	2	3	3	CSU release (2019), marketed by PlainsGold. Medium height, medium maturity. Excellent resistance to WSMV due to combination of resistance to wheat curl mite and the virus itself via *Wsm2*. Good combined resistance to all three rusts, good test weight, good milling and baking quality, high grain protein deviation. Certified seed only.
Hatcher Hard red winter Yuma/PI 372129//TAM-200/3/4*Yuma/4/KS91H184/Vista	CSU 2004	5	4	6	4	4	7	3	6	6	4	7	5	5	CSU release (2004), marketed by PlainsGold. Medium maturing semidwarf. Good test weight, moderate resistance to stripe rust, good milling and baking quality. Develops “leaf speckling” condition.

Column Key - heading date (HD), plant height (HT), straw strength (SS), coleoptile length (COL), stripe rust resistance (YR), leaf rust resistance (LR), stem rust resistance (SR), wheat streak mosaic virus tolerance (WSMV), wheat stem sawfly tolerance (WSS), test weight (TW), protein (PRO), milling (MILL) and baking quality (BAKE). Rating scale: 1 - very good, very resistant, very early, or very short to 9 - very poor, very susceptible, very late, or very tall/long. A priority is given to data collected in Colorado. Regional data or developer input is utilized when Colorado specific data is unavailable.

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Kivari AX Hard red winter (AF28/Byrd)//(AF10/2*Byrd)	CSU 2020	5	6	8	6	6	8	5	3	6	5	8	3	3	CSU release (2020), marketed by PlainsGold. CoAXium wheat for winter annual grassy weed control. Higher yielding and slightly later maturing than Crescent AX. Intermediate reaction to stripe rust and carries wheat curl mite resistance from Byrd parent. Certified seed only.
KS Big Bow Hard white winter KS050223M-2/KS11W15	KS-Manhattan 2022	5	5	4	3	4	--	2	2	3	--	5	4	5	KSU release (2022), marketed by the Kansas Wheat Alliance. First tested in 2023. Medium maturity and medium height. Resistant to WSMV.
KS Territory Hard red winter KS11HW15/TX10A001006	KS-Hays 2022	5	4	3	5	2	4	4	2	5	--	5	5	6	KSU release (2022), marketed by the Kansas Wheat Alliance. First entered in the CSU trial in 2023. Medium maturity, excellent straw strength, and resistant to WSMV and Triticum mosaic virus (TriMV).
Langin Hard red winter CO050270/Byrd	CSU 2016	1	4	8	3	3	6	8	6	5	6	6	3	3	CSU release (2016), marketed by PlainsGold. Early maturing semidwarf. Good drought stress tolerance and winterhardiness, stripe rust resistance, and quality. Medium coleoptile. Carries wheat curl mite resistance from Byrd parent. Very high yield potential for irrigation, but straw strength requires use of growth regulator.
LCS Atomic AX Hard red winter Undisclosed	Limagrain 2019	2	3	4	1	2	2	9	--	4	8	4	3	5	Limagrain release (2019), first entered in CSU Variety Trials in 2021. CoAXium wheat for winter annual grassy weed control. Excellent straw strength and resistance to stripe rust. Certified seed only.
LCS Julep Hard red winter T153/LCS Mint	Limagrain 2020	5	5	5	4	2	4	4	--	4	--	3	3	3	Limagrain release (2020). First entered in CSU variety trials in 2020. Medium maturity variety with very good stripe rust resistance and intermediate stem and leaf rust resistance. Adatped across the Central Plains. Good WSMV tolerance.
LCS Radar Hard red winter Undisclosed	Limagrain 2024	--	7	7	--	1	2	5	3	5	--	5	2	2	Limagrain release (2024). First entered into the CSU trials in 2024. Broadly adapted across the Great Plains, very good to excellent stripe and leaf rust resistance.
LCS Steel AX Hard red winter LCH13KSDH-20-87 / ACC 7-38	Limagrain 2021	1	4	2	4	8	2	8	--	3	--	3	3	6	Limagrain release (2021). First entered into the trials in 2023. CoAXium wheat for winter annual grass weed control. Broad adaptation, very good leaf rust resistance and excellent straw strength. Certified seed only.
LCS White Lightning Hard white winter Undisclosed	Limagrain 2024	--	5	9	--	1	3	9	--	6	--	7	2	4	Limagrain release (2024). First entered into the CSU trials in 2024. Hard white wheat. Adapted to western Great Plains, With excellent resistance to stripe rust. Certified seed only.

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Monarch Hard white winter CO07W722-F5/Snowmass//CO07W722-F5	CSU 2018	6	3	3	6	5	5	2	4	4	3	7	3	4	CSU release (2018), marketed by PlainsGold. Hard white winter with excellent straw strength and very high irrigated yield potential. Good stripe rust resistance. Quality more similar to Breck, but very low PPO. Certified seed only.
Ray Hard red winter Yellowstone*2/98X168E1	MT State 2018	9	9	7	3	2	--	8	--	6	--	4	4	4	Forage line available through the PlainsGold Brand with improved grain yield compared to other forage varieties.
Snowmass 2.0 Hard white winter CO07W722-F5/Snowmass//Brawl CL Plus	CSU 2018	4	4	4	4	4	5	1	3	5	5	4	3	1	CSU release (2018), marketed by PlainsGold in CWRF-Ardent Mills Ultragrain Premium Program. Hard white wheat, quality profile very similar to Snowmass but low PPO and better grain protein deviation. Good stripe and stem rust resistance and wheat streak mosaic virus resistance. Good straw strength, good test weight. Certified seed only.
Steamboat Hard red winter TAM 114/Antero//Byrd	CSU 2020	6	9	7	7	3	3	3	2	3	5	6	3	4	CSU release (2020), marketed by Crop Research Foundation of Wyoming. Medium maturing, tall, marginal straw strength. Good resistance to all three rusts and carries resistance to the wheat curl mite from Byrd. Good test weight and milling and baking quality.
Sunshine Hard white winter KS01HW152-6/HV9W02-267W	CSU 2014	3	6	7	5	5	6	2	7	6	6	4	4	4	CSU release (2014), marketed by PlainsGold in CWRF-Ardent Mills Ultragrain Premium Program. Hard white wheat. Excellent quality, good sprouting tolerance and straw strength, intermediate reaction to stripe rust. Very susceptible to mite-transmitted viruses. Certified seed only.
SY Wolverine Hard red winter Everest/Platte//SY Wolf	Agripro 2019	4	2	2	5	4	2	2	4	5	6	2	2	5	Agripro release (2019), first entered in CSU trials in 2019. Good overall disease resistance, good straw strength. Similar to SY Wolf in reaction to wheat streak mosaic virus. Good test weight. Certified seed only.
Valley Hard white winter CO07W722-F5/Antero//Snowmass	CSU 2022	5	7	4	3	3	6	4	4	5	4	4	4	2	CSU release (2018) marketed by PlainsGold in CWRF-Ardent Mills Ultragrain Premium Program. White-seeded with excellent quality and good pre-harvest sprouting tolerance. Moderately resistant to stripe, leaf, and stem rust. Medium height and medium maturity.
Whistler Hard red winter CO08W218/Snowmass//Byrd	CSU 2018	7	9	9	8	3	6	1	2	6	6	5	4	3	CSU release (2018), marketed by PlainsGold. Hard red winter, later maturing, tall, marginal straw strength. Good stripe and stem rust resistance and carries wheat curl mite resistance from Byrd parent. Very good milling and baking quality.
Windom SF Hard white winter Warhorse/Breck//CO12D1028	CSU 2022	4	2	4	7	6	8	1	3	2	1	5	3	3	CSU release (2021), marketed by PlainsGold in CWRF-Ardent Mills Ultragrain Premium Program. White-seeded with strong mixing and baking properties. Semi-solid stem (16/25) for partial resistance to the wheat stem sawfly. Wsm2 for resistance to wheat streak mosaic virus. Very good test weight, long coleoptile, tolerance to lower pH. Certified

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Small Grain Forage Trial Results

Sally Jones-Diamond, Kat Caswell, and Katie Russell

The 2023-2024 growing season was the third year of testing winter annual forages as a potential dual-purpose crop. There is little external information available on the quality and yield of forage for dual-purpose wheats as they have not been widely grown in our region. It is critical to possess local information about wheat varieties that have favorable forage characteristics with a potential for grain production and vice versa.

Testing Methods:
Entries were planted in small plots (6' by 30') at four dryland locations: Akron, Burlington, Orchard, and Yellow Jacket. Each site had a minimum of six wheat varieties, up to twelve. The six core varieties tested at all sites were Ray, Willow Creek, MTF1435, TAM 204, OK Corral, and Amplify SF. Orchard had two additional varieties, AP Baldy and SY Monument. At Akron, three additional wheat varieties (AP Baldy, SY Monument, and Cash) were tested, along with a triticale (719 Flex), and two forage hybrid rye lines (KWS Aviator and KWS Progas), for a total of twelve entries.

Forage sub-samples were cut from the center of the plots as each variety reached the early heading stage to determine forage yield and quality, with exception to Yellow Jacket where all varieties were sampled the same day. Forage wet and dry weights were obtained and used to calculate dry matter yield. Hay quality information based on NIR analyses was done by Dairyland Laboratories in Acadia, WI. The remainder of the plots were harvested for grain (yield area adjusted to account for forage sampling), and grain test weight and protein analyses were performed.

Yield, test weight, and dry matter yield values were statistically analyzed, and least significant differences are provided under each location table to compare entries within a location.

Results:
We harvested forage and grain from three of the four sites (Burlington lost to drought). Forage dry matter yield, harvest moisture, and quality, along with grain yield and quality from the three locations are shown on the next page.

COLORADO STATE UNIVERSITY EXTENSION

2024 Dryland Winter Forage Variety Performance Trials at Akron, Orchard, and Yellow Jacket

Crops Testing
www.csucrops.com

Akron

			Forage Harvest			Grain Harvest			Forage Quality[a]								
Brand/Source	Variety	Forage Species[b]	Dry Matter Yield	Moisture	Harvest Date	Yield	Test Weight	Protein	CP	RFQ	aNDFom	NDFD30	NDFD240	TDN	NEL	NEG	Milk/Ton
			ton/ac	% at harvest		lb/ac	lb/bu	percent	percent						Mcal/cwt	Mcal/cwt	lb/ton
TriCal	719 Flex Triticale	T	**5.5**	75	18-May	3676	43	13	10.5	141	58	59	75	60	61	33	2725
Montana State Univ.	Cash	W	4.7	74	28-May	3095	50	13	10.5	160	54	58	74	63	66	37	3007
Montana State Univ.	MTF1435	W	4.6	74	28-May	3809	51	13	10.0	152	56	60	76	61	64	35	2865
AgriPro	AP Baldy	W	4.3	72	28-May	3922	55	12	9.6	155	51	56	74	64	67	36	3030
AgriPro	SY Monument	W	3.7	71	24-May	3463	56	12	10.9	170	48	58	73	65	69	40	3207
PlainsGold	Ray	W	3.7	73	31-May	4112	51	13	9.3	153	51	55	75	65	67	36	3028
KWS Cereals	KWS AVIATOR	HR	3.7	80	13-May	3945	53	10	12.0	172	54	62	78	63	67	41	3114
KWS Cereals	KWS PROGAS	HR	3.5	79	13-May	**4979**	53	10	10.6	161	58	61	77	61	65	38	2990
Oklahoma Genetics, Inc	OK Corral	W	3.5	70	23-May	4343	54	12	11.2	188	48	67	80	66	72	46	3452
Watley Seed	TAM 204	W	3.2	73	18-May	3876	52	12	10.8	186	46	63	77	67	72	45	3419
PlainsGold	Amplify SF	W	3.1	75	18-May	4468	**59**	11	9.8	155	50	59	75	65	66	37	3007
Montana State Univ.	Willow Creek	W	-	-	-	2045	53	15	11.2	146	54	61	75	61	63	36	2818
		Average	3.9	74	22-May	3811	52	12	10.5	162	52	60	76	63	66	38	3055
		LSD (0.30)[c]	0.5			272	1										
		LSD (0.05)[c]	1.0			528	2										
		Coefficient of Variation (CV)	9.6			5.3	2.0										

Orchard

			Forage Harvest			Grain Harvest			Forage Quality[a]								
Brand/Source	Variety	Forage Species[b]	Dry Matter Yield	Moisture	Harvest Date	Yield	Test Weight	Protein	CP	RFQ	aNDFom	NDFD30	NDFD240	TDN	NEL	NEG	Milk/Ton
			ton/ac	% at harvest		lb/ac	lb/bu	percent	percent						Mcal/cwt	Mcal/cwt	lb/ton
Montana State Univ.	MTF1435	W	**3.8**	66	31-May	2806	56	14.0	16.1	179	48	66	81	68	68	44	3199
PlainsGold	Ray	W	**3.7**	67	31-May	2904	52	13.7	14.2	164	50	65	82	66	63	38	2865
PlainsGold	Amplify SF	W	3.3	69	20-May	**3111**	**58**	12.7	15.9	197	48	70	84	68	71	49	3425
AgriPro	AP Baldy	W	3.1	70	23-May	**3005**	**58**	13.3	14.7	214	46	73	86	70	74	52	3674
Oklahoma Genetics, Inc	OK Corral	W	3.1	71	20-May	**3042**	51	13.4	17.0	192	47	70	84	69	71	49	3443
Montana State Univ.	Willow Creek	W	2.9	67	31-May	1205	54	15.7	16.7	162	49	62	78	66	65	41	2995
AgriPro	SY Monument	W	2.8	73	20-May	**3248**	56	12.2	17.9	201	46	72	85	68	72	51	3494
Watley Seed	TAM 204	W	2.5	72	20-May	**3085**	52	13.4	15.0	189	48	67	82	67	70	46	3312
		Average	3.1	69	24-May	2801	55	13.6	15.9	187	48	68	83	68	69	46	3301
		LSD (0.30)[c]	0.4			251	0.7										
		LSD (0.05)[c]	0.8			500	1.4										
		Coefficient of Variation (CV)	7.9			8.8	2.0										

Yellow Jacket

			Forage Harvest			Grain Harvest			Forage Quality[a]								
Brand/Source	Variety	Forage Species[b]	Dry Matter Yield	Moisture	Harvest Date	Yield	Test Weight	Protein	CP	RFQ	aNDFom	NDFD30	NDFD240	TDN	NEL	NEG	Milk/Ton
			ton/ac	% at harvest		lb/ac	lb/bu	percent	percent						Mcal/cwt	Mcal/cwt	lb/ton
Watley Seed	TAM 204	W	**1.7**	60	6-Jun	-	-	-	11.7	163	50	61	79	66	66	38	3024
PlainsGold	Amplify SF	W	**1.7**	59	6-Jun	-	-	-	12.0	188	53	68	83	66	70	46	3349
Oklahoma Genetics, Inc	OK Corral	W	**1.7**	58	6-Jun	-	-	-	12.7	182	49	63	80	67	70	43	3279
Montana State Univ.	MTF1435	W	1.6	65	6-Jun	-	-	-	11.6	166	53	63	77	63	65	39	2993
PlainsGold	Ray	W	1.4	67	6-Jun	-	-	-	14.5	220	45	78	89	69	75	54	3733
Montana State Univ.	Willow Creek	W	1.3	66	6-Jun	-	-	-	14.9	182	45	66	81	67	68	44	3225
		Average	1.5	62	6-Jun				12.9	184	49	66	82	66	69	44	3267
		LSD (0.30)[c]	0.1														
		LSD (0.05)[c]	0.2														
		Coefficient of Variation (CV)	8.7														

[a]All forage quality analyses results are dry basis values. CP=crude protein; RFQ=relative feed quality; aNDFom=ash free neutral detergent fiber; NDFD30=neutral detergent fiber digestibility at 30 hours; NDFD240=neutral detergent fiber digestibility at 240 hours;TDN=total digestible nutrients, NEL=net energy for lactation; NEG=net energy gain; and Milk/ton=predicted amount of milk produced per ton of dry matter calculated using MILK2013.

[b]Forage Species: HR=Hybrid Rye, T=Triticale, and W=Wheat

[c]If the difference between two variety yields equals or exceeds the LSD value, the difference is significant. Farmers selecting a variety based on yield should use the LSD (0.30) to protect from false negative decisions. Companies or researchers may be interested in the LSD (0.05) to avoid false positive conclusions.

Trials were harvested for grain on July 2 (Orchard), and July 15 (Akron).

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