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Agricultural Experiment Station

Colorado State University

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

Making Better Decisions

2016 Colorado Winter Wheat Variety Performance Trials

Crops Testing

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Additional Resources on the Internet

Colorado State University Crop Variety Testing Program: www.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): www.coloradowheat.org

Variety Performance in the 2016 Eastern Colorado Winter Wheat Trials

Jerry Johnson and Sally Sauer

Colorado State University faculty, staff, and students 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. That is why we have 11 dryland variety performance trials, three irrigated variety performance trials, and ~30 on-farm variety tests each year.

We have a uniform variety testing program, meaning that all varieties are tested in all test locations. There were 46 varieties and 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 five varieties. The trials included a combination of public and private varieties and experimental lines from Colorado, Texas, Kansas, Oklahoma, Nebraska, Wyoming, and Montana. Seed companies with entries in the variety trials included WestBred (Monsanto), AgriPro (Syngenta), Limagrain Cereal Seeds, AGSECO, and Watley Seed Company. There were entries from five marketing organizations: PlainsGold (Colorado), Husker Genetics (Nebraska), the Crop Research Foundation of Wyoming, Oklahoma Genetics, 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 ft^2 (except the Fort Collins IVPT, which was 80 ft^2) 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 0.5 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 test weight information was obtained from a Harvest Master weighing system on the plot combine.

General Growing Season Comments

The 2015-2016 growing season can be characterized by three factors:

- Planting into generally dry soils followed by rain later in the fall that resulted in good stands. Fall temperatures and precipitation were above average.

- Drought conditions in the winter or spring. Very warm temperatures in February throughout Colorado. Very little snow in the southeast but precipitation was above average in February but below average in March.

- Above-average precipitation in April, May and June that led to stripe rust but high yields. Awesome early April precipitation all across Eastern Colorado up to 300% above average in parts of the northeast. There was a heat wave that started in early June and accelerated the development of wheat.

General Growing Conditions in Southeast Colorado - Kelly Roesch

With the return of a more normal rainfall pattern during the summer and fall of 2015, wheat producers had more ideal planting conditions than they had been experiencing through the past several years of drought. There was some improvement in the subsoil moisture profile and most fields had adequate moisture for germination and emergence to provide a good level of ground cover going into the winter months. A mild and somewhat dry winter kept the wheat crop in a condition that led to very little if any winterkill.

As the wheat began coming out of dormancy in March, warm temperatures and dry, windy conditions began to bring back memories of past drought years. The fear of drought was somewhat alleviated as widespread rainfall April 8th through April 22nd resulted in accumulations of 2 to 3½ inches of beneficial moisture. Cool and damp conditions experienced in May provided prime growing conditions for the wheat crop and also for the development of stripe rust. Fungicides were widely applied as the stripe rust was identified and then warmer temperatures in June helped to slow the proliferation of the rust spores. Above-average rainfall in June and July, combined with the rains received in April, left most fields with a 50% wetter than normal growing season when compared to the 10-year average. The increased moisture provided the necessary conditions for the development of tall and strong plants with full heads.

Harvest began in earnest the last week of June and was promptly halted in most locations by widespread rainfall June 28 through July 1. As the fields dried out, good harvest progress was made July 6th-15th. Although the majority of the fields were cut by July 20th, some harvest activity was still taking place on July 25th. Dryland yields ranged from 20 to 100 bu/ac with many farms averaging 60 to 70 bu/ac, making the 2016 wheat harvest one that won't soon be forgotten in Southeast Colorado. The bountiful yields led to long lines at grain elevators and storage facilities quickly running out of room. Lack of storage led to large ground piles, resulting in an even larger negative basis that started at -$0.90/bu at the beginning of harvest and went to -$1.40/bu near the end of harvest. Producers utilized on farm storage to the extent possible with the hope that price and basis will improve later this fall.

General Growing Conditions in the Central High Plains of Colorado - Ron Meyer

There were several moisture events in the fall of 2015 that led to excellent wheat stands. The wheat fields entered winter with low subsoil moisture levels but topsoil moisture was adequate and wheat fields entered the winter season with very good growth. During the 2015-16 winter, a couple of key snowfall events further enhanced wheat growth. Snowfall events were recorded in January and February, replenishing soil moisture that was nearing dry conditions.

February and March recorded much warmer than normal temperatures and wheat broke dormancy in late February – much earlier than average. March temperatures were warmer than normal which led to increased tillering. However, cool temperatures prevailed in April and May and wheat growth slowed tremendously.

May precipitation was variable but above normal in frequency, slowing spring crop planting, but enhancing wheat yield potential. Cooler and wetter condition prevailed during the spring and record wheat yields seemed attainable. This weather condition also provided an environment that was conducive to stripe rust. Thus, we now had two successive seasons with wetter than normal conditions and stripe rust outbreaks.

Stripe rust was evident in most fields in eastern Colorado by June. While last season stripe rust "exploded" across fields, in 2016 the advance was slower than anticipated. Many wheat fields were treated earlier this spring. Harvest brought exceptional yields with some dryland fields exceeding 100 bushels per acre. Many fields yielded 70 bushels per acre or more. This was double our long term average yield of 35 bushels per acre.

General Growing Conditions in the North Central High Plains of Colorado - Wilma Trujillo and Dennis Kaan

The majority of Northeast Colorado wheat producers planted into adequate soil moisture last fall. September and October were unusually warm and fall planted wheat was stressed but planting progressed. 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.

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. Warm temperatures and dry conditions prevailed, and moisture stress was observed at several locations across Northeast Colorado. The dry conditions persisted into mid-April.

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 wet and cool conditions were favorable for the development of stripe rust. Damage to wheat from stripe rust ranged from very mild to severe depending on wheat variety and the timeliness of fungicide applications. Producers had to balance the decision of increased cost of production against low commodity prices.

June started off with strong thunderstorms and localized hail associated with several storm systems. The abundance of heat and moisture generally improved wheat conditions. However, persisting stripe rust and other fungal diseases were still observed where surplus soil moisture and cool temperatures occurred.

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 the last week of July. Yield ranged from 40 to 100+ 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 timely disease control. Although many wheat producers reported high yields, grain protein content was generally low. Test weight varied from 58 to 64 lb/bu.

Dryland Variety Performance Trials - Southeast Locations

Arapahoe, Cheyenne County: Planted 9/16/15 and harvested 7/7/16. Trial was planted about 2" deep behind shovels. Stands were very good. Lush early spring growth, but the trial was showing drought stress symptoms by early April. Stripe rust levels were very high by early June and trial was sprayed June 1. Plants showed severe terminal drought stress by June 8. GPS: 39.001, -102.246

Lamar, Prowers County: Planted 9/15/15 and harvested 7/6/16. Trial planted 2-3" deep behind shovels to try to get down to moisture. Good stands in the fall. Severe drought stress by early April, but trial received rain on April 11. Low level of stripe rust in early May and trial was subsequently sprayed in mid-May. GPS: 37.775, -102.519

Sheridan Lake, Kiowa County: Planted 9/15/15 and harvested 7/6-7/16. Trial was dusted in at planting. Received rain at the end of September. Winter was very dry and trial showed severe drought stress in early April. Stripe rust was present and significant on susceptible entries. Trial was sprayed after flag leaf stage. GPS: 38.536, -102.472

Walsh, Baca County: Planted 10/1/15 and harvested 6/27/16. Trial planted into excellent moisture and had good fall precipitation. A warm early spring led to rapid growth. Stripe rust was present at very low levels, trial was not sprayed. Wheat streak mosaic virus (WSMV) and Triticum mosaic virus (TrMV) infections were significant by late spring. GPS: 37.4346, -102.3193

Dryland Variety Performance Trials - Northeast Locations

Akron, Washington County: Planted 10/7/15 and harvested 7/19/16. Trial was planted late due to wet conditions in the fall. Trial was planted ½" deep and stand emergence was uniform. Trial was dry by early spring. Stripe rust was found on May 20 and was sprayed on May 23. Trial was severely damaged by a hail storm on May 24. The trial results could not be used because of the hail damage. GPS: 40.1526,-103.1357

Burlington, Kit Carson County: Planted 9/16/15. Trial was dusted in at 1-2" deep at planting. Stands were very even and trial had lush growth in early spring. Plants had minor freeze damage on older leaves. Trial was accidentally combined by the cooperator before we could harvest it. GPS: 39.18, -102.30

Genoa, Lincoln County: Planted 9/23/15 and harvested 7/15/16. Trial was dusted in about 2" deep at planting. Stand establishment was fair but uniform. Freeze damage was found on new leaf tips in late March. Had good early spring moisture and stripe rust was present at high levels by June 6. Trial data could not be used due to hail damage from a bad storm on July 1. GPS: 39.288, -103.456

Julesburg, Sedgwick County: Planted 9/24/15 and harvested 7/9/16. Planted into adequate moisture, but the trial was very dry by the end of October. Stands were very uniform. Weather was very warm in early March and freeze damage was present in early April. Stripe rust was present but infection was not severe when trial was sprayed on May 23. GPS: 40.835, -102.336

Orchard, Morgan County: Planted 9/24/15 and harvested 7/13/16. Trial dusted in 1.5" deep behind shovels at planting. Received moisture in early November. Emergence and stand establishment was average. Had good moisture in late March. Trial was sprayed with fungicide for stripe rust on April 2 and again on June 6. Trial had a moderate infestation of wheat stem sawfly. GPS: 40.453, -104.071

Roggen, Weld County: Planted 9/23/15 and harvested 7/13/16. Trial dusted in 2" deep behind shovels at planting. Stands were very good. Trial had good moisture in late March and very lush early spring growth. Stripe rust was found in trial on March 22 and fungicide was applied on May 4 and again on May 25 to control stripe rust. GPS: 40.088, -104.257

Yuma, Yuma County: Planted 9/24/15 and harvested 7/8/16. Trial planted 2" deep to try to get down to moisture. Stand establishment was variable. Trial was drought stressed by mid-March. Heavy stripe rust infection by end of May, trial sprayed on June 3. GPS: 40.1858, -102.6614

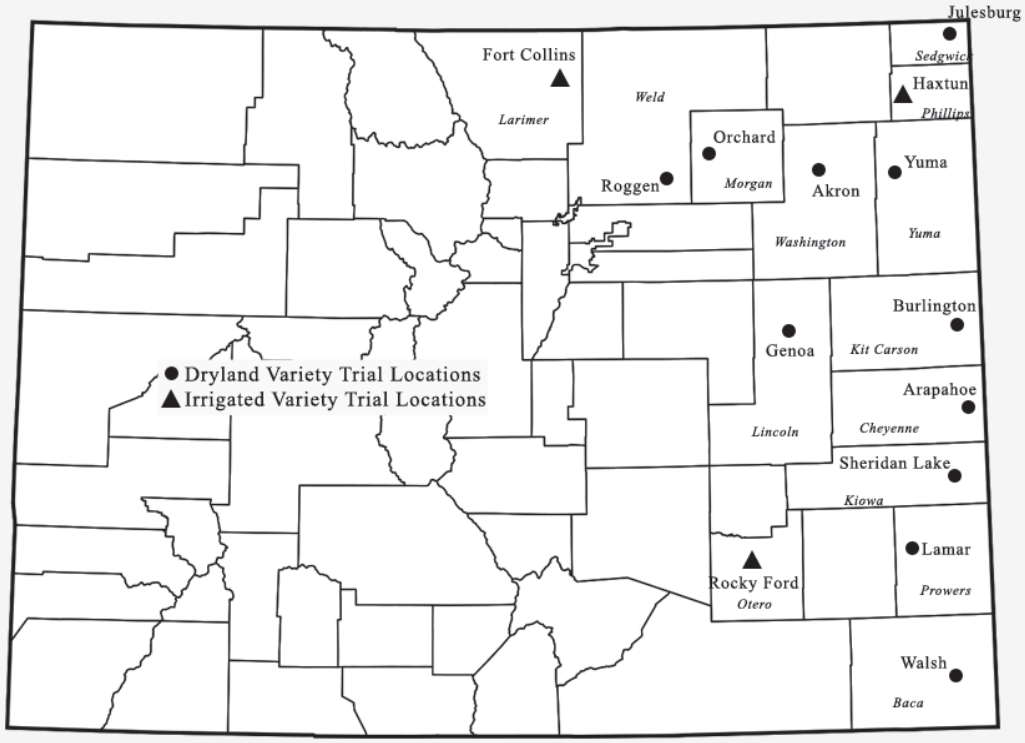
2016 Irrigated Variety Performance Trials

Fort Collins, Larimer County: Planted 9/23/15 and harvested 7/15/16. Extremely lush spring growth and excellent moisture received in the spring. Very few irrigations needed. Severe lodging was observed in the trial. Yield was reduced by early June heat. Stripe rust found in mid-May and trial was sprayed on May 22. GPS: 40.185, -102.661

Haxtun, Phillips County: Planted 10/14/15 and harvested 7/12/16. Before planting the field was tilled to get corn stalks broken up. Late date of planting. Stands were very even and trial had good spring growth. Low level of stripe rust in early May, but infection level increased quickly and trial was sprayed on May 22. GPS: 40.395, -102.612

Rocky Ford, Otero County: Planted 10/1/15 and harvested 7/14/16. Nitrogen deficiency was observed in early spring. Growth regulator was applied on March 16. Trial was irrigated once in mid-April and again on May 25. No stripe rust was observed in the trial. GPS: 38.039, -103.693

2016 UVPT (Dryland) and IVPT (Irrigated)
Trial Locations



Summary of 2016 Dryland Winter Wheat Variety Performance Results

	2016 Individual Trial Yield[a]								2016 Multi-Location Average				
Variety[b]	Arapahoe	Julesburg	Lamar	Orchard	Roggen	Sheridan Lake	Walsh	Yuma	Yield	Yield	Stripe Rust	Test Weight	Height
				bu/ac					bu/ac	% of avg	score (1-9)[c]	lb/bu	in
Antero	98.3	95.0	68.7	**51.4**	105.5	**115.5**	62.0	93.3	86.2	110%	2	57.2	34
CO11D1539	91.3	**96.2**	64.8	49.0	**111.1**	111.1	**66.4**	94.7	85.6	109%	3	56.3	36
Langin	**110.2**	84.2	**72.7**	45.3	101.2	**115.1**	**64.6**	90.0	85.4	109%	2	59.0	32
CO12D2011	95.2	89.0	62.6	47.3	**106.3**	108.6	62.1	94.1	83.2	106%	3	60.1	34
CO12D2010	93.8	91.1	66.2	46.2	103.0	108.9	57.5	94.3	82.6	105%	3	56.2	33
Hatcher	97.9	91.4	**71.3**	**50.7**	103.0	100.9	57.3	88.2	82.6	105%	5	57.7	33
Avery	93.0	95.7	66.7	47.7	**109.6**	**113.9**	58.7	73.8	82.4	105%	7	58.6	35
CO11D1312	92.2	**98.6**	64.9	**51.0**	**107.0**	108.0	62.6	74.1	82.3	105%	8	58.3	34
LCH13NEDH-14-69	89.9	91.8	56.5	44.2	**111.8**	**114.0**	57.6	90.5	82.0	104%	2	59.0	32
Joe	95.4	92.1	54.6	45.0	**110.7**	106.7	62.2	87.3	81.7	104%	1	58.7	34
Sunshine	85.3	95.5	57.2	**49.9**	**110.1**	102.2	60.7	91.8	81.6	104%	7	56.4	34
WB-Grainfield	92.9	93.1	61.0	**50.5**	96.4	105.1	60.5	92.1	81.5	104%	3	59.4	34
CO11D1767	96.0	91.4	63.3	**49.8**	94.6	110.7	58.0	85.8	81.2	103%	1	57.0	33
CO11D1397	94.4	89.3	67.1	48.5	104.4	**111.8**	60.0	71.5	80.9	103%	7	57.8	31
CO11D1236	102.3	90.4	58.8	47.9	101.1	105.5	64.0	76.2	80.8	103%	6	58.3	35
TAM 114	96.4	**100.6**	56.3	**51.1**	96.0	100.2	54.3	90.5	80.7	103%	2	60.6	34
CO12D922	70.0	**96.3**	61.2	**49.5**	102.2	108.5	**66.1**	91.2	80.6	103%	7	58.6	35
LCS Mint	96.4	91.8	54.6	47.3	105.3	110.2	54.0	84.7	80.5	103%	4	59.4	34
Byrd	94.2	86.8	67.9	46.0	100.6	110.3	60.4	73.6	80.0	102%	6	59.3	34
CO11D421	89.9	84.6	**70.4**	46.9	102.5	108.3	59.6	77.2	79.9	102%	4	57.6	33
Cowboy	94.1	83.0	62.0	**52.6**	**111.3**	110.7	50.0	75.1	79.8	102%	8	56.8	32
CO11D1306W	91.9	91.2	65.9	43.6	101.8	109.3	60.9	73.7	79.8	102%	7	59.6	34
Denali	87.9	**98.5**	59.6	**50.7**	101.9	102.4	56.6	76.5	79.3	101%	8	59.5	36
Oakley CL	81.9	92.6	57.2	45.6	99.9	104.8	53.2	94.9	78.8	100%	1	58.4	32
CO12D1028	84.0	92.8	66.5	48.2	**108.9**	95.5	59.4	72.4	78.5	100%	7	55.4	34
CO12D906	84.2	87.5	60.0	46.9	104.8	104.1	57.2	82.7	78.4	100%	5	58.7	33
Winterhawk	80.9	89.5	57.0	45.6	**107.2**	97.8	61.7	87.6	78.4	100%	4	59.6	35
WB4721	87.4	86.3	60.7	45.3	88.4	100.8	54.0	**102.4**	78.2	100%	2	60.4	33
SY Monument	95.5	89.1	57.9	**51.9**	93.1	99.9	51.9	85.5	78.1	99%	2	58.2	33
SY Sunrise	89.7	93.6	57.1	48.1	92.9	93.4	55.0	88.8	77.3	98%	2	59.6	31
Settler CL	84.8	87.2	61.2	49.4	98.4	99.5	53.1	81.3	76.8	98%	8	57.7	33
Ruth	90.0	93.4	48.6	**49.8**	90.1	102.9	50.8	88.8	76.8	98%	3	60.3	35
KanMark	86.7	92.2	54.3	42.3	97.5	106.9	54.0	78.2	76.5	97%	4	58.4	31
Brawl CL Plus	91.1	86.2	58.7	48.2	91.0	97.0	56.5	83.2	76.5	97%	4	58.0	34
Ripper	91.5	94.4	67.7	45.1	95.6	99.8	51.6	62.7	76.0	97%	8	57.1	34
LCS Chrome	83.2	83.3	59.3	39.2	97.2	99.0	55.4	87.8	75.6	96%	2	59.1	33
Snowmass	89.0	87.7	55.4	44.3	102.0	101.0	57.2	66.8	75.4	96%	8	58.8	34
SY Wolf	78.7	92.8	51.8	48.8	93.4	96.1	51.3	86.0	74.9	95%	3	56.1	33
LCH13-032	83.1	83.8	54.9	42.9	87.6	95.9	54.8	94.3	74.7	95%	3	60.5	32
TAM 204	93.2	79.4	65.1	39.5	91.7	91.5	57.3	78.1	74.5	95%	2	54.9	30
CO14A065	84.5	84.0	67.0	45.9	96.4	94.6	48.1	64.2	73.1	93%	5	55.4	31
Doublestop CL Plus	76.5	91.3	55.1	44.7	84.2	84.7	53.0	84.2	71.7	91%	4	58.8	34
Akron	86.2	87.2	59.6	40.9	88.2	93.3	54.8	63.1	71.7	91%	8	56.5	35
MTS1024	90.3	80.5	52.2	44.0	97.2	91.8	33.2	74.9	70.5	90%	2	55.3	31
CO14A058	72.4	82.2	67.9	43.5	90.4	89.3	53.2	61.4	70.1	89%	6	55.2	34
Prairie Red	77.6	86.4	55.4	39.9	78.8	88.9	53.0	71.7	69.0	88%	8	57.0	32
Average	**89.4**	**90.0**	**61.0**	**46.8**	**99.4**	**102.7**	**56.6**	**82.2**	**78.5**		**4**	**58.1**	**33**
[d]LSD (P<0.30)	6.2	4.7	3.8	3.2	6.3	4.2	2.4	5.7					

[a]Varieties in the top LSD yield group in each location are in bold.

[b]Varieties ranked according to multi-location average yield in 2016.

[c]Stripe rust score: 1 equals no stripe rust and 9 equals severe stripe rust infection.

[d]If 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-Yr (2015 and 2016) Dryland Variety Performance Results

Variety[b]	Brand/Source	Market Class[c]	2-Year Average[a] Yield	Yield	Test Weight	Plant Height
			bu/ac	% trial average	lb/bu	in
Joe	Kansas Wheat Alliance	**HWW**	81.5	115%	59.5	34
Antero	PlainsGold	**HWW**	81.2	115%	57.8	33
CO11D1767	Colorado State Univ. exp.	HRW	80.3	114%	57.0	33
CO11D1539	Colorado State Univ. exp.	HRW	78.8	111%	57.2	35
CO11D1236	Colorado State Univ. exp.	HRW	76.1	108%	58.6	35
SY Monument	AgriPro Syngenta	HRW	75.9	107%	58.4	33
Oakley CL	Kansas Wheat Alliance	HRW	75.3	106%	58.0	31
Langin	Colorado State Univ. exp.	HRW	74.7	106%	59.0	31
CO11D1306W	Colorado State Univ. exp.	**HWW**	74.1	105%	59.4	34
TAM 114	AGSECO	HRW	74.0	105%	59.9	33
WB-Grainfield	WestBred Monsanto	HRW	73.6	104%	59.2	34
Denali	PlainsGold	HRW	73.0	103%	59.1	35
Ruth	Husker Genetics	HRW	72.8	103%	60.1	34
LCS Mint	Limagrain	HRW	72.1	102%	58.6	34
Avery	PlainsGold	HRW	71.5	101%	58.0	35
Winterhawk	WestBred Monsanto	HRW	71.1	101%	59.1	34
Sunshine	PlainsGold	**HWW**	70.8	100%	56.7	33
Hatcher	PlainsGold	HRW	69.4	98%	57.0	33
CO11D1397	Colorado State Univ. exp.	HRW	69.4	98%	57.4	31
Cowboy	Crop Res. Foundation of WY	HRW	69.3	98%	56.5	32
Byrd	PlainsGold	HRW	69.3	98%	58.7	34
SY Wolf	AgriPro Syngenta	HRW	68.7	97%	56.4	32
KanMark	Kansas Wheat Alliance	HRW	68.5	97%	58.5	30
TAM 204	Watley Seed	HRW	67.6	96%	55.1	30
Settler CL	Husker Genetics	HRW	66.8	94%	56.8	32
Snowmass	PlainsGold	**HWW**	66.8	94%	58.0	34
Brawl CL Plus	PlainsGold	HRW	63.4	90%	58.1	33
MTS1024	Montana State Univ. exp.	HRW	60.6	86%	54.5	32
Ripper	PlainsGold	HRW	59.5	84%	55.7	32
Akron	Colorado State Univ.	HRW	59.3	84%	56.0	34
Prairie Red	PlainsGold	HRW	56.7	80%	56.7	31
		Average	**70.7**		**57.8**	**33**

[a]The 2-year average yield and plant heights are based on eight 2016 and nine 2015 trials. Test weights are based on nine 2016 trials and six 2015 trials.

[b]Varieties ranked according to average 2-year yield.

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

Summary of 3-Yr (2014, 2015, and 2016) 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
Antero	PlainsGold	**HWW**	74.6	114%	58.6	31
Oakley CL	Kansas Wheat Alliance	HRW	69.3	106%	58.8	29
SY Monument	AgriPro Syngenta	HRW	69.3	106%	59.3	30
Langin	Colorado State Univ. exp.	HRW	69.2	106%	59.8	29
Avery	PlainsGold	HRW	69.0	106%	59.3	32
Denali	PlainsGold	HRW	68.2	105%	60.3	32
WB-Grainfield	WestBred Monsanto	HRW	67.0	103%	60.0	31
LCS Mint	Limagrain	HRW	66.3	102%	59.7	31
Byrd	PlainsGold	HRW	66.2	101%	59.8	31
Cowboy	Crop Res. Foundation of WY	HRW	66.1	101%	58.3	30
Sunshine	PlainsGold	**HWW**	65.8	101%	57.5	30
Winterhawk	WestBred Monsanto	HRW	65.7	101%	60.4	31
Hatcher	PlainsGold	HRW	65.2	100%	58.2	30
SY Wolf	AgriPro Syngenta	HRW	64.9	100%	57.5	30
Settler CL	Husker Genetics	HRW	64.0	98%	57.7	29
KanMark	Kansas Wheat Alliance	HRW	63.2	97%	59.6	27
Snowmass	PlainsGold	**HWW**	63.2	97%	59.1	32
Brawl CL Plus	PlainsGold	HRW	60.6	93%	59.2	31
Ripper	PlainsGold	HRW	58.5	90%	57.3	29
Akron	Colorado State Univ.	HRW	57.7	89%	57.8	31
Prairie Red	PlainsGold	HRW	55.9	86%	57.7	29
		Average	**65.2**		**58.8**	**30**

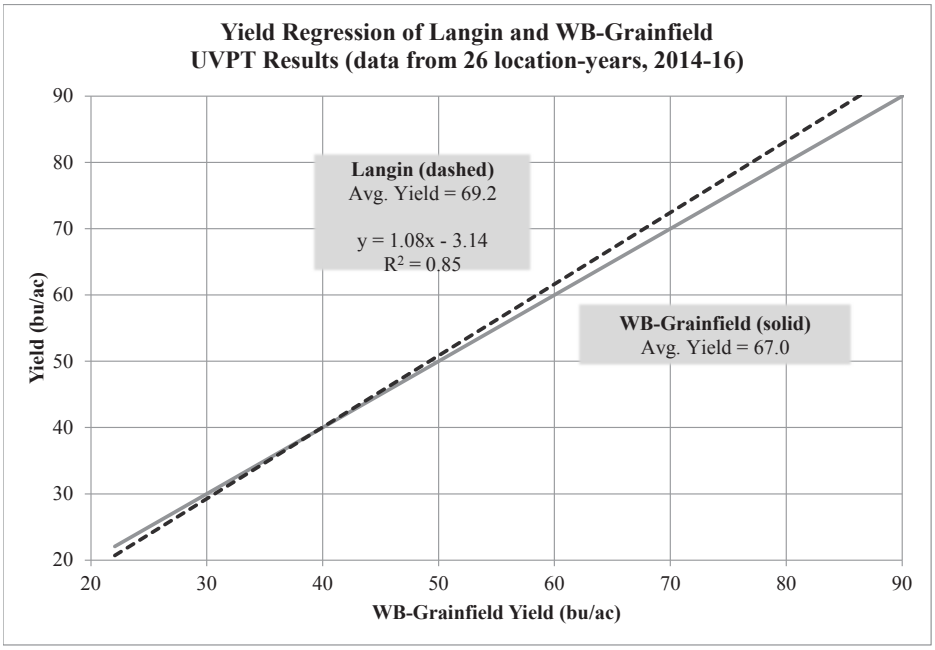
[a]The 3-year average yield is based on eight 2016, nine 2015, and nine 2014 trials. Test weights are based on nine 2016, six 2015, and eight 2014 trials. Plant heights are based on eight 2016, nine 2015, and nine 2014 trials.

[b]Varieties ranked according to average 3-year yield.

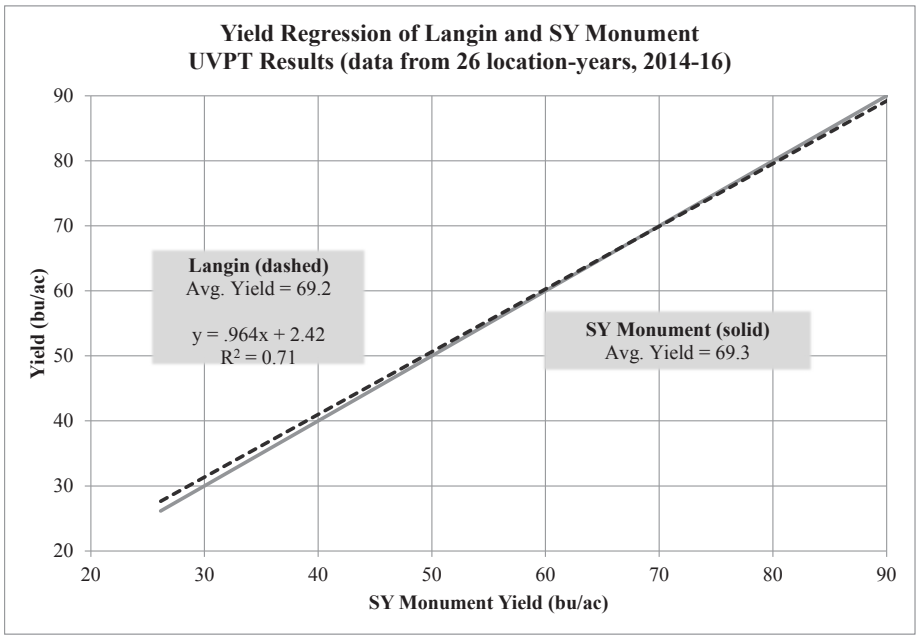
[c]Market class: HRW=hard red winter wheat; **HWW**=hard white winter wheat.

Head-to-Head Yield Comparisons

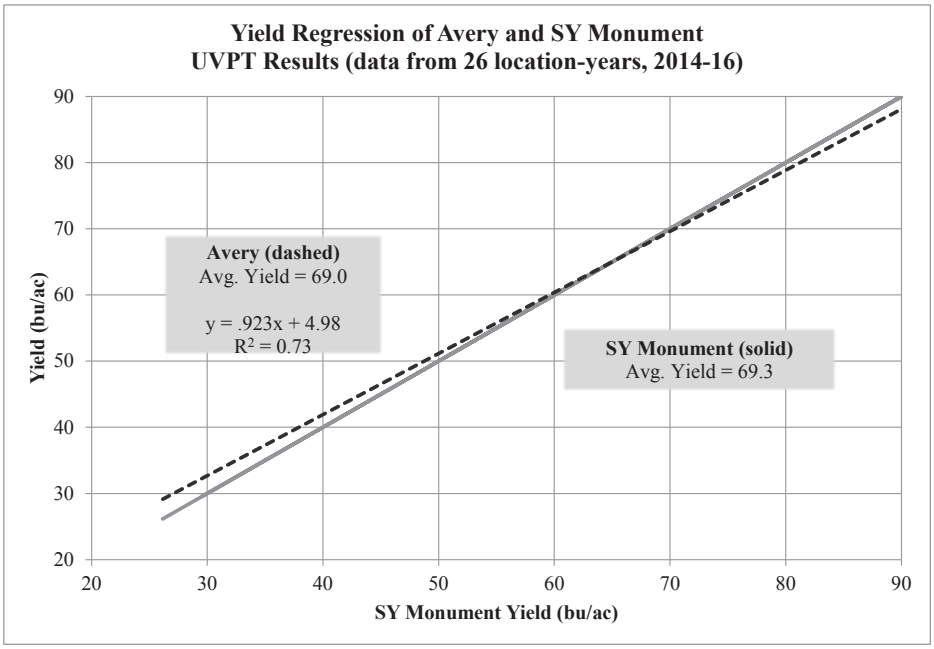
The following regressions are intended for use by the reader to be able to compare the predicted performance of one variety relative to another using results from multiple Dryland Variety Performance Trials results over the past four years (2013 through 2016). They are a tool to help growers visualize these relationships. 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 more results over multiple locations from different years. Additional testing of varieties might change the relationships portrayed in the following graphs.



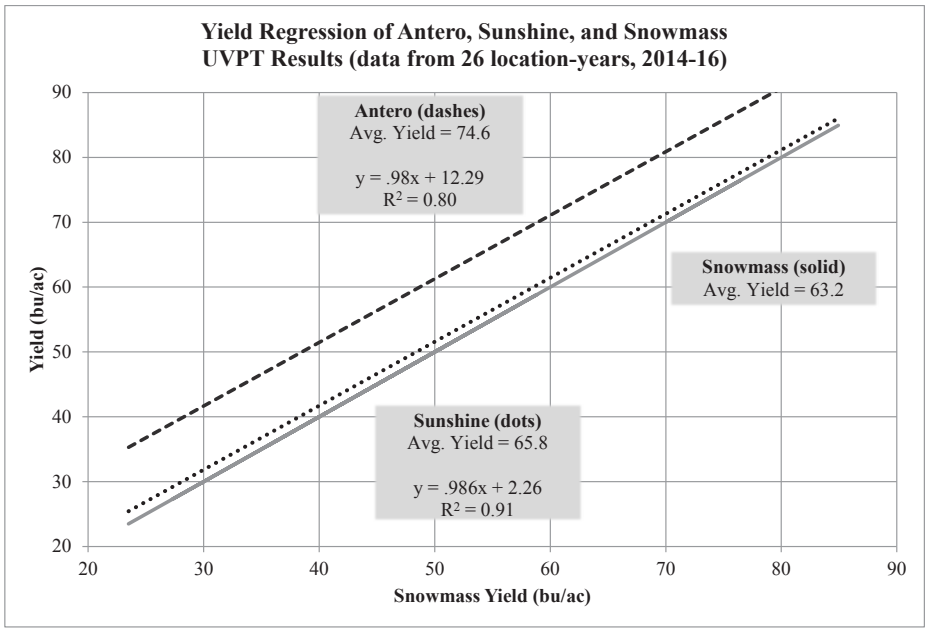
In the graph above of Langin and WB-Grainfield, the regression line of Langin (dashed) is above WB-Grainfield at yields above 40 bu/ac. Langin is predicted to yield somewhat lower than WB-Grainfield in low yield environments and higher than WB-Grainfield in high yield environments. If WB-Grainfield yielded 30 bu/ac, then we would predict Langin to yield 29.3 bu/ac. If WB-Grainfield yielded 80 bu/ac, then we would predict Langin to yield 83.3 bu/ac.



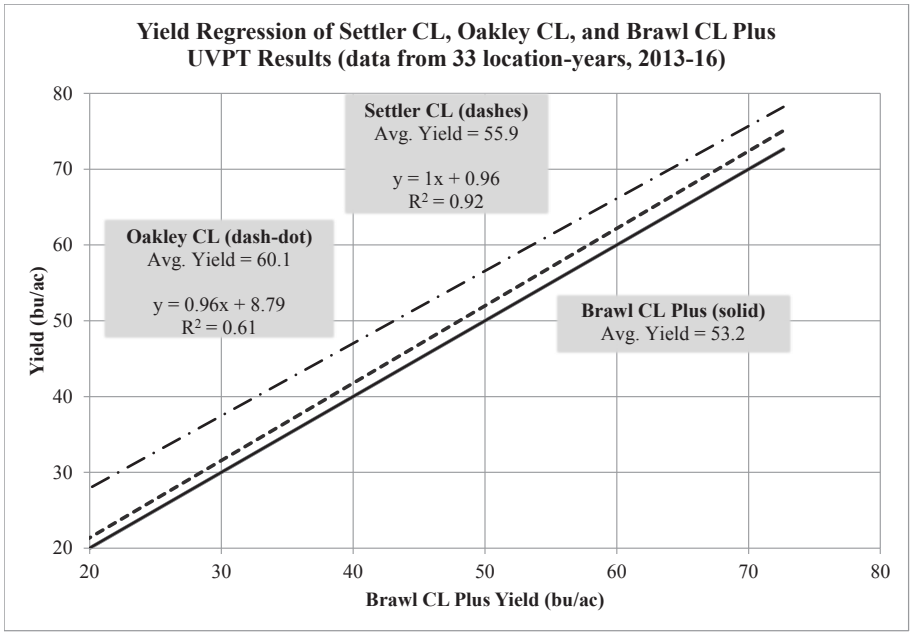
The above graph compares Langin and SY Monument. At all yield levels, Langin is predicted to yield very similar to SY Monument.



The graph above shows the comparison of two hard red varieties, Avery and SY Monument. At low yield levels, Avery is predicted to have a slightly higher yield than SY Monument, while at higher yield levels, SY Monument is predicted to yield slightly higher than Avery. When SY Monument yields 30 bu/ac, Avery is predicted to yield 32.6 bu/ac, and at a SY Monument yield of 80 bu/ac, Avery is predicted to yield 78.8 bu/ac.



This graph shows a comparison among three hard white winter varieties, Antero and Sunshine over Snowmass. There is not a substantial predicted difference in yield between Snowmass and Sunshine. Antero is predicted to be much higher yielding (by 11 or 12 bu/ac) than either Snowmass or Sunshine at all yield levels.



The final graph shows a comparison among three Clearfield varieties, Settler CL, Oakley CL, and Brawl CL Plus. Oakley CL will be higher yielding than Brawl CL Plus by 6 or 7 bu/ac across all yield environments. Settler CL is predicted to yield lower than Oakley CL at very low yields, and about 5 bu/ac lower than Oakley CL at high yield levels. Settler CL is predicted to have a very similar yield to Brawl CL Plus at all yield levels.

2016 Collaborative On-Farm Test (COFT) Variety Performance Results

Jerry Johnson, Wilma Trujillo, Dennis Kaan, Ron Meyer, Brian Talamantes, Kelly Roesch, and Sally Sauer

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 2016, five varieties were included: Byrd (popular HRW), Denali (HRW), Sunshine (high quality HWW), Avery (newly released HRW) and WB-Grainfield (HRW from WestBred). 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 20th 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 2015, over 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 2016, there were extremes in yield across Colorado. The highest yielding strip was over 105 bu/acre while the lowest recorded yield this year was 21 bu/acre. Yields were affected by stripe rust, winter drought, viruses, and hail.

The varieties tested in COFT this year fit different farmer needs. Farmers wanting to grow white wheat with high exceptional quality should consider Sunshine, the top yielding variety in this year's COFT. Denali is a great HRW option that is medium-late maturing and has very good test weight. Avery is a new HRW option that is medium-maturing and has above-average test weight. WB-Grainfield is an early-maturing HRW variety that has excellent test weight and good stripe rust resistance. Byrd is a medium-maturing HRW variety that has done well in the COFT, especially during drought years. 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.

We should not be lulled into complacency by the good precipitation received in 2014 through 2016. It should not be forgotten that drought is the major yield-determining factor in eastern Colorado. You can't spray for drought!

2016 Collaborative On-Farm Test (COFT) Variety Performance Results

	2016 Varieties[a]											
	Sunshine		Denali		Avery		WB-Grainfield		Byrd		COFT Average	
County/Nearest Town	Yield[b]	Test Weight	Yield[b]	Test Weight	Yield[b]	Test Weight	Yield[b]	Test Weight	Yield[b]	Test Weight	Yield[b]	Test Weight
	bu/ac	lb/bu	bu/ac	lb/bu	bu/ac	lb/bu	bu/ac	lb/bu	bu/ac	lb/bu	bu/ac	lb/bu
Adams/Prospect Valley	52.0	62.4	42.6	62.1	37.5	61.6	47.4	63.7	35.3	60.2	*43.0*	*62.0*
Baca/Pritchett	67.0	58.3	64.7	59.0	64.3	57.4	63.5	58.3	63.9	57.4	*64.7*	*58.1*
Baca/Two Buttes	53.3	54.4	47.7	54.7	51.1	55.7	52.2	56.0	50.5	54.9	*51.0*	*55.1*
Baca/Vilas	78.8	56.4	80.0	56.0	83.7	55.3	68.5	56.4	79.7	56.2	*78.2*	*56.1*
Cheyenne/Cheyenne Wells	62.0	59.3	71.4	59.7	58.1	57.6	60.5	58.1	60.0	58.2	*62.4*	*58.6*
Kiowa/Haswell	26.1	-	23.6	-	32.7	-	20.6	-	24.8	-	*25.6*	-
Kit Carson/Bethune	63.5	53.0	70.7	53.8	66.2	53.3	56.5	57.7	61.6	53.5	*63.7*	*54.3*
Kit Carson/Burlington N	108.1	57.1	100.9	58.4	104.3	56.8	94.7	58.5	96.3	58.1	*100.8*	*57.8*
Lincoln/Arriba	84.8	56.2	78.9	54.9	74.4	55.1	78.1	55.9	72.5	55.0	*77.7*	*55.4*
Logan/Leroy	83.3	60.4	74.4	60.8	70.7	60.6	79.9	62.3	60.6	60.5	*73.8*	*60.9*
Phillips/Haxtun	80.5	55.5	69.8	55.2	71.3	53.2	77.0	55.5	73.4	54.9	*74.4*	*54.9*
Prowers/Lamar	54.9	56.3	51.2	57.1	51.3	55.9	52.7	57.3	59.4	56.0	*53.9*	*56.5*
Prowers/Lamar S	80.7	57.2	75.4	57.0	84.4	57.3	74.8	57.8	81.4	57.3	*79.3*	*57.3*
Washington/Akron	67.1	62.1	72.8	61.5	63.3	60.3	62.4	61.6	67.3	61.1	*66.6*	*61.3*
Washington/Akron S	72.0	61.5	72.3	61.0	72.5	61.3	72.5	61.1	78.8	60.2	*73.6*	*61.0*
Washington/Central	79.6	59.6	78.1	60.1	80.1	59.2	74.5	59.3	71.5	59.3	*76.8*	*59.5*
Weld/Keenesburg	91.9	65.0	66.0	62.0	62.7	60.7	82.1	64.6	61.2	60.2	*72.8*	*62.5*
Weld/New Raymer SE	36.8	59.9	38.3	60.9	36.5	59.4	36.7	59.4	34.3	61.7	*36.5*	*60.3*
Weld/New Raymer SW	72.4	59.2	73.3	59.6	-	-	78.3	59.1	71.7	58.6	*73.9*	*59.1*
Weld/Roggen	64.4	63.1	73.3	62.4	68.2	62.1	61.8	63.0	66.9	61.8	*66.9*	*62.5*
Average	**69.0**	**58.8**	**66.3**	**58.7**	**64.9**	**57.9**	**64.7**	**59.2**	**63.6**	**58.2**	***65.8***	***58.6***
Yield Significance[c]	A		B		B		B,C		C			
Test Weight Significance[c]		B		B		C		A		C		

$LSD_{(P<0.30)}$ for yield = 1.7 bu/ac

$LSD_{(P<0.30)}$ for test weight = 0.3 lb/bu

[a]Varieties are ranked left to right by highest average yield.

[b]All yields are corrected to 12% moisture.

[c]Yield and test weight significance: varieties with different letters have yields or test weights that are significantly different from one another.

Summary of 2016 COFT Variety Results (20 tests included)

Variety	Yield[a]	Test Weight
	bu/ac	lb/bu
Sunshine	69.0	58.8
Denali	66.3	58.7
Avery	64.9	57.9
WB-Grainfield	64.7	59.2
Byrd	63.6	58.2
Average	**65.8**	**58.6**
$LSD_{(0.30)}$	1.7	0.3

[a]Yield corrected to 12% moisture.

Summary of 2-year (2015 and 2016) Irrigated Variety Performance Results at Fort Collins

Variety[a]	Brand/Source	Market Class[b]	2-Year Average Yield	Yield	Test Weight	Plant Height	Heading	Lodging
			bu/ac	% trial average	lb/bu	in	days from trial average	scale (1-9)[c]
CO11D1236	Colorado State Univ. exp.	HRW	98.7	122%	58.4	40	0	7
Denali	PlainsGold	HRW	97.2	120%	58.8	38	2	6
SY Sunrise	AgriPro Syngenta	HRW	92.6	114%	59.6	35	1	1
CO11D1306W	Colorado State Univ. exp.	**HWW**	92.4	114%	57.9	39	3	6
SY Wolf	AgriPro Syngenta	HRW	90.0	111%	56.9	37	2	4
Thunder CL	PlainsGold	**HWW**	86.5	107%	58.7	38	-2	2
KanMark	Kansas Wheat Alliance	HRW	84.0	104%	55.3	34	0	2
Oakley CL	Kansas Wheat Alliance	HRW	82.9	102%	55.3	38	1	7
Antero	PlainsGold	**HWW**	81.1	100%	54.5	38	0	8
Brawl CL Plus	PlainsGold	HRW	80.8	100%	57.0	37	-2	2
Cowboy	Crop Res. Found. of WY	HRW	80.4	99%	56.8	35	2	8
Avery	PlainsGold	HRW	80.4	99%	55.8	37	-1	8
CO11D1767	Colorado State Univ. exp.	HRW	79.5	98%	55.4	35	3	5
Byrd	PlainsGold	HRW	77.2	95%	55.6	37	-1	7
WB-Cedar	WestBred Monsanto	HRW	76.5	94%	54.9	33	-7	1
Langin	Colorado State Univ. exp.	HRW	75.9	94%	55.1	35	-3	7
CO11D1397	Colorado State Univ. exp.	HRW	74.7	92%	55.7	34	0	8
Hatcher	PlainsGold	HRW	73.1	90%	54.7	38	1	8
CO11D1539	Colorado State Univ. exp.	HRW	72.1	89%	53.5	37	-1	8
Yuma	CO State Univ.	HRW	65.3	81%	53.2	37	-1	6
Sunshine	PlainsGold	**HWW**	60.5	75%	53.2	34	-4	5
		Average	**81.0**		**56.0**	**36**		**5**

[a]Varieties ranked according to average 2-year yield at Fort Collins.

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

[c]Lodging scale: 1=no lodging, 9=severe lodging.

Summary of 3-year (2014, 2015, and 2016) Irrigated Variety Performance Results at Fort Collins

			3-Year Average					
Variety[a]	Brand/Source	Market Class[b]	Yield	Yield	Test Weight	Plant Height	Heading	Lodging
			bu/ac	% trial average	lb/bu	in	days from trial average	scale (1-9)[c]
Denali	PlainsGold	HRW	101.1	116%	59.8	37	2	4
SY Wolf	AgriPro Syngenta	HRW	93.8	108%	58.3	35	1	3
Thunder CL	PlainsGold	**HWW**	91.9	106%	59.3	36	-1	2
Avery	PlainsGold	HRW	91.6	105%	57.7	35	0	6
Antero	PlainsGold	**HWW**	91.1	105%	56.8	36	0	6
Cowboy	Crop Res. Found. of WY	HRW	90.3	104%	58.5	34	2	6
KanMark	Kansas Wheat Alliance	HRW	88.0	101%	57.7	33	1	2
Byrd	PlainsGold	HRW	88.0	101%	57.5	35	-1	6
Langin	Colorado State Univ. exp.	HRW	85.0	98%	56.9	33	-3	6
Oakley CL	Kansas Wheat Alliance	HRW	84.9	98%	57.3	36	1	5
Hatcher	PlainsGold	HRW	83.6	96%	56.6	35	0	6
Brawl CL Plus	PlainsGold	HRW	83.5	96%	58.3	36	-2	2
WB-Cedar	WestBred Monsanto	HRW	83.1	96%	56.5	31	-6	1
Yuma	CO State Univ.	HRW	77.1	89%	56.0	35	-1	5
Sunshine	PlainsGold	**HWW**	72.4	83%	55.8	33	-3	3
		Average	**87.0**		**57.5**	**35**		**4**

[a]Varieties ranked according to average 3-year yield at Fort Collins.

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

[c]Lodging scale: 1=no lodging, 9=severe lodging.

Summary of 2-year (2015 and 2016) Irrigated Variety Performance Results at Haxtun

Variety[a]	Brand/Source	Market Class[b]	2-Year Average Yield	2-Year Average Yield	2-Year Average Test Weight	2-Year Average Plant Height	Lodging[c]
			bu/ac	% trial average	lb/bu	in	scale (1-9)[d]
WB-Cedar	WestBred Monsanto	HRW	91.9	124%	58.7	32	3
Sunshine	PlainsGold	**HWW**	86.8	117%	54.6	35	5
Langin	Colorado State Univ. exp.	HRW	84.8	115%	59.0	36	9
SY Sunrise	AgriPro Syngenta	HRW	84.6	114%	57.5	34	3
SY Wolf	AgriPro Syngenta	HRW	82.2	111%	54.8	35	4
CO11D1767	Colorado State Univ. exp.	HRW	79.4	107%	56.3	38	6
Denali	PlainsGold	HRW	78.6	106%	58.4	39	5
CO11D1306W	Colorado State Univ. exp.	**HWW**	73.4	99%	55.6	38	6
Byrd	PlainsGold	HRW	73.4	99%	56.9	36	7
KanMark	Kansas Wheat Alliance	HRW	72.5	98%	56.5	33	2
Antero	PlainsGold	**HWW**	72.4	98%	55.5	37	8
Brawl CL Plus	PlainsGold	HRW	71.1	96%	56.9	36	3
Oakley CL	Kansas Wheat Alliance	HRW	70.6	95%	53.7	37	8
CO11D1236	Colorado State Univ. exp.	HRW	70.0	95%	56.2	38	7
Yuma	CO State Univ.	HRW	69.8	94%	55.1	36	6
CO11D1539	Colorado State Univ. exp.	HRW	68.8	93%	53.8	38	8
Avery	PlainsGold	HRW	67.0	91%	56.8	37	7
CO11D1397	Colorado State Univ. exp.	HRW	66.9	90%	53.6	34	5
Thunder CL	PlainsGold	**HWW**	66.2	89%	55.1	37	1
Hatcher	PlainsGold	HRW	62.9	85%	56.0	35	7
Cowboy	Crop Res. Found. of WY	HRW	60.7	82%	55.7	37	8
		Average	**74.0**		**56.0**	**36**	**6**

[a]Varieties ranked according to average 2-year yield at Haxtun.

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

[c]Lodging scores based on 2016 data.

[d]Lodging scale: 1=no lodging, 9=severe lodging.

Summary of 3-year (2014, 2015, and 2016) Irrigated Variety Performance Results at Haxtun

Variety[a]	Brand/Source	Market Class[b]	3-Year Average Yield	3-Year Average Yield	3-Year Average Test Weight	3-Year Average Plant Height	Lodging[c]
			bu/ac	% trial average	lb/bu	in	scale (1-9)[d]
WB-Cedar	WestBred Monsanto	HRW	102.3	113%	59.8	30	3
Langin	Colorado State Univ. exp.	HRW	98.1	109%	59.6	34	8
SY Wolf	AgriPro Syngenta	HRW	97.1	107%	55.5	33	3
Sunshine	PlainsGold	**HWW**	96.0	106%	56.1	34	4
Denali	PlainsGold	HRW	95.7	106%	59.5	38	5
Antero	PlainsGold	**HWW**	93.0	103%	57.3	36	7
KanMark	Kansas Wheat Alliance	HRW	91.7	101%	57.9	32	2
Oakley CL	Kansas Wheat Alliance	HRW	89.8	99%	55.6	36	7
Brawl CL Plus	PlainsGold	HRW	89.4	99%	58.3	35	4
Byrd	PlainsGold	HRW	89.1	99%	58.6	35	7
Avery	PlainsGold	HRW	83.8	93%	58.2	36	7
Yuma	CO State Univ.	HRW	83.4	92%	57.4	35	5
Thunder CL	PlainsGold	**HWW**	82.8	92%	56.2	36	2
Cowboy	Crop Res. Found. of WY	HRW	82.6	91%	56.9	36	6
Hatcher	PlainsGold	HRW	80.8	89%	57.5	34	7
		Average	**90.4**		**57.6**	**35**	**5**

[a]Varieties ranked according to average 3-year yield at Haxtun.

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

[c]Lodging scores based on 2014 and 2016 data.

[d]Lodging scale: 1=no lodging, 9=severe lodging.

Winter Wheat Variety Selection in Colorado for Fall 2016 Planting

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

- Producers should focus on multi-year and multi-location yield summary results when selecting a new variety – use results from the variety performance trials and from the on-farm tests.

- Producers should 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 (2016) for variety-specific information. There are descriptions in this table for all of the varieties entered in the 2015-2016 variety trials. Use the decision tree to choose the right variety with the right traits.

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

- Producers should 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 resistance/susceptibility, market prices, expected yield levels, and fungicide and application costs warrant an application, farmers should consult the North Central Regional Committee on Management of Small Grain Diseases (NCERA-184) fungicide efficacy chart. Regular updates to this chart can be found on the CSU Wheat Breeding Program "Wheat Links" page (wheat.colostate.edu/links.html).

- Producers should 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

- Producers should 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 virus, Triticum mosaic virus) or vectored by aphids (barley yellow dwarf virus).

- Producers should 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

- Producers should 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 directly at the following link: bit.ly/1MS5Hdh

Dryland Variety Performance – 2016

Many new varieties possessing multiple valuable traits and superior dryland or irrigated yields are currently available. The six top yielding varieties described in greater detail below are based on their rank in three-year average dryland yield performance.

Antero – A hard white wheat (HWW), released in 2012, and marketed by PlainsGold. It is very high-yielding and has had the highest three-year average dryland yield for three years in a row. It was also the top-yielding variety in the 2014 COFT. It has medium height and maturity, good drought stress tolerance, average test weight, good stripe rust resistance, and moderate sprouting tolerance (similar to Hatcher). A grower premium is not offered by Ardent Mills for Antero grown in Colorado.

Oakley CL – A medium-maturing hard red wheat (HRW) released in 2013 by Kansas State University-Hays and marketed by Kansas Wheat Alliance. It is a single-gene Clearfield variety. It has medium height and average test weight, and has very good stripe rust resistance. It has good milling and baking characteristics, and good wheat streak mosaic virus (WSMV) resistance.

SY Monument – A HRW variety released from AgriPro Syngenta in 2014 with medium-late maturity, average height, and above-average test weight. It has good drought tolerance and very good resistance to current races of stripe and leaf rusts.

Langin – An early-maturing HRW, released in 2016, and marketed by PlainsGold. It has very good test weight, is shorter in height, and has good quality. It has good stripe rust resistance and carries wheat curl mite resistance.

Avery – A medium-maturing, medium-height, HRW released in 2015 and marketed by PlainsGold. This variety is similar to Byrd, but has higher yield potential, larger kernels, and slightly better quality. Avery has above-average test weight. It carries wheat curl mite resistance and is moderately-susceptible to susceptible to stripe rust.

Denali – 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 (as in 2012). It is medium-tall, has excellent test weight and average milling and baking quality, and is moderately-susceptible to susceptible to current races of stripe rust.

Variety Selection for Irrigated Production Conditions at Haxtun and Fort Collins

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 five yielding varieties at each irrigated variety trial location based on a three-year average are shown below. Variety selection recommendations are not included for Rocky Ford as trials could not be harvested in 2014 and 2015.

Haxtun

WB-Cedar – An early-maturing HRW, marketed by WestBred Monsanto. It has good leaf and stripe rust resistance and excellent straw strength for high-input irrigated conditions. It has below-average winterhardiness.

Langin – See dryland description above. It has marginal straw strength for irrigated production.

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 stripe rust. Very good straw strength and good quality.

Sunshine – An early-maturing HWW released in 2014 and marketed by PlainsGold. It was the highest yielding variety in the 2015-16 Collaborative On-Farm Tests. It has excellent quality, average straw strength, and an intermediate reaction to stripe rust. A grower premium is offered through the CWRF-Ardent Mills Ultragrain Premium Program.

Denali – See dryland description above. It has above-average straw strength.

Fort Collins

Denali – See descriptions above.

SY Wolf – See irrigated description above.

Thunder CL – A medium-maturing, single-gene Clearfield HWW marketed by PlainsGold. It has very good straw strength, moderate stripe and leaf rust resistance, moderate resistance to wheat streak mosaic virus, and is shorter in height. This variety has excellent quality and a grower premium is offered through the CWRF-Ardent Mills Ultragrain Premium Program.

Avery – See dryland description above. It has marginal straw strength for irrigated production.

Antero – See dryland description above. It has very high yields under dryland and irrigated conditions, but marginal straw strength for fully-irrigated production conditions.

Description of Winter Wheat Varieties in Eastern Colorado Dryland and Irrigated Trials (2016)

Name, Class, and Pedigree	Origin	RWA*	HD	HT	SS	COL**	YR	LR	WSMV+	TW	MILL	BAKE	Comments
Akron Hard red winter TAM 107/Hail	CSU 1994	S	5	6	7	4	9	9	9	8	6	3	CSU release (1994). Vigorous growth, closes canopy early in spring and competes well with weeds. Leaf and stripe rust susceptible. Lower yields relative to more recent wheat releases, entered as historical check.
Antero Hard white winter KS01HW152-1/TAM 111	CSU 2012	S	3	6	8	6	2	7	5	5	3	6	CSU release (2012), marketed by PlainsGold. Medium height and maturity, good test weight, average straw strength, good resistance to stripe rust. Moderate sprouting tolerance.
Avery Hard red winter TAM 112/Byrd	CSU 2015	S	7	5	7	7	6	7	6+	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. Intermediate reaction to stripe rust.
Brawl CL Plus Hard red winter Teal 11A/Above//CO99314	CSU 2011	S	1	6	3	8	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 to reaction to both stripe rust and leaf rust.
Byrd Hard red winter TAM 112/CO970547-7	CSU 2011	S	4	5	7	7	7	7	6+	4	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.
Cowboy Hard red winter CO980829/TAM 111	WY-CSU 2011	R*	8	4	8	3	7	7	7	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).
Denali Hard red winter CO980829/TAM 111	CSU 2011	S	8	7	5	7	7	7	6	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.
Doublestop CL Plus Hard red winter N91D2308-13/OK03908C//OK03928C	OK 2013	S	4	5	3	8	3	3	6	4	3	3	Oklahoma State release (2013), marketed by Oklahoma Genetics Inc. First entered in CSU Variety Trials in 2016. Two-gene Clearfield wheat. Good leaf and stripe rust resistance, good test weight, good milling and baking quality.
Hatcher Hard red winter Yuma/PI 372129//TAM-200/3/4*Yuma/4/KS91H184/Vista	CSU 2004	R*	6	2	7	4	5	7	8	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.
Joe Hard white winter KS04HW101-3(98HW423/98HW170)/KS04HW119-3(TREGO*2/CO960293)	KSU 2015	S	6	6	7	5	1	2	2	4	4	4	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. Intermediate pre-harvest sprouting tolerance.

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.

* 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 for Byrd, TAM 112, and Avery are based on mechanical WSMV inoculation and do not take into account their resistance to the wheat curl mite vector of WSMV.

Description of Winter Wheat Varieties in Eastern Colorado Dryland and Irrigated Trials (2016)

Name, Class, and Pedigree	Origin	RWA*	HD	HT	SS	COL**	YR	LR	WSMV+	TW	MILL	BAKE	Comments
KanMark Hard red winter PRL/2*PASTOR//G980129W/3/KS970104-3-13	KSU 2014	S	7	2	2	5	6	2	6	3	3	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.
Langin Hard red winter CO050270/Byrd	CSU 2016	S	2	2	8	5	3	7	6+	3	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	5	2	5	2	1	7	3	6	4	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	6	7	6	4	4	8	6	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.
MTS1024 Hard red winter MT02113*4/MTS0359	MT EXP	S	9	2	2	4	4	--	--	9	7	2	MT State experimental, first entered into CSU trials in 2015. Potential release in Wyoming in 2016. Late maturity, good stripe rust resistance. Carries solid stem trait conferring some protection against wheat stem sawfly damage.
Oakley CL Hard red winter Above/Danby//KS03HW10	KSU 2013	S	7	5	8	6	1	4	2	4	3	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.
Prairie Red Hard red winter CO850034/PI372129//5*TAM 107	CSU 1998	R*	2	3	3	8	9	9	5	7	5	4	CSU release (1998), marketed by PlainsGold. Biotype 1 RWA-resistant version of TAM 107. Good stress tolerance, poor end-use quality, leaf and stripe rust susceptible. Lower yields relative to more recent wheat releases, entered as historical check.
Ripper Hard red winter CO940606/TAM107R-2	CSU 2006	R*	2	5	4	8	9	9	7	7	5	4	CSU release (2006), marketed by PlainsGold. Early-maturing, long coleoptile. Excellent drought stress tolerance, good baking quality. Very good recovery from stand reduction. Leaf and stripe rust susceptible, lower test weight.
Ruth Hard red winter OK98697/Jagalene//Camelot	NE 2015	S	4	5	4	5	3	6	7	2	3	5	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 N95L164/3/MILLENNIUM SIB//TXGH125888-120*4/FS2	NE 2008	S	7	4	2	6	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.

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Description of Winter Wheat Varieties in Eastern Colorado Dryland and Irrigated Trials (2016)

Name, Class, and Pedigree	Origin	RWA*	HD	HT	SS	COL**	YR	LR	WSMV+	TW	MILL	BAKE	Comments
Snowmass Hard white winter KS96HW94//Trego/CO960293	CSU 2009	S	4	8	8	4	6	6	2	4	6	2	CSU release (2009), marketed by PlainsGold in CWRF-Ardent Mills Ultragrain Premium Program. Hard white wheat. Medium-maturing, medium-tall. Good WSMV resistance, moderately susceptible to stripe rust, moderate sprouting tolerance.
Sunshine Hard white winter KS01HW152-6/HV9W02-267W	CSU 2014	S	2	5	5	8	5	8	--	7	3	1	CSU release (2014), marketed by PlainsGold in CWRF-Ardent Mills Ultragrain Premium Program. Hard white wheat. Excellent quality, good sprouting tolerance and straw strength, intermediate reaction to stripe rust.
SY Monument Hard red winter BC991149-11/00x0090-4	Agripro 2014	S	8	6	5	6	2	1	7	5	4	1	Agripro release (2014). First entered in CSU Variety Trials in 2014. Good drought tolerance, winterhardiness, quality, and resistance to both leaf and stripe rust.
SY Sunrise Hard red winter BC98337-10-53/CDC Falcon//NE03458	Agripro 2015	S	7	3	2	5	2	3	7	2	3	8	Agripro release (2015), first entered in CSU Irrigated Trials in 2015. Short semidwarf with good straw strength, winterhardiness, drought tolerance, stripe rust resistance, test weight. Stewardship Agreement requires no saved seed. Certified seed only.
SY Wolf Hard red winter W99-331/97x0906-8	Agripro 2010	S	7	5	3	4	3	1	6	6	3	6	Agripro 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.
TAM 114 Hard red winter TAM 111/TX98A0050	TX 2014	S	4	6	8	8	2	4	7	2	4	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.
TAM 204 Hard red winter TAM 112/3/Mason/Jagger//Pecos	TX 2014	S	6	3	2	5	2	6	3	9	6	8	Texas A&M release (2014), marketed by Watley seed. First entered in CSU trials in 2015. Awnless for grazing/dual purpose. Good resistance to stripe rust. Carries wheat curl mite resistance from TAM 112 parent.
Thunder CL Hard white winter KS01-5539/CO99W165	CSU 2008	R*	4	5	2	7	4	5	4	6	5	3	CSU release (2008), marketed by PlainsGold in CWRF-Ardent Mills Ultragrain Premium Program. Single-gene hard white Clearfield wheat. Good straw strength for irrigation. Excellent quality, moderate stripe rust resistance, moderate sprouting susceptibility.
WB-Cedar Hard red winter TAM 302/B1551W	Westbred 2010	S	2	2	2	5	3	5	7	7	3	7	Westbred release (2010). First entered in CSU Variety Trials in 2011. Hard red selection from Aspen HWW. Good stripe rust resistance, excellent straw strength for high-input/full irrigation. Very drought susceptible, lower test weight.
WB-Grainfield Hard red winter G982231/G982159//KS920709W	Westbred 2012	S	2	7	4	2	2	3	7	4	3	6	Westbred release (2012). First entered into CSU Trials in 2013. Early maturing tall semi-dwarf. Good leaf and stripe rust resistance, shorter coleoptile.

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.

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Description of Winter Wheat Varieties in Eastern Colorado Dryland and Irrigated Trials (2016)

Name, Class, and Pedigree	Origin	RWA*	HD	HT	SS	COL**	YR	LR	WSMV+	TW	MILL	BAKE	Comments
WB4303 Hard red winter PFAU/WEAVER/3/MASON/JGR//PECOS/4/FARMEC	Westbred 2015	S	3	4	1	--	6	2	7	8	2	2	Westbred 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.
WB4458 Hard red winter KS940786-7//G982163/G982002	Westbred 2012	S	2	6	3	--	5	5	6	4	6	6	Westbred 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.
WB4721 Hard red winter Not Disclosed	Westbred 2016	S	3	5	2	2	3	2	8	1	3	3	Westbred release (2016), first entered in CSU Variety Trials in 2016. Medium height, medium-late maturity. Good test weight, winterhardiness, drought tolerance, straw strength, and quality. Good resistance to stripe and leaf rust.
Winterhawk Hard red winter 474S10-1/X87807//HBK736-3	Westbred 2007	S	4	7	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.
Yuma Hard red winter NS14/NS25//2*Vona	CSU 1991	S	6	3	6	1	8	5	6	6	5	4	CSU release (1991). Medium maturity, semidwarf, short coleoptile, good baking quality characteristics. Susceptible to stripe rust. Long-term check for irrigated conditions.

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.

* 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.

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2016 Wheat Variety Decision Tree for Dryland Production

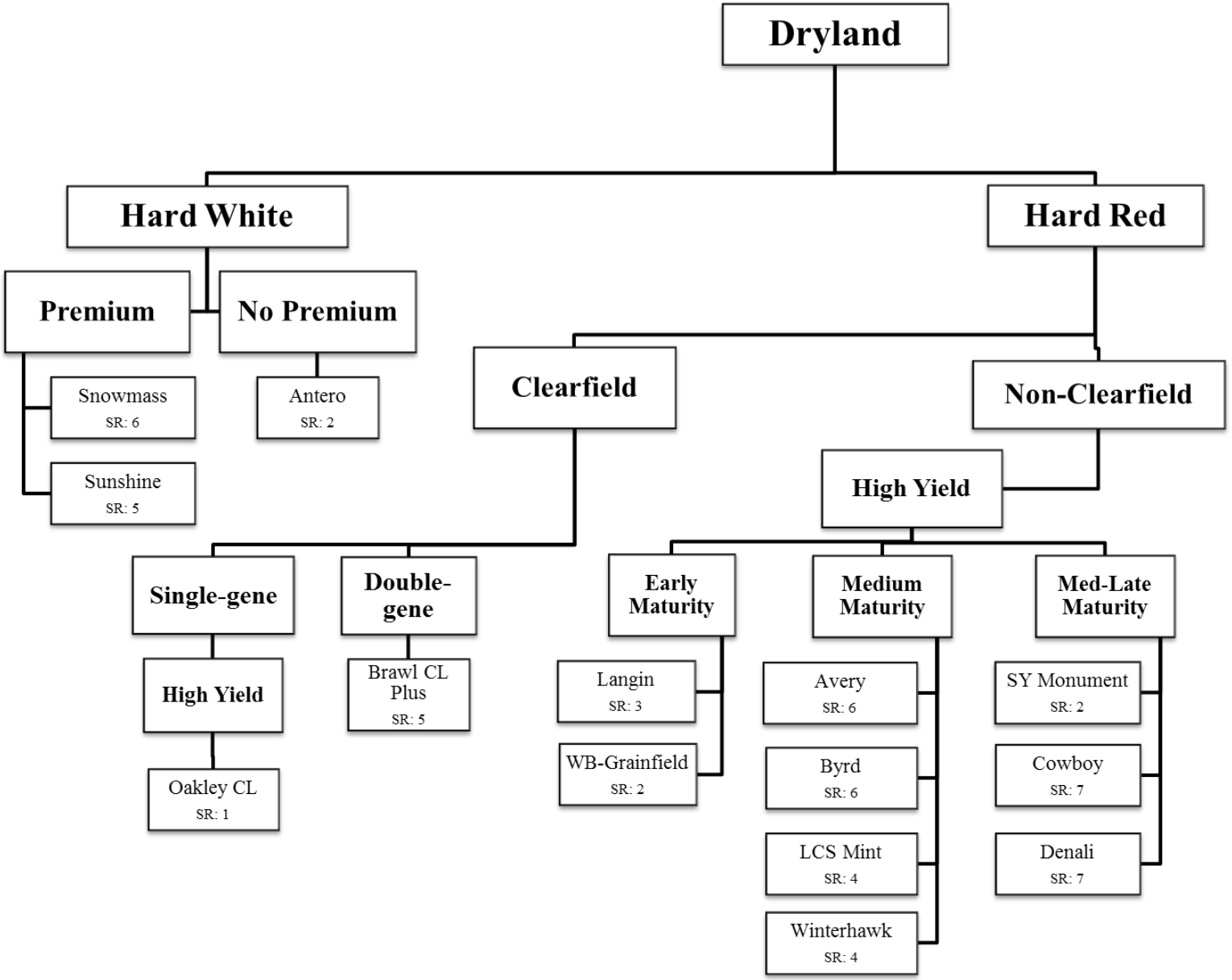
Jerry Johnson and Sally Sauer

The decision tree on the following page will help you 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 (2014-16) average yield above 100% when the trial average yield of 65.2 bu/ac is considered as 100%. Under each variety name are the letters SR for stripe rust with 1 being very resistant and 9 being very susceptible.

For farmers choosing to grow hard white wheat, you can decide whether you want to get into a premium program (CWRF-Ardent Mills Ultragrain Premium Program) that can pay an extra $.40 to $1.00 a bushel for growing Snowmass or Sunshine. Or, you can forego the premium program and plant Antero – a high-yielding white wheat adapted to the Great Plains.

If you decide to plant hard red winter wheat, there are substantially more options, and therefore some more decisions to be made. The first decision is whether you are going to plant a Clearfield variety or not. This may be an easy decision for some farmers. One of the Clearfield varieties, Brawl CL Plus, is a two-gene Clearfield variety. This means the herbicide Beyond can be mixed with methylated seed oil to make it more potent on some of the more intractable winter annual grasses, and especially volunteer rye. Brawl CL Plus has good test weight and quality, is early-maturing, an intermediate reaction to stripe rust, and a moderate resistance to leaf rust. The high-yielding, single-gene Clearfield wheat variety, Oakley CL, released by Kansas State University and marketed by the Kansas Wheat Alliance was the second-highest-yielding variety on a three-year average in our trials. It has average test weight and excellent stripe rust resistance.

Among the non-Clearfield, high-yielding varieties, WB-Grainfield and Langin are the two early-maturing varieties. WB-Grainfield is a tall semi-dwarf with very good stripe rust resistance. Langin is a new CSU release this year that is a semi-dwarf with good test weight and good stripe rust resistance. For the high-yielding, medium-maturing varieties, there are four options: Avery, Byrd, LCS Mint, and Winterhawk. Avery is similar to Byrd with a higher yield potential, above-average test weight, and a moderately-susceptible to susceptible reaction to stripe rust. LCS Mint has good test weight and is moderately resistant to stripe rust. Winterhawk has good drought tolerance and test weight, and is moderately resistant to stripe rust. The last group of high-yielding, non-Clearfield varieties are medium-to-late maturity varieties SY Monument, Denali, and Cowboy. SY Monument was third from the top for yield in the 2016 three-year summary and has average test weight and very good stripe rust resistance. Denali has excellent test weight and is susceptible to stripe rust. Cowboy is a medium height variety that is susceptible to stripe rust.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Premium
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Snowmass
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Sunshine
SR: 5
Antero
SR: 2
Clearfield
Non-Clearfield
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Single-gene
Double-gene
Early Maturity
Medium Maturity
Med-Late Maturity
High Yield
Oakley CL
SR: 1
Brawl CL Plus
SR: 5
Langin
SR: 3
WB-Grainfield
SR: 2
Avery
SR: 6
Byrd
SR: 6
LCS Mint
SR: 4
Winterhawk
SR: 4
SY Monument
SR: 2
Cowboy
SR: 7
Denali
SR: 7

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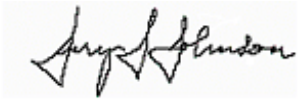

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