

Technical Report TR 17-4

Agricultural Experiment Station

Colorado
State
University

College of Agricultural Sciences

Department of Soil & Crop Sciences

Extension

Making Better Decisions



**2017 Colorado
Winter Wheat
Variety
Performance
Trials**

Crops
Testing

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Additional Resources on the Internet

Colorado State University Crop Variety Testing Program: csucrops.com

Colorado State University Wheat Breeding Program: wheat.colostate.edu

Colorado Wheat Variety Performance Database: ramwheatdb.com

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

Overview of 2016-2017 Eastern Colorado Winter Wheat Trials

Jerry Johnson and Sally Jones

Colorado State University researchers work hard to provide current, reliable, and unbiased wheat variety information to Colorado producers. Support of our research keeps public variety testing thriving in Colorado. Farmer support of public variety testing is our hope for the future. Our work in Colorado is possible due to the support and cooperation of the entire Colorado wheat industry, especially support from the Colorado Wheat Administrative Committee (wheat assessment) and the Colorado Wheat Research Foundation (seed royalties).

We test under a broad range of environmental conditions to best determine expected performance of new varieties. We have a uniform variety testing program, meaning that all dryland varieties are tested in all eleven dryland test locations and all irrigated varieties are tested in all three irrigated trials. There were 46 varieties including experimental lines in each of the 11 dryland trials. The three irrigated trials each had 32 varieties and the 30 collaborative on-farm tests (COFT) each had four varieties. The trials included a combination of public and private varieties and experimental lines from Colorado, Texas, Kansas, Nebraska, Wyoming, and Montana. Seed companies with entries in the variety trials included WestBred (Monsanto), AgriPro (Syngenta), Limagrain Cereal Seeds, and AGSECO. There were entries from four marketing organizations: PlainsGold (Colorado), Husker Genetics (Nebraska), the Crop Research Foundation of Wyoming, and the Kansas Wheat Alliance.

All dryland and irrigated trials were planted in a randomized complete block design with three replicates. Plot sizes were approximately 175 ft² (except the Fort Collins IVPT, which was 80 ft²) and all varieties were planted at 700,000 seeds per acre for dryland trials and 1.2 million seeds per acre for irrigated trials. Plot sizes for the COFT ranged from 0.25 to 1.5 acres per variety and seeding rates conformed to the wheat seeding rate of the collaborating farmer. Yields were corrected to 12% moisture. Variety trial plot weight, test weight, and grain moisture content information was obtained from a Harvest Master weighing system on the plot combine.

General Growing Season Comments

The 2016-2017 growing season can be characterized by three factors:

- Planting followed by rain later in the fall resulted in good stands, except in SE and west-central Colorado where drought conditions prevailed and wheat didn't emerge until spring. Drought conditions and high winds led to severe blowing in some locations in SE Colorado. Very long fall without freezing temperatures into November favored movement of the wheat curl mite (harboring viruses) from corn and other mite refuges to winter wheat fields. A severe cold snap in November stopped fall growth abruptly.
- Dry weather conditions in the winter and early spring. Very warm temperatures in February throughout Colorado. In the spring there were widespread virus symptoms showing on large areas in eastern Colorado.

- Above-average and well distributed precipitation at the end of April and in May and June that led to high yields despite prevalence of spring emergence and widespread virus infections. A heat wave in late May reduced the threat of widespread stripe rust infections.

General Growing Conditions in Southeast Colorado - Kelly Roesch

In the Southeast, a very dry fall and warm, dry winter conditions made it challenging to establish good wheat stands. The southernmost part of the area was the most challenging with some fields in Baca County not being planted and some emerged wheat was blown out. Planting conditions were better in the central and northern parts of the area but some fields had spots that didn't germinate until spring. Temperatures were average to slightly warmer in November through February. Moisture during this period followed the historic average.

As a result of warm temperatures and moisture in March, the wheat grew rapidly causing concern for potential damage from a late freeze. Pale western cutworm, army cutworm, and Russian wheat aphid were observed at levels that required treatment in many fields. Very beneficial April rain saved the 2017 wheat crop. An April 29th blizzard brought heavy wet snow and strong winds causing some stem breakage and it laid some fields flat, particularly in areas south of highway 50. In most cases the wheat stood back up and could be harvested. Freeze damage resulting from the storm was minimal as temperatures did not drop as low as predicted and the accumulated snow provided insulation.

As the crop progressed throughout May and June, disease issues were more widespread than in previous years with wheat streak mosaic virus (WSMV) and Triticum mosaic virus (TriMV) being the most prevalent. Stripe rust was present but was less of an issue in 2017 than in the past two years.

Harvest was well underway by June 20th and warm, dry weather in June allowed for the harvest to progress well. Moisture throughout the first two weeks of July caused the remaining harvest to be delayed; however the majority of the crop was completed by mid-July. Variation in yield was wide, ranging from 15 to 90-plus bu/ac across the area. Yields for the area as a whole were above-average.

General Growing Conditions in Northwest High Plains of Colorado - Wilma Trujillo

2017 was another challenging year for wheat producers. Most producers in Adams, Arapahoe, Morgan, Southwest Washington and Weld counties planted into low soil moisture, resulting in spring germination and emergence. Warm and dry conditions prevailed during the fall, which favored an outbreak of the wheat curl mite and widespread WSMV, TriMV, and/or High Plains wheat mosaic virus (HPWMoV) infections. September and October were warmer than they have been in previous years. Warm conditions continued into November. Snowfall in December was one of the lowest in recent winters.

Wheat that emerged in the fall began breaking dormancy in mid-February. Warm temperatures and dry conditions prevailed. Moisture stress was observed in several locations. Dry conditions

persisted into late-April. As the wheat continued to mature the expression of virus symptoms, WSMV, TriMV and/or HPWMoV became more evident. Symptoms included yellow streaking or mosaic patterns on young leaves, stunting and poor tillering on infected plants.

The second part of April and May were characterized by widespread precipitation events. Accumulated precipitation averaged 3 inches in April and 4 inches in May across the area. Also, April and May were marked by cooler temperatures. The wet and cool conditions were favorable for the development of stripe rust with damage ranging from very mild to severe depending on whether the farmer sprayed and if the wheat variety was susceptible or tolerant of the disease.

The abundance of heat and moisture generally improved wheat conditions in June. However, persisting stripe rust and other fungal diseases on wheat were still observed where surplus soil moisture and cool temperatures occurred in greater frequency.

Harvest activities gradually began in the first week of July. In mid-July, producers made significant progress in harvesting wheat in the midst of scattered precipitation. Wheat harvest was wrapped up by the last week of July. Yield ranged from 14 bu/ac to 82 bu/ac across the area. Yield variability could be attributed to the weather pattern during the growing season, selection of adapted wheat varieties, and pest and disease control at the right time. Although many wheat producers reported high yields, grain protein content tended to be low.

General Growing Conditions in Northeast Colorado - Dennis Kaan

The majority of Northeast Colorado wheat producers planted into adequate soil moisture last fall. September and October were unusually warm and complemented with timely rains beneficial to planting. Precipitation and warm temperatures were beneficial for wheat germination and emergence and the warm conditions continued into November. Temperatures were seasonal at the beginning of December. Colder temperatures prevailed during the remainder of the month, but without the dramatic cold spells early in the winter that have caused winterkill the past couple of years.

The exception was an area of central and southern Washington and Yuma counties, extending into northern Kit Carson county where soil moisture conditions were extremely dry, delaying plant germination into the spring months. Late 2016 growing conditions favored an outbreak of wheat curl mite populations and subsequent virus disease infections.

Snowfall during the winter months was above average and provided good moisture and cover for the wheat. Wheat began breaking dormancy in mid-March. Many of the poor stand establishment areas began to catch up to the better areas in northeastern Colorado.

Late April and early May were characterized by widespread rainfall. Accumulated precipitation ranged from 3 inches during April to 4 inches during May across the area. April and May were also marked by cool temperatures. The abundance of heat and moisture generally improved wheat conditions in June. However, persisting stripe rust and other fungal diseases on wheat were still observed where surplus soil moisture and cool temperatures occurred in greater

frequency. Producers had to balance the increased cost of production due to chemical application decisions against low commodity prices.

Harvesting activities gradually began in the first week of July. In mid-July, producers made significant progress in harvesting wheat in the midst of scattered precipitation. In Northeast Colorado, wheat harvest was wrapped up by mid-July with yields ranging from 40 to 80-plus bu/ ac across the area. Areas where late germination occurred saw yields in the 15 to 40 bushel range with harvest operations carrying into late July. Yield variability could be attributed to the weather pattern during the growing season, selection of adapted wheat varieties, and pest and disease control.

General Growing Conditions in East Central Colorado - Ron Meyer

Just prior to planting in the fall of 2016, locations in Kit Carson County received enough rainfall from a single event that wheat stands were very good. However, as locations moved west and north from Burlington, soil moisture levels remained dry and wheat stands were spotty or non-existent as the fall progressed. A warmer and dryer than normal fall persisted into winter. The dry situation persisted until March, when precipitation events began to take place region-wide.

March, April, and May recorded adequate rainfall to produce an above-average crop at most locations. The next production issues in wheat were observations of stripe rust and virus. Stripe rust levels ended with moderate infestations and were not as bad as the last two seasons. However, the long, warm fall enabled serious virus activity at some locations. Some wheat samples sent for virus testing came back positive for three viruses: wheat streak mosaic, High Plains wheat mosaic virus, and Triticum mosaic virus.

Dryland wheat yields in the Burlington area were very good with fields producing 65 to 100 bu/ ac. Test weight was variable, ranging from 56 to 62 lb/bu, and protein content was mostly below 11%.

Dryland Variety Performance Trials - Southeast Locations

Arapahoe, Cheyenne County: Planted 9/13/16 and harvested 7/5/17. Trial was planted into moisture. Plants had six tillers and soil moisture was good in early November. Average-to-good root development. Some freeze damage was noted in early spring and drought stress, brown wheat mite, and RWA symptoms were apparent. Trial was jointing by mid-April and significant drought stress symptoms were noted at that time. WSMV was prevalent in the trial and symptoms of BYDV were observed in November. GPS: 38.906, -102.314

Lamar, Prowers County: Planted 9/12/16. Dusted in at 1.5 inch depth at planting. At trial visit in mid-November, soil was very dry and plants had very poor root development with inconsistent stands. Very dry winter and RWA along with pale western cutworms were observed in the trial by mid-April. There was very little moisture in the top 4 inches of soil. Trial was not harvested after suffering severe hail damage in mid-June. Lost trial. GPS: 37.774, -102.519

Sheridan Lake, Kiowa County: Planted 9/13/16 and harvested 6/30/17. Trial was planted shallow into dry soil and received timely rain a week after planting. The rest of fall was very dry and warm, and February was one of the warmest on record. No disease was noted in the fall. The trial had very good weed control and some minor winterkill was observed in early spring. The trial received good rains in late March, but the soil was very dry by mid-April, and then timely rains occurred from late-April through early June. The trial was sprayed for stripe rust in late May. GPS: 38.5417, -102.4517

Walsh, Baca County: Planted 9/23/16. Trial planted into dry soil and experienced a very dry fall and winter. Field blew badly in the winter due to lack of emergence and stand establishment in the fall. Most seed germinated in the spring and stands were inconsistent. Lost trial. GPS: 37.4346, -102.3193

Dryland Variety Performance Trials - Northeast Locations

Akron, Washington County: Planted 9/14/16 and harvested 7/7/17. Planted into moisture and rained the day after planting. Had average stand establishment. Topsoil was dry down to 4 inches by mid-November. Trial was very dry from mid-October through mid-March. It received consistent and significant rainfall from late March through mid-June. By early May, growing degree-day accumulation was 10 days ahead of the long-term average. Significant infection of stripe and leaf rusts was observed in addition to mite-transmitted virus diseases (WSMV and HPWMoV). A few RWA were also found. GPS: 40.148, -103.141

Burlington, Kit Carson County: Planted 9/13/16 and harvested 7/6/17. Planted trial into moisture but very little moisture received during fall and winter. In November, good growth and root development were noted. Trial received timely and large amounts of rainfall from late March through grain-fill in June. Substantial WSMV in the field but much less was noted in the variety trial due to a later planting date. Significant lodging was observed at harvest. GPS: 39.295, -102.297

Genoa, Lincoln County: Planted 9/21/16. Planted into adequate moisture but topsoil was very dry by early November. Roots were poorly developed and stands were generally poor in the variety trial. Trial had good moisture in mid-April and had mix of fall and spring emerged plants. Trial received timely rains in late spring into early summer but was severely damaged by hail in early July. Lost trial. GPS: 39.287, -103.45

Julesburg, Sedgwick County: Planted 9/14/16 and harvested 7/6/17. Good planting conditions, with dry topsoil but good sub-soil moisture in mid-November. Fall stands were generally good with lush growth and many tillers. Early spring drought stress was noted by yellowing of lower leaves, but this was relieved by good precipitation from mid-March through May. Significant wheat streak mosaic virus infection noted. GPS: 40.837, -102.38

Orchard, Morgan County: Planted 9/16/16 and harvested 7/11/17. Trial planted into moisture in wheat stubble. By mid-November there were very good stands and good fall growth. The top few inches of soil were very dry but trial had good sub-soil moisture. Little moisture during the

winter but timely rainfall occurred from mid-April through May. In early April, some varieties were showing drought symptoms. Trial had moderate to severe stem cutting from wheat stem sawfly. GPS: 40.5187, -104.072

Roggen, Weld County: Planted 9/28/16 and harvested 7/11/17. Trial planted into moisture (after delaying planting, waiting for moisture) into wheat stubble. By mid-November the trial had very dry topsoil and little growth due to late planting, but stands were even. Little moisture during the winter but timely rainfall occurred from March through May, including snow in May. In early April, trial had good moisture and even growth. Significant virus infection from WSMV and BYDV was noted. GPS: 40.068, -104.281

Yuma, Yuma County: Planted 9/14/16 and harvested 7/7/17. Trial dusted in at planting into very hard ground. Trial received moisture a few days after planting and in early October. Very good fall growth, plants had average stand establishment. Very dry by mid-November and very little moisture received from mid-October through early March. Plants had many tillers by mid-April and some plants had yellow lower leaves, indicative of early season drought stress. By mid-May rains were received and the trial rebounded considerably. Timely rains received through the spring and early summer. Significant mite-transmitted virus symptoms observed in trial, which were confirmed as due to WSMV, TriMV, and HPWMoV. GPS: 40.188, -102.661

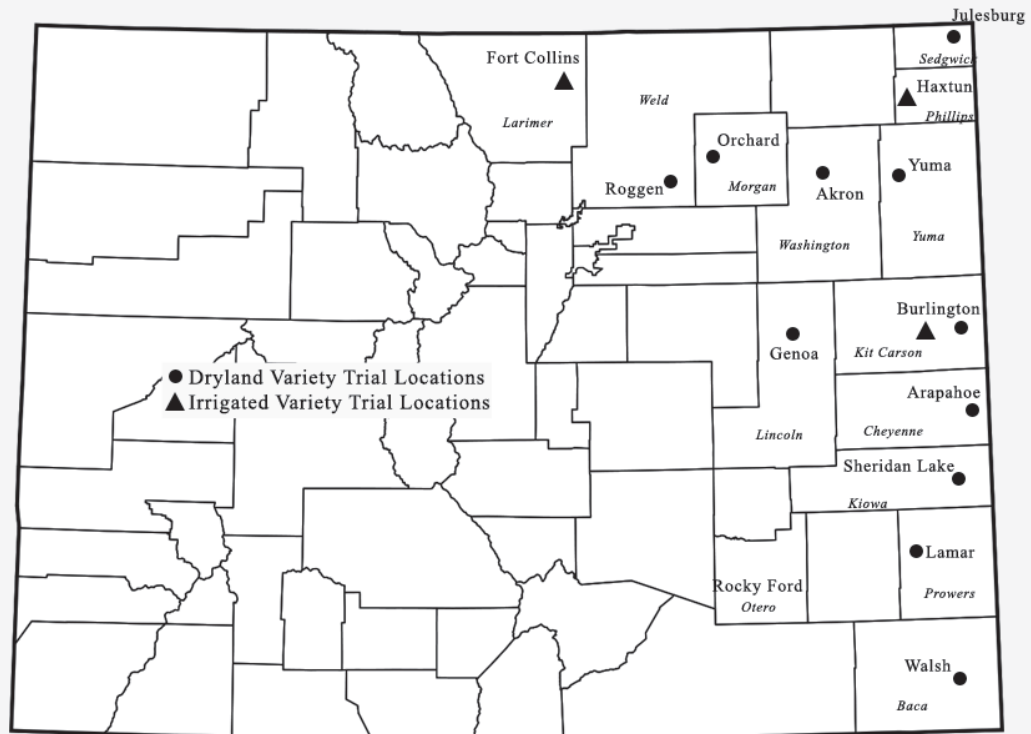
Irrigated Variety Performance Trials

Fort Collins, Larimer County: Planted 9/26/16 and harvested 7/17/17. Trial planted into good moisture, good stand establishment and fall growth. Good spring precipitation prior to start of spring irrigation. Wheat was laid flat from snow storm on May 18. Entries with good straw strength rebounded but those with poor straw strength showed significant lodging. Stripe rust found at relatively low levels in susceptible entries, but very hot temperatures in late June accelerated ripening of the trial. GPS: 40.185, -102.661

Haxtun, Phillips County: Planted 10/15/16 and harvested 7/12-13/17. Trial planted into moist soil in tilled silage corn residue. Even stands and uniform growth by mid-November. Trial didn't have much growth by mid-April but sub-soil moisture was good. Irrigation was turned on after mid-April. Trial showed significant symptoms of virus infection and was confirmed to have WSMV, TriMV, and HPWMoV. No significant lodging was noted in the trial. GPS: 40.406, -102.607

Burlington, Kit Carson County: Planted 10/11/16 and harvested 7/19/17. Planted into moist soil in tilled silage corn residue. Irrigation was turned on after mid-April. Significant lodging was observed by June. GPS: 39.299, -102.287

2017 UVPT (Dryland) and IVPT (Irrigated) Trial Locations



Summary of 2017 Dryland Winter Wheat Variety Performance Results

Variety ^b	2017 Individual Trial Yield ^d								2017 Multi-Location Average			
	Akron	Arapahoe	Burlington	Julesburg	Orchard	Roggen	Sheridan		Yield	Yield	Test	
							Lake	Yuma			Weight	Height
	bu/ac								bu/ac	% of avg	lb/bu	in
Langin	107.7	63.2	100.2	67.0	63.1	70.1	69.3	79.6	77.5	115%	60.0	31
Byrd	93.5	72.3	98.8	67.1	51.5	70.5	73.1	79.9	75.8	112%	60.1	34
Avery	88.6	69.0	91.8	65.4	56.3	71.4	75.8	70.6	73.6	109%	60.1	35
Antero	98.0	66.6	93.9	64.6	52.5	73.1	76.5	57.7	72.8	108%	59.6	34
Joe	107.1	55.0	91.7	62.6	47.1	66.9	70.0	78.2	72.3	107%	59.8	35
Snowmass	90.3	62.4	79.2	68.3	52.2	66.2	71.8	73.5	70.5	104%	59.7	35
Sunshine	99.8	54.6	95.8	59.6	53.8	64.1	62.0	57.1	68.4	101%	58.9	32
Oakley CL	96.0	55.6	80.9	61.2	42.4	65.0	72.8	70.4	68.0	101%	59.7	34
WB-Grainfield	100.4	54.8	90.5	59.7	46.7	62.0	66.7	62.4	67.9	101%	60.4	33
LCS Mint	88.5	55.2	86.5	59.7	43.6	66.6	71.0	67.6	67.3	100%	60.3	34
Tatanka	92.0	54.3	91.4	57.7	48.7	65.3	62.0	63.7	66.9	99%	59.1	31
SY Rugged	95.6	49.3	82.9	61.1	45.4	67.9	64.3	61.3	66.0	98%	58.8	30
Denali	82.7	49.8	88.5	55.9	43.6	65.1	67.1	68.3	65.1	96%	59.1	34
SY Wolf	92.1	54.3	82.2	53.4	41.3	68.6	66.2	60.9	64.9	96%	59.3	32
Hatcher	91.8	60.9	76.8	50.7	36.7	62.8	61.1	66.0	63.4	94%	58.9	32
Ruth	94.9	53.2	84.6	51.9	42.1	61.0	57.3	60.0	63.1	94%	60.2	33
Brawl CL Plus	85.9	53.6	85.7	56.1	42.7	61.3	59.4	60.3	63.1	93%	59.9	32
WB4462	87.4	47.0	86.0	58.4	46.9	64.2	60.4	54.4	63.1	93%	60.3	34
SY Monument	88.6	49.0	81.8	53.1	47.9	60.6	66.4	56.4	63.0	93%	58.4	31
Larry	90.3	48.8	89.3	56.6	40.1	58.3	64.7	54.6	62.8	93%	59.3	33
Winterhawk	81.1	46.2	83.0	57.6	45.7	65.2	60.8	55.6	61.9	92%	59.3	35
Cowboy	80.8	53.0	76.6	50.0	39.0	62.2	68.7	62.5	61.6	91%	57.3	33
TAM 114	84.4	53.4	78.2	54.5	43.3	56.4	57.9	61.6	61.2	91%	59.9	31
LCS Chrome	85.9	47.5	76.5	52.8	39.3	61.7	60.6	55.4	60.0	89%	59.2	32
Settler CL	80.6	53.2	81.8	43.5	42.0	62.9	60.9	49.1	59.3	88%	58.3	31
WB4721	85.2	44.2	83.2	48.8	43.4	59.1	60.2	45.7	58.7	87%	60.4	31
Loma	54.6	33.7	33.4	22.1	25.0	36.5	41.2	33.4	35.0	52%	55.7	31
Experimentals												
CO13D1783	98.8	77.7	92.5	69.1	60.1	73.3	81.2	79.5	79.0	117%	58.5	36
CO12D296	99.6	68.8	109.7	64.3	53.7	74.4	77.7	81.0	78.7	117%	61.1	32
CO13D1638	106.3	63.8	103.1	64.5	52.0	74.6	79.9	80.4	78.1	116%	59.4	33
CO12D1770	99.1	64.0	109.6	68.5	55.6	69.4	72.0	77.5	77.0	114%	60.7	31
CO13D1714	102.2	63.2	103.3	69.3	53.7	65.2	75.3	76.7	76.1	113%	60.4	34
CO13D1299	109.7	50.1	106.5	66.6	54.4	67.6	68.0	82.4	75.7	112%	59.8	32
CO12D597	103.7	68.9	92.6	67.5	53.5	71.8	71.7	75.3	75.6	112%	60.5	33
CO13D0787	96.2	57.5	98.1	69.7	48.5	71.4	79.0	77.1	74.7	111%	60.9	33
CO12D2011	98.6	63.3	96.9	62.4	50.0	68.0	71.5	65.6	72.1	107%	61.3	33
CO13D1383	96.8	62.8	94.7	64.5	51.0	65.7	71.9	65.1	71.6	106%	59.9	32
CO13003C	93.6	66.0	88.5	60.9	48.0	70.4	71.3	73.4	71.5	106%	58.8	34
CO13D1479	94.4	60.3	91.6	57.6	50.9	62.9	71.9	72.8	70.3	104%	59.3	34
CO13D1164	93.9	61.2	89.9	65.9	49.4	67.1	71.6	60.6	69.9	104%	60.2	34
CO13D1379	94.8	52.2	89.4	64.3	42.6	65.0	68.8	67.3	68.1	101%	59.3	31
CO13D2042	86.3	56.9	94.1	57.5	44.5	62.4	66.9	60.2	66.1	98%	59.9	33
CO13W187	100.2	53.1	82.9	54.5	40.0	62.0	68.5	57.3	64.8	96%	60.4	35
CO12M0367	94.6	48.6	82.3	50.5	43.1	63.0	68.0	64.8	64.4	95%	58.7	33
CO14A058	80.1	57.1	59.9	54.2	36.6	63.8	57.8	65.1	59.3	88%	56.4	32
CO14A065	79.6	52.7	66.6	48.9	35.7	65.1	60.5	65.0	59.3	88%	56.0	33
Average	92.4	56.7	87.5	58.7	46.6	65.2	67.4	65.5	67.5		59.4	33
^c LSD (P<0.30)	3.3	3.8	5.1	2.7	2.7	2.7	3.9	3.2				

^aVarieties in the top LSD yield group in each location are in bold.

^bVarieties ranked according to multi-location average yield in 2017.

^cIf the difference between two variety yields equals or exceeds the LSD value then they are significantly different with less than 30% probability that the difference is due to random error.

Rank of Variety Yield in 2017 Dryland Trials

2017 Multi-Location Average		2017 Individual Trial Rank							
Rank	Variety	Akron	Arapahoe	Burlington	Julesburg	Orchard	Roggen	Sheridan Lake	Yuma
Varieties Ranked by Yield									
1	Langin	Langin	Byrd	Langin	Snowmass	Langin	Antero	Antero	Byrd
2	Byrd	Joe	Avery	Byrd	Byrd	Avery	Avery	Avery	Langin
3	Avery	WB-Grainfield	Antero	Sunshine	Langin	Sunshine	Byrd	Byrd	Joe
4	Antero	Sunshine	Langin	Antero	Avery	Antero	Langin	Oakley CL	Snowmass
5	Joe	Antero	Snowmass	Avery	Antero	Snowmass	SY Wolf	Snowmass	Avery
6	Snowmass	Oakley CL	Hatcher	Joe	Joe	Byrd	SY Rugged	LCS Mint	Oakley CL
7	Sunshine	SY Rugged	Oakley CL	Tatanka	Oakley CL	Tatanka	Joe	Joe	Denali
8	Oakley CL	Ruth	LCS Mint	WB-Grainfield	SY Rugged	SY Monument	LCS Mint	Langin	LCS Mint
9	WB-Grainfield	Byrd	Joe	Larry	WB-Grainfield	Joe	Snowmass	Cowboy	Hatcher
10	LCS Mint	SY Wolf	WB-Grainfield	Denali	LCS Mint	WB4462	Tatanka	Denali	Tatanka
11	Tatanka	Tatanka	Sunshine	LCS Mint	Sunshine	WB-Grainfield	Winterhawk	WB-Grainfield	Cowboy
12	SY Rugged	Hatcher	Tatanka	WB4462	WB4462	Winterhawk	Denali	SY Monument	WB-Grainfield
13	Denali	Snowmass	SY Wolf	Brawl CL Plus	Tatanka	SY Rugged	Oakley CL	SY Wolf	TAM 114
14	SY Wolf	Larry	Brawl CL Plus	Ruth	Winterhawk	Denali	WB4462	Larry	SY Rugged
15	Hatcher	SY Monument	TAM 114	WB4721	Larry	LCS Mint	Sunshine	SY Rugged	SY Wolf
16	Ruth	Avery	Settler CL	Winterhawk	Brawl CL Plus	WB4721	Settler CL	Sunshine	Brawl CL Plus
17	Brawl CL Plus	LCS Mint	Ruth	SY Rugged	Denali	TAM 114	Hatcher	Tatanka	Ruth
18	WB4462	WB4462	Cowboy	SY Wolf	TAM 114	Brawl CL Plus	Cowboy	Hatcher	Antero
19	SY Monument	Brawl CL Plus	Denali	SY Monument	SY Wolf	Oakley CL	WB-Grainfield	Settler CL	Sunshine
20	Larry	LCS Chrome	SY Rugged	Settler CL	SY Monument	Ruth	LCS Chrome	Winterhawk	SY Monument
21	Winterhawk	WB4721	SY Monument	Oakley CL	LCS Chrome	Settler CL	Brawl CL Plus	LCS Chrome	Winterhawk
22	Cowboy	TAM 114	Larry	Snowmass	Ruth	SY Wolf	Ruth	WB4462	LCS Chrome
23	TAM 114	Denali	LCS Chrome	TAM 114	Hatcher	Larry	SY Monument	WB4721	Larry
24	LCS Chrome	Winterhawk	WB4462	Hatcher	Cowboy	LCS Chrome	WB4721	Brawl CL Plus	WB4462
25	Settler CL	Cowboy	Winterhawk	Cowboy	WB4721	Cowboy	Larry	TAM 114	Settler CL
26	WB4721	Settler CL	WB4721	LCS Chrome	Settler CL	Hatcher	TAM 114	Ruth	WB4721
27	Loma	Loma	Loma	Loma	Loma	Loma	Loma	Loma	Loma

This table shows the stability of variety performance across the 2017 trial locations. Follow any variety (top 10 are color-coded) from the left multi-location average column across to the right to see how each variety ranked at each location.

Summary of 2-Yr (2016 and 2017) Dryland Variety Performance Results

Variety ^b	Brand/Source	Market Class ^c	2-Year Average ^a			
			Yield		Test Weight	Plant Height
			bu/ac	% trial average	lb/bu	in
Langin	PlainsGold	HRW	81.5	112%	59.5	31
Antero	PlainsGold	HWW	79.5	110%	58.4	34
Avery	PlainsGold	HRW	78.0	108%	59.4	35
Byrd	PlainsGold	HRW	77.9	107%	59.7	34
CO12D2011	Colorado State University exp.	HWW	77.6	107%	60.7	34
Joe	Kansas Wheat Alliance	HWW	77.0	106%	59.2	35
Sunshine	PlainsGold	HWW	75.0	103%	57.7	33
WB-Grainfield	WestBred Monsanto	HRW	74.7	103%	59.9	34
LCS Mint	Limagrain	HRW	73.9	102%	59.9	34
Oakley CL	Kansas Wheat Alliance	HRW	73.4	101%	59.0	33
Hatcher	PlainsGold	HRW	73.0	101%	58.3	32
Snowmass	PlainsGold	HWW	73.0	101%	59.3	34
Denali	PlainsGold	HRW	72.2	100%	59.3	35
TAM 114	AGSECO	HRW	70.9	98%	60.2	32
Cowboy	Crop Res. Foundation of WY	HRW	70.7	97%	57.1	33
SY Monument	AgriPro Syngenta	HRW	70.5	97%	58.3	32
Winterhawk	WestBred Monsanto	HRW	70.1	97%	59.4	35
Ruth	Husker Genetics	HRW	70.0	96%	60.3	34
SY Wolf	AgriPro Syngenta	HRW	69.9	96%	57.7	32
Brawl CL Plus	PlainsGold	HRW	69.8	96%	58.9	33
WB4721	WestBred Monsanto	HRW	68.4	94%	60.4	32
Settler CL	Husker Genetics	HRW	68.1	94%	58.0	32
LCS Chrome	Limagrain	HRW	67.8	93%	59.2	32
CO14A065	Colorado State University exp.	HRW	66.2	91%	55.7	32
CO14A058	Colorado State University exp.	HRW	64.7	89%	55.8	33
Average			72.6		58.8	33

^aThe 2-year average yield, test weight, and plant heights are based on eight 2017 and eight 2016 trials.

^bVarieties ranked according to average 2-year yield.

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

Summary of 3-Yr (2015, 2016, and 2017) Dryland Variety Performance Results

Variety ^b	Brand/Source	Market Class ^c	3-Year Average ^a			
			Yield	Yield	Test Weight	Plant Height
			bu/ac	% trial average	lb/bu	in
Joe	Kansas Wheat Alliance	HWW	78.6	112%	59.6	34
Antero	PlainsGold	HWW	78.5	111%	58.4	34
Langin	PlainsGold	HRW	75.6	107%	59.3	31
Oakley CL	Kansas Wheat Alliance	HRW	73.0	104%	58.7	32
Avery	PlainsGold	HRW	72.2	102%	58.8	35
SY Monument	AgriPro Syngenta	HRW	71.8	102%	58.4	32
WB-Grainfield	WestBred Monsanto	HRW	71.8	102%	59.6	33
Byrd	PlainsGold	HRW	71.4	101%	59.2	34
LCS Mint	Limagrain	HRW	70.5	100%	59.2	34
Denali	PlainsGold	HRW	70.5	100%	59.1	35
Sunshine	PlainsGold	HWW	70.0	99%	57.5	32
TAM 114	AGSECO	HRW	69.9	99%	59.9	33
Ruth	Husker Genetics	HRW	69.7	99%	60.1	34
Winterhawk	WestBred Monsanto	HRW	68.1	97%	59.2	34
Snowmass	PlainsGold	HWW	68.0	96%	58.6	34
Hatcher	PlainsGold	HRW	67.5	96%	57.7	32
SY Wolf	AgriPro Syngenta	HRW	67.5	96%	57.4	32
Cowboy	Crop Res. Foundation of WY	HRW	66.8	95%	56.8	33
Settler CL	Husker Genetics	HRW	64.4	91%	57.4	32
Brawl CL Plus	PlainsGold	HRW	63.3	90%	58.7	33
Average			70.5		58.7	33

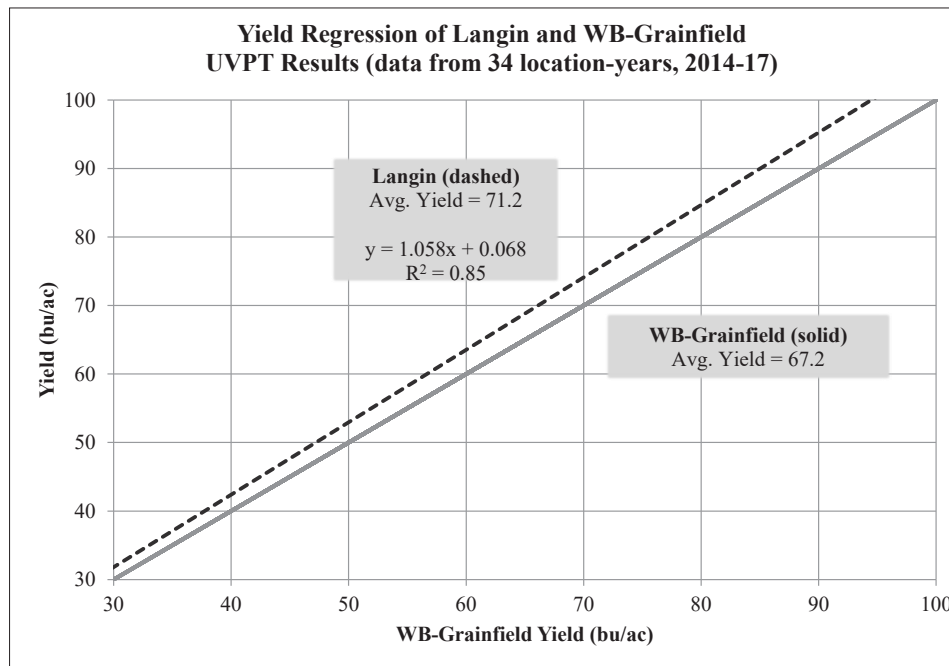
^aThe 3-year average yield and plant heights are based on eight 2017, eight 2016, and nine 2015 trials. Test weights are based on eight 2017, eight 2016, and six 2015 trials.

^bVarieties ranked according to average 3-year yield.

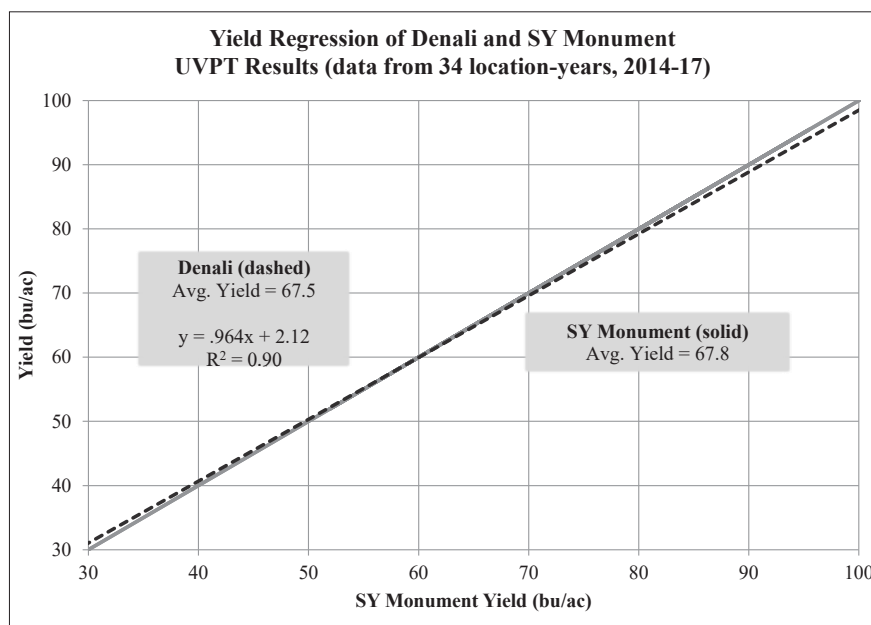
^cMarket class: HRW=hard red winter wheat; **HWW**=hard white winter wheat.

Graphs of Head-to-Head Yield Comparisons

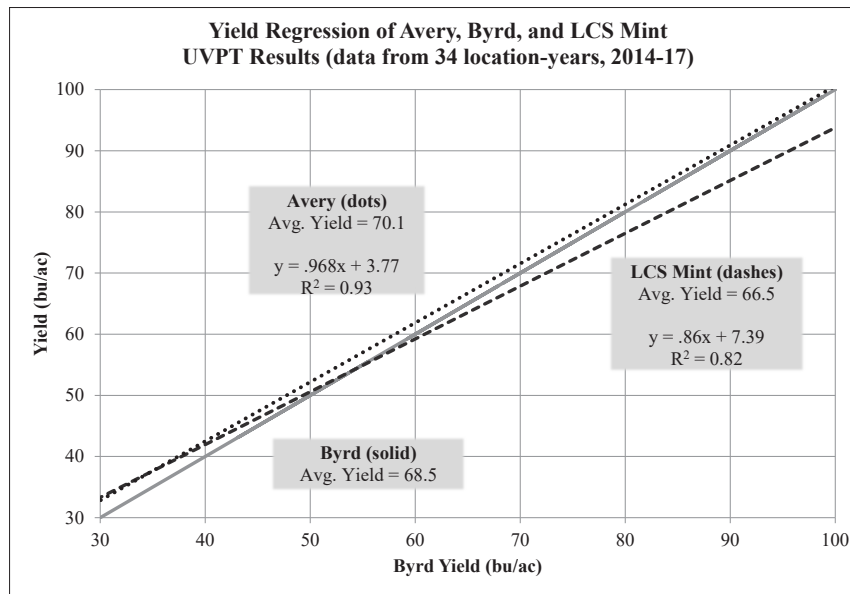
The following regressions are intended to compare the predicted performance of one variety relative to another variety. The regressions use results from multiple Dryland Variety Performance Trials and Collaborative On-Farm Test results over the past five years (2013 through 2017). These (or any other) yield comparisons can be made online at ramwheatdb.com, which uses the Dryland Variety Performance Trial data. The equation shown in each graph can be used to predict the yield of a variety given a yield of the variety listed on the bottom (x-axis) of the graph. The R^2 value of the regression is a statistical measure that represents how well a regression line fits the actual data. An R^2 value equal to 1.0 means the regression line fits the data perfectly. It is important to point out that the comparisons are expected to be more reliable when they include results over multiple locations from different years



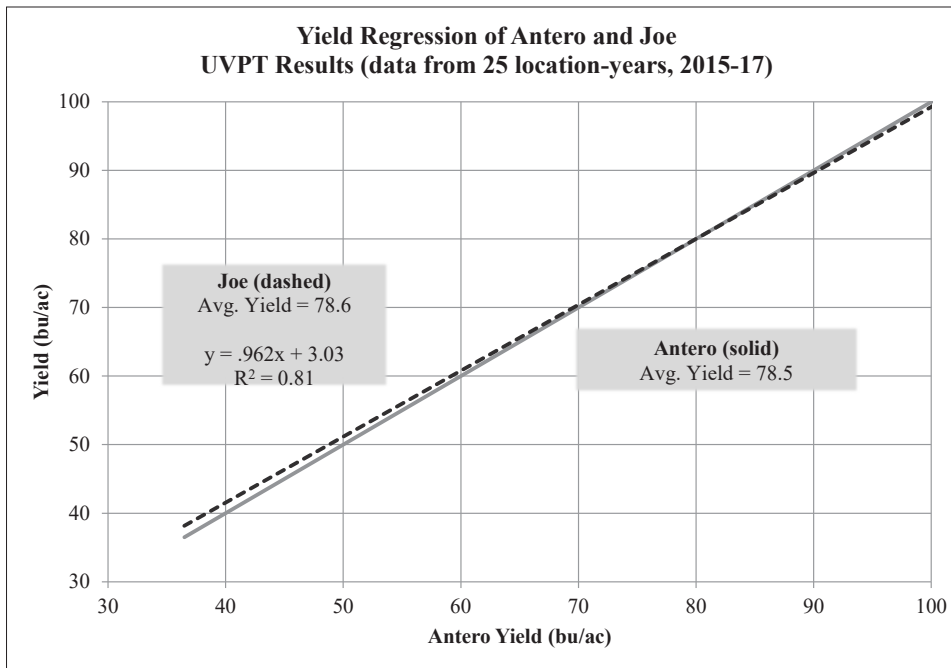
The graph above compares two early maturity varieties that are high-yielding, Langin and WB-Grainfield. The regression line of Langin (dashed) is above the WB-Grainfield line at all yield levels shown, meaning that Langin is predicted to yield higher than WB-Grainfield in both low and high yield environments. If WB-Grainfield yielded 50 bu/ac, then we would predict Langin to yield 53 bu/ac.



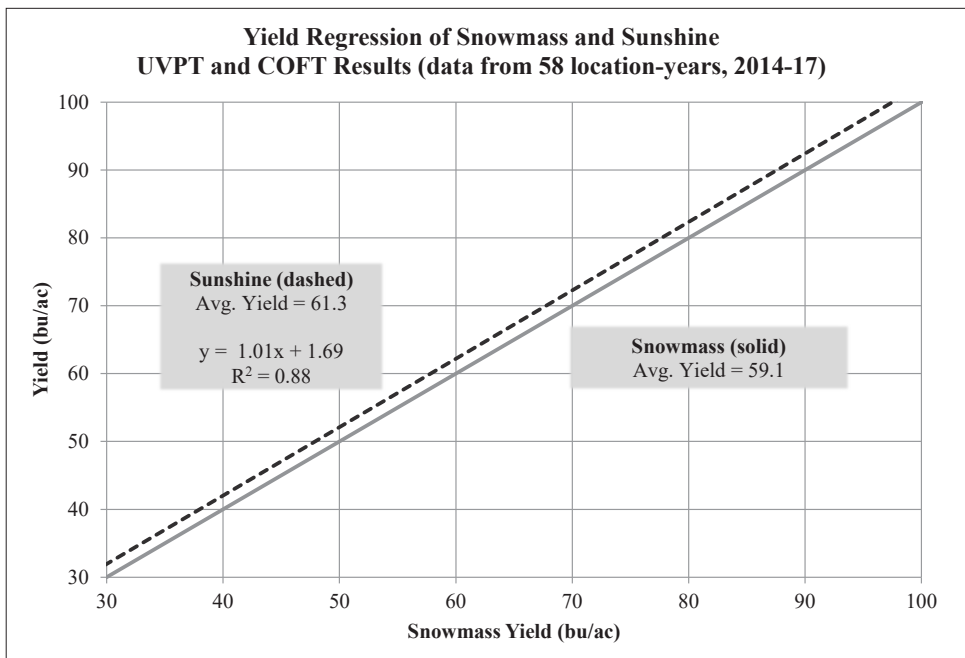
The above graph compares two medium-late maturity HRW wheats, Denali and SY Monument. Yields of the two varieties are so close together across all yield environments that we would not expect a significant difference between them. If SY Monument yielded 40 bu/ac, then we would expect Denali to yield 40.7 bu/ac. The two varieties differ for non-yield characteristics.



The graph above shows the comparison among three medium maturity hard red varieties, Avery, Byrd, and LCS Mint. At low yield levels, Avery and LSC Mint are predicted to have slightly higher yields than Byrd. At higher yield levels, Byrd and Avery are predicted to yield higher than LCS Mint. When Byrd yields 30 bu/ac, Avery is predicted to yield 32.8 bu/ac, and LCS Mint is predicted to yield 33.2 bu/ac. When Byrd yields 90 bu/ac, Avery is predicted to yield 90.9 bu/ac and LCS Mint is predicted to yield 84.8 bu/ac.



This graph shows a comparison between two non-premium hard white winter varieties, Antero and Joe. Yields of the two varieties are so close together across all yield environments that we would not expect a significant difference between them. If Antero had a yield of 90 bu/ac, we predict Joe would yield 89.6 bu/ac. The two varieties differ for non-yield characteristics.



The final graph shows a comparison between two hard white wheat varieties that generally bring a premium at harvest for high quality, Snowmass and Sunshine. Sunshine is expected to yield higher than Snowmass at all yield levels. If Snowmass yielded 50 bu/ac, we would predict Sunshine to yield 52.2 bu/ac.

2017 Collaborative On-Farm Test (COFT) Variety Performance Results

Jerry Johnson, Kelly Roesch, Wilma Trujillo, Dennis Kaan, Ron Meyer, and Sally Jones

The objective of our on-farm testing program is to compare the performance of wheat varieties that are of most interest to Colorado farmers. In 2017, four varieties were included: Denali (HRW), Sunshine (high quality HWW), Avery (newer HRW) and Langin (newly released HRW). Varieties in the COFT program are tested under farm field-scale conditions with farmer equipment. Colorado State University Extension agents oversee all aspects of the program. The COFT program is in its 21st 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 older inferior varieties and wider and faster adoption of improved varieties.

In the fall of 2016, thirty eastern Colorado wheat producers received seed of the four varieties and planted them in side-by-side strips under the same conditions as the wheat in the rest of the field. Twenty-four viable harvest results were obtained. Failed tests were due to drought conditions and hail. In 2017, there were extremes in yield across Colorado. The highest yielding strip was over 100 bu/acre while the lowest recorded yield this year was 9 bu/acre. Results were affected by winter drought, viruses, and hail.

The varieties tested in COFT this year fit different farmer needs. A new HRW option for farmers is Langin, the top-yielding variety in on-farm tests (and variety trials) this year. Langin is early maturing and has good test weight, stripe rust resistance and carries wheat curl mite resistance from the Byrd parent. Avery is a newer HRW option that yielded very well in the COFT and is medium-maturing with above-average test weight and carries wheat curl mite resistance from TAM 112 parent. However, it is moderately susceptible to stripe rust. Farmers wanting to grow white wheat with high exceptional quality should consider Sunshine. It does not have the same quality package as Snowmass but is part of the CWRF-Arden Mills Premium Program. It is early maturing with excellent quality but is moderately susceptible to stripe rust and susceptible to wheat streak mosaic virus. Denali is a reliable HRW option for medium-late maturing varieties where wheat streak mosaic virus is a concern. It is susceptible to stripe rust but resistant to wheat streak mosaic virus.

Don't select a variety to plant based upon the results from a single on-farm test. It is very important to use results from multiple locations.

Summary of 2017 COFT Variety Results (24 tests included)

Variety	Yield ^a	Test Weight	Protein
	bu/ac	lb/bu	percent
Langin	56.9	59.2	10.6
Avery	52.4	58.6	10.6
Sunshine	49.9	58.9	11.4
Denali	48.2	57.8	11.0
Average	65.8	58.6	10.9
LSD _(0.30)	1.8	0.4	

^aYield corrected to 12% moisture.

2017 Varieties (ranked left to right by highest yield)

Yield Significance^b A
LSD ($P < 0.30$) for yield = 1.8 bu/ac
LSD ($P < 0.30$) for test weight = 0.4 lb/bu

^bYield significance: varieties with different letters have yields that are significantly different from one another.

2017 Wheat Variety Decision Tree for Dryland Production

Jerry Johnson and Sally Jones

The decision tree on the following page helps Colorado growers make variety selection decisions based on important traits. All of the varieties shown in the decision tree have been tested in our trials for at least three years, across multiple locations. Varieties considered high-yielding in the decision tree had a three-year (2015-2017) yield above trial average. Under each variety name are the letters YR for stripe rust and WSMV for wheat streak mosaic virus with one being very resistant and nine being very susceptible.

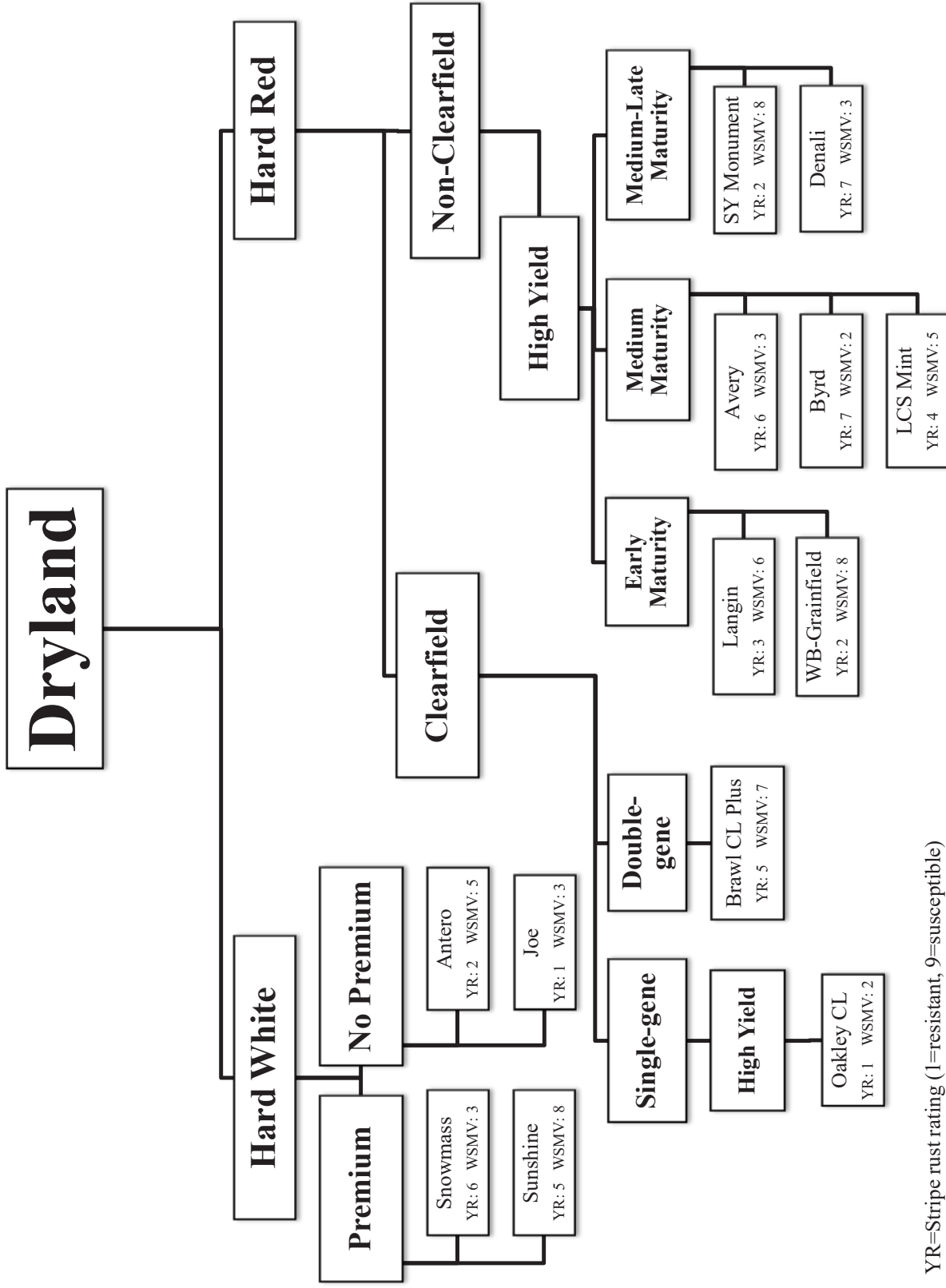
For farmers growing hard white wheat, Joe (from KSU) and Antero, top yielders among all varieties in the last three years, are highly recommended unless growers want to get into a HWW premium program. Joe is later maturing, better coleoptile length, very resistant to stripe rust, and good wheat streak resistance compared to Antero. Snowmass is in the CWRP-Arden Mills Ultragrain Premium Program. Superior in quality to all other HWW varieties, Snowmass is medium-maturing and medium-tall. It has good WSMV resistance, is moderately susceptible to YR, and has moderate sprouting tolerance. Sunshine has excellent quality, good sprouting tolerance and straw strength, and an intermediate reaction to stripe rust.

For growers planting a Clearfield variety, the double-gene Clearfield variety Brawl CL Plus is recommended for control of winter annual grasses that are not easily controlled using single-gene Clearfield varieties. The double-gene trait allows the herbicide Beyond to be mixed with methylated seed oil to make it more potent. Brawl CL Plus has good test weight, excellent quality, and is early-maturing but below average yield. The single-gene Clearfield variety, Oakley CL, is recommended for those seeking high yield, good YR and WSMV resistance and control of grassy weeds. It can lodge in high yield environments.

Most producers will plant non-Clearfield, high-yielding varieties. Recommended early maturing HRW varieties are Langin and WB-Grainfield, both with excellent YR resistance but WB-Grainfield is susceptible to WSMV whereas Langin has moderate resistance. Langin is a newer CSU release, substantially higher yielding than WB-Grainfield, although it has marginal straw strength.

For the high-yielding, medium-maturing varieties, there are three recommendations: Avery, Byrd, and LCS Mint. Avery is a doubled haploid-derived line similar to Byrd with a higher yield potential, larger kernels, slightly improved quality, and above-average test weight. Like Byrd, Avery carries wheat curl mite resistance and susceptibility to YR. LCS Mint has good test weight and is moderately resistant to YR.

The recommended high-yielding medium-to-late maturity HRW varieties are SY Monument and Denali. SY Monument was higher yielding over three years and has good drought tolerance, winter hardiness, quality, resistance to both leaf and YR, but is susceptible to WSMV. Denali has some tolerance to wheat streak mosaic virus and excellent test weight but is susceptible to stripe rust.



YR=Stripe rust rating (1=resistant, 9=susceptible)

WSMV=Wheat streak mosaic virus rating (1=resistant, 9=susceptible)

Summary of 2017 Irrigated Variety Performance Results

Variety ^b	2017 Individual Trial Yield ^a			2017 Multi-Location Average			
	Fort			Test			
	Burlington	Collins	Haxtun	Yield	Yield	Weight	Lodging
		bu/ac		bu/ac	% of avg	lb/bu	scale (1-9) ^c
SY Wolf	115.9	102.3	74.1	97.4	104%	57.0	3
WB4303	108.0	108.2	72.0	96.1	103%	55.3	2
Denali	106.8	105.0	74.6	95.5	102%	58.5	4
Byrd	110.1	96.2	78.8	95.1	102%	58.2	5
Langin	114.4	87.8	82.4	94.8	102%	57.9	5
KanMark	111.6	103.0	68.5	94.4	101%	58.0	3
Cowboy	109.4	103.7	67.8	93.6	100%	55.1	8
SY Sunrise	110.9	94.3	73.1	92.8	99%	58.9	5
Brawl CL Plus	113.3	83.5	75.4	90.7	97%	58.1	2
Avery	98.0	91.4	79.9	89.8	96%	57.0	8
Larry	110.4	96.0	60.7	89.0	95%	57.1	4
Sunshine	116.1	74.4	74.1	88.2	95%	56.2	5
Thunder CL	109.5	85.8	57.9	84.4	90%	57.6	1
WB-Grainfield	106.2	78.1	67.1	83.8	90%	58.8	4
Antero	92.7	77.8	79.8	83.4	89%	58.0	7
WB4458	99.4	88.0	61.4	83.0	89%	56.3	2
Experimentals							
CO13D1383	127.9	116.5	82.5	109.0	117%	58.6	2
CO12D296	112.0	118.7	86.8	105.8	113%	58.6	5
CO13D0787	111.7	104.0	97.0	104.2	112%	59.2	5
CO13D1299	124.5	103.8	82.9	103.8	111%	58.2	4
CO13D1783	107.1	108.0	81.1	98.8	106%	55.7	9
CO13D1638	110.1	97.2	88.7	98.7	106%	57.0	6
CO12D597	112.9	95.0	86.3	98.1	105%	57.6	6
CO12D1770	101.2	108.2	83.2	97.5	105%	57.4	4
CO12D2011	118.9	94.9	78.0	97.2	104%	59.0	4
CO13W187	108.3	94.7	75.5	92.8	99%	58.2	5
CO13D1479	100.8	101.7	67.3	90.0	96%	56.6	8
CO13D1379	104.8	97.1	66.4	89.4	96%	56.6	5
CO13D2042	98.7	93.8	72.5	88.3	95%	58.3	5
CO13D1164	94.8	86.2	81.9	87.6	94%	58.1	6
CO12M0367	96.7	98.8	65.5	87.0	93%	56.2	5
CO13D1714	103.3	76.1	80.7	86.7	93%	59.1	5
Average	108.3	96.0	75.7	93.3		57.6	5
^d LSD (P<0.30)	8.0	5.1	4.2				

^aVarieties in the top LSD yield group in each location are in bold.

^bVarieties ranked according to multi-location average yield in 2017.

^cLodging score: 1 equals no lodging and 9 equals severe lodging.

^dIf the difference between two variety yields equals or exceeds the LSD value then they are significantly different with less than 30% probability that the difference is due to random error.

Summary of 2-year (2016 and 2017) Irrigated Variety Performance Results

Variety ^b	Brand/Source	Market Class ^c	2-Year Average ^a				
			Yield	Yield	Test Weight	Plant Height	Lodging
			bu/ac	% trial average	lb/bu	in	scale (1-9) ^d
Denali	PlainsGold	HRW	95.3	105%	58.4	40	4
SY Sunrise	AgriPro Syngenta	HRW	94.9	104%	59.3	35	3
CO12D2011	Colorado State University Exp.	HWW	93.9	103%	59.0	38	4
WB4303	WestBred Monsanto	HRW	93.6	103%	54.7	36	1
KanMark	Kansas Wheat Alliance	HRW	93.0	102%	57.1	33	2
SY Wolf	AgriPro Syngenta	HRW	92.9	102%	56.5	38	3
Langin	PlainsGold	HRW	92.6	102%	57.6	36	7
Brawl CL Plus	PlainsGold	HRW	92.5	102%	58.1	39	2
Byrd	PlainsGold	HRW	91.2	100%	57.8	37	6
Sunshine	PlainsGold	HWW	90.2	99%	54.7	36	5
WB4458	WestBred Monsanto	HRW	89.9	99%	57.1	37	2
Thunder CL	PlainsGold	HWW	89.1	98%	57.6	38	2
Avery	PlainsGold	HRW	87.0	96%	57.1	38	7
Cowboy	Crop Research Foundation of WY	HRW	86.3	95%	55.5	37	8
Antero	PlainsGold	HWW	82.8	91%	56.3	38	7
Average			91.0		57.1	37	4

^aThe 2-year average yield and test weight are based on three 2016 and three 2017 trials. Plant heights are based on three 2016 and one 2017 trial. Lodging based on three 2016 and two 2017 trials.

^bVarieties ranked according to average 2-year yield.

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

^dLodging scale: 1=no lodging, 9=severe lodging.

Summary of 3-year (2015, 2016, and 2017) Irrigated Variety Performance Results

Variety ^b	Brand/Source	Market Class ^c	3-Year Average ^a				
			Yield	Yield	Test Weight	Plant Height	Lodging
			bu/ac	% trial average	lb/bu	in	scale (1-9) ^d
Denali	PlainsGold	HRW	92.5	108%	58.5	39	4
SY Sunrise	AgriPro Syngenta	HRW	91.2	106%	58.8	35	3
SY Wolf	AgriPro Syngenta	HRW	90.3	105%	56.3	37	3
Langin	PlainsGold	HRW	88.1	102%	57.5	36	6
KanMark	Kansas Wheat Alliance	HRW	86.4	101%	57.0	33	2
Byrd	PlainsGold	HRW	85.2	99%	57.4	37	6
Brawl CL Plus	PlainsGold	HRW	84.1	98%	57.7	37	2
Sunshine	PlainsGold	HWW	83.8	97%	55.0	35	5
Avery	PlainsGold	HRW	83.6	97%	56.9	38	7
Cowboy	Crop Research Foundation of WY	HRW	82.8	96%	55.7	36	8
Antero	PlainsGold	HWW	82.0	95%	56.3	38	7
Thunder CL	PlainsGold	HWW	81.2	95%	57.3	38	2
Average			85.9		57.0	37	5

^aThe 3-year average yield and test weight are based on two 2015, three 2016, and three 2017 trials. Plant heights are based on two 2015, three 2016, and one 2017 trial. Lodging based on one 2015, three 2016, and two 2017 trials.

^bVarieties ranked according to average 3-year yield.

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

^dLodging scale: 1=no lodging, 9=severe lodging.

Variety Selection for Irrigated Production Conditions in Eastern Colorado

The most important criteria for irrigated variety selection are yield, straw strength, and stripe rust resistance. Growth regulators can be used to economically mitigate risks from lodging in varieties with reduced straw strength. Under limited-irrigation conditions, drought stress tolerance can also be important. The top four above-average-yield varieties over multiple locations and years are described below.

Denali – Highest yielding in irrigated conditions over three years and multiple locations per year. A medium-late maturing HRW variety released in 2011 and marketed by PlainsGold for production in Colorado and marketed in Kansas by Kansas Wheat Alliance. It is photoperiod sensitive, which can cause late heading in years with abnormally warm early spring temperatures. It is medium-tall, has excellent test weight and average milling and baking quality, and is susceptible to stripe rust but carries resistance to the wheat curl mite that vectors virus diseases. It has above-average straw strength.

SY Sunrise – A short, late-maturing HRW released in 2015 by AgriPro Syngenta that has good stripe rust tolerance but is susceptible to WSMV. It ranked second highest in yield over three years and multiple locations. It has good-to-excellent straw strength and high test weight.

SY Wolf – A medium-maturing HRW released in 2010 and marketed by AgriPro Syngenta. It has a very broad disease resistance package, with good protection for leaf spotting diseases (tan spot and septoria), leaf rust, and good resistance to stripe rust. Very good straw strength and good quality. It has good test weight and quality.

Langin – An early maturing HRW, released in 2016, and marketed by PlainsGold. It has very good test weight, is short in height, and has good quality. It has good stripe rust resistance and carries wheat curl mite resistance. It is susceptible to lodging and would require growth regulators to mitigate risk in high yield conditions.

Important Variety Selection Considerations

It is not possible to accurately predict which variety will perform best in each field every year. However, there are some selection guidelines to improve the ability to select superior varieties. The variety performance summary tables and decision tree in this report provide useful information to farmers for improving variety selections. Other guidelines that improve selections are below.

- Focus on multi-year and location yield summary results when selecting a variety – use results from the three-year variety performance trials and from the on-farm tests.
- Pay attention to ratings for maturity, plant height, coleoptile length, disease and insect resistance, and end-use quality characteristics. Refer to the Description of Winter Wheat Varieties in Eastern Colorado Dryland and Irrigated Trials (2017) for variety-specific information. Use the decision tree to choose the variety with traits that are important to you.

Some other factors that influence the success of a wheat crop that should not be neglected:

- Control volunteer wheat and weeds to avoid loss of valuable soil moisture and to avoid creating a green bridge that could lead to serious virus disease infections vectored by the wheat curl mite (wheat streak mosaic virus, High Plains wheat mosaic virus, Triticum mosaic virus) or vectored by aphids (barley yellow dwarf virus).
- Be aware of current ratings for stripe rust resistance as well as the potential of new races of stripe rust to develop unexpectedly (as occurred in 2010 and 2012). If variety susceptibility, market prices, expected yield, and fungicide and application costs warrant an application, consult the North Central Regional Committee on Management of Small Grain Diseases (NCERA-184) fungicide efficacy chart. Updates to this chart can be found on the CSU Wheat Breeding Program “Wheat Links” page (wheat.colostate.edu/links.html).
- Plant treated seed for protection against common bunt (stinking smut) and other seed-borne diseases. Information on seed treatments is available from Michigan State University and Kansas State University at: tinyurl.com/hv5m9js and tinyurl.com/jgeznuh
- Soil sample to determine optimum fertilizer application rates. Sampling should be done prior to planting. Information on fertilizing winter wheat is available from Colorado State University Extension at: bit.ly/1K7pMGA
- Plant seeds per acre and not pounds per acre. Different varieties and seed lots can vary widely in seed size. Refer to How to Calibrate Your Drill available online at csucrops.com (click on the winter wheat tab) or here: bit.ly/1MS5Hdh

Description of Winter Wheat Varieties in Eastern Colorado Dryland and Irrigated Trials (2017)

Name, Class, and Pedigree	Origin	RWA*	HD	HT	SS	COL**	YR	LR	WSMV*	TW	MILL	BAKE	Comments
Antero	CSU 2012	S	5	7	8	5	2	7	5	5	4	6	CSU release (2012), marketed by PlainsGold. Medium height and maturity, good test weight, fair straw strength, good resistance to stripe rust. Moderate sprouting tolerance.
Hard white winter KS01HW152-1/TAM 111													
Avery	CSU 2015	S	6	7	7	5	6	7	3	4	4	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. Moderately susceptible to stripe rust.
Hard red winter TAM 112/Byrd													
Brawl CL Plus	CSU 2011	S	2	6	3	9	5	5	7	4	4	3	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.
Hard red winter Teal 11A/Above//CO99314													
Byrd	CSU 2011	S	4	6	7	6	7	7	2	4	3	2	CSU release (2011), marketed by PlainsGold. Excellent drought tolerance and quality. Average test weight and straw strength. Moderately susceptible to stripe rust. Carries wheat curl mite resistance from TAM 112 parent.
Hard red winter TAM 112/CO970547-7													
CO12D2011	CSU EXP	S	5	5	4	6	2	5	5	1	2	3	CSU experimental HWW, on increase for possible release fall 2017. Good stripe rust resistance, sprouting tolerance, straw strength, and quality. Very high test weight, lower polyphenol oxidase (PPO) activity for improved whole grain bread and noodle quality.
Hard white winter Denali/HV9W07-482W//Antero													
CO14A058	CSU EXP	S	6	6	7	5	6	6	4	7	8	6	CSU experimental HRW, on increase for possible release fall 2017. Carries novel proprietary <i>Avigen</i> herbicide tolerance traits for winter annual grassy weed control. Approximately 60% Byrd parentage and 40% Hatcher parentage.
Hard red winter (AF28/Byrd)//(AF10/2*Byrd)													
CO14A065	CSU EXP	S	9	4	6	6	5	6	4	7	8	3	CSU experimental HRW, on increase for possible release fall 2017. Carries novel proprietary <i>Avigen</i> herbicide tolerance traits for winter annual grassy weed control. Approximately 60% Byrd parentage and 40% Hatcher parentage.
Hard red winter (AF28/Byrd)//(AF10/2*Byrd)													
Cowboy	WY-CSU 2011	R*	7	6	8	3	7	7	6	7	4	5	CSU release (2011), marketed by Crop Research Foundation of Wyoming. Sister selection to Denali, but slightly shorter, lower straw strength, and 1 lb/bu lower test weight. Similar disease reaction and quality (except RWA biotype 1 resistant).
Hard red winter CO980829/TAM 111													
Denali	CSU 2011	S	8	7	5	5	7	7	3	2	4	6	CSU release (2011), marketed by PlainsGold and Kansas Wheat Alliance in Kansas. Excellent test weight. Medium tall, medium-late, medium-long coleoptile. Good straw strength and average quality. Moderate susceptibility to stripe and leaf rust.
Hard red winter CO980829/TAM 111													
Hatcher	CSU 2004	R*	6	4	7	5	5	7	6	5	5	4	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.
Hard red winter Yuma/PI 372129//TAM-200/3/4*Yuma/4/KS91H184/Vista													

Column Key - Russian wheat aphid resistance (RWA), heading date (HD), plant height (HT), straw strength (SS), coleoptile length (COL), stripe rust resistance (YR), leaf rust resistance (LR), wheat streak mosaic virus tolerance (WSMV), test weight (TW), milling quality (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.

* RWA rating denotes resistance to the original biotype (biotype 1) of RWA. All available cultivars are susceptible to the new biotypes of RWA.

** 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.

Description of Winter Wheat Varieties in Eastern Colorado Dryland and Irrigated Trials (2017)

Name, Class, and Pedigree	Origin	RWA*	HD	HT	SS	COL**	YR	LR	WSMV*	TW	MILL	BAKE	Comments
Joe Hard white winter KS04HW101-3(98HW423/98HW170)/(KS04HW119-3(TREGO*2/CO960293))	KSU 2015	S	7	7	7	3	1	2	3	4	4	5	KSU-Hays release (2015), marketed by the Kansas Wheat Alliance. First entered in CSU trials in 2015. Hard white wheat. Good leaf and stripe rust resistance, straw strength, test weight, and High Plains adaptation. Lower pre-harvest sprouting tolerance.
KanMark Hard red winter PRL/2*PASTOR//G980129W/3/KS970104-3-43	KSU 2014	S	6	1	2	1	6	2	9	3	4	2	KSU-Manhattan release (2014), marketed by the Kansas Wheat Alliance. First entered into CSU Variety Trials in 2014. Medium maturity, short semidwarf. Good leaf rust resistance, test weight, straw strength, and quality. Intermediate reaction to stripe rust. Very susceptible to mite-transmitted viruses.
Langin Hard red winter CO050270/Byrd	CSU 2016	S	3	3	8	4	3	7	6	3	5	1	CSU release (2016), marketed by PlainsGold. Early maturing semidwarf. Good test weight, stripe rust resistance, and quality. Medium coleoptile. Carries wheat curl mite resistance from Byrd parent. Straw strength marginal for irrigated production.
Larry Hard red winter KS940786-6-9EU/KS990011-1-~21//KS990159-3-~7	KSU 2016	S	5	6	2	5	2	7	8	2	3	6	KSU-Manhattan release (2016), marketed by the Kansas Wheat Alliance. First entered into CSU Variety Trials in 2017. Good stripe rust resistance, straw strength, and test weight. Very susceptible to mite-transmitted viruses.
LCS Chrome Hard red winter Not Disclosed	Limagrain 2016	S	5	4	2	5	2	1	7	3	5	5	Limagrain release (2016), first entered in CSU Variety Trials in 2016. Medium maturing, medium height, good straw strength and test weight. Good resistance to stripe rust and leaf rust.
LCS Mint Hard red winter Overley/CO980829	Limagrain 2011	S	5	8	6	5	4	8	5	3	2	3	Limagrain release (2011), first entered in CSU Variety Trials in 2013, previously tested in 2010 under experimental designation CO050175-1. Moderate resistance to stripe rust, good test weight, good milling and baking quality.
Loma Hard red winter Yellowstone//MTS0112/MTS0125	MT 2016	S	9	3	6	7	2	--	8	5	3	2	MT State release (2016), first entry in CSU trials in 2017. Late maturity, good stripe rust resistance. Carries solid stem trait conferring some resistance to wheat stem sawfly. Very susceptible to mite-transmitted viruses.
Oakley CL Hard red winter Above/Danby//KS03HW10	KSU 2013	S	6	5	8	9	1	4	2	4	4	3	KSU-Hays release (2013), marketed by the Kansas Wheat Alliance. First entered in CSU Variety Trials in 2013. Single-gene hard red Clearfield wheat. Good test weight, good stripe rust resistance, carries same WSMV resistance as Clara CL and Snowmass.
Ruth Hard red winter OK98697/Jagalene//Camelot	NE 2015	S	5	6	4	6	3	6	6	2	3	6	Nebraska release (2015), marketed by Husker Genetics. First entered in CSU Variety Trials in 2015. Medium height, medium maturity, medium length coleoptile. Good stripe rust resistance and good test weight.
Settler CL Hard red winter N951164/3/MILLENNIUM SIB//TXGH125888-120*4/FS2	NE 2008	S	5	4	2	7	7	8	7	6	3	4	Nebraska release (2008), marketed by Husker Genetics. Single-gene Clearfield wheat. Later maturing, medium height. Moderately susceptible to stripe rust.

Column Key - Russian wheat aphid resistance (RWA), heading date (HD), plant height (HT), straw strength (SS), coleoptile length (COL), stripe rust resistance (YR), leaf rust resistance (LR), wheat streak mosaic virus tolerance (WSMV), test weight (TW), milling quality (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.

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Description of Winter Wheat Varieties in Eastern Colorado Dryland and Irrigated Trials (2017)

Name, Class, and Pedigree	Origin	RWA*	HD	HT	SS	COL**	YR	LR	WSMV'	TW	MILL	BAKE	Comments
Snowmass	CSU 2009	S	5	7	8	4	6	6	3	4	6	2	CSU release (2009), marketed by PlainsGold in CWRP-Arden Mills Ultragrain Premium Program. Hard white wheat. Medium-maturing, medium-tall, poor straw strength. Good WSMV resistance, moderately susceptible to stripe rust, moderate sprouting tolerance.
Hard white winter KS96HW94//Trego/CO960293													
Sunshine	CSU 2014	S	3	4	5	6	5	8	8	7	3	2	CSU release (2014), marketed by PlainsGold in CWRP-Arden 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.
Hard white winter KS01HW152-6/HV9W02-267W													
SY Monument	Syngenta 2014	S	8	6	5	5	2	1	8	5	4	1	Syngenta release (2014). First entered in CSU Variety Trials in 2014. Good drought tolerance, winterhardness, quality, and resistance to both leaf and stripe rust. Very susceptible to mite-transmitted viruses.
Hard red winter BC991149-11/00x0090-4													
SY Rugged	Syngenta 2017	S	3	3	6	5	2	6	8	3	3	4	Syngenta release (2016), first entered in CSU Variety Trials in 2017. Dryland adapted, good stripe rust resistance, good milling and baking quality. Very susceptible to mite-transmitted viruses.
Hard red winter Greer/Doans													
SY Sunrise	Syngenta 2015	S	6	2	2	3	2	3	8	2	3	7	Syngenta release (2015), first entered in 2015 CSU Irrigated Trials. Short semidwarf, good straw strength, winterhardness, drought tolerance, stripe rust resistance, test weight. Marginal baking quality, very susceptible to mite-transmitted viruses. Stewardship Agreement requires no saved seed. Certified seed only.
Hard red winter BC98337-10-53/CDC Falcon//NE03458													
SY Wolf	Syngenta 2010	S	7	5	3	5	3	1	6	6	4	6	Syngenta release (2011). First entered in CSU Variety Trials in 2011. Good resistance to tan spot, septoria, leaf rust, and stripe rust. Best performance in Colorado trials under irrigation and in the I-70 corridor counties and further north.
Hard red winter W99-331/97x0906-8													
TAM 114	TX 2014	S	4	6	5	5	2	4	6	2	3	1	Texas A&M release (2014), marketed by AGSECO. First entered in CSU trials in 2015. Good resistance to leaf, stripe, stem rust, and Hessian fly. Good test weight and quality characteristics.
Hard red winter TAM 111/TX98A0050													
Tatanka	KSU 2016	S	5	5	6	7	2	4	6	3	4	4	KSU-Hays release (2016), marketed by Kansas Wheat Alliance. Medium maturity, medium height. Good resistance to stripe rust, moderate resistance to leaf rust. Good test weight.
Hard red winter KS07HW81/T151													
Thunder CL	CSU 2008	R*	5	4	2	6	4	5	9	6	5	3	CSU release (2008), marketed by PlainsGold in CWRP-Arden Mills Ultragrain Premium Program. Single-gene hard white Clearfield wheat. Good straw strength for irrigation. Excellent quality, moderate stripe rust resistance, moderate sprouting susceptibility. Very susceptible to mite-transmitted viruses.
Hard white winter KS01-5539/CO99W165													
WB-Grainfield	Monsanto 2012	S	2	6	4	2	2	3	8	4	3	6	Monsanto release (2012). First entered into CSU Trials in 2013. Early maturing tall semi-dwarf. Good leaf and stripe rust resistance, shorter coleoptile. Very susceptible to mite-transmitted viruses.
Hard red winter G982231/G982159//KS920709W													

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WB4303 Hard red winter PFAU/WEAVER/3/MASON/JGR//PECOS/4/FARMEC	Monsanto 2015	S	3	6	1	--	6	2	8	8	6	5	Monsanto release (2015), first entered in CSU Variety Trials in 2016. Medium short, medium-early, good straw strength, good quality. Moderately resistant to stripe and leaf rust. Lower test weight. Best adapted for irrigated production conditions. Very susceptible to mite-transmitted viruses.
WB4458 Hard red winter KS940786-7//G982163/G982002	Monsanto 2012	S	2	7	3	--	5	5	7	4	3	8	Monsanto release (2012), first entered in CSU Variety Trials in 2016. Medium height, medium-early. Good straw strength, winter hardiness, shatter resistance. Good drought and acid soil tolerance. Intermediate reaction to stripe and leaf rust.
WB4462 Hard red winter TAM 203//P25R47/Hitch	Monsanto 2015	S	5	7	7	5	7	3	8	5	5	5	Monsanto release (2015), first entered in CSU trials in 2017. Western adapted variety with a taller plant stature and medium maturity. Good winter hardiness and drought tolerance, moderately susceptible to stripe rust. Very susceptible to mite-transmitted viruses.
WB4721 Hard red winter Not Disclosed	Monsanto 2016	S	3	6	2	2	3	2	7	1	2	6	Monsanto release (2016), first entered in CSU Variety Trials in 2016. Good test weight, winterhardiness, drought tolerance, straw strength, quality, and resistance to stripe and leaf rust. Grower Agreement requires no saved seed. Certified seed only.
Winterhawk Hard red winter 474510-1/X87807//HBK736-3	Monsanto 2007	S	5	6	5	8	4	7	6	2	2	4	Westbred release (2007). Medium maturing, medium tall, long coleoptile. Intermediate reaction to stripe rust, susceptible to leaf rust, very susceptible to stem rust. Good drought tolerance, test weight, and quality.

Column Key - Russian wheat aphid resistance (RWA), heading date (HD), plant height (HT), straw strength (SS), coleoptile length (COL), stripe rust resistance (VR), leaf rust resistance (LR), wheat streak mosaic virus tolerance (WSMV), test weight (TW), milling quality (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. * RWA rating denotes resistance to the original biotype (biotype 1) of RWA. All available cultivars are susceptible to the new biotypes of RWA.

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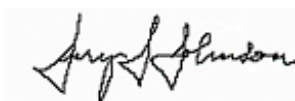
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