

Technical Report TR 18-4

Agricultural Experiment Station

Colorado
State
University

College of Agricultural Sciences

Department of Soil & Crop Sciences

Extension

Making Better Decisions



**2018 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 2017-2018 Eastern Colorado Winter Wheat Trials

Jerry Johnson and Sally Jones

Colorado State University researchers 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 and trait 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 56 varieties including experimental lines in each of the 11 dryland trials. The three irrigated trials each had 38 varieties and the 20 collaborative on-farm tests (COFT) each had five varieties. The trials included a combination of public and private varieties and experimental lines. Varieties from other states came from Kansas and Nebraska. Seed companies with entries in the variety trials included AgriMaxx Wheat, AgriPro Syngenta, Dyna-Gro Seed, Limagrain Cereal Seeds, and WestBred Monsanto. There were entries from two marketing organizations: PlainsGold (Colorado) 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 150 ft² (except the Fort Collins irrigated trial, 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 0.15 to 2.2 acres per variety in side-by-side strips and seeding rates conformed to the seeding rate used by 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 a plot combine.

General Growing Season Comments – the tale of two regions

There was good subsoil moisture from above-average rainfall during summer 2017. Dry fall conditions in southeast Colorado made stand establishment difficult. Some timely rain events in May 2018 and good subsoil moisture led to above-average yields in parts of Prowers and Kiowa counties. Most of northeast Colorado trials, and wheat acres, were late-planted. Above-average and well distributed precipitation at the end of April as well as during May and June led to above-average yields despite more severe sawfly infestations, hail, and widespread virus infections. A heat wave in late May and early June reduced the threat of widespread stripe rust infections.

General Growing Conditions in Southeast Colorado - Kelly Roesch

The summer of 2017 was wetter than normal through July, then the rain stopped and dryness prevailed. Subsoil moisture was plentiful at the time of planting but finding good topsoil

moisture was a challenge. The area received a good rain (2-3 inches) on the 24th -25th of September leading to good stands of wheat.

The winter was warmer and drier than normal but the moisture received in September and subsoil moisture carried the wheat crop through until spring. Spring conditions were warmer and drier than normal. There were some areas that received rain showers but the whole area was gradually moving into drought conditions.

A large portion of the wheat crop was sprayed for brown wheat mites in April. The warm dry conditions in May and June all but eliminated rust infections. Plants showing virus infection symptoms were less prevalent than in the past few years.

Harvest got underway by June 25th and warm dry weather allowed for the harvest to progress well – the majority of the crop was harvested by mid-July. Yields in the southeast ranged from 15 to 50+ bu/ac with the average in the range of 35 bu/ac. Considering the severity of the drought conditions throughout spring and summer the wheat crop did remarkably well. Protein levels improved overall from last year but there was still significant production of wheat at protein contents of 10% or below.

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

Most producers in Adams, Arapahoe, Morgan, southwest Washington and Weld counties planted into good soil moisture in early to mid-October, planting being delayed due to late September rain. Very warm conditions dried surface soil considerably causing sporadic germination and poor stand establishment in some fields.

Warm and dry conditions prevailed during the fall, as September and October were unusually warm and continued into November. Light but very beneficial snows in January and February brought more favorable conditions for spring growth. Temperatures in April were below average and delayed jointing stage by about two weeks. Precipitation in late April and May was beneficial to this year's wheat crop even though hot and dry conditions prevailed during grain filling. June started with localized hail associated with several thunderstorm systems. Hail damage was significant in 2018.

Harvesting activities gradually began in the last week of June. In mid-July, producers made significant progress harvesting wheat in the midst of scattered precipitation. Wheat harvest was wrapped up by the third week of July.

Yield ranged from 20 to 60+ bu/ac across the area. Yield variability could be attributed to the weather pattern during the growing season, hail storms and wheat variety planted. Lower yield was mainly associated with the presence of the wheat stem sawfly, which caused heavy yield losses in stricken areas. Grain protein content was below average, but not as low as in 2017. Test weight varied from 54 to 63 lb/bu.

General Growing Conditions in Northeast Colorado - Dennis Kaan and John Spring

Wheat producers in northern Washington, Yuma, Logan, Phillips and Sedgwick counties planted later than normal (early to mid-October) but into good soil moisture. The area received adequate rains for good emergence and good stand establishment.

There were warm temperatures in September through November. Snows in January and February created good conditions for late-emerging wheat. March was dry, with moisture stress being observed in various locations. Lower spring temperatures resulted in delayed jointing. Good spring precipitation across the area contributed greatly to good production this year. Temperatures rose at the time of grain filling but timely rains kept soil moisture conditions good. Severe hail in many locations led to the loss of wheat yield.

Stripe rust was not an issue this year due to the dry conditions and lack of the disease in Texas and Oklahoma. However, some fungal (tan spot) and bacterial (bacterial streak) diseases were observed in the area. Damage to wheat from these diseases ranged from very low to mild depending on wheat variety.

Harvesting activities began gradually in the last week of June and finished by the third week of July. Yield ranged from 40 to over 60 bu/ac across the area. There was wheat stem sawfly damage on larger area this year indicating a spreading pest. Wheat was not docked for low protein this year but much of it was below average. Test weight was normal, varying from 59 to 64 lb/bu.

General Growing Conditions in East Central Colorado - Ron Meyer

Growing season conditions for the 2018 wheat crop were variable within east central Colorado. South of the I-70 corridor rainfall was limited, especially the further south one traveled, and this area was dry late into the season. There were large pockets that received timely rainfall north and east of this corridor. Hail was again observed at scattered locations. As a result, those wheat fields that benefitted from rainfall and escaped hail damage yielded exceptionally well. Eighty bushels per acre were observed from these wheat fields which is nearly double our average in this geographic area. Wheat fields that experienced less rainfall yielded 30 to 50 bushels per acre.

While there were no observations of stripe or leaf rust outbreaks, there were scattered wheat fields that experienced economically significant high levels of Russian wheat aphid (RWA) infestation.

Cumulative Rainfall and Growing Degree Days (GDD) from September 1, 2017 to
July 1, 2018 for Trial Locations

Trial Location	Rainfall	GDD	Avg. Yield	Bushels/ Inch Rain	Bushels/ Thousand GDD
	in	°F	bu/ac		
Akron	14	2173	84	6.0	38.7
Arapahoe	10	2532	61	5.9	24.1
Burlington	14	2449	82	6.0	33.5
Fort Collins (Irrigated)	-	2058	103	-	50.0
Haxtun (Irrigated)	-	2279	79	-	34.7
Julesburg	18	2300	65	3.6	28.3
Lamar	8	3054	69	9.0	22.6
Orchard	13	2136	52	3.9	24.3
Sheridan Lake	8	2738	54	6.8	19.7
Walsh	11	2994	38	3.4	12.7
Yuma	19	2196	67	3.5	30.5

Weather data collected from farmlogs.com

Dryland Variety Performance Trials - Southeast Locations

Arapahoe, Cheyenne County: Planted 9/20/2017 and harvested 6/28/2018. Plots planted into dry, hard topsoil but trial received over an inch of rain within a few days after planting. Good stands and lush fall growth were noted. Winter was somewhat dry, but the trial received timely moisture in the spring. No disease or insect issues noted by end of May. Trial had received rain in mid-May and again in mid-June. Minimal shattering (<5%) was noted right before harvest. GPS: 38.92234, -102.31422

Lamar, Prowers County: Planted 9/21/2017 and harvested 6/28/2018. Planted into marginal moisture, trial received over an inch of rain from showers in the days immediately after planting. Good stand establishment and a lot of fall growth. Winter was dry and trial received minimal moisture in March and April. In early May the soil was dry through the top portion of the root zone, but plants were not showing drought stress symptoms. Growth was very uniform and lush. No disease issues noted. Very little rain from May through harvest, although trial received small amount (<10%) of hail damage a week before harvest. GPS: 37.98745, -102.50393

Sheridan Lake, Kiowa County: Planted 9/20/2017 and harvested 6/27/2018. Planted into dry topsoil (plenty of subsoil moisture after top 3") and received over an inch of rain a few days after planting. The rest of fall was mild and minimal moisture was received from October-March. No disease was noted in the fall or spring. Good weed control. Trial received some rain in mid-April, but was looking slightly drought stressed by early May before timely rains occurred in mid-May. GPS: 38.5425, -102.4647

Walsh, Baca County: Planted 10/12/2017 and harvested 6/28/2018. Trial planted into good moisture. Emergence and stand establishment were acceptable although compaction was an issue on edge rows of plots. Very little moisture received during late-fall and entire winter. Infrequent and low amounts of moisture received in early spring until good rains in mid-May. No disease issues. GPS: 37.43448, -102.31954

Dryland Variety Performance Trials - Northeast Locations

Akron, Washington County: Planted 10/8/2017 and harvested 7/12/2018. Very good soil moisture at planting. Snowed and rained day after planting. Plants had very little plant growth in the fall. Trial received 0.72" of precipitation in January and another 0.5" in February. In April, stands were acceptable and soil moisture was average. Trial received precipitation in mid-April (over 2") and again in early May (1.8"). There was vigorous growth and excellent stands by early May with no disease noted. The trial had frequent rainfall throughout May and June, over 6.5" in May and another 2.7" in June. CSU Pathologist, Dr. Kirk Broders, identified Bacterial leaf streak in the trial in mid-June but at low levels. GPS: 40.1492, -103.13687

Burlington, Kit Carson County: Planted 9/20/2017 and harvested 7/1/2018. Planted into marginal moisture, but trial received 1.2" of rain within a week of planting. Trial characterized by above-average stands and early tillering by November. Received moisture in late January (6" of snow) and again in mid-March and April. Well-above-average tillering and growth by the end

of March. Trial showed lush growth and was heavily tillered in early May through early June. No disease noted. GPS: 39.29991, -102.29835

Genoa, Lincoln County: Planted 9/19/2017. Planted into dry mulch about 2.5” deep into moisture. Trial had even emergence and acceptable stands by early November. Wheat had some fall growth and top few inches of soil were dry in early February. Trial received moisture in early spring but was severely damaged by hail on May 14. Lost trial. GPS: 39.3562, -103.4922

Julesburg, Sedgwick County: Planted 10/8/2017 and harvested 7/10/2018. Field had excellent soil moisture at planting. Trial had very little plant growth in the fall due to late planting. Little moisture received over winter. By end of March plants had 3-4 leaves and emergence was satisfactory. Ground was hard and dry on top. Consistent rain events in April and May. Early June was hot and dry but more rains received in last half of June. GPS: 40.8996, -102.22933

Orchard, Morgan County: Planted 9/18/2017 and harvested 7/2/2018. Planted into excellent moisture and trial received rain in week following planting. Plant tillering was weak in the fall. Received moderate moisture in mid-January and February. More moisture received in mid-March. By end of March plant stands and growth were satisfactory with sufficient soil moisture. However, by the middle of April the trial was dry. Wheat stem sawfly damage was significant in June. GPS: 40.47969, -104.07124

Roggen, Weld County: Planted 10/4/2017. Planted into good soil moisture in no-till wheat stubble. Trial was emerged by early November although fall growth before dormancy was minimal. At end of March trial had very good soil moisture and stands were variable. Consistent moisture received throughout the spring but by mid-June trial was very dry. Trial was severely damaged by hail in mid-June and was lost due to variable stands. GPS: 40.08824, -104.26023

Yuma, Yuma County: Planted 10/6/2017 and harvested 7/9/2018. Trial planted relatively late, but into excellent soil moisture. Stands were uniform and a lot of growth in the fall. Trial received small amounts of moisture during the winter. Stands were still acceptable in early April but wheat was showing drought stress by then. Good rains in late April and throughout May and June with over 3” received on June 6 and another 1.2” on June 24. Some hail damage noted at harvest. GPS: 40.186, -102.6612

Irrigated Variety Performance Trials

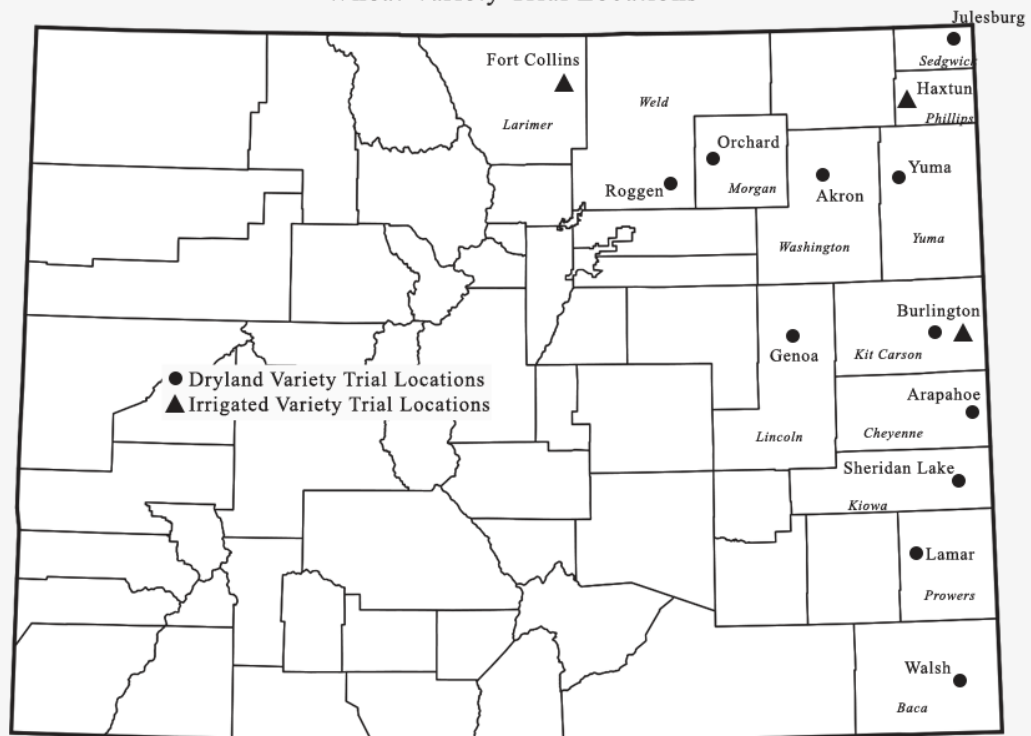
Fort Collins, Larimer County: Planted 9/22/2017 and harvested 7/18/2018. Trial planted into good moisture and 1.1” rain received day after planting. Very good plant stands by early November and lush growth. Moisture received during winter and more precipitation in late April (0.45”). Trial was irrigated regularly starting in mid-March as needed until July 1. No disease or insect pest issues noted in the trial. GPS: 40.65295, -104.9992

Haxtun, Phillips County: Planted 10/23/2017 and harvested 7/14/2018. Trial planted after corn silage harvest into moderate-heavy corn residue. Field was disced twice and then vertically tilled prior to planting. Good seed bed and trial irrigated immediately after planting. Plants emerged

in mid-late November. In late March plants were very small but stands were acceptable. Some varieties were just heading in early June; no disease was noted at that time. Minor hail damage occurred in mid-June. Fusarium head blight was found across trial in early July. No other diseases were noted. GPS: 40.3941, -102.61417

Burlington, Kit Carson County: Planted 10/12/2017. Planted into moist soil in tilled corn residue. Trial had small (three-leaf stage) plants by end of March but excellent stands. Trial destroyed by hail in mid-June. GPS: 39.2043,-102.14492

2018 Dryland and Irrigated Winter Wheat Variety Trial Locations



Summary of 2018 Dryland Winter Wheat Variety Performance Results

Variety ^b	2018 Individual Trial Yield ^a									2018 Multi-Location Average				
	Akron	Arapahoe	Burlington	Julesburg	Lamar	Orchard	Lake	Walsh	Yuma	Yield	Test		Test	
											bu/ac	% of avg	lb/bu	% of avg
														Height
Langin	100.4	71.9	81.3	66.2	75.7	63.1	59.2	47.3	69.6	70.5	111%	60.0	100%	31
Antero	90.4	69.2	84.1	69.7	76.7	54.5	62.8	49.4	68.7	69.5	109%	59.5	99%	33
Snowmass 2.0	92.1	60.3	93.7	62.4	75.8	56.8	56.2	41.0	71.1	67.7	106%	60.3	100%	31
Breck	87.6	60.0	88.1	69.5	70.1	54.5	61.6	43.9	70.3	67.3	106%	61.5	102%	32
Whistler	88.2	70.7	79.0	64.7	68.7	59.4	57.3	43.4	73.8	67.2	106%	58.7	98%	33
Sunshine	86.3	64.3	83.7	62.9	78.0	48.9	58.1	42.3	74.7	66.6	105%	58.8	98%	31
Monarch	83.5	66.2	90.9	57.7	75.7	55.2	57.6	39.4	71.2	66.4	104%	60.2	100%	30
Avery	88.4	60.2	82.2	60.9	69.8	47.9	57.0	50.7	72.9	65.5	103%	59.8	100%	33
WB4418	83.2	61.0	86.4	71.1	70.7	45.8	54.2	43.9	68.0	64.9	102%	59.5	99%	29
SY Monument	84.1	59.0	85.7	72.5	68.6	49.6	53.3	41.6	69.0	64.8	102%	59.5	99%	31
Long Branch	84.6	63.0	84.4	62.6	68.9	48.0	60.7	37.3	72.7	64.7	102%	59.1	98%	31
Canvas	87.7	61.6	86.4	66.0	68.2	52.0	56.7	42.2	61.1	64.7	102%	60.4	101%	30
Denali	86.5	58.7	85.5	68.7	65.5	52.2	53.1	38.8	71.3	64.5	101%	60.7	101%	33
Byrd CL Plus	87.6	65.9	79.5	60.9	69.7	53.8	56.0	41.4	64.3	64.4	101%	59.7	99%	33
WB4462	84.7	61.0	86.3	68.2	66.2	49.5	52.9	37.6	65.3	63.5	100%	60.5	101%	34
Crescent AX	83.3	62.1	82.4	63.2	71.2	57.1	48.5	34.5	66.7	63.2	99%	60.6	101%	32
Byrd	85.1	56.3	82.8	61.1	69.4	56.7	52.5	36.6	67.8	63.1	99%	60.3	100%	32
WB-Grainfield	85.2	58.0	80.3	64.4	69.6	51.3	55.5	39.5	62.8	63.0	99%	59.6	99%	32
Oakley CL	81.6	63.3	75.0	64.8	67.8	52.4	55.6	40.8	59.8	62.4	98%	59.6	99%	31
LCS Mint	83.2	62.8	80.9	62.1	69.5	46.3	56.2	38.5	60.2	62.2	98%	61.4	102%	33
Brawl CL Plus	82.6	60.7	80.7	63.0	71.7	51.1	57.4	33.3	58.7	62.1	98%	60.5	101%	32
Hatcher	76.7	63.3	71.2	65.1	72.6	52.4	51.6	41.5	63.7	62.0	97%	59.9	100%	31
Winterhawk	82.3	52.3	77.2	68.2	75.7	46.9	49.5	38.3	62.9	61.5	97%	60.8	101%	33
WB4721	83.3	57.4	84.6	64.4	71.7	47.1	52.3	39.6	52.8	61.5	97%	61.2	102%	31
SY Rugged	80.0	63.6	78.7	61.7	68.0	47.9	52.0	39.0	61.1	61.3	96%	58.7	98%	28
SY Wolf	82.0	60.2	83.5	62.4	63.4	44.2	52.0	31.6	70.7	61.1	96%	60.1	100%	30
Snowmass	75.9	59.7	78.4	61.2	68.8	45.3	53.1	34.6	71.1	60.9	96%	60.6	101%	34
AM Eastwood	85.3	57.9	81.9	58.1	65.0	45.3	48.9	33.6	62.6	59.9	94%	59.9	100%	26
Incline AX	75.4	61.9	69.7	57.8	63.0	53.1	48.7	32.6	70.6	59.2	93%	58.0	97%	31
SY Legend CL2	81.3	60.5	72.3	60.9	64.7	46.1	50.1	31.7	62.4	58.9	93%	60.1	100%	30
LCS Chrome	77.3	47.5	85.4	65.1	70.3	35.4	46.7	34.9	48.7	56.8	89%	59.9	100%	32
Experimentals														
CO12D296	90.7	66.0	83.2	74.8	70.8	58.5	55.1	44.8	74.8	68.8	108%	60.9	101%	31
CO15D092R	87.7	69.6	85.5	61.0	69.2	63.4	61.6	43.0	72.9	68.2	107%	59.3	99%	30
CO15D098R	86.9	72.1	79.1	75.6	74.4	57.4	58.1	44.7	62.1	67.8	107%	61.1	102%	34
CO15D129R	96.2	64.8	87.2	71.8	70.7	55.2	56.2	32.1	72.4	67.4	106%	62.1	103%	30
CO14A070	84.0	64.5	79.6	68.1	76.8	57.3	57.3	36.0	76.0	66.6	105%	60.0	100%	33
CO15A018	87.8	65.3	86.7	68.0	73.0	56.2	53.0	36.5	70.6	66.3	104%	59.0	98%	30
CO15SFD061	88.0	64.7	78.3	66.4	69.2	56.7	58.1	43.0	66.4	65.6	103%	57.6	96%	33
CO12D597	82.8	58.9	77.1	70.1	69.2	60.9	53.8	37.3	74.7	65.0	102%	60.5	101%	32
CO13007	89.8	61.9	82.0	71.6	70.6	48.8	55.8	40.1	61.6	64.7	102%	60.2	100%	33
CO13D1638	88.1	59.2	81.5	64.5	62.1	53.1	59.6	36.5	75.8	64.5	101%	59.4	99%	32
CO13D1479	87.7	55.9	92.4	59.7	68.6	51.5	55.3	36.9	71.0	64.3	101%	60.5	101%	32
CO13D1486	83.2	57.0	84.9	66.8	70.3	52.3	56.5	36.0	70.1	64.1	101%	60.0	100%	31
CO15D127R	85.8	60.1	78.5	62.2	73.0	54.3	55.8	40.0	65.5	63.9	100%	60.2	100%	31
CO13D1714	79.1	55.8	79.8	65.0	70.8	53.9	54.3	42.8	71.9	63.7	100%	59.8	100%	33
CO13D0787	83.4	66.0	76.2	66.3	65.1	55.7	56.9	36.5	66.8	63.7	100%	61.4	102%	32
CO15D130W	86.7	62.1	86.1	66.1	66.0	47.5	51.7	33.8	72.0	63.5	100%	59.5	99%	29
CO14A136	85.7	61.5	86.4	60.7	71.1	57.5	49.6	34.2	64.8	63.5	100%	60.1	100%	31
CO15D094R	85.8	60.7	81.1	70.1	75.1	47.5	58.2	29.8	60.6	63.2	99%	61.2	102%	33
CO15D027RC	80.0	60.6	83.5	64.5	65.5	47.2	52.7	38.8	63.9	61.9	97%	60.7	101%	33
CO15SFD107	75.9	57.3	79.8	60.8	66.4	53.5	52.7	36.8	63.8	60.8	96%	60.6	101%	33
CO13D1164	78.8	57.6	78.1	67.0	66.2	47.6	51.2	32.8	64.9	60.5	95%	59.9	100%	33
CO15SFD092	80.0	55.7	82.1	62.5	63.9	48.6	53.6	26.3	57.3	58.9	93%	60.2	100%	30
CO15D063RC	84.3	51.1	81.8	57.2	60.8	46.8	47.7	30.2	66.3	58.5	92%	61.0	102%	31
CO15SFD095	76.4	59.2	83.1	58.0	63.5	53.4	46.7	27.4	57.7	58.4	92%	62.2	103%	32
NHH144913-3	77.7	54.2	75.1	63.3	61.0	42.5	48.2	36.5	57.4	57.3	90%	56.5	94%	31
Average	84.4	61.1	82.0	64.8	69.4	51.7	54.4	38.1	66.6	63.6		60.1		32
^a LSD (P<0.30)	3.2	3.4	4.0	2.7	3.8	3.1	2.9	3.9	4.4					

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

^bVarieties ranked according to average yield across nine trials in 2018.

^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 2018 Dryland Trials

2018 Multi-Location Average

2018 Individual Trial Rank

Rank	Variety	Akron	Arapahoe	Burlington	Julesburg	Lamar	Orchard	Sheridan Lake	Walsh	Yuma
Varieties Ranked By Yield										
1	Langin	Langin	Langin	Snowmass 2.0	SY Monument	Sunshine	Langin	Antero	Avery	Sunshine
2	Antero	Snowmass 2.0	Whistler	Monarch	WB4418	Antero	Whistler	Breck	Antero	Whistler
3	Snowmass 2.0	Antero	Antero	Breck	Antero	Snowmass 2.0	Crescent AX	Long Branch	Langin	Avery
4	Breck	Avery	Monarch	WB4418	Breck	Winterhawk	Snowmass 2.0	Langin	WB4418	Long Branch
5	Whistler	Whistler	Byrd CL Plus	Canvas	Denali	Langin	Byrd	Sunshine	Breck	Denali
6	Sunshine	Canvas	Sunshine	WB4462	WB4462	Monarch	Monarch	Monarch	Whistler	Monarch
7	Monarch	Breck	SY Rugged	SY Monument	Winterhawk	Hatcher	Antero	Brawl CL Plus	Sunshine	Snowmass
8	Avery	Byrd CL Plus	Hatcher	Denali	Langin	Brawl CL Plus	Breck	Whistler	Canvas	Snowmass 2.0
9	WB4418	Denali	Oakley CL	LCS Chrome	Canvas	WB4721	Byrd CL Plus	Avery	SY Monument	SY Wolf
10	SY Monument	Sunshine	Long Branch	WB4721	LCS Chrome	Crescent AX	Incline AX	Canvas	Hatcher	Incline AX
11	Long Branch	AM Eastwood	LCS Mint	Long Branch	Hatcher	WB4418	Oakley CL	LCS Mint	Byrd CL Plus	Breck
12	Canvas	WB-Grainfield	Crescent AX	Antero	Oakley CL	LCS Chrome	Hatcher	Snowmass 2.0	Snowmass 2.0	Langin
13	Denali	Byrd	Incline AX	Sunshine	Whistler	Breck	Denali	Byrd CL Plus	Oakley CL	SY Monument
14	Byrd CL Plus	WB4462	Canvas	SY Wolf	WB-Grainfield	Avery	Canvas	Oakley CL	WB4721	Antero
15	WB4462	Long Branch	WB4418	Byrd	WB4721	Byrd CL Plus	WB-Grainfield	WB-Grainfield	WB-Grainfield	WB4418
16	Crescent AX	SY Monument	WB4462	Crescent AX	Crescent AX	WB-Grainfield	Brawl CL Plus	WB4418	Monarch	Byrd
17	Byrd	Monarch	Brawl CL Plus	Avery	Brawl CL Plus	LCS Mint	SY Monument	SY Monument	SY Rugged	Crescent AX
18	WB-Grainfield	Crescent AX	SY Legend CL2	AM Eastwood	Sunshine	Byrd	WB4462	Snowmass	Denali	WB4462
19	Oakley CL	WB4721	Snowmass 2.0	Langin	Long Branch	Long Branch	Sunshine	Denali	LCS Mint	Byrd CL Plus
20	LCS Mint	WB4418	SY Wolf	LCS Mint	Snowmass 2.0	Snowmass	Long Branch	WB4462	Winterhawk	Hatcher
21	Brawl CL Plus	LCS Mint	Avery	Brawl CL Plus	SY Wolf	Whistler	Avery	Byrd	WB4462	Winterhawk
22	Hatcher	Brawl CL Plus	Breck	WB-Grainfield	LCS Mint	SY Monument	SY Rugged	WB4721	Long Branch	WB-Grainfield
23	Winterhawk	Winterhawk	Snowmass	Byrd CL Plus	SY Rugged	Canvas	WB4721	SY Rugged	Byrd	AM Eastwood
24	WB4721	SY Wolf	SY Monument	Whistler	Snowmass	SY Rugged	Winterhawk	SY Wolf	LCS Chrome	SY Legend CL2
25	SY Rugged	Oakley CL	Denali	SY Rugged	Byrd	Oakley CL	LCS Mint	Hatcher	Snowmass	SY Rugged
26	SY Wolf	SY Legend CL2	WB-Grainfield	Snowmass	Byrd CL Plus	WB4462	SY Legend CL2	SY Legend CL2	Crescent AX	Canvas
27	Snowmass	SY Rugged	AM Eastwood	Winterhawk	SY Legend CL2	Denali	WB4418	Winterhawk	AM Eastwood	LCS Mint
28	AM Eastwood	LCS Chrome	WB4721	Oakley CL	Avery	AM Eastwood	AM Eastwood	AM Eastwood	Brawl CL Plus	Oakley CL

Summary of 2-Yr (2017 and 2018) Dryland Variety Performance Results

Variety ^b	Brand/Source	Market Class ^c	2-Year Average ^a				Plant Height
			Yield	Yield	Test Weight	Test Weight	
			bu/ac	% trial average	lb/bu	% trial average	in
Langin	PlainsGold	HRW	73.8	111%	60.0	100%	31
CO12D296	Colorado State University Exp.	HRW	73.4	110%	61.0	102%	31
Whistler	PlainsGold	HRW	72.8	109%	58.7	98%	34
Snowmass 2.0	PlainsGold	HWW	71.5	107%	60.1	100%	31
Antero	PlainsGold	HWW	71.1	107%	59.5	99%	34
CO13D1638	Colorado State University Exp.	HWW	70.9	106%	59.4	99%	33
Canvas	PlainsGold	HRW	70.4	106%	60.5	101%	31
CO12D597	Colorado State University Exp.	HRW	70.0	105%	60.5	101%	33
CO13D1714	Colorado State University Exp.	HWW	69.6	104%	60.1	100%	33
Breck	PlainsGold	HWW	69.5	104%	61.4	103%	33
Avery	PlainsGold	HRW	69.3	104%	60.0	100%	34
Byrd	PlainsGold	HRW	69.1	104%	60.2	100%	33
CO13D0787	Colorado State University Exp.	HRW	68.8	103%	61.2	102%	32
Monarch	PlainsGold	HWW	68.8	103%	60.0	100%	31
Byrd CL Plus	PlainsGold	HRW	67.7	102%	59.3	99%	33
Sunshine	PlainsGold	HWW	67.4	101%	58.9	98%	31
CO13D1479	Colorado State University Exp.	HWW	67.1	101%	59.9	100%	33
Snowmass	PlainsGold	HWW	65.4	98%	60.2	100%	34
WB-Grainfield	WestBred Monsanto	HRW	65.3	98%	60.0	100%	32
Oakley CL	Kansas Wheat Alliance	HRW	65.0	98%	59.6	100%	33
CO13D1164	Colorado State University Exp.	HWW	64.9	97%	60.0	100%	34
Denali	PlainsGold	HRW	64.8	97%	59.9	100%	34
LCS Mint	Limagrain	HRW	64.6	97%	60.9	102%	33
SY Monument	AgriPro Syngenta	HRW	64.0	96%	59.0	99%	31
SY Rugged	AgriPro Syngenta	HRW	63.5	95%	58.7	98%	29
WB4462	WestBred Monsanto	HRW	63.3	95%	60.4	101%	34
SY Wolf	AgriPro Syngenta	HRW	62.9	94%	59.8	100%	31
Hatcher	PlainsGold	HRW	62.6	94%	59.5	99%	31
Brawl CL Plus	PlainsGold	HRW	62.6	94%	60.2	101%	32
Winterhawk	WestBred Monsanto	HRW	61.7	93%	60.1	100%	34
WB4721	WestBred Monsanto	HRW	60.2	90%	60.8	102%	31
Incline AX	PlainsGold	HRW	59.2	89%	57.0	95%	32
LCS Chrome	Limagrain	HRW	58.3	87%	59.6	100%	32
Average			66.7		59.9		32

^aThe 2-year average yield, test weight, and plant heights are based on 17 trials (nine 2018 and eight 2017 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 (2016, 2017, and 2018) Dryland Variety Performance Results

Variety ^b	Brand/Source	Market Class ^c	3-Year Average ^a				Plant Height
			Yield	Yield	Test Weight	Test Weight	
			bu/ac	% trial average	lb/bu	% trial average	in
Langin	PlainsGold	HRW	77.5	111%	59.7	100%	31
Antero	PlainsGold	HWW	75.9	109%	58.8	99%	34
Breck	PlainsGold	HWW	73.9	106%	61.0	103%	33
Avery	PlainsGold	HRW	73.5	105%	59.5	100%	34
Byrd	PlainsGold	HRW	72.6	104%	59.9	101%	33
Sunshine	PlainsGold	HWW	72.0	103%	58.1	98%	32
WB-Grainfield	WestBred Monsanto	HRW	70.5	101%	59.8	101%	33
LCS Mint	Limagrain	HRW	69.7	100%	60.4	102%	33
Oakley CL	Kansas Wheat Alliance	HRW	69.4	100%	59.2	100%	33
Denali	PlainsGold	HRW	69.4	100%	59.8	101%	34
Hatcher	PlainsGold	HRW	69.0	99%	58.9	99%	32
Snowmass	PlainsGold	HWW	68.6	98%	59.8	101%	34
SY Monument	AgriPro Syngenta	HRW	68.5	98%	58.8	99%	32
Brawl CL Plus	PlainsGold	HRW	67.0	96%	59.5	100%	33
Winterhawk	WestBred Monsanto	HRW	67.0	96%	59.9	101%	34
SY Wolf	AgriPro Syngenta	HRW	66.7	96%	58.6	99%	32
WB4721	AGSECO	HRW	65.9	95%	60.7	102%	32
LCS Chrome	Limagrain	HRW	63.8	92%	59.5	100%	32
Incline AX	PlainsGold	HRW	63.7	91%	56.5	95%	32
Average			69.7		59.4		33

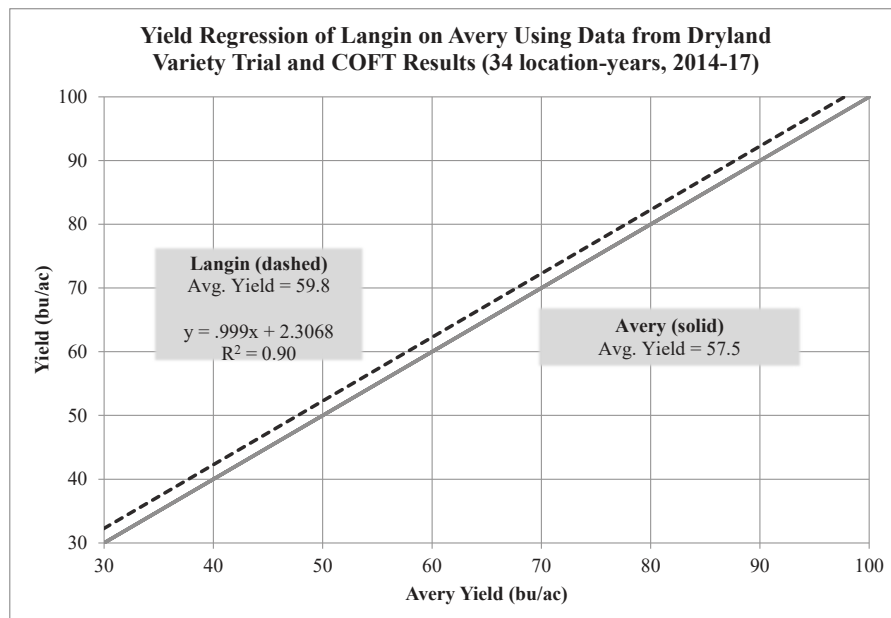
^aThe 3-year average yield and test weights are based on 25 trials (nine 2018, eight 2017, and eight 2016 trials). Plant heights are based on 24 trials (eight 2018, eight 2017, and eight 2016 trials).

^bVarieties ranked according to average 3-year yield.

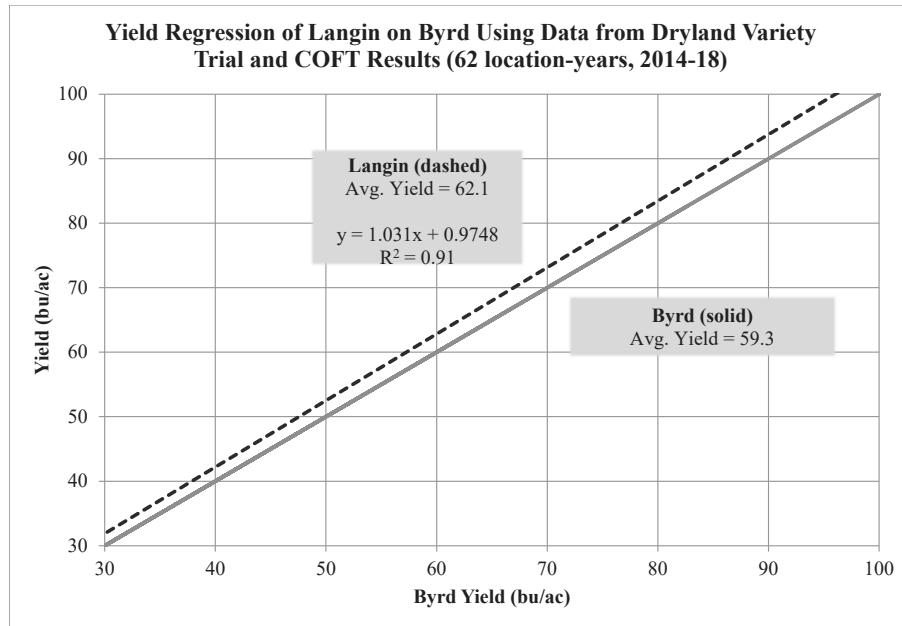
^cMarket class: HRW=hard red winter wheat; **HWW**=hard white winter wheat.

Head-to-Head Yield Comparisons

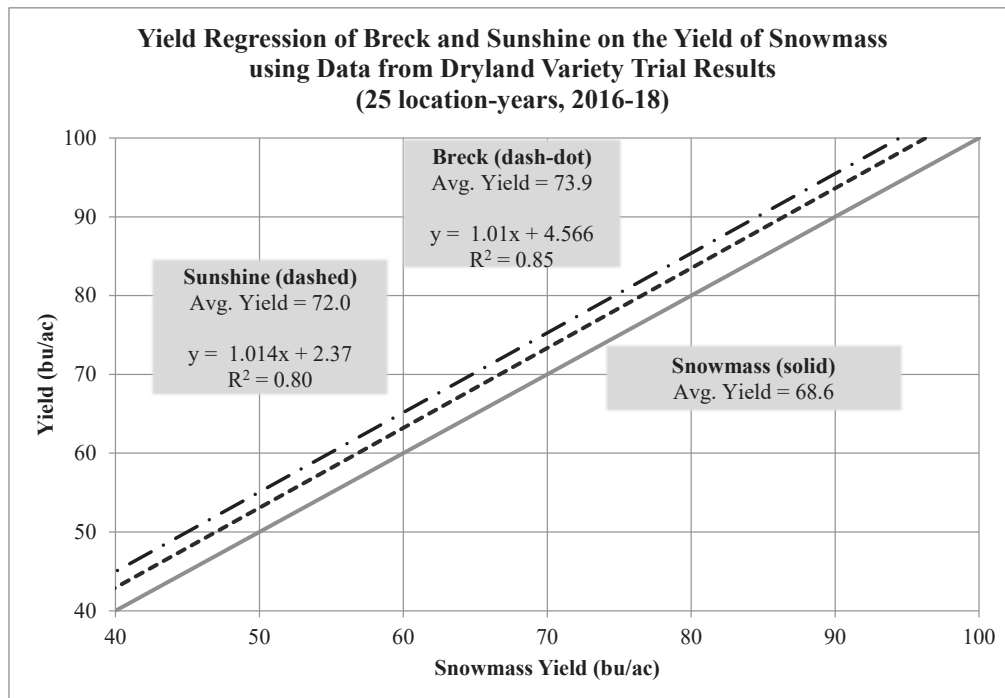
These regressions are used to compare the predicted performance of one variety relative to another variety. The regressions use results from multiple Dryland Variety Performance Trials and Collaborative On-Farm Test (COFT) results over the past five years (2014 through 2018). These (or any other) yield 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 high-yielding varieties, Langin and Avery. The regression line of Langin (dashed) is above the Avery line at all yield levels shown and is consistently expected to yield about 2 bu/ac higher. If Avery yielded 50 bu/ac, then it is predicted that Langin would yield 52.3 bu/ac.



The above graph compares two popular HRW wheats, Byrd and Langin. Across all of the yield levels shown, Langin is expected to yield higher than Byrd, and the difference is greater at higher yield levels. If Byrd yielded 60 bu/ac, it is predicted that Langin would yield 62.8 bu/ac.



The final graph compares three hard white wheat varieties that generally bring a premium at harvest for high quality: Snowmass, Sunshine, and Breck (a newly released variety). Sunshine is expected to yield higher than Snowmass at all yield levels and Breck is predicted to yield higher than both Sunshine and Snowmass across all yield levels. If Snowmass yielded 60 bu/ac, it is expected that Sunshine would yield 63.2 bu/ac and Breck would yield 65.2 bu/ac.

2018 Collaborative On-Farm Test (COFT) Variety Performance Results

Jerry Johnson, Kelly Roesch, Wilma Trujillo, Dennis Kaan,
Ron Meyer, John Spring, 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 2018, five varieties were included: Snowmass (high quality HWW), Breck (newly released HWW), Byrd (HRW), Avery (newer HRW) and Langin (2017 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 22nd 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 2017, thirty eastern Colorado wheat producers received seed of the five varieties and planted them in side-by-side strips under the same conditions as the wheat in the rest of the field. Twenty viable harvest results were obtained. Failed tests were due to drought conditions and hail. In 2018, there were extremes in yield across Colorado. The highest yielding strip was over 80 bu/ac while the lowest recorded yield this year was 12 bu/ac. Results were affected by winter drought, wheat stem sawfly, mite-transmitted 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 the variety trials, this year and last year. Langin is early maturing, has good test weight, excellent quality, stripe rust resistance and carries wheat curl mite resistance from the Byrd parent. Byrd, the most popular HRW variety in Colorado, at 28% of the 2017 planted acreage, performed well in COFT 2018. It is drought tolerant, is medium maturing, and has high quality. Byrd carries wheat curl mite resistance from its TAM 112 parent. Avery, released in 2015, 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 its TAM 112 parent. Avery is moderately susceptible to stripe rust.

Farmers wanting to grow white wheat with exceptionally high quality should consider Breck or Sunshine. Breck, with 50% Antero in its parentage, has proven itself to be high yielding in COFT as well as the variety trials. Sunshine and Breck do not have the same quality package as Snowmass (and not the same premium) but are high quality varieties and part of the CWRP Ardent Mills Ultragrains Premium Program. Sunshine is early maturing with excellent quality but is moderately susceptible to stripe rust and susceptible to mite transmitted viruses. Snowmass the standard for high wheat quality, has yields just below average on a 3-year average in variety trials.

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 COFT locations and the variety trial results.

2018 Collaborative On-Farm Test (COFT) Variety Performance Results

2018 Varieties (ranked left to right by highest yield)

County/Nearest Town	Breck Test			Langin Test			Byrd Test			Avery Test			Snowmass Test			COFT Average Test		
	Yield ^a bu/ac	Weight lb/bu	Protein percent	Yield ^a bu/ac	Weight lb/bu	Protein percent	Yield ^a bu/ac	Weight lb/bu	Protein percent	Yield ^a bu/ac	Weight lb/bu	Protein percent	Yield ^a bu/ac	Weight lb/bu	Protein percent	Yield ^a bu/ac	Weight lb/bu	Protein percent
Adams/Bennett N	35.4	63	9.6	29.0	60.9	9.4	29.9	60.9	9.8	32.7	60.8	9.8	20.4	61	10.7	29.5	61.3	9.9
Adams/Prospect Valley	20.6	63.6	10.5	24.0	62.0	9.6	25.6	61.7	10.4	21.1	60.9	10.6	23.8	61.8	9.9	23.0	62.0	10.2
Baca/Pritchett	23.8	60.5	12.5	25.6	59.1	11.6	27.1	59.8	11.4	25.7	59.6	11.2	27.2	58.8	12.0	25.9	59.6	11.8
Bent/Lamar	33.1	60.2	9.1	32.4	57.2	8.6	32.0	58.0	8.7	35.1	58.4	9.1	31.4	58.2	8.7	32.8	58.4	8.8
Kiowa/Haswell	43.5	62.3	8.0	44.3	58.3	7.4	47.4	59.3	7.7	39.2	60.2	8.9	42.1	60.7	8.3	43.3	60.2	8.1
Kit Carson/Bethune	38.8	62.5	15.9	32.3	61.2	14.3	39.5	61.3	15.0	36.6	63.2	15.8	28.1	61.4	14.0	35.1	61.9	15.0
Kit Carson/Burlington N	84.3	61.8	12.7	83.6	60.4	11.8	82.8	61.7	11.8	81.9	61.3	11.7	69.8	61.7	12.0	80.5	61.4	12.0
Kit Carson/Stratton	64.6	62.8	9.0	72.1	61.4	8.4	67.1	60.4	8.7	66.6	62.5	8.5	61.9	62.2	9.0	66.4	61.9	8.7
Prowers/Holly	47.3	60.6	11.8	59.7	58.3	11.9	42.4	59.3	11.9	44.4	59.1	12.5	57.4	57.9	11.7	50.3	59.0	12.0
Prowers/Lamar	46.7	60.3	13.2	34.1	57.8	12.6	36.2	57.6	13.1	41.1	58.8	12.7	31.2	58.3	13.8	37.9	58.6	13.1
Prowers/Wiley	28.2	58.6	9.6	25.8	56.8	8.6	23.3	57.4	9.3	27.7	57.7	9.4	17.6	58.0	9.6	24.5	57.7	9.3
Sedgwick/Julesburg	66.4	62.4	10.4	63.0	59.4	10.3	65.3	60.6	10.2	64.9	59.7	10.4	56.4	59.8	10.2	63.2	60.4	10.3
Sedgwick/Julesburg S	44.3	64.6	8.6	45.6	60.7	8.6	42.7	60.9	8.8	43.7	61.2	8.3	40.6	61.8	8.7	43.4	61.8	8.6
Washington/Akron N	71.6	63.3	10.2	75.6	60.7	9.5	71.5	61.6	10.2	69.2	61.5	9.7	67.8	61.2	9.9	71.2	61.7	9.9
Washington/Anton	18.4	57.8	15.3	16.2	54.4	14.3	13.5	54.9	14.6	14.4	54.6	14.5	12.5	55.3	15.0	15.0	55.4	14.7
Washington/Central	34.0	63.1	10.0	26.1	60.2	9.8	28.2	60.4	9.0	29.7	61.5	9.8	25.0	60.6	10.2	28.6	61.2	9.8
Weld/Keenesburg	36.8	56.8	17.9	35.9	57.9	17.7	37.1	55.7	16.6	34.8	54.3	16.8	34.2	59.3	15.3	35.7	56.8	16.9
Weld/New Raymer SE	61.8	62.0	10.7	65.9	60.5	10.3	66.7	60.0	10.3	63.7	61.5	10.1	58.8	61.0	10.9	63.4	61.0	10.5
Weld/Roggen	25.4	57.6	15.9	26.7	56.9	14.1	21.4	55.3	15.0	20.3	56.6	14.6	20.1	55.4	14.4	22.8	56.4	14.8
Yuma/Yuma	52.0	62.6	9.3	54.2	58.6	9.2	52.6	60.0	9.2	51.9	60.0	9.2	51.4	60.0	9.1	52.4	60.2	9.2
Average	43.8	61.3	11.5	43.6	59.1	10.9	42.6	59.3	11.1	42.2	59.7	11.2	38.9	59.7	11.2	42.2	59.8	11.2

Yield Significance^b

A

A, B

B, C

C

D

LSD ($P < 0.30$) for yield = 1.1 bu/ac

LSD ($P < 0.30$) for test weight = 0.3 lb/bu

LSD ($P < 0.30$) for protein = 0.1 percent

^aAll yield and protein data are corrected to 12% moisture.

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

Summary of 2018 COFT Variety Results (20 tests included)

Variety	Yield ^a bu/ac	Test Weight lb/bu	Protein percent
Breck	43.8	61.3	11.5
Langin	43.6	59.1	10.9
Byrd	42.6	59.3	11.1
Avery	42.2	59.7	11.2
Snowmass	38.9	59.7	11.2
Average	42.2	59.8	11.2
LSD _(0.30)	1.2	0.3	0.2

^aYield corrected to 12% moisture.

2018 Wheat Variety Decision Tree for Dryland Production

Jerry Johnson and Sally Jones

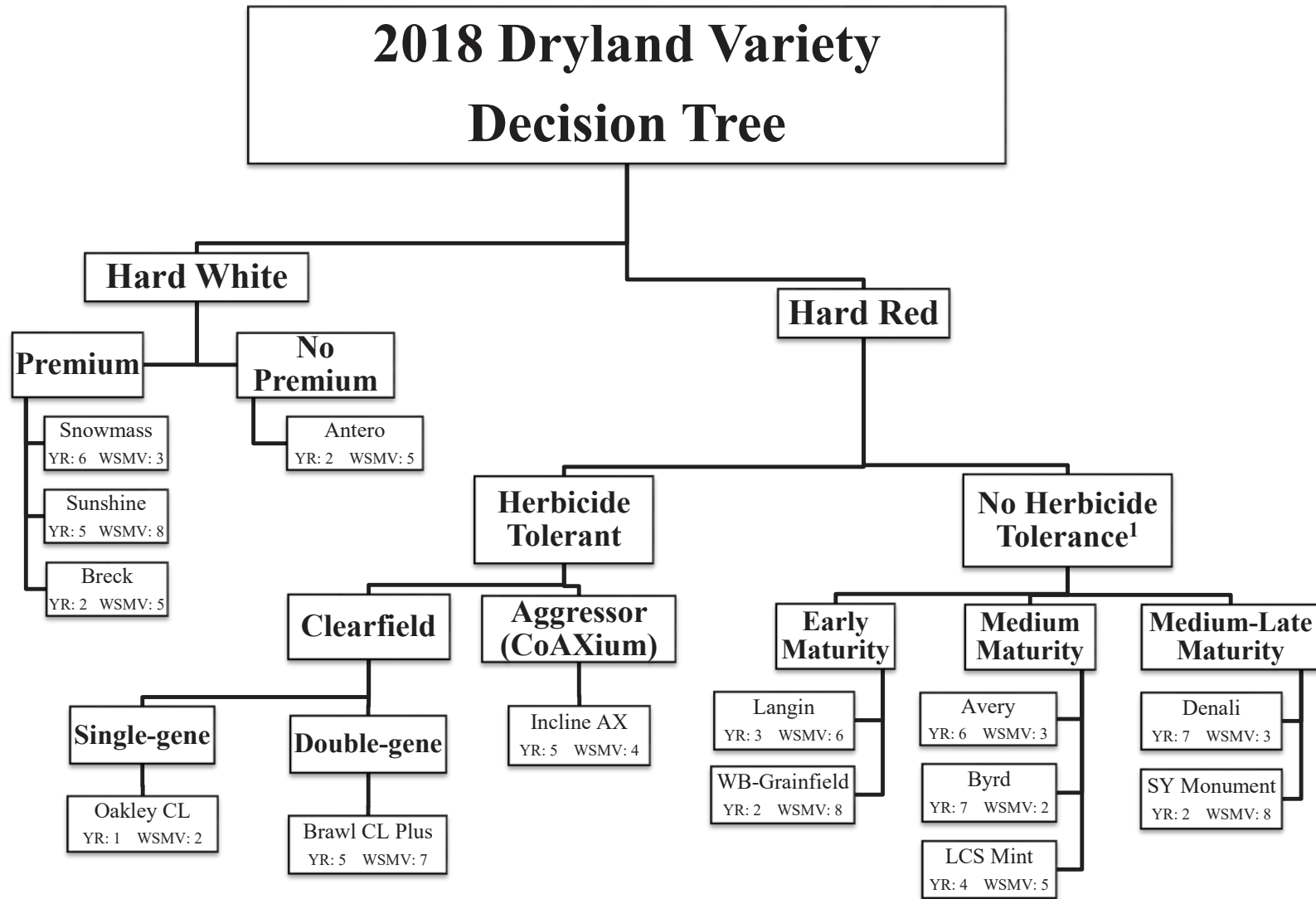
The decision tree on the following page helps Colorado growers make variety selection decisions based on important traits. All of the varieties shown in the decision tree have been tested in our trials for at least three years, across multiple locations. Under each variety name are the scores, YR for stripe rust and WSMV for wheat streak mosaic virus, with ‘1’ being very resistant and ‘9’ being very susceptible. Other variety traits are discussed below in the context of a decision tree.

For farmers growing hard white wheat, Antero, one of the top yielders among all varieties in the last three years, is highly recommended unless growers prefer the CWRP-Ardent Mills Ultragrain® Premium Program. Antero has good test weight, moderate sprouting tolerance and fair straw strength. Snowmass, Sunshine, and Breck are in the Ultragrain Premium Program. Snowmass, with superior quality, is medium-maturing and medium-tall but has poor straw strength. It has moderate sprouting tolerance. Sunshine has excellent quality, good sprouting tolerance and straw strength and is susceptible to all mite-transmitted viruses. Breck, the newcomer to the Ultragrain Premium Program, is a high-yielding variety with good sprouting tolerance, straw strength, and quality. It has very high test weight, at polyphenol oxidase (PPO) activity for improved whole grain bread and noodle quality.

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, above average grain protein content, and is early-maturing but has below-average yield. The single-gene Clearfield variety, Oakley CL, is recommended for those seeking high yield, above average grain protein content, and control of grassy weeds.

The new CoAXium™ Wheat Production System based on Aggressor™ herbicide, a different class of compounds from Beyond, is an option for excellent control of winter annual grasses. Incline AX, the herbicide-tolerant variety, has 66% Byrd and 34% Hatcher parentage, with good quality and straw strength but lower test weight and yield.

Most producers will plant high-yielding HRW varieties. Recommended early-maturing HRW varieties are Langin and WB-Grainfield. Langin is a newer CSU release and the top yielder in the three-year average results. For the high-yielding, medium-maturing varieties, there are three recommendations: Avery, Byrd, and LCS Mint. Byrd is the most widely planted winter wheat variety in Colorado on 28.4% of 2018 acreage. Avery, the second most popular Colorado variety at 12% of 2018 acreage, is 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. LCS Mint has good test weight and average yield in Colorado trials. Recommended high-yielding medium-to-late maturity HRW varieties are Denali and SY Monument. Denali is higher-yielding than SY Monument, and has excellent test weight. SY Monument has high quality and good winter hardiness.



¹No tolerance to Beyond (Clearfield system) or Aggressor (CoAXium system) herbicides

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

Summary of 2018 Irrigated Variety Performance Results

2018 Individual Trial Yield^a

2018 Multi-Location Average

Variety ^b	Fort Collins	Haxtun	Yield	Yield	Test Weight	Test Weight	Height
	bu/ac	bu/ac	bu/ac	% of avg	lb/bu	% of avg	in
WB4303	107.2	90.9	99.1	108%	56.4	95%	31
WB4418	106.6	87.0	96.8	106%	59.2	99%	31
Canvas	108.8	78.5	93.6	103%	60.4	101%	31
SY Wolf	104.2	82.7	93.4	102%	59.0	99%	33
Denali	104.4	81.6	93.0	102%	59.7	100%	34
Long Branch	108.1	76.9	92.5	101%	58.2	98%	34
Monarch	108.5	76.3	92.4	101%	58.9	99%	32
Snowmass 2.0	108.3	74.8	91.6	100%	59.2	99%	34
WB-Grainfield	96.4	86.4	91.4	100%	59.7	100%	34
Breck	99.4	83.4	91.4	100%	60.8	102%	34
SY Sunrise	100.1	82.2	91.2	100%	60.3	101%	30
LCS Chrome	99.4	82.3	90.9	99%	60.2	101%	35
Crescent AX	110.2	70.5	90.3	99%	60.8	102%	33
Sunshine	99.0	80.6	89.8	98%	59.2	99%	34
Brawl CL Plus	96.2	81.0	88.6	97%	60.9	102%	33
Thunder CL	98.8	73.9	86.4	95%	58.6	98%	34
WB4458	90.6	77.9	84.2	92%	60.2	101%	34
Underwood	93.3	71.3	82.3	90%	59.7	100%	31
AM Eastwood	90.4	72.1	81.3	89%	59.1	99%	30
Experimentals							
CO15D129R	109.7	91.3	100.5	110%	61.9	104%	32
CO15D027RC	108.9	83.4	96.1	105%	60.5	101%	36
CO15D098R	110.6	81.1	95.9	105%	60.4	101%	36
CO12D296	107.9	81.7	94.8	104%	60.8	102%	32
CO13D1486	103.6	85.1	94.3	103%	59.6	100%	32
CO13007	107.1	80.4	93.8	103%	60.3	101%	35
CO15D127R	107.3	78.1	92.7	101%	58.9	99%	31
CO14A070	109.9	74.5	92.2	101%	60.1	101%	34
CO12D597	106.3	78.1	92.2	101%	59.3	99%	34
CO13D1638	102.0	82.3	92.1	101%	58.6	98%	35
CO14A136	110.9	72.1	91.5	100%	59.0	99%	34
CO15D094R	106.4	76.4	91.4	100%	61.0	102%	34
CO15A018	106.1	75.6	90.9	99%	57.9	97%	32
CO13D1714	98.0	83.2	90.6	99%	59.8	100%	34
CO15D130W	103.8	77.3	90.5	99%	58.7	98%	31
CO13D1164	100.4	80.1	90.3	99%	59.7	100%	34
CO13D0787	100.6	78.9	89.8	98%	60.5	101%	34
CO15D063RC	95.2	78.8	87.0	95%	60.5	101%	32
CO15SFD092	100.3	68.8	84.6	93%	60.1	101%	33
Average	103.3	79.4	91.3		59.7		33
^c LSD (P<0.30)	3.5	2.9					

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

^bVarieties ranked according to multi-location average yield in 2018.

^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.

Summary of 2-year (2017 and 2018) Irrigated Variety Performance Results

Variety ^b	Brand/Source	Market Class ^c	2-Year Average ^a				Plant Height
			Yield	Yield	Test Weight	Test Weight	
			bu/ac	% trial average	lb/bu	% trial average	in
Monarch	PlainsGold	HWW	102.3	110%	58.7	100%	33
CO12D296	Colorado State University Exp.	HRW	101.4	109%	59.4	102%	33
Snowmass 2.0	PlainsGold	HWW	98.9	106%	58.6	100%	34
CO13D0787	Colorado State University Exp.	HRW	98.4	105%	59.7	102%	34
WB4303	WestBred Monsanto	HRW	97.3	104%	55.8	95%	33
CO13D1638	Colorado State University Exp.	HWW	96.1	103%	57.6	98%	36
Canvas	PlainsGold	HRW	96.0	103%	58.6	100%	33
SY Wolf	AgriPro Syngenta	HRW	95.8	103%	57.8	99%	35
CO12D597	Colorado State University Exp.	HRW	95.7	102%	58.3	100%	35
Breck	PlainsGold	HWW	94.9	102%	59.7	102%	35
Denali	PlainsGold	HRW	94.5	101%	59.0	101%	37
SY Sunrise	AgriPro Syngenta	HRW	92.1	99%	59.5	102%	31
Brawl CL Plus	PlainsGold	HRW	89.9	96%	59.2	101%	35
Sunshine	PlainsGold	HWW	88.9	95%	57.4	98%	34
CO13D1164	Colorado State University Exp.	HWW	88.7	95%	58.7	100%	35
CO13D1714	Colorado State University Exp.	HWW	88.2	94%	59.4	101%	35
WB-Grainfield	WestBred Monsanto	HRW	86.8	93%	59.2	101%	35
Thunder CL	PlainsGold	HWW	85.2	91%	58.0	99%	35
WB4458	WestBred Monsanto	HRW	83.5	89%	57.9	99%	34
Average			93.4		58.5		34

^aThe 2-year average yield and test weight are based on five trials (two 2018 trials and three 2017 trials). Plant heights are based on three trials (two 2018 and one 2017 trial).

^bVarieties ranked according to average 2-year yield.

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

Summary of 3-year (2016, 2017, and 2018) Irrigated Variety Performance Results

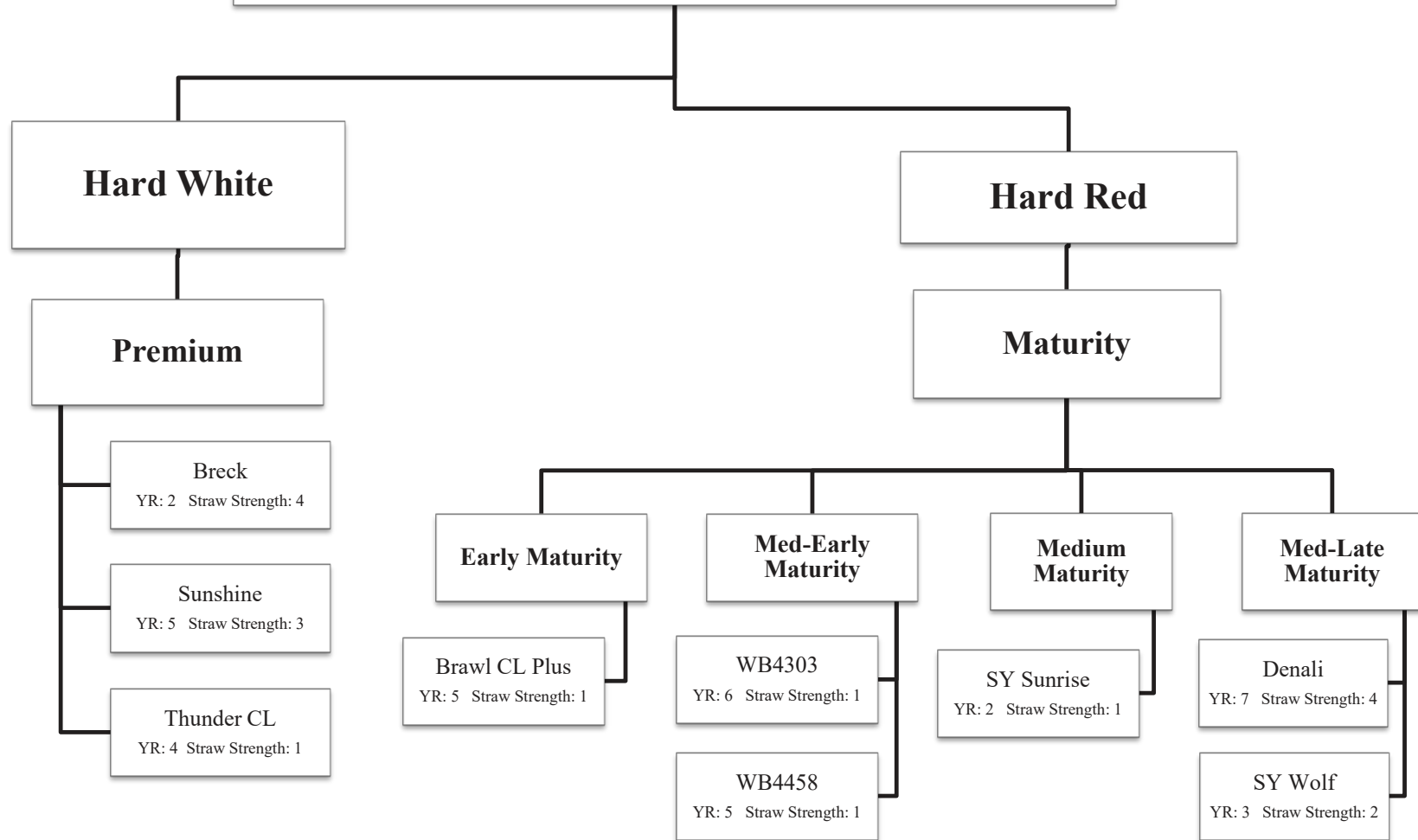
Variety ^b	Brand/Source	Market Class ^c	3-Year Average				Plant Height
			Yield	Yield	Test Weight	Test Weight	
			bu/ac	% trial average	lb/bu	% trial average	in
WB4303	WestBred Monsanto	HRW	95.0	103%	55.1	95%	35
Denali	PlainsGold	HRW	94.7	103%	58.7	102%	38
SY Sunrise	AgriPro Syngenta	HRW	93.9	102%	59.6	103%	34
Breck	PlainsGold	HWW	93.3	101%	59.5	103%	37
SY Wolf	AgriPro Syngenta	HRW	93.0	101%	57.1	99%	36
Brawl CL Plus	PlainsGold	HRW	91.5	99%	58.8	102%	37
Sunshine	PlainsGold	HWW	90.1	98%	55.8	96%	35
WB4458	WestBred Monsanto	HRW	88.5	96%	57.9	100%	36
Thunder CL	PlainsGold	HWW	88.4	96%	57.9	100%	37
Average			92.1		57.8		36

^aThe 3-year average yield and test weight are based on eight trials (three 2016, three 2017, and two 2018 trials). Plant heights are based on six trials (three 2016, one 2017, and two 2018 trials).

^bVarieties ranked according to average 3-year yield.

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

2018 Irrigated Variety Decision Tree



Straw Strength (1=very good, 9=very poor)

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

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 trees 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 collaborative 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 (2018) for variety-specific information.

Use the wheat variety database, a great resource, at <http://ramwheatdb.com/> to aid in variety selection. Head to head comparisons are easily made between varieties at <http://ramwheatdb.com/>

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, and triticum mosaic virus) or vectored by aphids (barley yellow dwarf virus and cereal 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. 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/jgeznub

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/2Kn8egF

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 at this URL: bit.ly/1MS5Hdh

Description of Winter Wheat Varieties in Eastern Colorado Dryland and Irrigated Trials (2018)

Name, Class, and Pedigree	Origin	RWA*	HD	HT	SS	COL**	YR	LR	WSMV*	TW	PRO**	MILL	BAKE	Comments
AM Eastwood Hard red winter Not Disclosed	AgriMaxx 2017	S	3	3	2	5	3	7	4	3	--	5	4	AgriMAXX release (2017). First entered into CSU Variety Trials in 2018. Early maturing, medium-short, good winterhardiness, good straw strength. Moderately resistant to stripe rust, moderately susceptible to leaf rust, moderately resistant to WSMV. Good test weight and milling and baking quality.
Antero Hard white winter KS01HW152-1/TAM 111	CSU 2012	S	4	6	8	5	2	7	5	4	6	3	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.
Avery Hard red winter TAM 112/Byrd	CSU 2015	S	5	7	4	6	7	7	3	6	7	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.
Brawl CL Plus Hard red winter Teal 11A/Above//CO99314	CSU 2011	S	2	6	1	9	5	6	7	4	1	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. Certified seed only.
Breck Hard white winter Denali/HV9W07-482W//Antero	CSU 2017	S	4	6	4	6	2	5	5	1	4	2	3	CSU release (2017), marketed by PlainsGold. 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. Certified seed only.
Byrd Hard red winter TAM 112/CO970547-7	CSU 2011	S	3	5	7	6	7	6	2	6	7	3	3	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.
Byrd CL Plus Hard red winter CO06072/4*Byrd	CSU 2018	S	4	7	5	3	7	5	5	7	7	5	6	CSU release (2018), marketed by PlainsGold. Two-gene Clearfield wheat in Byrd background. Highly similar to Byrd with exception of tolerance to Beyond herbicide. Certified seed only.
Canvas Hard red winter Denali/Antero//Byrd	CSU 2018	S	5	3	2	5	2	6	3	3	5	2	3	CSU release (2018), marketed by PlainsGold. Hard red winter, medium maturing, medium-short, good straw strength. Good stripe rust and carries wheat curl mite resistance from Byrd parent. Good test weight and milling and baking quality.
Crescent AX Hard red winter AF28/Byrd//AF10/2*Byrd	CSU 2018	S	3	6	3	6	5	6	3	4	6	3	4	CSU release (2018), marketed by PlainsGold. Carries non-GMO <i>Axigen</i> herbicide tolerance trait. Approximately 66% Byrd and 34% Hatcher parentage. Much improved yield and test weight relative to Incline AX. Intermediate reaction to stripe rust and carries wheat curl mite resistance from Byrd parent.
Denali Hard red winter CO980829/TAM 111	CSU 2011	S	7	7	4	6	7	6	3	3	7	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.

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), 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.

* 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.

++ 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 (2018)

Name, Class, and Pedigree	Origin	RWA*	HD	HT	SS	COL**	YR	LR	WSMV ⁺	TW	PRO**	MILL	BAKE	Comments
Hatcher Hard red winter Yuma/PI 372129//TAM-200/3/4*Yuma/4/KS91H184/Vista	CSU 2004	R*	4	3	7	5	5	7	6	7	8	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.
Incline AX Hard red winter (AF28/Byrd)/(AF10/2*Byrd)	CSU 2017	S	8	3	4	6	5	6	4	9	8	9	4	CSU release (2017), marketed by PlainsGold. Carries non-GMO <i>Axigen</i> herbicide tolerance trait for winter annual grassy weed control. Approximately 66% Byrd and 34% Hatcher parentage. Good quality, good straw strength. Lower test weight. Certified seed only.
Langin Hard red winter CO050270/Byrd	CSU 2016	S	1	2	8	4	3	5	6	7	6	4	2	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.
LCS Chrome Hard red winter Not Disclosed	Limagrain 2016	S	5	4	4	6	2	2	7	8	4	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	7	5	5	4	7	5	3	6	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.
Long Branch Hard red winter Not Disclosed	Dyna-Gro 2016	S	7	7	2	--	3	3	--	2	--	--	--	Dyna-Gro release (2016). First entered into CSU Variety Trials in 2018. Medium-late maturing, medium-tall with very good straw strength, good winterhardiness, and moderate resistance to stripe rust.
Monarch Hard white winter CO07W722-F5/Snowmass//CO07W722-F5	CSU 2018	S	6	3	1	5	3	5	4	6	6	4	5	CSU release (2018), marketed by PlainsGold. Hard white winter with very good straw strength and very high irrigated yield potential. Good stripe rust resistance. Quality more similar to Sunshine and Breck, but very low PPO.
NHH144913-3 Hard red winter Settler CL/NE07457//Brawl CL Plus	NE EXP	S	4	5	3	--	3	6	7	9	--	4	4	Potential Univ. Nebraska release (2018). Two-gene Clearfield wheat. First entered in CSU trials in 2018. Good stem rust and wheat soilborne virus resistance, seems broadly adapted in the Great Plains. Low test weight.
Oakley CL Hard red winter Above/Danby//KS03HW10	KSU 2013	S	5	5	7	9	1	5	2	5	2	3	4	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. Certified seed only.
Snowmass Hard white winter KS96HW94//Trego/CO960293	CSU 2009	S	4	7	9	4	6	6	3	5	8	6	2	CSU release (2009), marketed by PlainsGold in CWRP-Ardent Mills Ultragrains Premium Program. Hard white wheat. Medium-maturing, medium-tall, poor straw strength. Good WSMV resistance, moderately susceptible to stripe rust, moderate sprouting tolerance. Certified seed only.

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), 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.

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

++ 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 (2018)

Name, Class, and Pedigree	Origin	RWA*	HD	HT	SS	COL**	YR	LR	WSMV ⁺	TW	PRO ⁺⁺	MILL	BAKE	Comments
Snowmass 2.0 Hard white winter CO07W722-F5/Snowmass//Brawl CL Plus	CSU 2018	S	4	4	3	4	3	5	3	5	5	3	1	CSU release (2018), marketed by PlainsGold. Hard white winter with quality profile very similar to Snowmass but low PPO and better grain protein deviation. Good stripe rust and wheat streak mosaic virus resistance. Good straw strength, good test weight.
Sunshine Hard white winter KS01HW152-6/HV9W02-267W	CSU 2014	S	1	3	3	7	5	6	8	5	3	4	2	CSU release (2014), marketed by PlainsGold in CWRP-Arden Mills Ultragrains Premium Program. Hard white wheat. Excellent quality, good sprouting tolerance and straw strength, intermediate reaction to stripe rust. Very susceptible to mite-transmitted viruses. Certified seed only.
SY Legend CL2 Hard red winter Agripro Exp/AP503 CL2 sib	Syngenta 2018	S	4	5	5	5	3	2	5	2	--	3	4	Syngenta release (2018), first entered in CSU trials in 2018. Two-gene Clearfield wheat. Excellent yield record in the western High Plains. Good overall disease tolerance. Stewardship Agreement requires no saved seed. Certified seed only.
SY Monument Hard red winter BC991149-11/00x0090-4	Syngenta 2014	S	7	5	4	5	2	2	8	6	5	5	1	Syngenta release (2014). First entered in CSU Variety Trials in 2014. Good drought tolerance, winterhardiness, quality, and resistance to both leaf and stripe rust. Very susceptible to mite-transmitted viruses.
SY Rugged Hard red winter Greer/Doans	Syngenta 2017	S	5	1	5	5	2	3	8	5	3	3	3	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.
SY Wolf Hard red winter W99-331/97x0906-8	Syngenta 2010	S	6	4	2	5	3	2	6	6	4	3	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.
Thunder CL Hard white winter KS01-5539/CO99W165	CSU 2008	R*	3	6	1	7	4	5	9	7	8	5	3	CSU release (2008), marketed by PlainsGold in CWRP-Arden Mills Ultragrains 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. Certified seed only.
Underwood Hard red winter Not Disclosed	Dyna-Gro 2015	S	3	5	2	--	3	2	--	1	--	--	--	Dyna-Gro release (2015). First entered into CSU Variety Trials in 2018. Medium-early maturing, medium plant height, with excellent straw strength and good winterhardiness.
WB-Grainfield Hard red winter G982231/G982159//KS920709W	Monsanto 2012	S	2	6	3	2	2	4	8	3	6	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.
WB4303 Hard red winter PFAU/WEAVER/3/MASON/JGR//PECOS/4/FARMEC	Monsanto 2015	S	3	3	1	6	6	3	8	9	4	8	4	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.

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), 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.

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Description of Winter Wheat Varieties in Eastern Colorado Dryland and Irrigated Trials (2018)

Name, Class, and Pedigree	Origin	RWA*	HD	HT	SS	COL**	YR	LR	WSMV ⁺	TW	PRO ⁺⁺	MILL	BAKE	Comments
WB4418 Hard red winter XA4402	Monsanto 2017	S	5	4	1	--	4	4	5	4	--	4	6	Monsanto release (2017), first entered in CSU trials in 2018. Medium short plant height, medium maturity, with excellent straw strength. Average to above average fungal and viral disease package. Grower Agreement requires no saved seed. Certified seed only.
WB4458 Hard red winter KS940786-7//G982163/G982002	Monsanto 2012	S	3	5	1	3	5	7	7	4	2	6	7	Monsanto release (2012), first entered in CSU Variety Trials in 2016. Medium height, medium-early. Good straw strength, winterhardiness, 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	3	7	4	4	7	3	8	5	3	2	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	4	3	2	3	2	7	2	1	3	4	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.
Whistler Hard red winter CO08W218/Snowmass//Byrd	CSU 2018	S	9	7	9	4	2	6	2	6	6	6	3	CSU release (2018), marketed by PlainsGold. Hard red winter, medium-late maturing, tall, fair straw strength. Good stripe rust resistance and carries wheat curl mite resistance from Byrd parent. Good milling and baking quality.
Winterhawk Hard red winter 474S10-1/X87807//HBK736-3	Monsanto 2007	S	4	7	4	8	4	7	6	4	5	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 (YR), leaf rust resistance (LR), wheat streak mosaic virus tolerance (WSMV), 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.

* 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.

++ PRO ratings represent "grain protein deviation" (relative grain protein level accounting for differences in grain yield).

CoAXium™ Wheat Production System for Winter Annual Grass Control Driven by Aggressor™ Herbicide

Eric Westra, Todd Gaines, Phil Westra, and Chad Shelton

- CoAXium™ Wheat Production System is a combination of a patented herbicide-tolerant trait, elite varieties, a new herbicide Aggressor™, and robust technology stewardship
- AXigen™ is a new non-GMO trait that confers tolerance to the Group 1 herbicide Aggressor registered for use on CoAXium wheat varieties with the AXigen trait for winter annual grass control in wheat (jointed goatgrass, feral rye, and downy brome)
- AXigen was developed at Colorado State University with funding and vision from the Colorado Wheat Research Foundation (CWRF)
- The CoAXium Wheat Production System is commercialized through a partnership with CWRF, Albaugh, LLC, and Limagrain
- The first CoAXium Wheat Production System varieties with the AXigen trait are Incline AX (PlainsGold) and LCS Fusion AX (Limagrain), available to plant in fall of 2018

Crop safety and weed control have been assessed for this new production system at CSU. Both fall and spring treatments with Aggressor herbicide on Incline AX and LCS Fusion AX showed no crop injury based on yield and visual response at any tested Aggressor rates. The rates included twice the highest labeled rate for Aggressor, indicating acceptable crop safety in case of a spray overlap. Aggressor provided commercially desirable control of all three winter annual grasses in studies conducted by CSU in 2016 and 2017, with excellent activity on feral rye and downy brome and good activity on jointed goatgrass. See the Aggressor label for adjuvant, liquid fertilizer, and broadleaf herbicide tank mix recommendations.

Stewardship to mitigate the risk of resistance to Aggressor in winter annual grass weeds is a key component of the CoAXium Wheat Production System. Stewardship agreements outline the limitations on repeated use of Aggressor and CoAXium wheat varieties in common crop rotations. Other herbicide modes of action and other control methods should be used in the crop rotation to keep winter annual grass population densities low and reduce the selection pressure for resistance to Aggressor.



Downy brome (left) and feral rye (right) control with Aggressor™ (left) in CoAXium™ wheat.

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A handwritten signature in black ink, which appears to read "Jerry Johnson".

Jerry Johnson, Extension Specialist Crop Production



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