



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**

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Authors

Sally Jones-Diamond, Director & Agronomist - Crops Testing Program, CSU Dept. of Soil & Crop Sciences, Phone: 970-214-4611, E-mail: sally.jones@colostate.edu

Dr. Esten Mason, Associate Professor & Wheat Breeder, CSU Dept. of Soil & Crop Sciences, Phone: 970-491-5787, E-mail: esten.mason@colostate.edu

Ed Asfeld, Research Associate & Field Technician - Crops Testing Program, CSU Dept. of Soil & Crop Sciences, Phone: 970-554-0980, E-mail: ed.asfeld@colostate.edu

Jason Webb, Research Associate & Agronomist - Crops Testing Program, CSU Dept. of Soil & Crop Sciences, Phone: 970-520-1359, E-mail: jason.webb@colostate.edu

Mikayla Hammers, Graduate Student - CSU Wheat Breeding Program, CSU Dept. of Soil & Crop Sciences, E-mail: mik.hammers@colostate.edu

Ron Meyer, Agronomy Specialist - Golden Plains Area, CSU Extension, Phone: 719-346-5571, E-mail: rf.meyer@colostate.edu

Michaela Mattes, Agronomy Specialist - Southeast Area, CSU Extension, E-mail: michaela.mattes@colostate.edu

Kat Caswell, Agronomy Specialist - Washington and Weld Counties, CSU Extension, Phone: 970-381-8533, E-mail: kat.caswell@colostate.edu

Catie Green, Agronomy Specialist - Sedgwick County, CSU Extension, Phone: 970-474-3479, E-mail: catie.green@colostate.edu

Tyler Benninghoven - Seed and Trait Specialist - PlainsGold, Colorado Wheat, Phone: 970-702-1460, E-mail: tbenninghoven@coloradowheat.org

Dr. Judy Harrington, Research Associate - Crops Testing Program, CSU Dept. of Soil & Crop Sciences, E-mail: judy.harrington@colostate.edu

Ayden Marler, Undergraduate Research Assistant - Crops Testing Program, CSU Dept. of Soil & Crop Sciences, E-mail: ayden.marler@colostate.edu

Zane Jenkins, Station Manager and Agronomist - Plainsman Research Center, CSU Agricultural Experiment Station, Phone: 719-353-1017, E-mail: zane.jenkins@colostate.edu

Dr. Kyle Mankin, Research Leader, USDA-ARS Water Management and Systems Research Unit, Phone: 970-492-7401, E-mail: kyle.mankin@usda.gov

Dr. Peter Kleinman, Research Leader, USDA-ARS Soil Management and Sugarbeet Research Unit, Phone: 970-492-7200, E-mail: peter.kleinman@usda.gov

Brett Pettinger, Research Associate - Plainsman Research Center, CSU Agricultural Experiment Station, Phone: 719-324-5643, E-mail: brett.pettinger@colostate.edu

Additional Resources

Colorado State University Crop Variety Testing Program: www.csucrops.org and on X (formerly Twitter) with the handle [@CSUCrops](https://twitter.com/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 ft² except the Fort Collins irrigated trial, which was 80 ft². 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.

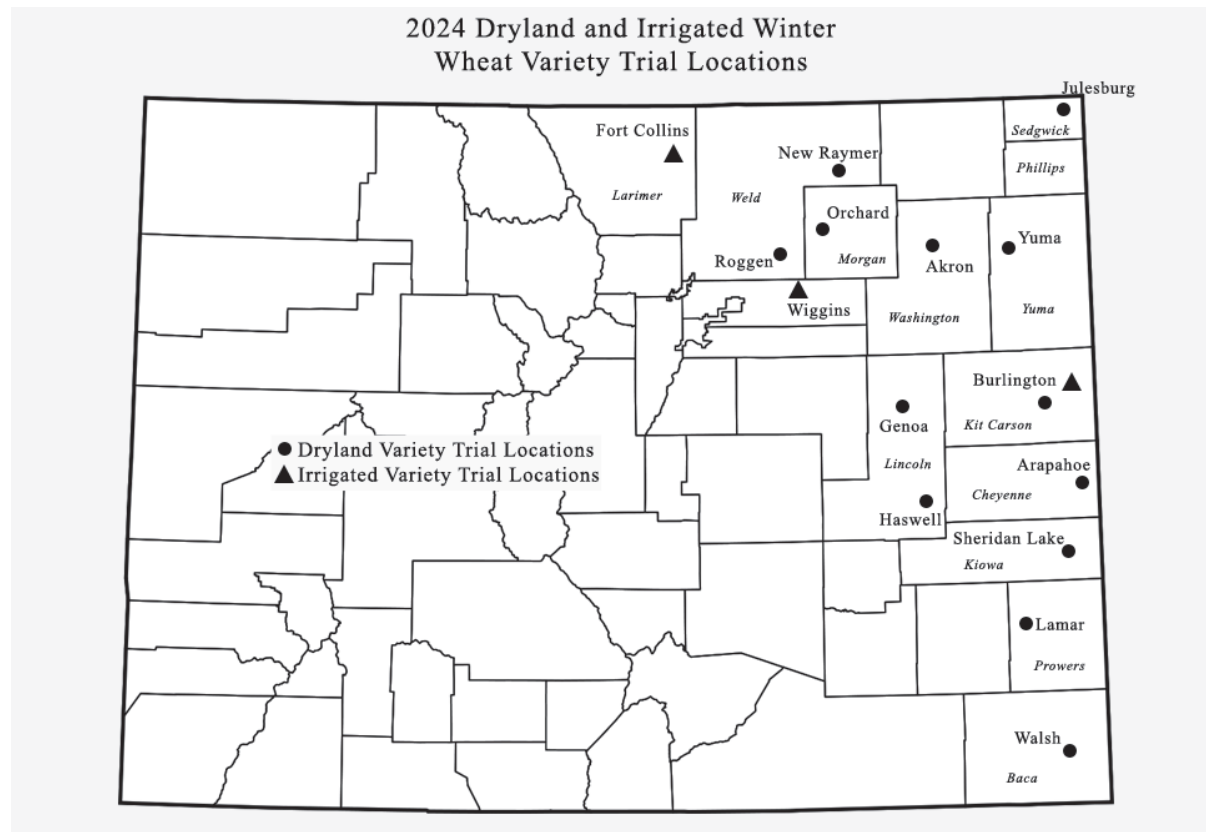
General Growing Conditions Affecting the 2024 Colorado Wheat Crop

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
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, -103.8999	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, -104.399	40.00743, -104.1009
County	Washington	Cheyenne	Kit Carson	Lincoln	Lincoln	Sedgewick	Prowers	Weld	Morgan	Weld	Kiowa	Baca	Yuma	Kit Carson	Larimer	Adams
Soil Type	Rago silt loam	Wiley complex	Kuma and Keith silt loams	Weld silt loam	Basid silt loam	Rago and Kuma silt loams	Baca silt loam	Olney fine sandy loam	Ascalon sandy loam	Weld loam	Olney sandy loam	Wiley loam	Planner 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
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
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 and early summer. Light wheat stem sawfly pressure, although minimal lodging was noted in the trial at harvest.	Planted 2" 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 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 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 fall residue. Fall emergence and growth was very good. Lush growth in the spring. Curworm 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 emergence. Good fall 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. Palsade plant growth regulator was applied in spring.	Planted 1.5" deep into moisture. Good fall emergence. Trial irrigated as needed starting in late spring. Wheat stem sawfly present at low levels, but lodging was due to high yield. Palsade plant growth regulator was applied in spring.	Planted 1.5" deep into 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. Palsade 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



Summary of 2024 Dryland Winter Wheat Variety Performance Results



Brand/Source	Market Class	Variety ^a	2024 Multi-Location Average					Sawfly Cutting ^e rating (1-9)	2024 Individual Trial Yield ^b					
			Yield ^b bu/ac	Test Weight lb/bu	Protein ^c percent	Heading ^d days from average	Sawfly Cutting ^e rating (1-9)		Sheridan					
									Yield percent of average	Weight percent	Heading ^d days from average	Akron	Julesburg	Lamar
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
‡LSD (0.30)			2.6		0.6				3.6	2.7	2.8	2.9	3.3	2.6
‡LSD (0.05)			5.0		1.1				6.9	5.1	5.4	5.5	6.3	4.9

^aVarieties 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.

^bYield 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.

^cProtein adjusted to 12% moisture content and averaged across six trials in 2024.

^dVarieties with positive values headed later than the trial averages and varieties with negative values headed earlier than average. Based on three trials in 2023.

^eWheat 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).

^fFarmers 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).

The data included in this table may not be republished without permission. Contact Sally Jones-Diamond (sally.jones@colostate.edu)

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

Brand/Source	Market Class	Variety ^a	2024 Multi-Location Average					2024 Individual Trial Yield ^b		
			Yield ^b bu/ac	Yield percent of average	Test Weight lb/bu	Protein ^c percent	Heading ^d days from average	Akron bu/ac	Julesburg bu/ac	Orchard
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
LSD (0.30)					0.7			3.6	2.7	2.9
LSD (0.05)					1.3			6.9	5.1	5.5
Coefficient of Variation (CV)					1.1			5.1	6.5	8.2

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

^bYield 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.

^cProtein adjusted to 12% moisture content and averaged across three trials in 2024.

^dVarieties with positive values headed later than the trial averages and varieties with negative values headed earlier than average. Based on three trials.

^eFarmers 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 - Southeast Region

Brand/Source	Market Class	Variety ^a	2024 Multi-Location Average				2024 Individual Trial Yield ^b		
			Yield ^b bu/ac	Yield percent of average	Test Weight ^b lb/bu	Protein ^c percent	Lamar	Sheridan Lake	Walsh
PlainsGold	HRW	Whistler	45.7	118%	60.2	12.7	41.0	36.0	38.5
PlainsGold	HRW	Kivari AX	44.0	114%	60.3	12.2	41.5	26.5	32.5
PlainsGold	HRW	Avery	43.1	111%	59.9	12.3	46.0	31.5	34.5
CROPLAN	HRW	CP7017AX	42.5	110%	61.5	12.1	45.0	38.5	45.0
PlainsGold	HWW	Breck	41.4	107%	61.1	13.0	40.5	37.5	42.0
PlainsGold	HRW	Byrd	40.3	104%	60.8	13.0	40.0	27.0	29.5
PlainsGold	HWW	Windom SF	39.8	103%	59.4	12.8	48.5	49.5	41.5
PlainsGold	HRW	Canvas	39.3	102%	61.5	13.2	43.0	35.5	41.0
PlainsGold	HWW	Monarch	39.2	101%	61.3	12.2	36.5	34.0	37.0
PlainsGold	HRW	Crescent AX	38.3	99%	60.2	11.7	52.0	40.5	41.5
PlainsGold	HRW	Guardian	37.8	98%	61.6	13.1	43.0	34.0	31.5
PlainsGold	HRW	Amplify SF	37.6	97%	61.1	13.4	47.5	40.5	46.0
PlainsGold	HWW	Snowmass 2.0	36.8	95%	60.7	11.7	43.0	32.5	40.5
PlainsGold	HRW	Byrd CL Plus	36.0	93%	60.2	12.3	34.0	34.0	36.0
PlainsGold	HRW	Langin	35.1	91%	60.1	12.8	44.0	34.0	42.0
PlainsGold	HRW	AP Sunbird	34.6	89%	61.9	12.9	41.0	36.5	36.5
PlainsGold	HRW	Fortify SF	34.3	89%	60.2	13.0	40.0	33.5	34.0
Limagrain	HRW	LCS Julep	33.8	87%	61.5	13.6	46.0	39.5	38.5
PlainsGold	HRW	CP7220	31.0	80%	58.0	13.2	47.0	38.5	37.0
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	CO18D007W	43.5	112%	60.8	12.4	47.0	45.0	39.5
Colorado State University exp.	HRW	CO18D297R	42.5	110%	60.7	12.9	45.0	43.5	44.0
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
Coefficient of Variation (CV)			7.1		1.7		5.4	7.2	13.0

^aVarieties grouped according to released varieties or experimentals, and then ranked from highest to lowest yield across three southeast Colorado trials in 2024.

^bYield 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.

^cProtein adjusted to 12% moisture content.

^dFarmers 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) Dryland Winter Wheat Variety Performance Results

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

^aThe 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).

^bMarket class: HRW=hard red winter wheat; **HWW**=hard white winter wheat.

^cVarieties ranked from highest to lowest average 2-year yield.

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Contact Sally Jones-Diamond (sally.jones@colostate.edu)*



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



Brand/Source	Market Class ^b	Variety ^c	3-Year Average ^a					
			Yield		Test Weight		Plant	
			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

^aThe 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).

^bMarket class: HRW=hard red winter wheat; **HWW**=hard white winter wheat.

^cVarieties ranked from highest to lowest average 3-year yield.

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Contact Sally Jones-Diamond (sally.jones@colostate.edu)*

2024 Collaborative On-Farm Test (COFT) Variety Performance 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.



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

Variety	Yield ^a bu/ac	Test Weight lb/bu	Protein ^a 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	0.2
	Coefficient of Variation (CV)	9.3%	2.4%
		2.4%	4.5%

^aYield and protein corrected to 12% moisture.



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



2024 Varieties (ranked left to right by highest yield)

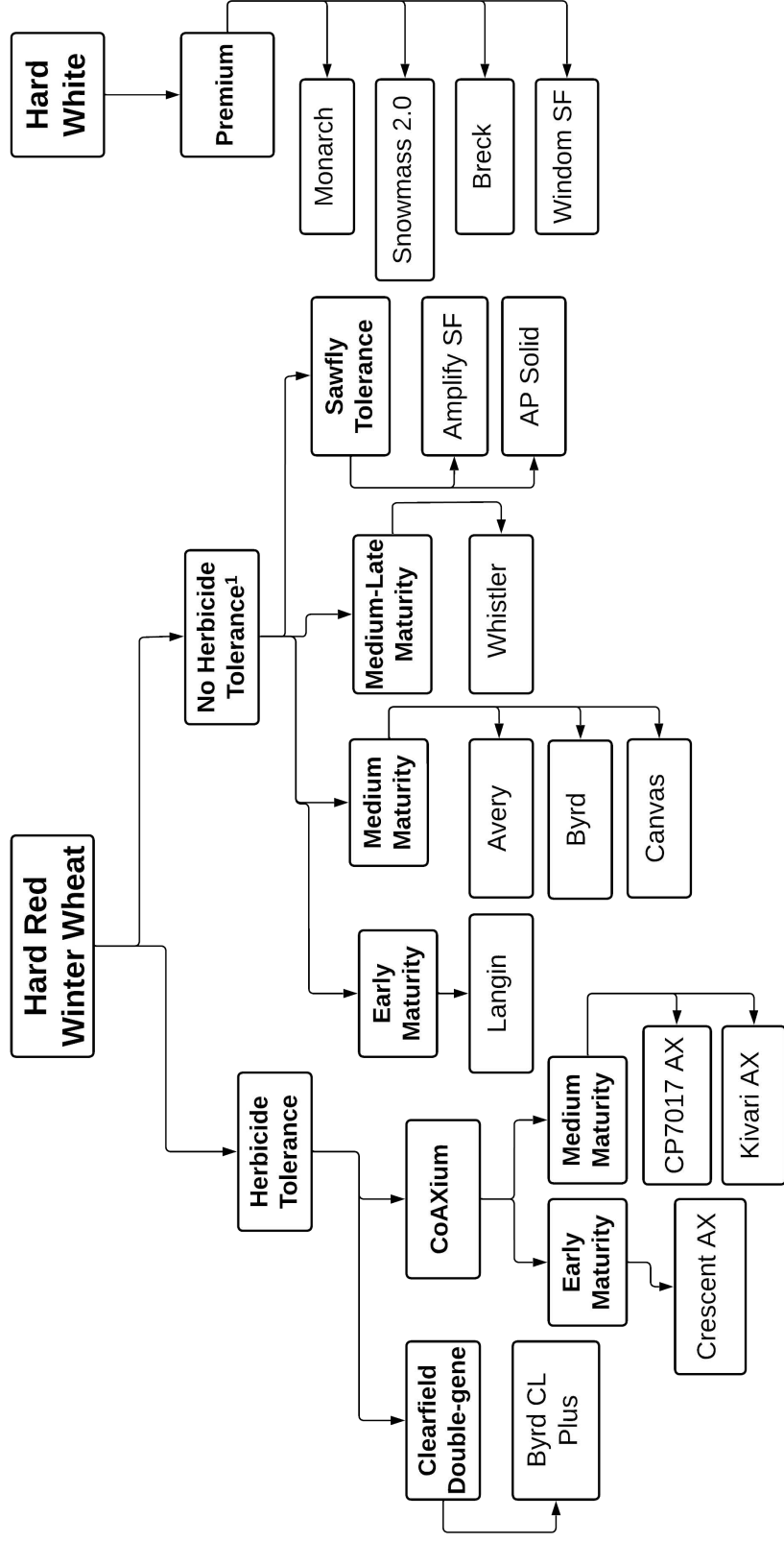
Nearest Town/County	Kivari AX			Amplify SF with Indigo			Amplify SF			AP Solid			Guardian			KS Territory			COFT Average		
	Test			Test			Test			Test			Test			Test			Test		
	Yield ^a bu/ac	Weight lb/bu	Protein percent	Yield ^a bu/ac	Weight lb/bu	Protein percent	Yield ^a bu/ac	Weight lb/bu	Protein percent	Yield ^a bu/ac	Weight lb/bu	Protein percent	Yield ^a bu/ac	Weight lb/bu	Protein percent	Yield ^a bu/ac	Weight lb/bu	Protein percent	Yield ^a bu/ac	Weight lb/bu	Protein 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	63	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			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



¹No 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.





Summary of 2024 Irrigated Winter Wheat Variety Performance Results

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

^aVarieties ranked from highest to lowest yield across three irrigated trials in 2024.

^bYield 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.

^cProtein adjusted to 12% moisture content and averaged across two trials in 2024.

^dVarieties with positive values headed later than the trial averages and varieties with negative values headed earlier than average. Based on one trial.

^eLodging score: 1 equals no lodging and 9 is severe lodging. Scores from three trials in 2024.

^fFarmers 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

Brand/Source	Market Class ^b	Variety ^c	2-Year Average ^a					
			Yield		Test Weight		Plant	
			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

^aThe 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).

^bMarket class: HRW=hard red winter wheat; **HWW**=hard white winter wheat.

^cVarieties 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

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

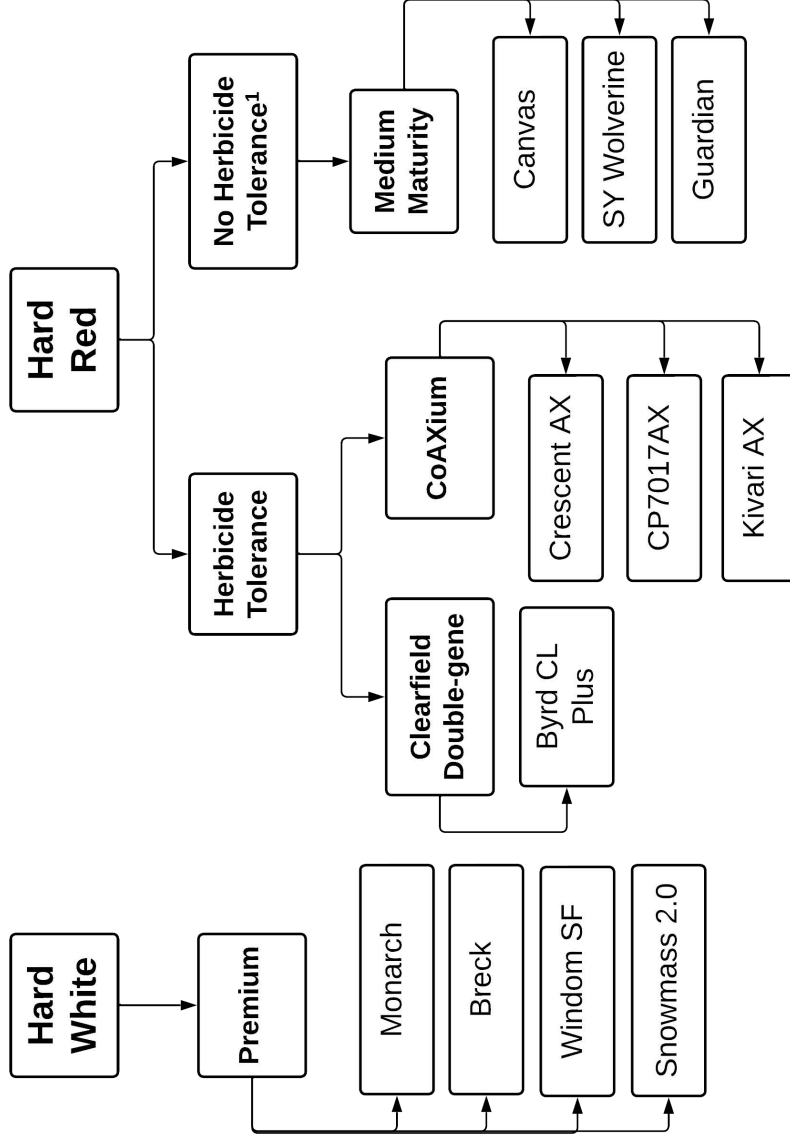
^aThe 3-year average yield, test weight, and protein are based on nine trials (three each year). Plant heights are based on seven trials (three 2024, two 2023 and three 2022).

^bMarket class: HRW=hard red winter wheat; HWW=hard white winter wheat.

^cVarieties ranked from highest to lowest average 2-year yield.

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Contact Sally Jones-Diamond (sally.jones@colostate.edu)*

CSU Fall 2024 Irrigated Winter Wheat Decision Tree



¹No 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.



Wheat Production Management Tips

Sally Jones-Diamond and Tyler Benninghoven

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

Seeds/lb.	Emergence	Desired Population (plants/acre)					
		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

Method 2: 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.

Seeding Date	<u>Step 1:</u> Plant Population plants/acre	<u>Step 2:</u> Row Spacing inches	<u>Step 3: Emergence Percent</u>		
			Average 70%	Excellent 80%	90%
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**	TWWSS*	PRO**	MILL	BAKE	Comments	
Amplify SF	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.
Hard red winter Bearpaw/Antero//Antero	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	AgriPro 2021	7	3	3	3	5	7	6	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.
Hard red winter Undisclosed	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.
Avery	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.
Hard red winter Teal 11A/Above//CO99314	CSU 2017	5	6	5	8	7	5	2	4	2	7	2	2	4	CSU release (2017), marketed by PlainsGold in CWRP-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.
Hard white winter Denali/HV9W07-482W//Antero	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	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.
Hard red winter TAM 112/CO970547-7	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.

* Coleoptile length ratings range from 1=very short (~50 mm or ~2 in) to 9=very long (~100 mm or ~4 in). Coleoptile lengths should be interpreted for relative variety comparisons only.

** WSMV ratings are based on field evaluations in Colorado under pressure from wheat curl mite transmitted viruses. Scores may reflect both resistance to the wheat curl mite and resistance to mite-transmitted viruses.

+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**	TWSS*	PRO**	MILL	BAKE	Comments	
CO18035RA Hard red winter (AF28/Byrd//AF26/Byrd)//2*Byrd//AF10 M3/2*Byrd//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//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. <i>Wsm2</i> 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. <i>Wsm2</i> 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 (PRO), 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.

* Coleoptile length ratings range from 1=very short (~50 mm or ~2 in) to 9=very long (~100 mm or ~4 in). Coleoptile lengths should be interpreted for relative variety comparisons only.

** WSMV ratings are based on field evaluations in Colorado under pressure from wheat curl mite transmitted viruses. Scores may reflect both resistance to the wheat curl mite and resistance to mite-transmitted viruses.

+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	TWWSS	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, <i>Wsm3</i> , 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 <i>Wsm2</i> . 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.

* Coleoptile length ratings range from 1=very short (~50 mm or ~2 in) to 9=very long (~100 mm or ~4 in). Coleoptile lengths should be interpreted for relative variety comparisons only.

** WSMV ratings are based on field evaluations in Colorado under pressure from wheat curl mite transmitted viruses. Scores may reflect both resistance to the wheat curl mite and resistance to mite-transmitted viruses.

+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	TWWSS	PRO	MILL	BAKE	Comments	
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. Adapted 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.

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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 ** WSMV ratings are based on field evaluations in Colorado under pressure from wheat curl mite transmitted viruses. Scores may reflect both resistance to the wheat curl mite and resistance to mite-transmitted viruses.

+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*	TWWS*	PRO**	MILL	BAKE	Comments	
Monarch	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.
Hard white winter															
CO07W722-F5/Snowmass//CO07W722-F5															
Ray	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.
Hard red winter															
Yellowstone*2/98X168E1															
Snowmass 2.0	CSU 2018	4	4	4	4	4	5	1	3	5	5	4	3	1	CSU release (2018), marketed by PlainsGold in CWRP-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.
Hard white winter															
CO07W722-F5/Snowmass//Brawl CL Plus															
Steamboat	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.
Hard red winter															
TAM 114/Antero//Byrd															
Sunshine	CSU 2014	3	6	7	5	5	6	2	7	6	6	4	4	4	CSU release (2014), marketed by PlainsGold in CWRP-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.
Hard white winter															
KS01HW152-6/HV9W02-267W															
SY Wolverine	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.
Hard red winter															
Everest/Platte//SY Wolf															
Valley	CSU 2022	5	7	4	3	3	6	4	4	5	4	4	4	2	CSU release (2018) marketed by PlainsGold in CWRP-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.
Hard white winter															
CO07W722-F5/Antero//Snowmass															
Whistler	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.
Hard red winter															
CO08W218/Snowmass//Byrd															
Windom SF	CSU 2022	4	2	4	7	6	8	1	3	2	1	5	3	3	CSU release (2021), marketed by PlainsGold in CWRP-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 seed only.
Hard white winter															
Warhorse/Breck//CO12D1028															

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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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.



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



Brand/Source	Variety	Forage Species ^b	Forage Harvest			Grain Harvest			Forage Quality ^a								
			Dry Matter	Moisture	Harvest	Yield	Weight	Protein	CP	RFQ	aNDFom	NDFD30	NDFD240	TDN	NEL	NEG	Milk/Ton
			Yield	% at harvest	Date												
Akron																	
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																	
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																	
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														

^aAll 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.

^bForage Species: HR=Hybrid Rye, T=Triticale, and W=Wheat

^cIf 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).

The data included in this table may not be republished without permission. Contact Sally Jones-Diamond (sally.jones@colostate.edu).

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