Avery Hard Red Winter Wheat (CO11D174)

Colorado State University Wheat Breeding Program

General

- Pedigree - TAM 112/Byrd; cross made 2009, doubled haploid generated in 2010
- Characteristics

Chaff color	white	Stripe rust	moderately susceptible
Awns	awned	Leaf rust	susceptible
Plant height	medium-tall	Stem rust	susceptible
Maturity	medium	RWA (biotype 1 and 2)	susceptible
Coleoptile length	medium	Hessian fly	susceptible
Straw strength	average	Greenbug (biotype E)	resistant
Test weight	average	Wheat curl mite	resistant
Pre-harvest sprouting	good (similar to Hatcher)	Wheat streak mosaic	moderately susceptible
		Barley yellow dwarf	tolerant
		WSBMV/WSSMV	resistant

Field Performance

Avery has been tested in Colorado and Western Kansas in the CSU Elite Trial since 2013. Data from these trials are summarized below; entries are ranked by the three-year dryland average (**bold**).

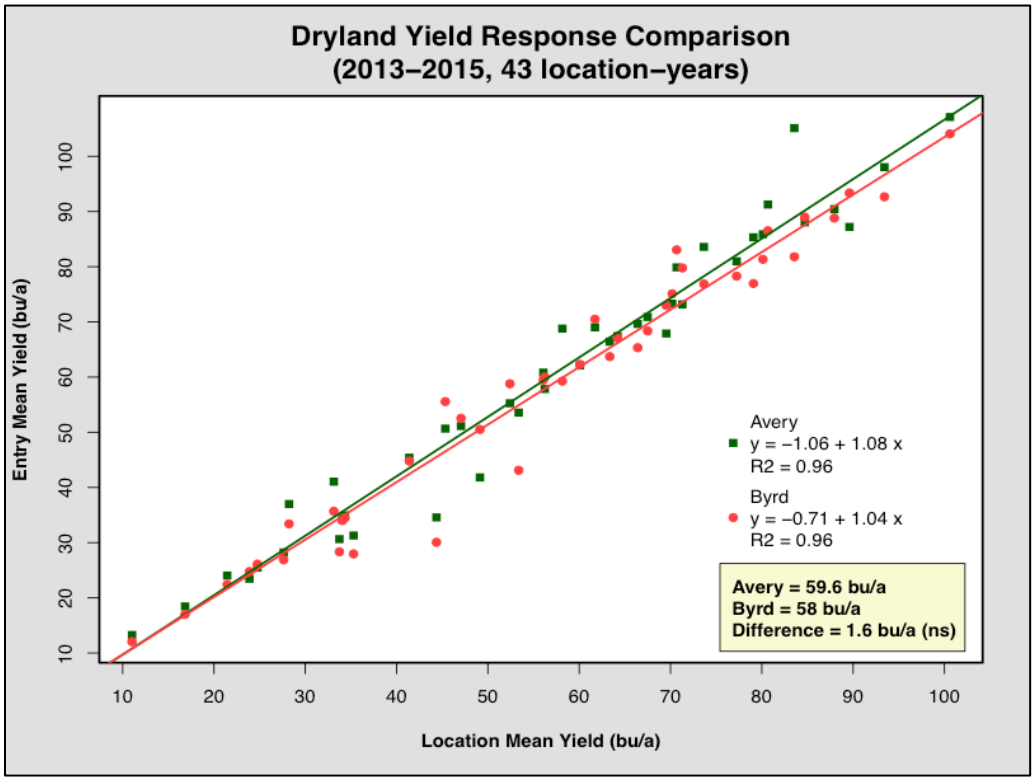
Entry	2013	2014	2015	2 Yr Avg	3 Yr Avg	Avg TestWt	NE CO	SE CO	Irrig CO-NE	Western KS
Antero	33.6	67.0	68.7	67.8	**58.2**	59.0	62.2	37.2	96.2	52.5
Avery	**34.2**	**67.5**	**64.6**	**66.2**	**57.2**	**58.4**	**61.1**	**37.2**	**90.7**	**47.0**
Denali	34.1	65.7	66.6	66.1	**57.1**	59.2	61.1	36.3	89.8	47.5
Byrd	33.3	65.5	65.7	65.6	**56.6**	58.7	60.2	37.7	88.8	48.4
LCS Mint	34.8	63.5	59.0	61.5	**54.0**	59.1	57.2	37.3	95.3	47.6
Snowmass	31.4	60.7	63.8	62.1	**53.5**	58.2	56.9	35.6	89.1	41.3
Hatcher	32.7	64.1	57.0	61.0	**53.1**	58.0	56.7	34.1	83.8	46.1
Brawl CL Plus	33.9	61.2	56.9	59.3	**52.2**	58.8	55.6	34.2	81.0	48.4
Average	33.5	64.4	62.8	63.7	**55.2**	58.7	58.8	36.2	89.3	47.4
Locations	7	10	8	18	**25**	25	21	4	6	7

Avery was tested in Colorado dryland (UVPT) Variety Trials in 2013 and 2014. A subset of the entries from these trials is summarized below (entries are ranked by two-year average **in bold**).

Entry	2014 Yield	2015 Yield	Average Yield	Northeast Yield Avg	Southeast Yield Avg	Average Test Wt
Antero	62.3	76.7	**69.5**	79.3	43.9	59.5
SY Monument	56.7	74.1	**65.4**	75.7	38.6	59.9
Oakley CL	58.0	72.2	**65.1**	73.3	43.7	59.0
Denali	59.2	67.4	**63.3**	73.1	37.9	60.8
Avery	**64.1**	**61.9**	**63.0**	**71.0**	**42.2**	**60.3**
WB-Grainfield	54.7	66.6	**60.6**	68.5	40.1	60.6
Byrd	60.4	59.7	**60.1**	67.6	40.5	60.5
Cowboy	60.2	59.9	**60.0**	69.2	36.2	59.5
Winterhawk	55.5	64.6	**60.0**	68.2	38.8	61.2
LCS Mint	55.4	64.5	**59.9**	66.1	43.9	60.1
Sunshine	56.4	61.2	**58.8**	66.9	37.8	58.2
LCS Pistol	56.1	60.7	**58.4**	66.9	36.2	59.5
Snowmass	56.4	59.0	**57.7**	66.1	35.8	59.7
Hatcher	57.2	57.8	**57.5**	64.1	40.2	58.9
T158	54.1	57.1	**55.6**	63.2	35.7	59.5
TAM 113	54.8	55.4	**55.1**	61.1	39.4	58.9
TAM 112	54.8	53.5	**54.1**	60.7	36.9	61.6
Akron	54.8	48.3	**51.6**	58.1	34.5	59.1
Ripper	56.5	44.8	**50.6**	57.3	33.2	57.9
Prairie Red	54.5	45.8	**50.1**	56.4	33.8	58.5
Average	57.1	60.6	**58.8**	66.7	38.5	59.6
Locations	9	9	**18**	13	5	18

Data for Avery and other entries tested in the the Colorado Irrigated Variety Performance Trials (IVPT) may be found at: http://csucrops.com and http://ramwheatdb.com.

Regression of entry mean yield for Avery and Byrd on location mean yield of 43 replicated, dryland trials in Colorado from 2013 to 2015.



End-Use Quality

Avery has been evaluated in comprehensive milling and baking quality tests in the CSU Wheat Quality Laboratory since 2010. Byrd and Denali were included in these tests as checks.

Trait (unit of measurement)	Samples	Avery	Byrd	Denali
SKCS kernel weight (mg) †	15	30.0	28.3 *	30.7 ns
SKCS kernel diameter (mm)	15	2.61	2.52 *	2.58
SKCS kernel hardness (score)	15	64.0	63.4 ns	62.2 ns
Test weight (lb/bu)	15	58.9	58.8 ns	60.1 *
NIR wheat ash (%)	38	1.41	1.48 *	1.47 *
Total flour extraction (%)	15	72.7	74.0 *	71.6 *
Break flour extraction (%)	15	48.1	51.1 *	48.6 ns
NIR flour ash (%)	26	0.46	0.46	0.46 ns
Polyphenol oxidase (L-Dopa)	15	0.51	0.49 ns	0.36 *
Grain color (Minolta L*)	15	57.1	56.5 ns	55.5 *
Wheat protein content (%)	30	12.2	13.2	12.2 ns
Mixograph mixing time (min)	25	5.5	6.3 *	3.2 *
Mixograph tolerance (score) ‡	25	4.1	4.6 *	2.4 *
Bake mix time (min)	15	5.1	5.4 ns	3.1 *
Bake absorption (%)	15	62.3	63.4 ns	61.2 *
Loaf volume (cc)	15	1034	1086 *	836 *
Crumb grain (score) ‡	15	4.1	3.9 ns	2.8 *
Milling Rating		Very Good	Good	Good
Baking Rating		Good	Good	Acceptable

† Single kernel characterization system (SKCS).

‡ Mixograph tolerance and crumb grain scores: 0=very poor, 6=very good.

* Value for Byrd or Denali significantly different from Avery based on a paired t-test at the 5% probability level; ns=not significant.