



COLORADO STATE UNIVERSITY

Agricultural Experiment Station

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

2026



2026 WINTER WHEAT VARIETY PERFORMANCE TRIALS

Making Better Decisions



CROPS TESTING
PROGRAM

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Additional Resources

Colorado State University Crop Variety Testing Program: www.csucrops.org

Wheat Variety Performance Database: www.wheattrials.com

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

State University Wheat Entomology Program: www.csuwheatentomology.com Colorado Wheat Administrative Committee (CWAC), Colorado Association of Wheat Growers (CAWG), and Colorado Wheat Research Foundation (CWRF): www.coloradowheat.org

Overview of 2025-2026 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 that enter varieties, and farmers who donate their resources 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 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 two irrigated trials in Northeast Colorado. In the dryland trials, 58 varieties were tested, including experimental lines across the two regions of the 13 total trial locations. The two irrigated trials had 30 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, and Limagrain Cereal Seeds. There were entries from the Colorado State University marketing organization PlainsGold, the Kansas State University marketing organization Kansas Wheat Alliance, the University of Nebraska-Lincoln marketing organization Nu Horizon Genetics, the Oklahoma State University marketing organization Oklahoma Genetics Inc (OGI) and Montana State University.

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 all the dryland trials, 1.5 million seeds per acre for the irrigated Wiggins trial, and 2 million seeds per acre for the irrigated Fort Collins site. Individual location management data is listed in the 2026 Wheat Trial Management and Characteristics table in this report. Grain yield and protein were corrected to 12% moisture content. Variety trial grain weight, test weight, and moisture content information were obtained from a HarvestMaster H2 GrainGage™ weigh system on a Zurn 150 plot combine. Protein content was obtained using a FOSS Infratec™ NOVA grain analyzer. Data was analyzed using a spatial mixed model applied within each location, with location included as a fixed effect in the overall analysis in the multi-location results tables.

General Growing Conditions Affecting the 2026 Colorado Wheat Crop

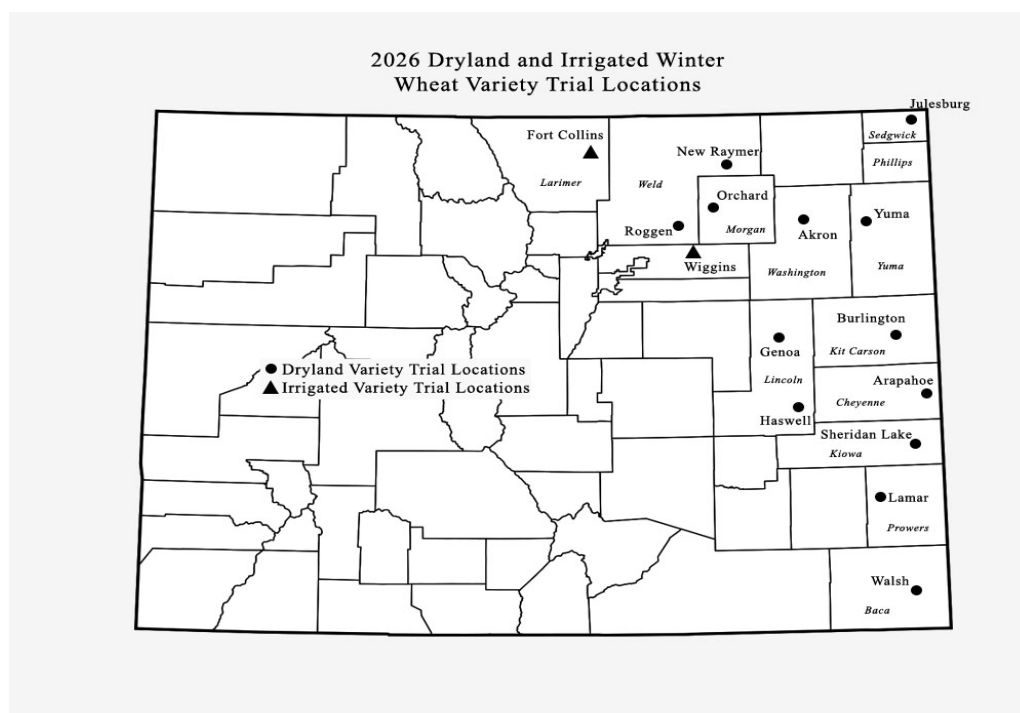
Wheat planting conditions in the fall of 2025 were normal for the region, with most wheat planted into moisture. Although fall stands were good, late-fall and winter precipitation was scattered, and Northeast Colorado was in a moderate drought by January. The drought became

more widespread across eastern Colorado in late March, with Northeast Colorado worsening into extreme drought and the rest of eastern Colorado abnormally dry (east central) or in moderate or severe drought (southeast). Conditions worsened in April, but spring storms in May provided relief for East-Central Colorado.

Unfortunately, drought was not the only major obstacle for our wheat crop this season. Eastern Colorado had an abnormally warm winter. Then in early May, most of eastern Colorado experienced a hard freeze with temperatures in the mid to low 20s. The extent of the damage was not readily apparent until early June, when plants and fields that appeared healthy were found to have little to no grain in the heads. Isolated hail events either destroyed or severely damaged wheat fields for several producers in June.

Triticum mosaic virus (TriMV) and wheat streak mosaic virus (WSMV), both vectored by the wheat curl mite, were widespread again this season and severely affected yield in some fields with susceptible varieties and heavy mite pressure. Brown wheat mites were observed at treatable levels across eastern Colorado in the late fall and early spring. Russian wheat aphids were observed at the highest levels that we've seen in many years, likely due to the mild winter, with many fields requiring treatment. Similarly, bird cherry-oat aphid was observed across the state, which resulted in some fields showing symptoms of cereal dwarf virus later in the spring. Wheat stem sawfly (WSS) was still widespread across many northeastern Colorado counties, and the pest continues to spread south and east.

By late June, most wheat was ready for harvest, which was 2 to 3 weeks earlier than normal. Yields were much lower than predicted, with an average of 19 bushels per acre. Test weight was generally high, around 59 pounds per bushel, and protein was average in most areas, around 12.5 percent. The 2026 wheat harvest in Colorado was the smallest wheat crop in the state since 1965, which mirrors the national wheat harvest that is the smallest since 1957 according to early estimates from the USDA's Economic Research Service.



2026 Wheat Trial Management and Characteristics

Dryland Locations																Irrigated Locations			
Location	Akron	Arapahoe	Burlington	Genoa	Haswell	Julesburg	Lamar	New Raymer	Orchard	Roggen	Sheridan Lake	Walsh	Yuma	Fort Collins	Wiggins				
Average Yield (bu/ac)	N/A	N/A	N/A	N/A	29	29	N/A	N/A	N/A	N/A	N/A	N/A	N/A	82	141				
GPS Coordinates (Lat/Long)	40.14936, -103.14065	38.910621, -102.314272	39.315240, -102.25794	39.359738, -103.51099	38.6414480, -103.253037	40.83718, -102.35773	38.0405065, -102.53899	40.538203, -103.88399	40.472201, -104.07014	40.087955, -104.25965	38.54181, -102.314933	37.4341681, -102.314933	40.18619, -102.65641	40.652917, -104.992806	40.007916, -104.09962				
County	Washington	Cheyenne	Kit Carson	Lincoln	Lincoln	Sedgwick	Provers	Weld	Morgan	Weld	Kiowa	Baca	Yuma	Larimer	Adams				
Soil Type	Weld silt loam	Wiley complex	Kuma-Keith silt loams	Weld silt loam	Wild silt loam	Rago & Kuma silt loams	Colby silt loam	Olney fine sandy loam	Planner sandy loam	Ascalon sandy loam	Olney sandy loam	Wiley loam	Haxtun sandy loam	Fort Collins loam	Heldt clay loam				
Soil Organic Matter	1.7%	1.9%	2.0%	2.1%	1.9%	2.2%	1.4%	2.1%	1.3%	1.5%	1.1%	1.5%	1.7%	1.5%	1.7%				
Soil pH	5.4	8.2	7.4	7.2	8.3	6.3	8.2	6.5	6.8	6.8	8.1	8.2	8.4	8.1	8.0				
Soil Test Nutrients at Planting (N and P, lb/ac)	125 lb N 81 lb P	140 lb N 8 lb P	156 lb N 66 lb P	87 lb N 26 lb P	65 lb N 18 lb P	134 lb N 27 lb P	43 lb N 22 lb P	199 lb N 41 lb P	80 lb N 31 lb P	36 lb N 76 lb P	43 lb N 12 lb P	122 lb N 20 lb P	41 lb N 18 lb P	59 lb N 8 lb P	50 lb N 57 lb P				
Fertilizer applied at Planting	6 lb N 21 lb P	3.8 lb N 13 lb P	3.5 lb N 12 lb P	3.5 lb N 12 lb P	6 lb N 20 lb P	6.5 lb N 22 lb P	7 lb N 23.5 lb P	None	3.6 lb N 12.3 lb P	None	7 lb N 23.4 lb P	None	6 lb N 20.5 lb P	None	6.8 lb N 23 lb P				
Tillage	No-Till	Sweep Tillage	Tilled	Sweep & chisel tillage	No-Till	Tilled	No-Till	No-Till	No-Till	No-Till	No-Till	No-Till	No-Till	Tilled	No-Till				
Previous Crop	Proso Millet to Fallow	Corn to Fallow	Corn to Fallow	Grain Sorghum to Fallow	Grain Sorghum to Fallow	Corn to Fallow	Wheat to Fallow	Proso Millet to Fallow	Proso Millet to Fallow	Corn to fallow	Grain Sorghum to Fallow	Grain Sorghum to Fallow	Grain Sorghum to Fallow	Pinto Beans	Black-Eyed Peas				
Planting Depth	1.5"	1.75"	1.5"	1.75"	1.5"	2"	1.5"	1.5"	1.5"	1"	1.5"	1"	1.25"	1"	1.5"				
Planter Type	Disc drill	Disc drill	Disc drill	Disc drill	Disc drill	Disc drill	Disc drill	Disc drill	Disc drill	Disc drill	Disc drill	Disc drill	Disc drill	Disc drill	Disc drill				
Planting Date	9/15/2025	9/19/2025	9/19/2025	9/11/2025	9/9/2025	9/22/2025	9/9/2025	9/15/2025	9/18/2025	9/16/2025	9/9/2025	9/23/2025	9/16/2025	10/1/2025	9/30/2025				
Harvest Date	N/A	N/A	N/A	N/A	6/23/2026	7/2/2026	N/A	N/A	N/A	N/A	N/A	N/A	N/A	7/13/2026	7/14/2026				
Biotic Stress	Wheat curl mite, Russian wheat aphid, wheat stem sawfly	N/A	Wheat curl mite, Russian wheat aphid, bird cherry-oat aphid	N/A	Brown wheat mite	Wheat stem sawfly	N/A	Wheat curl mite, brown wheat mite, bird cherry-oat aphid	Wheat curl mite, brown wheat mite, Russian wheat aphid	Wheat curl mite, brown wheat mite, Russian wheat aphid	Brown wheat mite, Russian wheat mite	Brown wheat mite, Russian wheat aphid	Wheat curl mite	Wheat curl mite, Russian wheat aphid	Russian wheat aphid				
Abiotic Stress	Drought, freeze	Drought	Drought, freeze	Drought	Drought, freeze	Drought, freeze	Freeze	Drought, freeze	Drought, freeze	Drought, freeze	Drought, freeze	Drought, freeze	Freeze	Freeze	Freeze				
Pesticides Applied (In-Season)	4/2/26: dimethoate 400 EC at 0.3 pt/ac, Express at 0.31 oz/ac, and Huskie FX at 0.14 gal/ac	-	-	-	-	-	-	-	-	-	-	3/25/26: Warhawk at 1 pt/ac and Lambda Select at 3.8 oz/ac	-	-	5/2026: Lorsban and fungicide, 2,4-D and Widematch applied in-season				
Total Rainfall: January 1 to Harvest	N/A	N/A	N/A	N/A	2.9 inches	7.5 inches	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.6 inches	-				
General Comments	Excellent moisture at planting. Good emergence. Very dry winter and early spring. Trial sprayed on 4/2/26 for brown wheat mites. Hard freeze in May combined with heavy TrnMv and WSMV pressure and a late-season hail rendered the trial unharvestable.	Good moisture at planting. Trial was drought stressed in early spring, but timely rains came shortly after. Good yield potential in June, but trial lost to late-season hail that caused significant seed loss from the heads.	Trial looked good early season and into spring. Hard freeze in May prevented seed fill in most varieties. Trial lost to freeze.	Planted into good moisture below 3/4" depth. By early spring trial was very drought stressed and ultimately abandoned due to extreme drought and field variability.	Planted 1.5" deep, into moisture. Fall emergence and stands were excellent. Very dry winter and spring. Minimal freeze damage noted from late-season cold temperatures. Total moisture from planting to harvest was 3.9" with half of the precipitation received in May.	Planted 2" deep, into moisture. Fall emergence and stands were good. Very dry winter and early spring. Minimal freeze damage noted from May freeze. Total moisture from planting to harvest was 7.5" with half of the precipitation received in May-June.	Planted into excellent moisture. Great fall stands and growth. Early spring trial was lush and had high yield potential. The hard freeze in May prevented seed fill in most varieties. Trial lost to freeze.	Planted into moisture, very dry fall and spring. Trial ultimately lost to severe drought.	Planted into moisture, very dry fall and spring. Trial ultimately lost to severe drought.	Tough planting conditions but good fall emergence. Very heavy virus pressure in the spring combined with drought led to loss of the trial.	Good stands in fall. Trial freeze in May which prevented seed fill in almost all varieties. extreme drought and variability within trial area.	Planted into moisture. Good fall stands and growth. Brown wheat mite pressure was consistent throughout the spring. A late spring freeze caused damage to many early maturity varieties.	Planted 1.25" deep into moisture. Fall emergence and stands were excellent. Very dry winter and early spring. Some WSMV and TrnMV pressure. Freeze damage in May to early varieties. Trial harvested but data not usable for decisions due to variability from freeze.	Planted 1" deep, into moisture and tilled pinto bean residue. Fall emergence and stands were good. Russian wheat aphid pressure was consistent throughout the spring. Trial received around 14" of irrigation during the growing season with 2-3" applied in the fall. Minimal disease pressure.	Planted 1.5" deep, into moisture and no-till black-eyed pea residue. Fall emergence and stands were excellent. Very dry winter and early spring. Trial received around 14" of irrigation during the growing season with 2-3" applied in the fall. Minimal disease pressure.				

Dashes denote missing information, N/A means not applicable

Summary of 2026 Dryland Winter Wheat Variety Performance Results

2026 Multi-Location Average									2026 Individual Trial Yield ^b	
Brand/Source	Market Class	Variety ^a	Yield ^b	Yield	Test Weight	Protein ^c	Virus	Wheat Stem Sawfly	Haswell	Julesburg
			bu/ac	percent of average	lb/bu	percent	rating (1-9) ^d	rating (1-9) ^d	bu/ac	
Kansas Wheat Alliance	HRW	KS Tradition	37.0	128%	60.1	9.9	2	6	35	39
PlainsGold	HRW	Whistler	36.1	125%	58.7	11.1	2	5	39	33
PlainsGold	HRW	Guardian	34.1	118%	60.7	11.1	4	5	36	32
PlainsGold	HRW	Sheridan	33.8	117%	59.9	10.5	3	4	36	31
PlainsGold	HRW	Outlaw	33.4	116%	58.7	11.1	3	4	35	32
PlainsGold	HRW	Avery	33.1	114%	59.8	10.9	3	5	33	32
Croplan	HRW	CP7017AX	32.9	114%	61.1	10.3	3	6	33	32
PlainsGold	HW	Telluride	31.8	110%	59.6	12.1	3	4	33	30
PlainsGold	HRW	Kivari AX	31.6	109%	58.6	11.3	4	4	34	30
PlainsGold	HRW	Crescent AX	31.6	109%	59.9	11.4	3	4	34	30
PlainsGold	HRW	Jim Quick	31.4	109%	59.2	11.0	3	4	31	31
PlainsGold	HRW	Canvas	30.9	107%	60.7	11.0	3	4	30	31
PlainsGold	HRW	Byrd	30.2	104%	59.8	11.1	3	5	31	30
AgriPro	HRW	AP Solid	30.0	104%	60.8	11.5	4	2	-	29
PlainsGold	HRW	Byrd CL Plus	30.0	104%	58.8	10.5	4	4	33	28
USDA-ARS & Colo. State Univ.	HRW	Bernd	29.8	103%	59.8	11.3	1	4	32	27
PlainsGold	HRW	Hoyt SF	29.3	101%	59.7	11.7	3	2	28	31
PlainsGold	HW	Snowmass 2.0	29.2	101%	59.8	10.5	3	4	28	30
PlainsGold	HW	Monarch	28.9	100%	59.7	10.9	3	3	29	30
PlainsGold	HW	Breck	28.8	100%	59.9	11.3	2	3	30	28
PlainsGold	HRW	Langin	28.4	98%	58.5	10.5	4	3	31	26
Croplan	HRW	CP7599CLP	28.0	97%	61.2	11.1	3	5	28	28
PlainsGold	HRW	Gabriel	27.9	97%	60.6	11.8	2	4	29	28
PlainsGold	HRW	Amplify SF	27.1	94%	59.5	12.1	5	1	26	27
Dyna-Gro	HRW	Ramsay	26.7	92%	58.2	13.8	4	5	27	26
AgriPro	HRW	AP Sunbird	26.7	92%	58.7	11.1	3	4	26	28
AgriPro	HRW	AP Tango	26.7	92%	58.6	11.5	4	5	24	28
Oklahoma Genetics Inc.	HRW	Breakthrough	26.7	92%	60.5	11.8	3	-	27	-
Kansas Wheat Alliance	HRW	KS Homesteader CL+	26.2	91%	60.7	14.1	4	5	26	27
PlainsGold	HW	Windom SF	26.0	90%	59.9	10.6	5	2	29	25
PlainsGold	HRW	Fortify SF	25.8	89%	57.7	12.6	3	1	21	30
Croplan	HRW	CP7462	25.4	88%	58.7	11.8	5	3	25	27
Kansas Wheat Alliance	HRW	KS Territory	25.3	87%	59.3	11.8	3	4	21	29
Croplan	HRW	CP7869	25.0	87%	57.2	12.5	6	4	22	28
Croplan	HRW	CP7909	22.7	78%	57.2	12.8	8	4	21	25
Oklahoma Genetics Inc.	HRW	Showdown	22.6	78%	57.6	10.6	4	-	23	-
Dyna-Gro	HRW	Milestone	22.0	76%	56.8	12.0	4	5	15	28
Experimentals										
Colorado State University exp.	HRW	CO210077R	32.2	111%	59.2	11.5	2	4	34	30
Colorado State University exp.	HRW	CO22D002R	32.2	111%	60.3	11.4	2	5	34	31
Colorado State University exp.	HRW	CO22194RA	31.8	110%	59.1	11.1	2	4	38	26
Colorado State University exp.	HRW	CO210418R	31.7	109%	62.0	11.8	2	3	34	31
Colorado State University exp.	HRW	CO20D108R	31.4	109%	59.4	12.5	2	4	32	30
Colorado State University exp.	HRW	CO21SF197R	31.0	107%	60.3	11.4	3	1	34	29
University of Nebraska-Lincoln exp.	HRW	NSF22115	30.5	106%	59.8	11.4	4	2	-	30
University of Nebraska-Lincoln exp.	HRW	NSF23324	30.4	105%	59.1	13.3	5	2	-	30
Colorado State University exp.	HRW	CO20022RC	30.2	104%	60.0	11.9	2	4	31	29
Colorado State University exp.	HRW	CO22195RA	29.9	103%	59.8	12.1	3	2	34	26
Colorado State University exp.	HRW	CO21SF226R	29.4	102%	61.2	12.5	3	1	28	30
University of Nebraska-Lincoln exp.	HRW	NHH19651	29.0	100%	60.0	11.5	5	5	-	30
Colorado State University exp.	HRW	CO21D1790R	28.9	100%	60.3	12.3	2	3	25	32
Colorado State University exp.	HW	CO20D068W	28.9	100%	60.0	11.3	2	3	30	29
Colorado State University exp.	HRW	CO20D036R	28.3	98%	59.5	12.0	3	4	32	26
Colorado State University exp.	HRW	CO22SF047RA	27.9	96%	58.9	11.5	3	1	30	28
Colorado State University exp.	HW	CO22SFD168W	26.8	93%	59.4	11.1	4	2	27	27
Colorado State University exp.	HRW	CO21SF240R	26.0	90%	59.2	13.7	3	3	21	30
Colorado State University exp.	HRW	CO23SFD004RA	23.6	82%	54.9	12.6	2	1	25	23
Colorado State University exp.	HRW	CO23SFD034RC	23.0	80%	56.8	12.7	6	1	22	23
Colorado State University exp.	HRW	CO23SFD035RC	21.7	75%	55.3	12.6	6	1	21	22
Average			28.9	100%	59.3	11.6	3	3	29	29
^e LSD (0.30)			3.5		1.6				2.9	1.6
^e LSD (0.05)			6.7		3.0				5.5	3.0
Coefficient of Variation (CV)			8.9%		3.5%				15.4%	4.9%

^aVarieties grouped according to released varieties or experimentals, and then ranked from highest to lowest yield across two Colorado trials in 2026.

^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 two sites and not arithmetic averages.

^cProtein adjusted to 12% moisture content and averaged across two trials in 2026.

^dRating: 1 equals no cutting or virus (TriMV and WSMV) and 9 is severe cutting or virus. Virus scores based on three trials and cutting scores based on one trial.

^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).

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

Summary of 2-Year (2025-2026) Dryland Winter Wheat Variety Performance Results

Variety ^b	Brand/Source	Market Class ^c	2-Year Average ^a					
			Yield		Test Weight		Protein	
			bu/ac	% trial average	lb/bu	% trial average	percent	% trial average
Whistler	PlainsGold	HRW	60.9	112%	58.3	100%	12.2	98%
Breck	PlainsGold	HWW	58.0	107%	60.0	103%	12.8	103%
CO22SF047RA	Colorado State University exp.	HRW	57.9	107%	58.6	100%	12.0	97%
Avery	PlainsGold	HRW	57.4	106%	58.6	100%	12.1	97%
CO19410R	Colorado State University exp.	HRW	57.0	105%	59.2	101%	12.3	99%
CO20D036R	Colorado State University exp.	HRW	56.7	105%	58.2	99%	12.3	99%
Outlaw	PlainsGold	HRW	56.5	104%	57.2	98%	12.1	98%
Byrd	PlainsGold	HRW	55.7	103%	58.2	99%	12.2	98%
CO20022RC	Colorado State University exp.	HRW	55.7	103%	59.7	102%	12.4	100%
Crescent AX	PlainsGold	HRW	55.1	102%	58.3	100%	12.3	99%
CO20D108R	Colorado State University exp.	HRW	55.1	102%	57.7	99%	12.5	100%
Langin	PlainsGold	HRW	55.0	102%	57.6	99%	12.0	97%
Gabriel	PlainsGold	HRW	54.9	101%	59.4	102%	12.9	104%
Telluride	PlainsGold	HWW	54.8	101%	58.3	100%	12.4	100%
CO21D1790R	Colorado State University exp.	HRW	54.8	101%	59.0	101%	11.9	96%
Monarch	PlainsGold	HWW	54.5	101%	58.3	100%	11.9	96%
AP Sunbird	AgriPro	HRW	54.5	101%	58.9	101%	12.4	100%
CP7017AX	Croplan	HRW	54.1	100%	59.6	102%	12.2	99%
Hoyt SF	PlainsGold	HRW	54.0	100%	58.9	101%	12.3	99%
Canvas	PlainsGold	HRW	53.8	99%	59.3	101%	12.4	100%
Sheridan	PlainsGold	HRW	53.4	99%	58.2	99%	12.3	99%
CO21SF226R	Colorado State University exp.	HRW	53.3	98%	59.7	102%	12.8	103%
Kivari AX	PlainsGold	HRW	53.2	98%	57.3	98%	12.0	97%
Guardian	PlainsGold	HRW	53.1	98%	59.2	101%	12.9	104%
Byrd CL Plus	PlainsGold	HRW	53.0	98%	58.3	100%	12.1	98%
Snowmass 2.0	PlainsGold	HWW	53.0	98%	58.2	100%	12.3	99%
Windom SF	PlainsGold	HWW	52.6	97%	59.3	101%	12.6	102%
KS Territory	Kansas Wheat Alliance	HRW	52.5	97%	58.1	99%	12.7	103%
Amplify SF	PlainsGold	HRW	50.4	93%	58.6	100%	12.8	103%
Fortify SF	PlainsGold	HRW	49.9	92%	57.7	99%	12.8	103%
CP7869	Croplan	HRW	48.2	89%	57.4	98%	12.9	104%
CP7909	Croplan	HRW	44.4	82%	56.8	97%	13.1	106%
Average			54.2	100%	58.5	100%	12.4	100%

^aThe 2-year average yield, test weight, and protein are based on 12 trials (two 2026 and ten 2025 trials).

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

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

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Summary of 3-Year (2024-2026) Dryland Winter Wheat Variety Performance Results

Variety ^b	Brand/Source	Market Class ^c	3-Year Average ^a					
			Yield	Yield	Test Weight	Test Weight	Protein	Protein
			bu/ac	% trial average	lb/bu	% trial average	percent	% trial average
Whistler	PlainsGold	HRW	60.5	110%	58.4	99%	12.1	100%
Avery	PlainsGold	HRW	57.6	105%	58.6	100%	11.8	97%
CO19410R	Colorado State University exp.	HRW	57.5	104%	59.5	101%	12.2	100%
Breck	PlainsGold	HWW	57.5	104%	59.9	102%	12.5	103%
Outlaw	PlainsGold	HRW	57.3	104%	57.6	98%	11.8	97%
Telluride	PlainsGold	HWW	56.1	102%	58.7	100%	12.1	100%
Byrd	PlainsGold	HRW	56.1	102%	58.5	100%	12.1	99%
Monarch	PlainsGold	HWW	55.9	101%	58.8	100%	11.8	97%
Crescent AX	PlainsGold	HRW	55.6	101%	58.5	100%	12.0	98%
AP Sunbird	AgriPro	HRW	55.6	101%	59.3	101%	12.2	100%
CP7017AX	Croplan	HRW	55.3	100%	59.6	101%	12.2	100%
CO20D108R	Colorado State University exp.	HRW	55.3	100%	58.4	99%	12.0	99%
Langin	PlainsGold	HRW	55.3	100%	58.0	99%	11.9	97%
CO20022RC	Colorado State University exp.	HRW	55.3	100%	59.5	101%	12.2	100%
Sheridan	PlainsGold	HRW	54.9	100%	58.8	100%	12.3	101%
Kivari AX	PlainsGold	HRW	54.8	99%	57.6	98%	11.9	98%
Canvas	PlainsGold	HRW	54.7	99%	59.3	101%	12.3	101%
Hoyt SF	PlainsGold	HRW	54.6	99%	59.4	101%	12.0	99%
Gabriel	PlainsGold	HRW	54.0	98%	59.4	101%	12.6	103%
Snowmass 2.0	PlainsGold	HWW	53.9	98%	58.6	100%	12.0	99%
Byrd CL Plus	PlainsGold	HRW	53.2	96%	58.5	100%	12.0	98%
Guardian	PlainsGold	HRW	52.9	96%	59.5	101%	12.7	104%
Windom SF	PlainsGold	HWW	52.4	95%	58.3	99%	12.5	103%
Amplify SF	PlainsGold	HRW	51.1	93%	58.8	100%	12.6	104%
Fortify SF	PlainsGold	HRW	50.3	91%	58.2	99%	12.6	104%
Average			55.1	100%	58.8	100%	12.2	100%

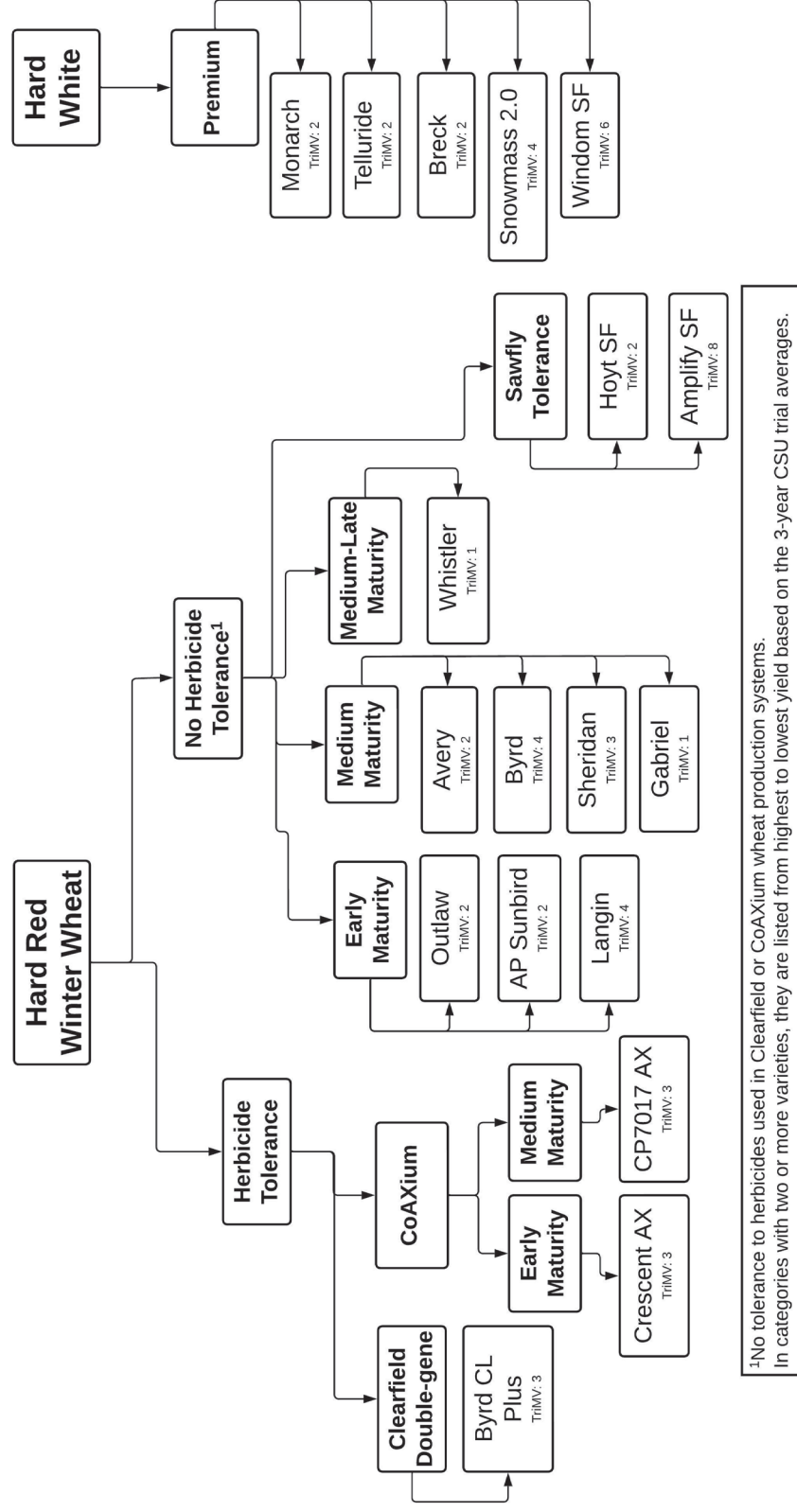
^aThe 3-year average yield, test weight, and protein are based on 18 trials (two 2026, ten 2025, and six 2024 trials).

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

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

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Fall 2026 CSU Dryland Wheat Decision Tree



AGRICULTURAL
EXPERIMENT STATION
COLORADO STATE UNIVERSITY



CROPS TESTING
PROGRAM

Summary of 2026 Irrigated Winter Wheat Variety Performance Results

										2026 Individual Trial Yield	
2026 Multi-Location Average									Fort Collins		Wiggins
Variety ^a	Brand/Source	Market Class ^b	Yield ^c	Yield	Test Weight	Protein ^d	Lodging	Heading ^e			
			bu/ac	percent of average	lb/bu	percent	score (1-9) ^f	days from average		bu/ac	
Telluride	PlainsGold	HWW	132.5	119%	62.2	14.4	3	2		97	168
Hoyt SF	PlainsGold	HRW	126.6	114%	62.0	14.1	3	2		96	157
CO20D108R	Colorado State University exp.	HRW	124.2	111%	61.8	13.7	3	2		94	155
CO19410R	Colorado State University exp.	HRW	123.7	111%	62.3	14.2	3	1		95	152
Monarch	PlainsGold	HWW	123.6	111%	62.1	13.7	1	3		87	161
LCH23-9139	Limagrain exp.	HRW	122.3	110%	61.9	13.8	3	1		88	157
Outlaw	PlainsGold	HRW	115.7	104%	60.8	14.7	2	-1		89	143
Sheridan	PlainsGold	HRW	115.7	104%	61.7	14.9	1	2		88	143
Snowmass 2.0	PlainsGold	HWW	115.1	103%	61.6	14.7	2	0		84	147
CP7869	Croplan	HRW	115.1	103%	61.6	14.3	2	-1		86	145
Canvas	PlainsGold	HRW	114.0	102%	62.3	13.7	1	1		83	145
LCS Caballero AX	Limagrain	HRW	113.6	102%	61.6	14.6	2	0		82	146
Ramsay	Dyna-Gro	HRW	112.8	101%	60.4	14.8	1	4		85	140
Breck	PlainsGold	HWW	112.6	101%	62.7	14.4	8	3		89	136
Guardian	PlainsGold	HRW	111.0	100%	62.8	14.6	4	2		94	128
Windom SF	PlainsGold	HWW	110.7	99%	63.6	14.9	1	1		82	139
Amplify SF	PlainsGold	HRW	110.1	99%	60.9	14.8	3	2		86	135
LCS High Noon	Limagrain	HRW	110.0	99%	61.7	14.4	4	-1		78	142
CO22056RA	Colorado State University exp.	HRW	109.4	98%	60.8	13.9	4	-1		85	134
Byrd CL Plus	PlainsGold	HRW	108.9	98%	61.7	14.1	6	0		88	130
NE Dunbar CLP	NU Horizon Genetics	HRW	108.7	98%	61.4	14.7	1	-1		87	130
Kivari AX	PlainsGold	HRW	108.1	97%	61.3	14.6	8	-1		90	126
Milestone	Dyna-Gro	HRW	107.5	97%	59.0	15.1	1	5		71	144
Crescent AX	PlainsGold	HRW	104.1	93%	61.6	14.7	6	-5		72	136
LCS Helix AX	Limagrain	HRW	101.5	91%	61.2	15.3	4	-3		67	136
AP Sunbird	AgriPro	HRW	101.5	91%	62.8	14.5	6	-3		81	122
CP7462	Croplan	HRW	96.5	87%	59.5	16.2	1	-3		55	138
CP7599CLP	Croplan	HRW	96.4	87%	60.8	15.6	4	-3		61	132
LCS Atomic AX	Limagrain	HRW	96.2	86%	60.7	15.8	2	-6		56	136
CP7909	Croplan	HRW	94.6	85%	60.2	13.7	1	-2		63	127
Average			111.4	100%	61.5	14.6	3	0		82	141

^aVarieties ranked from highest to lowest yield across two irrigated trials in 2026.

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

^cYield adjusted to 12% moisture content. Multi-location yield and test weight values for each variety are arithmetic averages from the two sites and could not be statistically analyzed due to the wide variation between sites.

^dProtein adjusted to 12% moisture content and averaged across two trials in 2026.

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

^fLodging score: 1 equals no lodging and 9 is severe lodging. Scores from one trial in 2026.

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Summary of 2-Year (2025-2026) Irrigated Winter Wheat Variety Performance Results

Variety ^b	Brand/Source	Market Class ^c	2-Year Average ^a						
			Yield		Test Weight		Protein	Height	Lodging
			bu/ac	% trial average	lb/bu	% trial average	percent	in	score (1-9) ^d
Telluride	PlainsGold	HWW	122.4	113%	60.0	100%	13.9	31	5
Monarch	PlainsGold	HWW	115.1	106%	60.5	100%	13.3	33	3
Hoyt SF	PlainsGold	HRW	113.6	105%	60.1	100%	13.7	32	4
Sheridan	PlainsGold	HRW	112.5	104%	60.2	100%	14.0	33	3
Canvas	PlainsGold	HRW	112.4	104%	61.0	101%	13.6	33	3
Snowmass 2.0	PlainsGold	HWW	110.9	102%	60.0	100%	14.2	32	1
Breck	PlainsGold	HWW	109.2	101%	61.1	101%	14.6	32	4
Guardian	PlainsGold	HRW	107.3	99%	61.0	101%	14.5	33	5
Crescent AX	PlainsGold	HRW	106.7	99%	60.3	100%	14.6	32	5
LCS Atomic AX	Limagrain	HRW	106.5	98%	60.2	100%	14.8	30	3
Amplify SF	PlainsGold	HRW	106.5	98%	60.1	100%	14.2	34	4
Byrd CL Plus	PlainsGold	HRW	106.5	98%	59.6	99%	13.8	36	5
AP Sunbird	AgriPro	HRW	105.4	97%	60.8	101%	14.2	30	2
Kivari AX	PlainsGold	HRW	104.9	97%	59.3	98%	13.7	33	5
Windom SF	PlainsGold	HWW	104.8	97%	61.5	102%	14.3	33	7
CP7869	Croplan	HRW	104.5	97%	59.9	99%	14.0	31	2
LCS Helix AX	Limagrain	HRW	103.5	96%	59.8	99%	14.3	33	6
CP7909	Croplan	HRW	96.5	89%	59.1	98%	13.7	32	1
Average			108.3	100%	60.2	100%	14.1	32	4

^aThe 2-year average yield, test weight, and protein are based on six trials (two 2026 and three 2025). Plant heights are based on four trials (two 2026 and two 2025). Lodging is based on two trials (one 2026 and one 2025).

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

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

^dLodging score: 1 equals no lodging and 9 is severe lodging.

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Summary of 3-Year (2024-2026) Irrigated Winter Wheat Variety Performance Results

Variety ^b	Brand/Source	Market Class ^c	3-Year Average ^a						
			Yield		Test Weight		Protein	Height	Lodging
			bu/ac	% trial average	lb/bu	% trial average	percent	in	score (1-9) ^d
Telluride	PlainsGold	HWW	121.9	107%	59.9	99%	13.4	31	3
Monarch	PlainsGold	HWW	117.9	104%	60.3	100%	13.0	32	2
Hoyt SF	PlainsGold	HRW	117.7	104%	60.6	101%	13.2	31	2
Sheridan	PlainsGold	HRW	116.1	102%	60.4	100%	13.5	32	2
Canvas	PlainsGold	HRW	116.1	102%	61.0	101%	13.4	31	2
Breck	PlainsGold	HWW	113.3	100%	61.1	101%	14.2	31	3
Snowmass 2.0	PlainsGold	HWW	112.9	99%	60.0	99%	13.7	30	1
Crescent AX	PlainsGold	HRW	112.8	99%	60.1	100%	13.9	31	6
Byrd CL Plus	PlainsGold	HRW	111.1	98%	59.8	99%	13.6	34	4
Amplify SF	PlainsGold	HRW	110.8	97%	60.2	100%	13.8	33	3
Windom SF	PlainsGold	HWW	110.5	97%	60.5	100%	13.8	30	4
Guardian	PlainsGold	HRW	110.5	97%	60.8	101%	14.1	32	2
Kivari AX	PlainsGold	HRW	110.4	97%	58.9	98%	13.1	31	6
LCS Atomic AX	Limagrain	HRW	108.8	96%	60.3	100%	14.1	30	2
Average			113.6	100%	60.3	100%	13.6	31	3

^aThe 3-year average yield, test weight, and protein are based on eight trials (two 2026, three 2025, and three 2024). Plant heights are based on seven trials (two 2026, two 2025, and three 2024). Lodging is based on five trials (one 2026, one 2025, and three 2024).

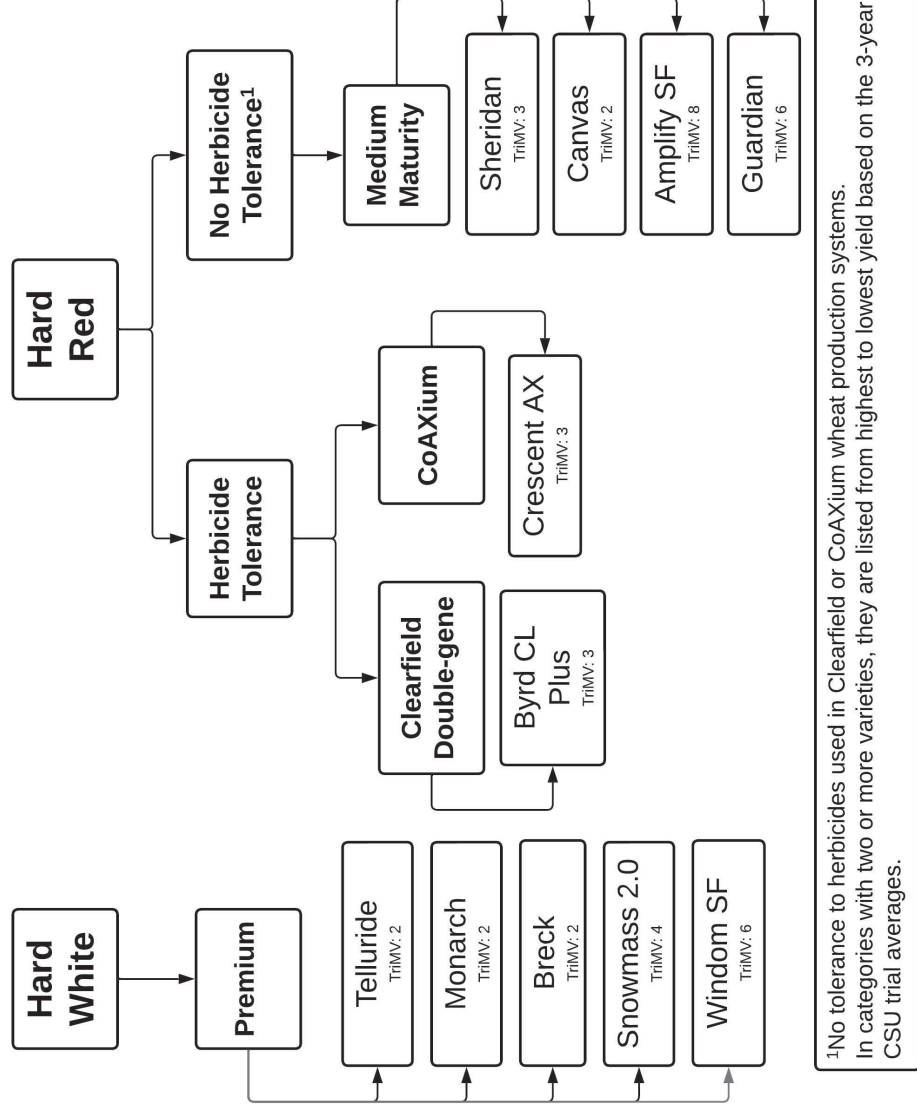
^bVarieties ranked from highest to lowest average 3-year yield.

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

^dLodging score: 1 equals no lodging and 9 is severe lodging.

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Fall 2026 CSU Irrigated Wheat Decision Tree



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.

Description of Winter Wheat Varieties in Eastern Colorado Dryland and Irrigated Trials (2025-2026)

Name/Class/Pedigree	Origin	HD	HT	SS	COL*	YR	LR	SR	WSMV**	TriMV**	WSS+TW	PRO**	MILL	BAKE	Comments
Amplify SF	2021	6	7	4	7	6	3	2	8	8	1	3	3	3	6 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. CSO sunsets harvest 2026.
Hard red winter															
Bearpaw/Antero/Antero															
AP Solid	AgriPro 2021	7	3	3	5	8	6	5	5	2	1	2	2	3	5 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															
AP Sunbird	AgriPro 2023	3	4	4	5	7	2	5	3	2	9	2	2	2	4 AgriPro release (2024). First entered in CSU variety trials in 2023. Early to medium early variety with moderately strong WSMV resistance. Very good milling and baking qualities.
Hard red winter															
Undisclosed															
Avery	CSU 2015	5	7	5	6	6	8	8	1	2	7	5	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.
Hard red winter															
TAM 112/Byrd															
Bernd	KS-USDA 2025	5	4	3	--	4	3	1	1	1	--	4	3	3	6 USDA-ARS release and co-developed with CSU. First entered into the CSU variety trials in 2026. Excellent WSMV and TriMV resistance (Wsm1) with wheat curl mite resistance. Very good straw strength. Commercial release pending.
Hard red winter															
Wsm1-Overley/Fuller/CO050270/3/CO050337-2 F2/4/Byrd															
Breakthrough	OK 2020	5	3	5	2	6	6	3	2	2	--	2	4	2	3 OSU release (2020). Good resistance to WSMV based on Wsm1 and stem rust. Very good test weight and milling quality, and above-average protein.
Hard red winter															
Wsm1-Overley/Fuller/CO050270/3/CO050337-8															
Breck	CSU 2017	5	5	5	8	8	5	2	4	2	7	2	2	2	4 CSU release (2017), marketed by PlainsGold in CWRP-Arden 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															
Byrd	CSU 2011	4	6	5	5	8	7	8	4	4	7	4	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 Cmc4 for moderate resistance to WSMV and has tolerance to TriMV.
Hard red winter															
TAM 112/CO970547-7															
Byrd CL Plus	CSU 2018	5	8	5	5	5	5	8	4	3	5	5	6	4	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. Tolerant to TriMV. Certified seed only.
Hard red winter															
CO06072/4*Byrd															

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), yellowing disease (YD), 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 and TriMV 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. Lines susceptible to TriMV have been shown to contain high levels of *Triticum mosaic* virus.

+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 (2025-2026)

Name/Class/Pedigree	Origin	HD	HT	SS	COL*	YR	LR	SR	WSMV**	TriMV**	WSS+TW	PRO**	MILL	BAKE	Comments	
Canvas	CSU 2018	5	4	2	6	4	6	2	2	2	6	3	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. Carries <i>Cmrc4</i> for moderate resistance to WSMV and has tolerance to TriMV. Good test weight and milling and baking quality.
Hard red winter Denali/Antero//Byrd																
CO20022RC	CSU EXP	5	5	4	6	5	--	--	2	2	8	3	7	1	4	CSU experimental line, first entered in the CSU trials in 2024. Two-gene Clearfield. Carries <i>Cmrc4</i> for wheat curl mite resistance and has tolerance to TriMV. Potential release in 2026.
Hard red winter CO14079RC/CO12D075																
CO20D108R	CSU EXP	6	5	3	7	4	5	1	1	1	5	5	7	3	3	CSU experimental line, first entered into the CSU trials in 2023. Carries <i>Cmrc4</i> for moderate resistance to WSMV and has tolerance to TriMV.. Moderate resistance to stripe rust and good resistance to stem rust. Good milling and excellent baking quality. Potential release in 2025.
Hard red winter CO13D1320/Valley//Canvas																
CO21D1790R	CSU EXP	4	2	3	7	3	--	--	2	3	4	3	6	5	1	CSU wheat breeding line. Carries <i>Cmrc4</i> for wheat curl mite resistance and has tolerance to TriMV. Bx7oe for strong mixing and high-end baking quality.
Hard red winter																
CO21SF226R	CSU EXP	5	6	9	9	9	--	--	6	5	1	1	3	4	7	CSU breeding line with semi-solid stem (19/25) for partial resistance to wheat stem sawfly.
Hard red winter CO15SFD088/CO15SFD067//CO16SF075																
CP7017AX	Croplan 2020	4	2	6	2	5	4	1	3	3	7	3	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.
Hard red winter Undisclosed																
CP7462	Croplan 2022	3	5	1	--	2	5	3	6	--	--	5	--	--	--	CROPLAN by Winfield United release (2022). First entered in CSU variety trials in 2026. Medium early maturity, excellent straw strength, and average test weight and protein.
Hard red winter Undisclosed																
CP7599CLP	Croplan 2025	5	5	3	--	5	5	6	3	--	--	2	--	--	--	CROPLAN by Winfield United release (2025). First entered in CSU variety trials in 2026. Medium maturity, good resistance to WSMV, and very good test weight.
Hard red winter Undisclosed																
CP7869	Croplan 2017	4	4	4	4	2	1	1	8	8	8	5	5	2	6	CROPLAN by WinField United release (2017). First entered into CSU trials in 2020. High yield potential, strong straw, good test weight. Good resistance to leaf, stem, and stripe rusts.
Hard red winter Undisclosed																

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), yellowing disease (YD), 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 and TriMV 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. Lines susceptible to TriMV have been shown to contain high levels of *Triticum mosaic virus*.

+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 (2025-2026)

Name/Class/Pedigree	Origin	HD	HT	SS	COL*	YR	LR	SR	WSMV**	TriMV**	WSS**TW	PRO**MILL	BAKE	Comments		
Croplan 7909 Hard red winter Undisclosed	Croplan 2018	4	4	5	4	7	5	5	8	8	6	5	6	3	6	CROPLAN by WinField United release (2018). First entered into CSU trials in 2020. Excellent yields and higher protein potential with very good winterhardness, broad adaptation, and excellent soilborne mosaic resistance.
Crescent AX Hard red winter (AF28/Byrd)/(AF10/2*Byrd)	CSU 2018	3	7	8	4	6	6	--	2	3	7	3	6	3	2	CSU release (2018), marketed by PlainsGold. CoAXium wheat for winter annual grassy weed control. AEarlier and much improved yield and test weight relative to Incline AX. Intermediate reaction to stripe rust. Carries <i>Cmrc4</i> for moderate resistance to WSMV and has tolerance to TriMV. Certified seed only.
Fortify SF Hard red winter Byrd/Bearpaw/Byrd	CSU 2019	4	6	6	5	6	7	4	3	2	2	3	5	3	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.
Gabriel Hard red winter Canvas//X170868/Canvas	CSU 2024	6	4	3	7	4	5	1	1	1	5	3	4	3	4	CSU release (2024), marketed by PlainsGold. First entered into the CSU trials in 2023. Similar performance as Canvas. Resistant to the wheat curl mite and carries <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. Certified seed only.
Guardian Hard red winter Antero/Snowmass/Byrd	CSU 2019	6	7	6	7	4	4	2	4	6	7	2	2	3	3	CSU release (2019), marketed by PlainsGold. Medium height, medium maturity. Good 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.
Hoyt SF Hard red winter CO16SFD020/CO16SF029	CSU 2025	6	4	4	2	5	--	--	4	2	2	3	7	2	8	CSU release (2025) marketed by PlainsGold. First entered into the CSU trials in 2024. Semi-solid stem (15 out of 25) for partial resistance to wheat stem sawfly. Certified seed only.
Jim Quick Hard red winter Avery/CO07W722-F5/CO11D1316W	CSU 2025	5	4	5	5	4	8	2	1	2	6	2	5	3	2	CSU release (2025), first entered into the CSU trials in 2023. Carries <i>Cmrc4</i> for moderate resistance to WSMV and has tolerance to TriMV. Moderate susceptibility to stripe rust and good resistance to stem rust. Good milling and baking quality. Potential release in 2026.
Kivari AX Hard red winter (AF28/Byrd)/(AF10/2*Byrd)	CSU 2020	5	6	8	6	7	8	5	6	6	5	6	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 Homesteader CL+ Hard red winter KS14-50809/Brawl CL Plus	KS-Hays 2024	6	5	4	--	2	7	4	2	4	7	4	4	--	--	KSU release (2023), marketed by Kansas Wheat Alliance. Two-gene Clearfield wheat. Medium-late maturity. Resistant to stripe rust and has higher temperature resistance to WSMV. Certified seed only (CSO) variety.

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), yellowing disease (YD), 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 and TriMV 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. Lines susceptible to TriMV have been shown to contain high levels of *Triticum mosaic virus*.

+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 (2025-2026)

Name/Class/Pedigree	Origin	HD	HT	SS	COL	YR	LR	SR	WSMV	TriMV	WSS	TW	PRO	MILL	BAKE	Comments
KS Territory Hard red winter KS11HW15/TX10A001006	KS-Hays 2022	5	4	3	3	2	4	4	3	2	7	5	4	5	7	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).
KS Tradition Hard red winter Joe/KS14-50809/Bentley	KS-Hays 2025	8	7	4	5	2	2	2	3	--	--	5	--	--	--	KSU release (2025), marketed by Kansas Wheat Alliance. Late maturity, resistant to leaf, stem, and stripe rust, and moderately resistant to BYDV and tolerant to WSMV. Average test weight and protein.
Langin Hard red winter CO050270/Byrd	CSU 2016	2	3	8	3	2	6	8	4	4	7	5	6	4	3	CSU release (2016), marketed by PlainsGold. Early maturing semidwarf. Good drought stress tolerance and winterhardness, 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	3	4	4	5	3	2	9	--	7	7	6	5	4	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 Caballero AX Hard red winter Undisclosed	Limagrain 2025	8	8	1	--	8	8	--	1	--	--	3	--	--	--	Limagrain release (2025). Late maturity and excellent straw strength. Susceptible to stripe and leaf rust, but resistant to WSMV. Very good test weight.
LCS Helix AX Hard red winter Undisclosed	Limagrain 2019	4	4	4	6	5	4	2	--	--	8	3	8	4	4	Limagrain release (2018), first entered in CSU Variety Trials in 2020. CoAXium wheat for winter annual grassy weed control. Broad adaptation, good resistance to stem rust and Fusarium head blight. Certified seed only.
LCS High Noon Hard red winter Undisclosed	Limagrain 2016	5	7	1	--	1	1	--	5	--	--	4	--	--	--	Limagrain release (2016). Medium maturity dual-purpose wheat. Resistant to stripe and leaf rust, but susceptible to WSMV. Good test weight and protein.
LCS Steel AX Hard red winter LCH13KSDH-20-87/ACC 7-38	Limagrain 2021	4	4	3	4	5	2	8	--	7	5	4	3	3	5	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.
Milestone Hard red winter Danby/Winterhawk/CIMMYT-06-3040	Dyna-Gro 2020	6	4	2	--	3	--	--	--	--	--	8	--	--	--	Dyna-Gro release (2020). Medium maturity with excellent straw strength. First entered in CSU variety trials in 2026. Below average test weight but tolerant to stripe rust.

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), yellowing disease (YD), 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 (2025-2026)

Name/Class/Pedigree	Origin	HD	HT	SS	COL*	YR	LR	SR	WSMV**	TriMV**	WSS**TW	PRO**MILL	BAKE	Comments		
Monarch	CSU 2018	6	3	3	6	4	5	2	5	2	5	4	7	4	CSU release (2018), marketed by PlainsGold. Hard white winter with excellent straw strength and very high irrigated yield potential. Tolerant to TriMV. Good stripe rust resistance. Quality more similar to Breck, but very low PPO. Certified seed only.	
Hard white winter																
CO07W722-F5/Snowmass//CO07W722-F5																
NE Dunbar CLP	UNL 2026	3	2	5	5	--	--	--	--	3	7	3	4	3	8	University of Nebraska experimental line. First entered into the CSU trials in 2024.
Hard red winter																
OK09915C/NH11565																
Outlaw	CSU 2024	2	2	4	2	2	7	2	3	2	7	5	5	4	3	CSU release (2024), 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.
Hard red winter																
CO12D1777/Langin																
Ramsay	Dyna-Gro 2021	6	5	2	--	3	--	--	--	--	--	5	--	--	--	Dyna-Gro release (2021). Medium maturity with excellent straw strength. First entered in CSU variety trials in 2026. Average test weight and protein content.
Hard red winter																
Undisclosed																
Sheridan	CSU 2023	5	6	4	8	3	5	1	5	3	7	3	4	3	3	CSU release (2023). Medium maturity and height and moderate straw strength. Very long coleoptile. Good resistance to stripe rust, stem rust, and moderate for leaf rust. Excellent grain protein deviation. Tolerant to TriMV. Good milling and baking quality.
Hard red winter																
CO12D906/CO11D1353/Monarch																
Showdown	OK 2018	6	7	5	4	4	5	6	8	6	--	6	--	--	--	Oklahoma Genetics, Inc. release (2018). Medium maturity with medium-tall plant height. Susceptible to WSMV. Average test weight and protein.
Hard red winter																
W99-194/OK02518W																
Snowmass 2.0	CSU 2018	3	4	4	5	6	5	1	4	4	5	5	4	3	1	CSU release (2018), marketed by PlainsGold in CWRFF-Arden Mills Ultragrain Premium Program. Hard white wheat, quality profile very similar to Snowmass but low PPO and better grain protein deviation.
Hard white winter																Good stripe and stem rust resistance and wheat streak mosaic virus resistance. Good straw strength, good test weight. Certified seed only.
CO07W722-F5/Snowmass//Brawl CL Plus																
Telluride	CSU 2023	4	4	2	4	8	6	1	4	2	7	4	4	3	3	CSU release (2023). 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. Certified seed only.
Hard white winter																
CO12D906/CO07W722-F5																
Whistler	CSU 2018	7	9	9	7	5	6	1	2	1	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. Overall very good virus tolerance. Carries <i>Cmrc4</i> for moderate resistance to WSMV and has tolerance to TriMV. Very good milling and baking quality.
Hard red winter																
CO08W218/Snowmass//Byrd																
Windom SF	CSU 2022	4	2	4	7	6	8	1	5	6	1	3	4	3	2	CSU release (2021), marketed by PlainsGold in CWRFF-Arden 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. <i>Wsm2</i> for resistance to WSMV. 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), yellowing disease (YD), 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).

2026 Small Grain Forage Trial Results

Sally Jones-Diamond, Jason Webb, Kristi Bartolo, Jeff Davidson, Zane Jenkins, and Zach Czarnecki

The 2025-2026 growing season was the fifth year of testing winter annual forages. There is increasing interest from farmers regarding 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 Walsh, along with irrigated locations at Rocky Ford and Center. The trials at Orchard and Center were lost due to drought and freeze at Orchard and extreme field variation at Center. The trials at Burlington and Walsh were not harvested for grain yield due to a hard freeze in May.

Each site had a minimum of six entries up to 22 entries. The six core varieties tested at all sites were Ray, MTF1435, MT Cash, OK Corral, Whistler, and Amplify SF (Gabriel at Walsh). Amplify SF, Gabriel, and Whistler are traditional, non-forage wheat varieties that were included. Additional entries were mostly winter triticale, but a few hybrid and open pollinated rye lines were also tested at research station sites.

Forage sub-samples were cut from the center of the plots as each variety reached the soft dough or early heading stage (Center) to determine forage yield and quality. If the entries were harvested on one date, the growth stage of each plot was reported. Forage wet and dry weights were obtained and used to calculate dry matter yield. Hay quality information was based on NIR analyses 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 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. Grain yield is presented in pounds per acre to allow for easy comparisons among species with differing standard grain test weights. Forage harvest dates for each location are provided in the footnotes beneath each table.

2026 Dryland Winter Forage Variety Performance Trial at Akron

Brand/Source	Variety	Forage Species ^b	Dry Matter Yield ^c ton/ac	Moisture % at harvest	Harvest Growth Stage	Grain Harvest			Forage Quality ^a				
						Yield lb/ac	Test Weight lb/bu	Grain Protein percent	Plant Height in	Dry Matter			
										RFO	CP	aNDFom	NEFD30 percent
KWS Cereals	KWS Progas	H. Rye	5.5	38.8	Soft Dough	2583	49.5	12.7	31	113	9.2	91.0	47
TriCal Superior Forage	TriCal Showtime	Trit	4.9	28.6	Soft Dough	1858	50.7	10.8	32	104	9.7	91.6	42
KWS Cereals	KWS Aviator	H. Rye	4.8	42.1	Soft Dough	2118	50.9	11.8	43	94	7.2	87.5	50
TriCal Superior Forage	TriCal Exp 554	Trit	4.7	30.7	Soft Dough	1376	46.7	12.8	34	67	6.9	90.4	58
NuHorizon Genetics	NT21436	Trit	4.7	31.4	Soft Dough	1902	51.6	13.6	33	92	9.0	91.0	49
SeeCan	Hazlet	OP Rye	4.6	37.9	Soft Dough	2127	55.0	10.5	38	98	7.5	89.7	52
Univ. of California-Davis	UCT 2502	Trit	4.5	31.1	Soft Dough	1978	49.4	11.9	25	102	9.1	89.4	48
Univ. of California-Davis	UCT 2501	Trit	4.4	35.3	Soft Dough	2085	50.0	12.4	25	138	12.0	92.1	40
TriCal Superior Forage	TriCal Exp 938	Trit	4.2	33.0	Soft Dough	1611	48.6	15.8	33	88	9.4	89.9	52
Univ. of California-Davis	UCT 2505	Trit	4.0	27.5	Soft Dough	1485	53.5	11.8	24	88	8.8	91.0	53
TriCal Superior Forage	TriCal Exp 209	Trit	3.9	29.4	Soft Dough	1423	49.0	14.6	29	90	8.1	90.2	52
PlainsGold	Gabriel	W	3.9	27.0	Soft Dough	1326	61.4	11.4	21	116	9.4	91.8	44
TriCal Superior Forage	Surge	Trit	3.6	34.9	Soft Dough	1040	46.6	12.2	33	100	8.8	91.4	50
PlainsGold	Whistler	W	3.6	27.1	Soft Dough	1831	59.0	10.9	20	103	8.4	93.4	47
PlainsGold	Ray	W	3.5	35.0	Soft Dough	1104	52.5	14.2	20	93	9.9	90.2	51
NuHorizon Genetics	NT Pronto	Trit	3.5	28.7	Soft Dough	1181	47.7	14.1	24	98	9.8	88.9	50
Univ. of California-Davis	UCT 2504	Trit	3.4	45.5	Soft Dough	1573	49.1	12.7	23	106	9.3	90.1	46
Univ. of California-Davis	UCT 2503	Trit	3.4	41.5	Soft Dough	1247	49.8	12.5	25	91	8.2	90.8	51
Montana State Univ.	MT Cash	W	3.4	40.3	Soft Dough	963	53.9	14.4	31	92	8.4	91.6	52
PlainsGold	Amplify SF	W	3.3	31.0	Soft Dough	1019	58.2	13.6	23	108	11.4	91.9	49
OklaHoma Genetics, Inc	OK Corral	W	3.3	29.1	Soft Dough	1314	54.2	12.3	22	103	9.7	92.2	46
Various	MTF1435	W	-	-	Soft Dough	810	53.0	13.7	20	100	10.5	90.4	50
Average						1543	51.8	12.7	28	99	9.1	90.7	50
LSD (0.30) ^d						173				44	64	65	38
LSD (0.05) ^d						335							
Coefficient of Variation (CV)						15.1%							

^aAll forage quality analyses results are dry basis values. CP=crude protein; RFO=relative feed quality; aNDFom=ash free neutral detergent fiber; NEFD30=neutral detergent fiber digestibility at 30 hours; TDN=total digestible nutrients using OARDC; NEL=net energy for lactation using OARDC; NEG=net energy gain using OARDC; and Milk/ton=predicted amount of milk produced per ton of dry matter calculated using MILK2013.

^bForage Species: OP Rye=Open Pollinated Rye; H. Rye=Hybrid Rye; Trit=Triticale; W=Wheat.

^cHarvest at Akron was targeted for the soft dough growth stage. Trial was planted on Oct. 1, 2025 and harvested on June 15th and 22nd for forage and July 6 for grain.

^dIf 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.

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2026 Dryland Winter Forage Variety Performance Trial at Burlington

						Forage Quality ^a								
Brand/Source	Variety	Forage Species	Dry Matter	Moisture	Harvest Growth Stage	RFQ	Dry							
			Yield ^b				CP	Matter	aNDFom	NDFD30	TDN	NEL	NEG	Milk/Ton
			ton/ac	% at harvest		percent				Mcal/cwt				lb/ton
PlainsGold	Whistler	Wheat	3.3	37.9	Soft Dough	107	12.0	91.5	49	47	62	63	37	2648
Montana State Univ.	MT Cash	Wheat	2.6	35.0	Soft Dough	96	13.4	92.1	50	46	60	61	35	2522
TriCal Superior Forage	MTF1435	Wheat	2.3	37.0	Soft Dough	103	12.9	92.7	50	48	60	62	35	2596
PlainsGold	Amplify SF	Wheat	2.2	35.2	Soft Dough	99	13.4	93.3	50	46	61	63	36	2587
PlainsGold	Ray	Wheat	2.1	24.4	Soft Dough	96	13.9	92.6	51	48	59	60	34	2464
Oklahoma Genetics, Inc	OK Corral	Wheat	1.8	31.0	Soft Dough	100	13.5	93.1	51	48	60	61	34	2515
Average			2.4	33.4	-	100	13.2	92.6	50	47	60	62	35	2555
LSD (0.30) ^c			0.3											
LSD (0.05) ^c			0.6											
Coefficient of Variation (CV)			9.0%											

^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; TDN=total digestible nutrients using OARDC; NEL=net energy for lactation using OARDC; NEG=net energy gain using OARDC; and Milk/ton=predicted amount of milk produced per ton of dry matter calculated using MILK2013.

^bHarvest at Burlington was targeted for the soft dough growth stage. Trial was planted on Sept. 19, 2025 and harvested on June 5th for most varieties and June 15th for Ray.

^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.

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2026 Dryland Winter Forage Variety Performance Trial at Rocky Ford

Grain Harvest										Forage Quality ^a									
Brand/Source	Variety	Forage		Dry Matter Yield ^c ton/ac	Moisture % at harvest	Harvest Growth Stage	Yield lb/ac	Test Weight lb/bu	Dry				Mcal/cwt						
		Species ^b	Yield ^c						CP	Matter	aNDFom percent	NDFD30	TDN	NEL	NEG	Milk/Ton lb/ton			
																	RFQ		
TriCal Superior Forage	TriCal Exp 209	Trit	7.3	58.2	Soft Dough	366	49.7	122	9.6	97.8	41	37	68	70	43	2835			
Univ. of California-Davis	UCT 2501	Trit	6.5	62.7	Soft Dough	728	52.4	108	7.3	98.4	54	56	61	63	34	2749			
NuHorizon Genetics	NT21436	Trit	6.2	58.1	Soft Dough	377	53.5	70	6.5	97.9	60	44	56	57	27	2192			
TriCal Superior Forage	TriCal Exp 554	Trit	5.6	58.4	Soft Dough	296	50.5	83	6.9	98.4	53	42	59	60	31	2314			
TriCal Superior Forage	TriCal Exp 938	Trit	5.6	58.7	Hard Dough	342	52.1	88	8.5	98.3	52	43	61	62	34	2508			
Various	MTF1435	W	5.6	58.9	Soft Dough	238	56.1	89	7.7	98.9	52	42	60	61	32	2509			
Univ. of California-Davis	UCT 2502	Trit	5.6	61.2	Soft Dough	710	52.6	103	8.0	98.2	50	47	62	63	35	2583			
PlainsGold	Ray	W	5.5	60.0	Soft Dough	248	56.5	99	8.3	98.2	50	51	61	63	34	2662			
Montana State Univ.	MT Cash	W	5.4	56.3	Hard Dough	215	58.3	98	7.1	98.9	55	49	60	61	33	2595			
PlainsGold	Whistler	W	5.4	54.9	Hard Dough	696	56.8	88	5.2	98.2	52	45	60	61	31	2504			
KWS Cereals	KWS Progas	H. Rye	5.3	59.5	Soft Dough	332	53.8	102	4.9	98.5	56	44	64	66	38	2692			
TriCal Superior Forage	TriCal Showtime	Trit	5.2	58.1	Soft Dough	372	51.7	80	7.0	98.0	57	47	58	60	30	2363			
PlainsGold	Gabriel	W	5.1	58.0	Hard Dough	419	58.0	92	6.4	97.9	52	52	59	60	31	2485			
Oklahoma Genetics, Inc	OK Corral	W	4.8	52.0	Hard Dough	236	54.0	101	7.6	98.5	49	48	61	62	34	2628			
Univ. of California-Davis	UCT 2505	Trit	4.7	60.3	Hard Dough	128	29.7	76	6.6	98.2	59	47	58	59	29	2342			
SeeCan	Hazlet	OP Rye	4.7	61.9	Hard Dough	237	50.5	81	5.6	98.3	57	44	59	60	30	2426			
KWS Cereals	KWS Aviator	H. Rye	4.6	59.3	Hard Dough	297	51.5	76	5.3	98.5	53	41	60	61	31	2407			
NuHorizon Genetics	NT Pronto	Trit	4.5	55.7	Soft Dough	95	33.5	76	6.4	99.0	53	43	59	61	31	2414			
TriCal Superior Forage	Surge	Trit	4.5	57.1	Hard Dough	179	44.0	80	5.8	37.8	55	45	59	60	30	2342			
Univ. of California-Davis	UCT 2504	Trit	4.1	61.4	Milk	79	42.9	90	7.9	97.7	55	50	59	60	31	2456			
Univ. of California-Davis	UCT 2503	Trit	3.8	58.8	Soft Dough	171	41.8	81	7.4	98.3	57	48	58	59	30	2378			
PlainsGold	Amplify SF	W	3.8	57.2	Soft Dough	310	55.3	100	8.0	98.8	52	53	60	61	32	2577			
Average				5.2	58.5	-	321	50.2	90	7.0	95.6	53	46	60	61	32	2498		
LSD (0.30) ^d				0.9			99												
LSD (0.05) ^d				1.7			190												
Coefficient of Variation (CV)				12.8%			24.1%												

^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; TDN=total digestible nutrients using OARDC; NEL=net energy for lactation using OARDC; NEG=net energy gain using OARDC; and Milk/ton=predicted amount of milk produced per ton of dry matter calculated using MILK2013.

^bForage Species: OP Rye=Open Pollinated Rye; H. Rye=Hybrid Rye; Trit=Triticale; W=Wheat.

^cHarvest at Rocky Ford was targeted for the soft dough growth stage. Trial was planted on Sept. 19, 2025 and harvested on June 1 for forage and July 10 for grain. A hard May freeze severely affected grain yield.

^dIf 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.

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2026 Dryland Winter Forage Variety Performance Trial at Walsh

						Forage Quality ^a								
Brand/Source	Variety	Forage Species ^b	Dry Matter		Harvest Growth Stage	Dry					NEL	NEG	Milk/Ton	
			Yield ^c	Moisture		RFQ	CP	Matter	aNDFom	NDFD30				TDN
			ton/ac	% at harvest		percent			Mcal/cwt			lb/ton		
KWS Cereals	KWS Aviator	H. Rye	1.5	53.8	Soft Dough	124	12.9	90.0	58	62	62	63	37	2943
Univ. of California-Davis	UCT 2505	Trit	1.3	34.7	Soft Dough	101	11.2	91.4	52	49	62	64	37	2690
KWS Cereals	KWS Progas	H. Rye	1.2	54.9	Milk	130	13.1	91.1	55	62	64	65	40	3067
PlainsGold	Whistler	W	1.2	40.2	Milk	116	13.6	91.7	46	49	63	65	39	2757
Univ. of California-Davis	UCT 2501	Trit	1.0	56.9	Watery	125	12.9	91.5	48	55	65	66	41	2962
PlainsGold	Gabriel	W	0.9	41.5	Milk	105	11.8	91.6	47	45	63	65	38	2688
Univ. of California-Davis	UCT 2503	Trit	0.9	47.3	Milk	124	13.3	91.3	46	51	65	66	41	2932
NuHorizon Genetics	NT Pronto	Trit	0.8	46.3	Milk	102	12.1	90.4	51	48	62	64	37	2689
NuHorizon Genetics	NT21436	Trit	0.8	53.2	Milk	109	11.6	91.0	51	51	63	65	38	2820
TriCal Superior Forage	MTF1435	W	0.8	48.9	Milk	94	10.9	91.9	52	48	60	62	34	2530
TriCal Superior Forage	Surge	Trit	0.7	49.5	Milk	120	13.1	91.9	48	51	64	66	40	2871
Univ. of California-Davis	UCT 2502	Trit	0.7	64.0	Watery	122	12.4	91.0	52	59	62	64	38	2875
Oklahoma Genetics, Inc	OK Corral	W	0.6	31.6	Soft Dough	134	15.6	92.3	41	47	64	66	41	2834
Montana State Univ.	MT Cash	W	0.6	51.6	Milk	97	10.5	91.9	53	50	60	62	34	2628
PlainsGold	Ray	W	0.6	49.5	Milk	101	11.6	91.4	53	51	61	62	35	2651
Univ. of California-Davis	UCT 2504	Trit	0.3	54.0	Soft Dough	122	14.2	91.4	48	53	63	64	39	2839
Average			0.9	48.6	-	114	12.5	91.4	50	52	63	64	38	2799
LSD (0.30) ^d			0.1											
LSD (0.05) ^d			0.2											
Coefficient of Variation (CV)			10.8%											

^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; TDN=total digestible nutrients using OARDC; NEL=net energy for lactation using OARDC; NEG=net energy gain using OARDC; and Milk/ton=predicted amount of milk produced per ton of dry matter calculated using MILK2013.

^b Forage Species: H. Rye=Hybrid Rye; Trit=Triticale; W=Wheat

^c Harvest at Walsh was targeted for the milk growth stage. Trial was planted on Sept. 23, 2025 and harvested on June 3, 2026.

^d 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.

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Seed Storage, Certified Seed, and Plant Variety Protection: Best Practices for Farmers

Laura Pottorff

Seed Storage and Inventory Management

Seed held in inventory from one growing season to the next can still be sold and used if its viability (germination potential) and vigor (overall health and resilience) remain acceptable. One key reason for storing seeds is to preserve desired genetic stocks for years following low production seasons, which are often influenced by environmental factors.

Seed deterioration is inevitable, but proper storage can delay the loss of viability and vigor. Common factors contributing to seed deterioration include age, temperature, humidity and physical damage of seeds.

To minimize deterioration and preserve seed quality, follow these guidelines:

- **Cool, Dry, and Dark Environment:** Store seeds at temperatures between 32°F and 50°F (0°C to 10°C), maintain low relative humidity, and keep seeds away from light to prevent aging.
- **Airtight Containers:** Use sealed containers or resealable plastic bags to prevent moisture and air exchange. Ensure seeds are thoroughly dried before storage.
- **Regular Monitoring:** Inspect stored seeds periodically for signs of mold, moisture, or deterioration.
- **Isolation from Contaminants:** Store seeds away from chemicals, fertilizers, and other contaminants.
- **Record Keeping:** Maintain detailed records of storage practices, including dates and conditions, to track seed viability.
- **Periodic Germination Testing:** Retest germination rates regularly to comply with state (Colorado – 13-month expiration) and federal (6-month expiration) seed labeling laws. Discard or repurpose seeds with poor viability.
- **FIFO Inventory Management:** Use a “first in, first out” system to sell older inventory first, ensuring seed quality and legal compliance with labeling laws.

Certified Seed: It Pays to Plant the Best

Certified seed offers numerous advantages over common or bin-run seed, including higher yields, improved crop quality, reduced risk of crop failure, lower input costs, and reduced weed competition. While certified seed may involve a higher initial investment, its superior quality, genetic purity, and disease resistance make it a reliable choice for maximizing crop performance and profitability.

Certified Seed Longevity

Although certified seed does not inherently have a longer storage life than common or bin-run seed, its superior handling and storage practices help retain viability and vigor for longer periods. Proper storage conditions—cool temperatures, low humidity, darkness, and airtight containers—are essential for preserving seed quality over time.

Saving Seed of PVP-Protected Varieties

Many certified seed varieties come with restrictions on saving or selling seed. The Plant Variety Protection Act (PVP) protects the intellectual property rights of plant breeders, ensuring their investment in research and development is safeguarded. This protection benefits farmers by facilitating ongoing innovation in plant breeding.

Types of Protection for Certified Seed:

- **PVP¹:**
 - Varieties must be sold by name, and farmer-saved seed sales are prohibited.
 - Seed conditioners may be held liable for cleaning protected seed that are illegally sold.
 - Farmers may save grain for their own planting but cannot sell it.
- **PVP Title V Option²:**
 - Seed may only be sold as a certified class if elected by the owner.
 - Sales of non-certified seed are illegal under Title V of the Federal Seed Act.
- **Single Use Seed Agreements (Certified Seed Only)³:**
 - Growers agree to use seed solely for planting and producing a single crop.
 - Saving or selling grain for future planting is prohibited.

To help discern which certified varieties can be saved and which varieties need to be purchased each year, refer to the table on the following page.

Table 1. PVP Status of selected varieties. *Any omissions of varieties or miscategorizations were unintentional, categorizations are based on communication with variety owners. June 2026

PVP¹ – Unauthorized propagation is prohibited. Grain may be saved for planting by the grower only. Seed must be sold by variety name. Sale of farmer-saved seed is prohibited.			
WB4418		WB4483	
PVP + Title V option² – Unauthorized propagation is prohibited. Grain may be saved for planting by the grower only. Sale of farmer-saved seed is prohibited. Seed must be sold by variety name. Seed may only be sold as a class of Certified Seed.			
Antero	AP BigFoot	AP Everrock	AP Roadrunner
AP Solid	Avery	Breck	Byrd
Canvas	Fortify SF	Guardian	KS Dallas
KS Hamilton	KS Providence	Langin	LCS Julep
LCS Mint	LCS Radar	Monarch	NuGrain
Outlaw	Ray	Sheridan	SY Assure
SY Legend	SY Ovation	SY Wolverine	Whistler
	Telluride		
Single Use³ – All the provisions of PVP and Title V apply. In addition, seed of these wheat varieties must be purchased every year due to stewardship agreements or exclusive contracts.			
Amplify SF	AP18 AX	Brawl CL+	Byrd CL+
Crescent AX	Gabriel	Hoyt SF	Kivari AX
KS Bill Snyder	KS Homesteader CL+	KS Territory	LCS Atomic AX
LCS Helix AX	NE Prism CLP	Settler CL	Snowmass
Snowmass 2.0	SY Sunrise	WB4347	WB4422
WB4444	WB4595	WB4733CLP	Windom SF

Effects of Seed Size and Aging on Germination and Vigor of Wheat

Behroze Rostami, Randy Crowl, Sally Jones-Diamond, Laura Pottorff

Summary

Seed size strongly influences wheat germination, seedling vigor, and early biomass. This study evaluated the effects of three seed sizes (small, medium, large) on germination, seedling vigor, and biomass in three Colorado wheat varieties (Byrd, Amplify SF, Langin) using a two-factor factorial experiment with four replications. Analysis of variance showed that seed size and its interaction with variety significantly affected germination, vigor, and both fresh and dry seedling weight, while varietal differences alone were not significant. Large seeds exhibited the highest germination (99.1%), vigor (98.1%), and dry biomass (11.97–13.51 g), medium seeds were intermediate, and small seeds were lowest. Economic analysis indicated that smaller seeds reduce seeding costs per acre due to higher seed numbers per pound, but reduced vigor and biomass may limit early growth and yield potential. These findings highlight that larger seeds improve early seedling performance, support uniform stand establishment, and may enhance profitability under variable field conditions.

Introduction

Seed size is a key physical determinant of seed quality, influencing germination, vigor, and crop establishment. Larger seeds are generally associated with higher survival, faster growth, and greater yield potential (Zhang et al., 2023; Shahwani et al., 2014). Conversely, smaller seeds offer economic advantages, as they are less costly and require fewer pounds per unit area to achieve the desired plant density, thereby enabling cost-effective cultivation and the ability to purchase larger quantities or multiple varieties.

Seed aging is a natural, irreversible process that progressively reduces germination and vigor, ultimately leading to seed death, even under optimal storage conditions (Pérez-García et al., 2008). Both seed size and aging are therefore critical factors influencing seed performance and overall crop productivity.

Optimizing seeding rates in relation to seed size and aging is essential for maximizing wheat yield potential and maintaining seed quality. This study was conducted to evaluate the effects of seed size and seed aging on germination and vigor in three commercially grown wheat cultivars in Colorado. Furthermore, the economic impact of seed size was examined, as smaller seeds providing a greater number of seeds per pound and potential cost advantages, but may exhibit reduced vigor, particularly after extended storage. A clear understanding of these relationships can inform evidence-based seed management strategies that enhance production efficiency, minimize economic losses associated with seed deterioration, and ultimately improve the profitability and sustainability of wheat cultivation systems.

Materials and Methods

Experimental Design

A two-factor factorial experiment (three seed sizes $\times$ three varieties) with four replications was conducted at the Colorado Seed Laboratory, Colorado State University, in spring 2025.

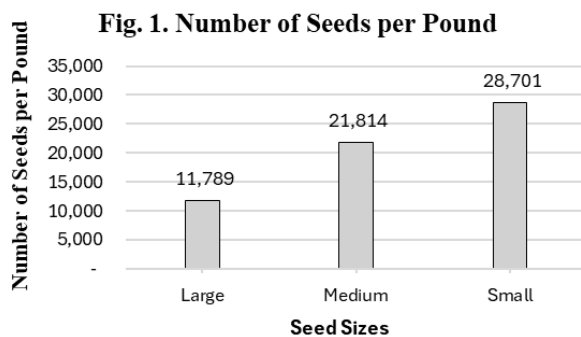
Treatments

The study included three wheat varieties (Byrd, Amplify SF, and Langin) and three seed sizes: large (>2.38 mm), medium (1.95 – 2.12 mm), and small (<1.95 mm). The details of treatments with their symbols and sizes are shown in Table-1. Fig. 1 shows number of seeds per pound for each seed size.

Table-1: Treatments, TKW and number of seeds per pound

Treatments	TKW (g)	No. Seeds/lb
AL	42	10,803
AM	20.4	22,200
AS	15.8	28,709
BL	36.1	12,574
BM	20.6	22,051
BS	15.6	29,003
LL	37.8	11,990
LM	21.4	21,189
LS	16	28,392

TKW: Thousand Kernel Weight, lb: pound, AL: Amplify SF Large, AM: Amplify SF Medium, AS: Amplify SF Small, BL: Byrd Large, BM: Byrd Medium, BS: Byrd Small, LL: Langin Large, LM: Langin Medium, LS: Langin Small



Seed Grading and Storage

Seeds were graded using a series of sieves with mesh sizes of 2.38 mm, 2.12 mm, and 1.95 mm. Seeds retained on the 2.38 mm sieve were classified as large seeds, those retained between 2.12 mm and 1.95 mm as medium seeds, and those passing through the 1.95 mm sieve as small seeds. Foundation seeds produced during the 2023–2024 season by the Agronomy Foundation Seed program were stored under ambient room conditions for use in the 2025 and 2026 experiments.

Data Collection

Thousand Kernel Weight (TKW) and seeds per pound were recorded prior to testing. Germination followed Association of Official Seed Analysts (AOSA) procedures using 400 seeds in rolled towels at 20 °C under an 8 h light/16 h dark photoperiod for 7 days in SG30 germination chambers (Hoffman Manufacturing). Vigor was tested, following AOSA protocols using 400 seeds incubated at 41 °C for 72 h in a VWR controlled environment chamber, followed by 7 days at 20 °C in SG30

chambers. The seedlings after germination test were weighed for fresh weight and oven-dried at 55 °C for 72 h to determine dry weight.

Data Analysis

Data were analyzed using ANOVA, and mean differences were assessed by the LSD test at the 5% significance level.

Results and Discussion

Germination and Vigor

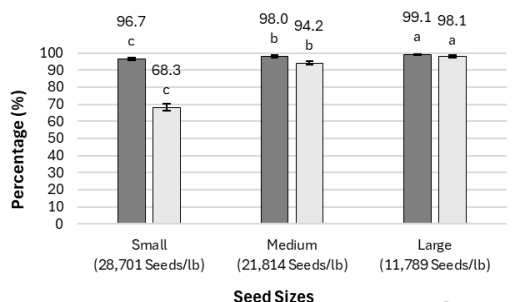
Analysis of variance revealed that seed size and the interaction between seed size and variety significantly affected germination and vigor, whereas variety alone showed no significant effect, the three varieties performed statistically the same percentage of germination and vigor.

Large seeds recorded the highest germination (99.1%) and vigor (98.1%), followed by medium size seeds (98.0% and 94.2%), whereas small seeds showed significantly lower germination (96.7%) and vigor (68.3%) (Fig. 2). As shown in Table-2, treatments AL, BL, and LL achieved the highest germination (99.75%, 99.25%, and 98.25%) and vigor (99.75%, 98.00%, and 96.50%), respectively.

The three varieties performed statistically the same; however, positive effect of seed size was most pronounced in Amplify SF, moderate in Byrd, and least evident in Langin. The combination of Amplify SF with large seed size produced higher germination (99.75%) and vigor (99.75%), which was not statistically different than Byrd and Langin (Fig. 3), demonstrating that larger seeds enhanced germination and vigor across all varieties in a similar manner.

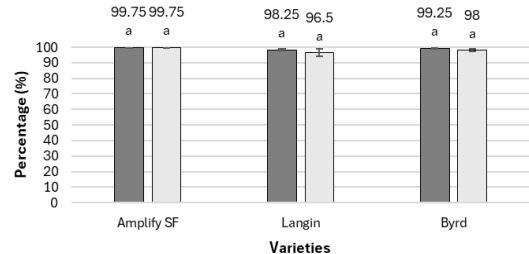
The superior performance of large seeds is likely due to their greater nutrient reserves and higher metabolic activity, which promote rapid and uniform emergence. These results corroborate earlier reports that larger seeds generally exhibit higher vigor due to increased endosperm reserves and metabolic activity (Zhang et al., 2023; Shahwani et al., 2014). Overall, the results indicate that using larger seeds enhances germination and vigor across all varieties, particularly those with high genetic potential.

Fig. 2. Effect of Seed Size on Germination and Vigor



Data represent mean standard deviation (SD) (n=4).

Fig. 3. Varietal Effects on Germination and Vigor

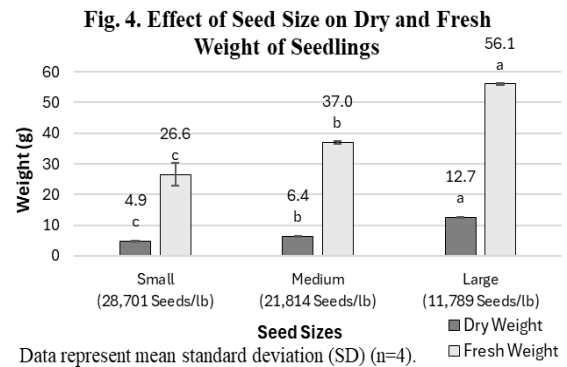


Data represent mean standard deviation (SD) (n=4).

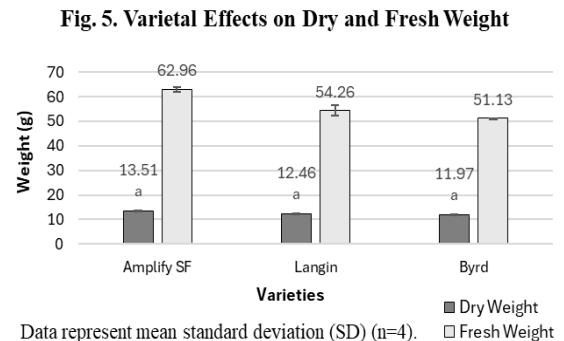
Biomass (Dry and Fresh Weight)

The analysis of variance showed that seed size and the interaction between seed size and variety had a significant effect on both dry and fresh weight of seedlings, whereas the effect of variety alone was not significant.

Fresh and dry weight increased by increasing seed size across all varieties. Among the treatment combinations, the highest dry weight was recorded in Amplify SF with large seeds (AL, 13.51 g), followed closely by Langin with large seeds (LL, 12.46 g) and Byrd with large seeds (BL, 11.97 g). Treatments with medium seeds (AM, LM, BM) produced moderate dry weights ranging from 6.12 to 6.74 g, while small seed treatments (AS, LS, BS) showed the lowest dry weights (4.54–5.05 g) (Table 2). The same findings recorded with fresh weight (Fig. 4). This trend clearly indicates that larger seeds produce more vigorous seedlings with greater biomass accumulation across all varieties.



Although varietal differences were not statistically significant, Amplify SF exhibited numerically higher mean dry (13.51 g) and fresh (62.96 g) weights, followed by Langin with 12.46 g and 54.26 g, respectively and the lower dry (11.97 g) and fresh (51.13 g) weight was recorded by Byrd (Fig. 5).



The consistent increase in both dry and fresh biomass with larger seed size can be attributed to the greater endosperm reserves that provide more energy for initial growth, leading to robust seedlings with higher photosynthetic capacity. These findings are consistent with previous research reporting that larger seeds produce more vigorous seedlings with higher biomass accumulation and improved establishment (Shahwani et al., 2014; Pérez-García et al., 2008). Overall, the results confirm that larger seeds significantly enhance early seedling biomass, contributing to stronger stand establishment and potential yield advantages, particularly under dryland or rainfed conditions.

Seed Aging

The impact of seed aging will be evaluated in 2026 after storing seeds for one year under room temperature conditions. Data is not yet available.

Table-2. Effect of Seed Size on Germination, Vigor, Fresh and Dry Weight of Wheat Varieties

No.	Treatments	Germination (%)		Vigor (%)		Fresh Weight (g)		Dry Weight (g)	
1	Amplify SF Large (AL)	99.75	a	99.75	a	62.96	a	13.51	a
2	Amplify SF Medium (AM)	98.50	bc	95.75	c	37.46	e	6.12	f
3	Amplify SF Small (AS)	96.50	e	80.50	e	28.43	g	4.54	i
4	Byrd Large (BL)	99.25	ab	98.00	ab	51.13	c	11.97	c
5	Byrd Medium (BM)	97.50	d	88.75	d	33.5	f	6.74	d
6	Byrd Small (BS)	95.75	e	68.50	f	24.86	i	4.98	h
7	Langin Large (LL)	98.25	c	96.50	bc	54.26	b	12.46	b
8	Langin Medium (LM)	98.00	cd	98.00	bc	40.03	d	6.47	e
9	Langin Small (LS)	97.75	cd	55.75	g	26.49	h	5.05	g
Average		97.9		86.7		39.91		8.0	
LSD (5%)		0.84		2.69		1.81		0.084	

Data represents mean (n=4). Mean within each column with the same letters are not significantly different according to LSD at $p \leq 0.05$.

Economic Impact of Seed Size

The economic implications of seed size are primarily linked to seeding rate and cost per acre. Because wheat seed is sold by weight, smaller seed lots containing more seeds per pound can reduce planting costs while achieving similar plant populations. In this study, large seeds averaged about 12,000 seeds per pound, medium seeds 21,000 seeds per pound, while small seeds exceeded 28,000 seeds per pound (Table 1).

At a target seeding rate of 750,000 seeds per acre, large seed lots would require approximately 63 lb per acre, medium seeds ~36 lb per acre, whereas small seed lots would require only ~27 lb seeds per acre. Based on an average certified seed price of \$0.25 per pound, this represents a potential savings of about \$9.00 per acre when using small seeds and \$6.00 per acre with medium seeds compared to large seeds.

However, the reduction in cost must be weighed against the decrease in seed vigor and seedling biomass observed in this study. Small seeds produced significantly lower vigor (68.3%) and dry weight (4.5–5.0 g) compared with large seeds (98.1% vigor, 11.9–13.5 g). Reduced vigor can delay emergence, compromise stand uniformity, and lower yield potential, particularly under dryland conditions. Similar findings have been reported by Neely and Esser (2022), who observed that larger seeds improved stand establishment and produced yield increases of up to 8 bushel per acre, more than compensating for the additional seed cost.

Overall, while smaller seeds may offer short-term economic savings through reduced seeding rates, larger seeds provide greater agronomic reliability and return on investment under variable field conditions. Optimizing seeding rates relative to seed size and environmental stress can therefore improve both seed-use efficiency and overall profitability in wheat production systems.

Conclusion

This study demonstrates that seed size significantly influences wheat germination, seedling vigor, and biomass accumulation, whereas varietal differences were less pronounced. Large seeds consistently produced higher germination percentages, greater vigor, and increased dry and fresh weights across all three wheat varieties. From an economic perspective, while smaller seeds can reduce seeding costs due to their higher seed count per pound, the lower vigor and biomass associated with small seeds may compromise emergence and yield potential, particularly under dryland or stress-prone conditions. Therefore, larger seeds, despite slightly higher upfront costs, offer a more reliable return on investment by enhancing early seedling performance and overall crop productivity. Optimizing seeding rates according to seed size and environmental conditions can maximize both agronomic performance and profitability for Colorado wheat growers.

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Note: This document represents an ongoing study. We welcome your comments, suggestions, and constructive feedback to further refine and improve this work. Please feel free to contact us at: behroze.rostami@colostate.edu

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